

Inventory of protected area restrictions in the trilateral Wadden Sea

A comparison of the existing different
protection regimes

A&W-rapport 22-146



Commissioned by

PROGRAMMA **NAAR EEN**
RIJKE WADDENZEE

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List of abbreviations

Table 1-1 List of abbreviations and (English) definitions

Abbreviation	Definition	Definition in English (if applicable)
AIS	Automatic Identification System	
BEK 867	Bekendtgørelse 867	Order 867
BHD	Birds and Habitats Directive	
BNatSchG	Bundesnaturschutzgesetz	Federal Nature Conservation Act
CWSS	Common Wadden Sea Secretariat	
EU	European Union	
EZK	Ministerie van Economische Zaken en Klimaat	Ministry of Economic Affairs and Climate
GADM	Database of Global Administrative Areas	
GPS	Global Positioning System	
HD	Habitats Directive	
HH	Hamburg	
HmbBNatSchAG	Hamburgerisches Gesetz zur Ausführung des Bundesnaturschutzgesetzes	Hamburg Act on the Implementation of the Federal Nature Conservation Act
IenW	Ministerie van Infrastructuur en Waterstaat	Ministry of Infrastructure and Water Management
IUCN	International Union for Conservation of Nature and Natural Resources	
LFischG	Landesfischereigesetz	Schleswig-Holstein State Fisheries Act
LKN	Landesbetrieb für Küstenschutz, Nationalpark und Meeresschutz Schleswig-Holstein	Schleswig-Holstein Agency for Coastal Defence, National Park and Marine Conservation
LNatSchG	Landesnaturschutzgesetz	Schleswig-Holstein State Nature Conservation Act
LNV	Ministerie van Landbouw, Natuur en Voedselkwaliteit	Ministry of Agriculture, Nature and Food quality
LS	Lower-Saxony	
MEGMA	Monitoring Effectiveness Area Protection Measures	
MPA	Marine Protected Area	
NABU	Naturschutzbund Deutschland e.V.	Nature And Biodiversity Conservation Union
NAGBNatSchG	Niedersächsisches Ausführungsgesetz zum Bundesnaturschutzgesetz	Lower Saxony Implementation Act to the Federal Nature Conservation Act
Nds. FischG	Niedersächsisches Fischereigesetz	Lower Saxony Fisheries Act
NGO	Non-Governmental Organisation	
NLWKN	Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz	Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency
NP	Nationalpark	National Park

NPG	Gesetz zum Schutz des schleswig-holsteinischen Wattenmeeres - Nationalparkgesetz Schleswig-Holstein	Act for protection of the Wadden Sea of Schleswig Holstein
NPNordSBefV	Verordnung über das Befahren der Bundeswasserstraßen in Nationalparks im Bereich der Nordsee	Ordinance on the Navigation of Federal Waterways in National Parks in the North Sea Area
NVWA	Nederlandse Voedsel- en Warenautoriteit	Dutch Food Safety Authority
NWattNPG	Gesetz über den Nationalpark "Niedersächsisches Wattenmeer"	Act on the National Park "Wadden Sea of Lower Saxony"
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic	
PDOK	Publieke Dienstverlening Op de Kaart	Public Services On the Map
PKB	Planologische Kernbeslissing	National Planning Decree
PRODUS	Project Sustainable Shellfish Culture	
PRW	Programma naar een Rijke Waddenzee	Program towards a Rich Wadden Sea
QSR	Quality Status Report	
RD	Rijksdriehoekskoördinaten	State Triangulation Coordinates
RWS	Rijkswaterstaat	Department of Waterways and Public Works
SH	Schleswig-Holstein	
SIBES	Synoptic Intertidal Benthic Survey	
SUBES	Synoptic Subtidal Benthic Survey	
TBB	Toegangs Beperkend Besluit	Access Restriction Decision
TCA	Trilateral Conservation Area	
TGC	Trilateral Governmental Conference on the protection of the Wadden Sea	
TMAP	Trilateral Monitoring and Assessment Programme	
TWSC	Trilateral Wadden Sea Cooperation	
VISWAD	Covenant over gebiedssluiting voor garnalenvisserij op de Waddenzee	Covenant on area closure for shrimp fishery in the Wadden Sea
VMS	Vessel Monitoring System	
WaStrG	Bundeswasserstraßengesetz	Federal Waterways Act
WattMG HA	Gesetz über den Nationalpark Hamburgisches Wattenmeer	Hamburg Wadden Sea National Park Act
WFD	Water Framework Directive	
WGS84	World Geodetic System 1984	
WMR	Wageningen Marine Research	
Wnb	Wet natuurbescherming	Dutch Nature protection law
WOT	Wetenschappelijke Onderzoekstaken	Legal investigative task nature and environment
Wro 2008	Wet ruimtelijke ordening	Spatial Planning Act
WSB	Wadden Sea Board	

1 Introduction

1.1 Background and motivation

EU Biodiversity Strategy

In May 2020, the EU Biodiversity Strategy for 2030 was adopted. The strategy comprises a comprehensive, ambitious and long-term plan to protect nature and reverse the degradation of EU ecosystems, in line with the commitments in the European Green Deal. The strategy aims to put Europe's biodiversity on a path to recovery by 2030 for the benefit of people, climate and the planet, and contains specific actions and commitments. In the following years the objectives of the strategy will be implemented and integrated in legislative proposals. The EU and its Member States committed to implement more than 100 actions by 2030.

One important action of the EU Biodiversity Strategy is to establish a larger coherent EU-wide network of protected areas on land and at sea. For that purpose, the Strategy defined the following key commitments to be attained by 2030 in line with the global biodiversity framework (EU Commission 2022).

1. Legally protect a minimum of 30% of the EU land area and a minimum of 30% of the EU's Sea area and integrate ecological corridors, as part of a true Trans-European Nature Network.
2. *Strictly protect* at least a third of the EU's protected areas, including all remaining EU primary and old-growth forests.
3. Effectively manage all protected areas, defining clear conservation objectives and measures, and appropriately monitor them

According to the strategy, the target of 30% of the land and 30% of the sea in the EU under legal protection by 2030 should be reached by completing the Natura 2000 network and by protection under national schemes (this can be also regional and local protection schemes).

The strategy states that the designation of additional protected and strictly protected areas will be a responsibility of the Member States (See 2.2).

Definitions on strict protection

Strictly protected areas are a subset of the 30% legally protected areas, meaning that 10% of EU land and 10% of EU sea should be under strict protection in 2030. In the context of the EU Biodiversity Strategy for 2030, '*strictly protected areas*' are defined by the EU Commission Staff Working Document as follows (EU Commission 2022) (For an overview of definitions on strict protection see Appendix 1):

*'Strictly protected areas are **fully and legally protected areas** designated to **conserve and/or restore** the integrity of biodiversity-rich natural areas with their underlying ecological structure and supporting natural environmental processes. Natural processes are therefore left **essentially undisturbed** from human pressures and threats to the area's **overall ecological structure and functioning**, independently of whether those pressures and threats are located inside or outside the strictly protected area'.*

In this context the condition that natural processes should be left '*essentially undisturbed*' by human pressures and threats implies that limited activities are only allowed if they are well-controlled and do not interfere with natural processes or will enhance natural processes. Activities

in this case may include *'scientific research, natural disaster prevention, invasive alien species control, non-intrusive activities and installations, non-intrusive and strictly controlled recreational activities, when such activities are compatible with the conservation objectives of the areas on the basis of a case-by-case assessment'*. Furthermore, management activities should be limited to those necessary for the restoration and/or conservation of the habitats and species for whose protection the area has been designated. Also, activities that are necessary for the restoration of natural values should be authorised.

Strictly protected areas are also defined in the Guidelines for applying the IUCN protected area management categories to marine protected areas (2019) (Day *et al.* 2019). The definitions for categories Ia Strict nature reserve and Ib Wilderness area, are largely in line with the Strategy objective of leaving natural processes essentially undisturbed:

Category I Strict protection:

- Ia: strict nature reserve: *'Strictly protected for biodiversity and also possibly geological/geomorphological features where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values. Such protected areas can serve as indispensable Reference areas for scientific research and monitoring.'*
- Ib, wilderness area: *'Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition'*

In category Ia, *scientific research* involving collection may be permitted if that collection cannot be conducted elsewhere and if the collection activity is minimised to that which is absolutely necessary to achieve the scientific goals of the study. *Extraction to control invasive species* is also permitted in some category Ia MPAs.

In category Ib, in addition to the allowed activities in Ia, in some circumstances, also *sustainable resource use by indigenous people* is allowed to conserve their traditional, spiritual and cultural values, provided this is done in accordance with cultural tradition.

Furthermore, the concept of strict protection according to the IUCN is often also associated with the definition of category II National Parks:

- II: National Parks: *protected areas are large natural or near natural areas set aside to protect largescale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities*

Allowed activities are as with category Ib. Additionally this category also provides for *visitation, non-extractive recreational activities* and *nature tourism* (e.g. snorkelling, diving, swimming, boating, etc.) and approved research, provided that research cannot be done elsewhere. Extractive use of any kind (of alive and dead material) is not in line with this objective (no-take zone).

However, according to the EU Biodiversity Strategy (EU Commission 2022), the definition of category II allows for a process of zoning, in which strict protection does not necessarily apply to the whole protected area and thus is not *'fully and legally protected'*.

Different protection regimes

Germany, Denmark and the Netherlands have declared different areas in the Wadden Sea for the protection of certain natural values (such as (breeding) birds and seals), whereby zoning of activities is applied to different degrees of protection, reaching from banning only single activities, to closing areas off for mostly every human activity (generally referred to as 'closed' areas). In the light of the EU Biodiversity Strategy, the subject of protected areas with stricter protection regimes is recently gaining renewed (political) attention (For definitions, see Appendix 1). In the trilateral Wadden Sea, the draft text of the Wilhelmshaven Declaration gave rise to a discussion on how to address the above-mentioned targets on strictly protected areas of the EU Biodiversity Strategy for 2030. The general consensus hereby was that the Wadden Sea countries should strive for the highest possible protection in support of the Trilateral Wadden Sea Cooperation (TWSC) targets.

In the run-up to a trilateral government statement which is planned to be announced in December 2022, the three countries currently examine in this regard whether further agreements need to be made concerning strictly protected areas for the coming years. A first step towards a common strategy is to create a better understanding of the current situation of the different zoning protection regimes that exist within the Conservation Area in the three Wadden Sea countries.

The Dutch Program towards a Rich Wadden Sea (PRW) has therefore requested Altenburg & Wymenga ecologisch onderzoek and BioConsult SH to carry out an inventory of the current situation with regard to different zoning protection regimes within the trilateral Conservation Area in The Netherlands, Germany and Denmark.

1.2 Goal and scope

Goal

The purpose of this study is to picture the current situation, knowledge status and facts on the stricter protected areas within the trilateral Conservation Area in the Dutch, German and Danish Wadden Sea by means of a comparative study. The outcome is a report that shows the results of an inventory with comparative matrix tables and explanatory maps.

This study focuses on the following research questions:

1. *In what way have the Wadden Sea countries currently implemented more strictly protected areas and different zoning regimes?*
 - a. *Which protected areas exist, do they have a definition and does this differ per country?*
 - b. *Where are the areas located, what is their surface area, and how are they assigned?*
 - c. *What are the legal obligations with regard to these areas?*
 - d. *Which activities are prohibited and which activities are allowed in these areas? (do illegal activities still take place?)*
 - e. *How is the management arranged in these areas? (passive or active)*
 - f. *How is surveillance and enforcement arranged in these areas?*
 - g. *For how long have the areas been closed and does monitoring take place?*
2. *To what extent do the protected areas cover land-sea gradients?*

3. *What policy developments, besides the EU biodiversity strategy, might be expected in the next few years in relation to protected areas (including zoning and gradations within them)?*

Scope

Due to the wide variation in the degree of protection and between local/federal legislation and countries, a workable framework was needed in order to define the scope. In this study, the following assumptions were therefore used:

- The analysis focuses on areas with a more strict protection regime within the wider protection regime of the formal Conservation Area in the trilateral Wadden Sea (See also Figure 2-1). The (trilateral) Conservation Area consists of the Dutch National Planning Decree area ('Planologische Kernbeslissing', PKB), the three German National Parks and the Danish Wildlife and Nature Reserve has a total size of 11,950 km² (Figure 1-1). This additional or stricter protection of natural values is applicable by e.g. the zoning or banning of certain human activities which may come closer to the definition of 'strictly' protected areas of the EU Biodiversity strategy (See Appendix 1). The extent of protection of the overarching regimes themselves like Natura 2000, OSPAR, Marine Strategy Framework Directive and Water Framework Directive are not analysed in this study.
- Furthermore, in the Netherlands, the North Sea coastal zone is not included in this analysis since it falls outside the formal boundary of the Dutch Wadden Sea Conservation Area. In Germany and Denmark, parts of the North Sea coastal zone are included since they fall within the Conservation Area boundary.
- To answer the question to what extent the more strictly protected areas cover a land-sea gradient, we make use of recent available trilateral ecotope data to give an indication of the gradients. Regarding the visualisation, we take into account the boundaries of the areas that are more strictly protected and apply to a zoning protection regime. Additionally, when data is available we give an overview of areas that are specifically assigned for certain seabed disturbing activities. The focus on these activities is based on a previous study on bottom disturbing activities (Rippen *et al.* 2020). However, we do not show locations of intensities or frequencies of activities that are not assigned to a demarcated area.

In addition to these assumptions, the goal of this study is not to give a risk assessment of the effects that activities may have in the designated protected areas, but to give an overview of factual information with regard to the research questions. In this regard, the study does not directly give hard conclusions on if the more strictly protected areas or zoning protection regimes are in line with the definition of 'strictly' protected areas, however only a general indication is given.

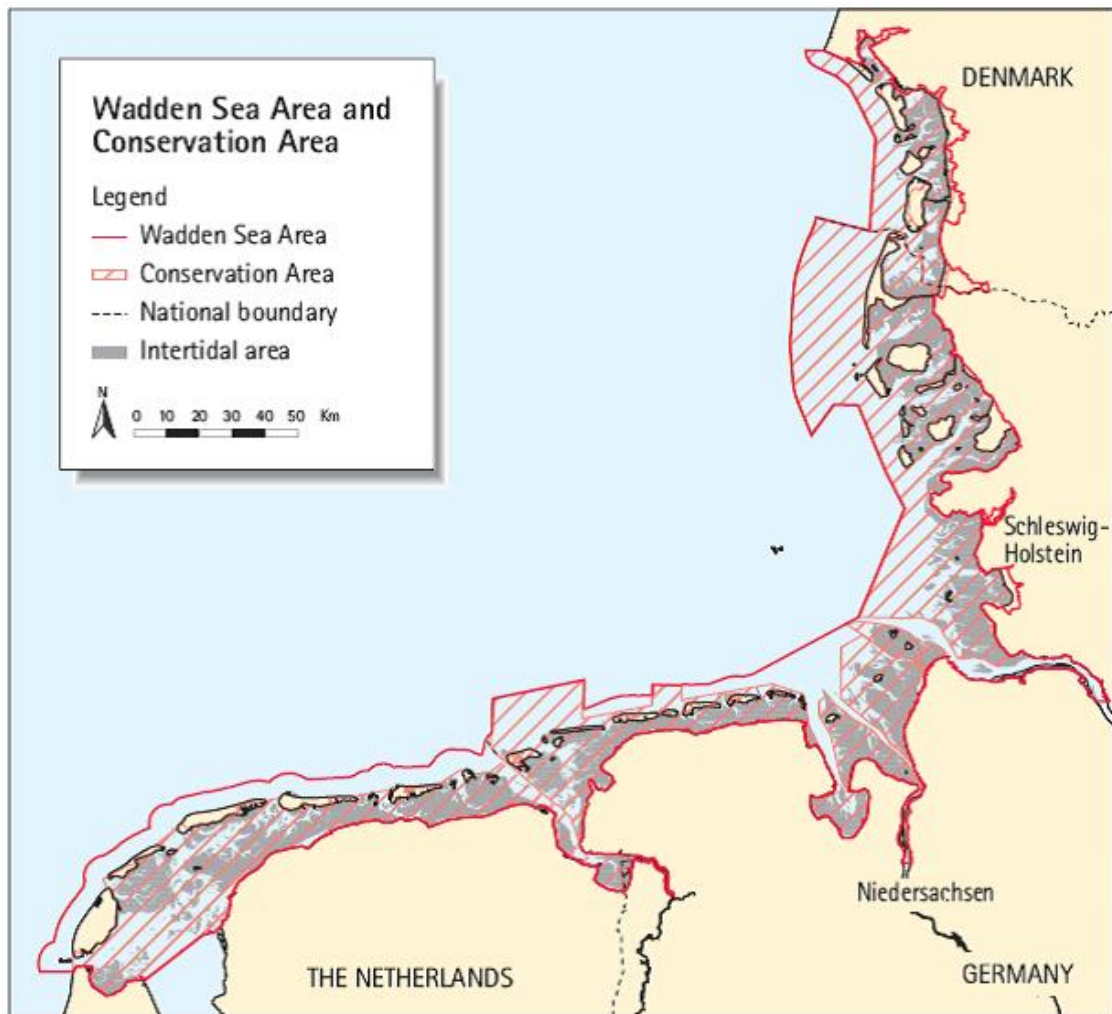


Figure 1-1 Wadden Sea Conservation Area outline

1.3 Approach

The approach for this study was divided in different steps: 1) preparation and information collection, 2) analysis and 3) visualization which will be summarized in the following sections.

1) Preparation and information collection

In preparation for the inventory, an initial overview was made of contacts from different organizations (i.e. the Common Wadden Sea Secretariat, ministries, provinces, National Park administrations, NGO's, universities) that are known to have knowledge and possibly quantitative information about (strictly) protected areas at the trilateral level.

The information for the inventory was further retrieved through:

- Interviews;
- Examination of legislative and government documents;
- Reliable internet resources

Based on the prepared contact list, interviews were conducted (see Appendix 8 for the list of organizations and contacts). During the interview, all research questions were included. Parallel

to the interviews, information was collected by scanning legal and government documents and consulting internet resources.

2) *Analysis*

The different (zoning of) protected areas are categorized as follows:

1. Legally protected areas
2. Areas protected by voluntary agreements.

The first category comprises areas that have stricter protection on a basis in formal laws. Category two comprises areas that gain additional protection based on voluntary agreements, such as via covenants in which permit holders voluntarily leave out certain parts of a N2000 area out of a permit. While the Wadden Sea is legally protected by itself by Natura 2000 and National Park laws, legally protected areas in this context refer to additional legal protection within these wider protection regimes.

For Germany, the analysis was done separately for each involved federal state (Schleswig-Holstein, Hamburg and Lower Saxony), due to the differences in implementation of protected areas. For each 'protected area category' per country (or federal state), the legal framework and (if available) a definition of the (zoning) areas was described based on legal documentation. Furthermore, an overview of allowed and prohibited activities was made based on legal documents and permit information. When available, qualitative information about occurrences of illegal activities based on interviews was included. Information about management, monitoring and enforcement was described and collected based on interviews, documents and internet resources.

3) *Visualization*

For each country, we created maps to illustrate the different categories of protected areas and zoning regimes and visualize the land-sea gradient of the protected areas. Furthermore, only if data was available, areas that are specifically assigned for certain bottom disturbing activities were shown in an overview map.

All maps were created in ArcGis. All data sources used for the visualization can be found in Appendix 10. We only used available data that had spatial information (e.g. coordinates). Textual descriptions of borders of protected areas were not included in this report. In the Netherlands, documents with information on coordinates of protected areas were often described in a way that two coordinates are connected along the border of terrestrial land or territorial sea. In these situations, we used country base maps from GADM (2022) for the border of the terrestrial part of the Netherlands and Ministerie van Defensie (2022) as border of the sea.

Disclaimer

All area calculations were conducted in Amersfoort/RD New (epsg 28992) for the Netherlands, ETRS89 / UTM zone 32 N for Germany and WGS84 for Denmark. Conversion to different coordinate systems can potentially result in slightly different area calculations.

Furthermore, the areas in the maps created for Denmark are created by the authors of this report, on info given in statutory order and maps supplied by authority. The areas are partly delimited by landmarks and local circumstances within the areas (e.g. edges of salt marshes). Therefore, accurate statements about surface areas and the exact location of this zones cannot be made within this report and information given can only be used as an estimate.

The structure of paragraphs and subparagraphs differs slightly between the main country chapters due to the differences in governmental guidance.

Due to large amount of legislation, agreements, and often changing decisions and covenants across the three countries in combination with the sometimes complex data collection, we cannot guarantee that our overview is fully complete.

1.4 Reading guide

Chapter 2 gives a general overview of the trilateral agreements and cooperation regarding area protection, with special focus on the Reference areas. Furthermore, the designation criteria of strictly protected areas of the EU Biodiversity Strategy definition are explained.

In Chapter 3, the main legal framework on protected areas in the Netherlands is discussed, after which the information regarding the research question on different 'legally protected' areas and areas based on voluntary agreements are described.

Chapter 4 starts with the general legal framework on protected areas applied in the whole of Germany. In the subparagraphs more details on zoning protection regimes are described for each of the three federal states of Lower Saxony (§ 4.2), Hamburg (§ 4.3) and Schleswig-Holstein (§ 4.4)

In Chapter 5, the Danish legal framework on protected areas is described, followed by a description on the different protection zones with regard to the research questions.

A summary of the main findings and highlights is given in Chapter 6. Furthermore, an overview concerning differences and similarities between countries (and federal state) is given as well as a final discussion and comparative matrix with regard to strict area protection on a trilateral scale.

2 Trilateral agreements and strict area protection

In the following paragraphs a general overview of the trilateral agreements and cooperation regarding area protection is given, with special focus on the Reference areas. Furthermore, the designation criteria of strictly protected areas of the EU Biodiversity Strategy definition are explained.

2.1 Trilateral cooperation

The Netherlands, Germany and Denmark signed a declaration of cooperation in 1982 to work together for the protection of the trilateral Wadden Sea. The Wadden Sea Board (WSB) is the governing body that leads the collaboration, monitors the work and adopts and implements the strategies of the collaboration. A Governmental Conference, prepared by the Common Wadden Sea Secretariat (CWSS), takes place every four years to continue the cooperation. Hereby a Ministerial Declaration is signed by the ministers of each country. Furthermore, every four years the current ecological status of the trilateral Wadden Sea is described and evaluated in the Quality Status Report (QSR) which is the output of the Trilateral Monitoring and Assessment Programme (TMAP).

TMAP is the joint monitoring programme of the Wadden Sea states. Launched in 1997 (Stade Declaration), the programme spans a broad range of topics, such as morphology, ecological processes, wildlife and human activities. TMAP covers the entire Wadden Sea Area including islands and offshore areas. Within TMAP The common goals for the trilateral area are included in the Trilateral Wadden Sea Plan, which also describes the joint measures, actions and projects for the protection of the area.

Trilateral Reference areas

In November 1991, the 6th Trilateral Governmental Conference on the protection of the Wadden Sea was held in Esbjerg, Denmark of which the results were documented in the Esbjerg Declaration (1991). One of the guiding principles and objectives that was adopted to cooperate in scientific research and monitoring with respect to the Wadden Sea, was the designation of trilateral 'Reference areas' to be able to monitor undisturbed conditions of nature development (in the context of initiating the Trilateral Monitoring and Assessment Program). These Reference areas are defined as follows:

'Sufficiently large areas, spread evenly over the Wadden Sea, where all exploitation and all disturbing activities are banned and which can serve as Reference areas for scientific purposes' (Esbjerg Declaration (1991)).

According to the 1991 Ministerial Declaration, areas serving as Reference areas for scientific purposes must:

- Have a sufficiently large size;
- Be spread evenly over the Wadden Sea;
- Be free of exploitation and disturbances ("zero-use zone").

A precondition for the measurement and assessment of the effects of anthropogenic influence on natural ecosystem structures and processes is the comparison of areas with and without human resource utilization. In the Quality Status Report of 1999 was concluded that the above-

mentioned features can be only represented by '*entire tidal basins, stretching from the salt marshes to the ebb delta opening out into the adjacent North Sea*'.

At the 9th TGC, again held in Esbjerg in 2001, the ministers recalled 'the decision taken at the 6th Wadden Sea Conference to designate Reference areas, and in this respect, to welcome the designation of a Reference area without resource exploitation in the Schleswig-Holstein Wadden Sea in 1999 in addition to the Danish zero use Reference area designated in 1982, and the Hamburg zero-use area designated in 1990, and the anticipated designation of a Reference area in the Dutch Wadden Sea (CWSS 2002) (see Figure 2-1). In the next chapters the legal protection and details regarding the different official Reference areas will be described in further detail.

2.2 Designation criteria strictly protected areas

According to the EU Biodiversity Strategy, a strictly protected area should be legally protected. As stated in the Commission Staff Working Document (2022), a protected area may be strictly protected in its entirety, but it can also be a strictly protected part of a wider protected area. In that sense, a strictly protected area may be part of Natura 2000 or it may be under a national protection scheme. Strictly protected areas can be designated through specific national legal instruments, such as some existing nature reserves, through specific long-term contractual agreements, or through zoning in the management planning of wider areas. In these cases, the strictly protected areas must be clearly identified in the management plans and those plans have to have a legal standing.

The designation instrument of each protected area, independently of its legal character, should thereby clearly identify:

- the natural values for which the area is protected;
- the conservation objectives for those natural values;
- measures to reach the objectives, or
- a mechanism for their timely identification;
- the mechanism through which the conservation measures will be regularly reviewed on the basis of science, taking into account their effectiveness and the progress achieved.

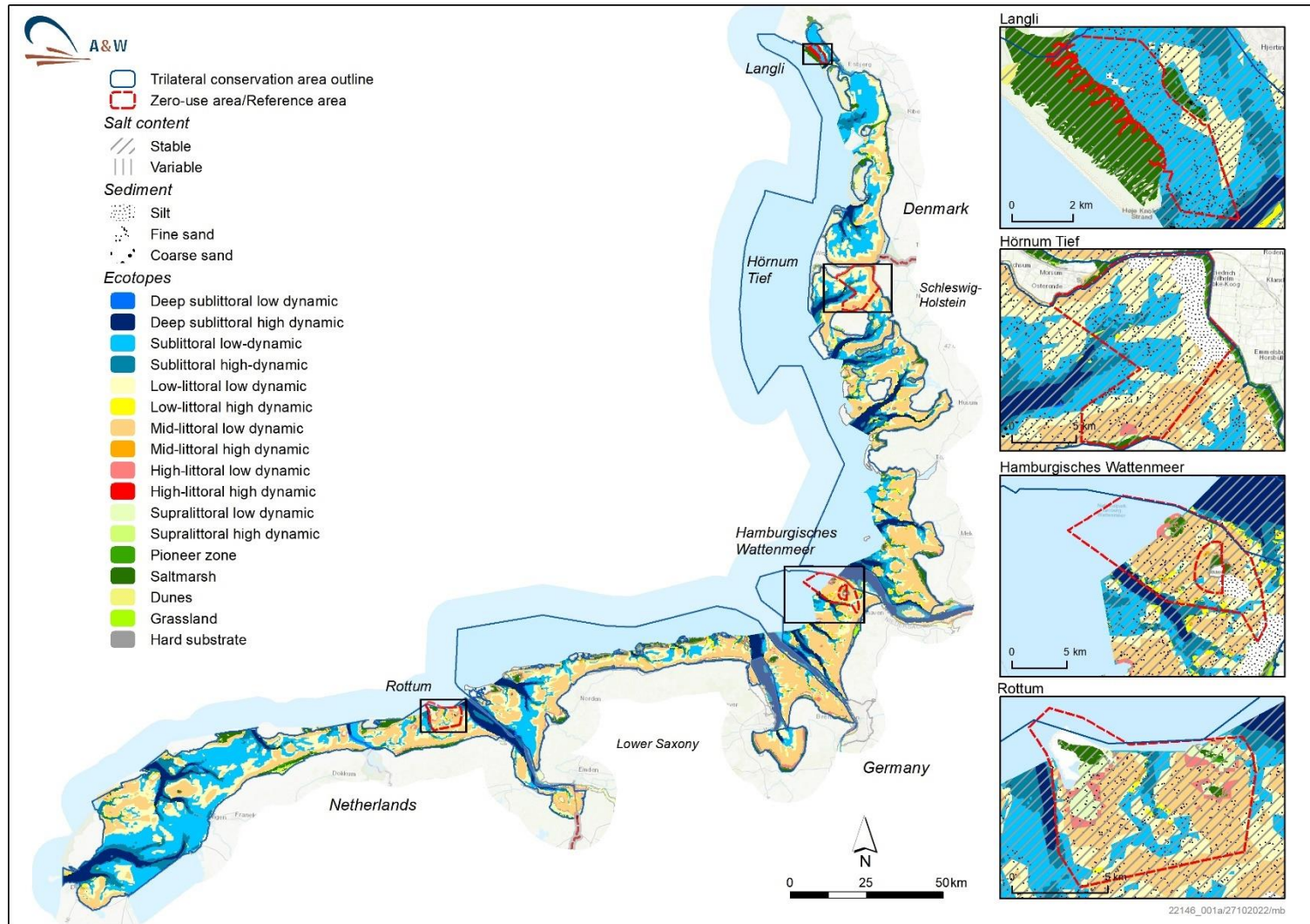


Figure 2-1 Overview location of trilateral Reference areas (red dashed line) within the trilateral Conservation Area outline (blue line) and ecotope gradients. See Appendix 10 for sources of the map content.

3 The Netherlands

In this chapter, the main legal framework in the Netherlands on area protection or 'closure' of areas is introduced. In the following paragraphs the different characteristics of protection of these areas are described where a division is made in areas that are legally assigned, or areas that are protected by means of voluntary agreements. In § 3.4, the main findings are described and summarized in overview Table 3-1.

3.1 Main legal framework on protected areas

National law

Nature protection law

Since 2017 the new Dutch Nature protection law (Wet natuurbescherming (2017)); before Natuurbeschermingswet (1998) (Hereafter, Wnb) came into force in which the international obligations from the Birds- (1979) and Habitats Directive (1992) (BHD) have been legally implemented. The Wnb gives rise to several policy instruments and obligations with regard to protected areas. In line with the HD a management plan needs to be installed for N2000 areas (Art 2.3), deterioration of N2000 is prohibited (Art 2.2) and a proper assessment needs to be made to permit activities (Art. 2.7 t/m 2.9). Furthermore, by means of an access restriction decision, 'closed' areas can be assigned (Art. 2.5) (see § 3.2.2). According to the Wnb (Art. 2.7), it is prohibited to act in such a way that will jeopardize the conservation status of the habitat types and species and may cause significant effects. However, the Wnb does not provide in itself an explicit prohibition of disturbance. Therefore, the duty of care applies (Art. 1.11).

Fishery law

The Visserijwet (Fisheries law) is the primary law regarding fishing regulations in Dutch waters. The Dutch fishery law dates from 1963 and has a key role on all forms of fishing within the Dutch waterways, including the Wadden Sea and the North-Sea. The primary aim of the law was to promote the efficiency of commercial fisheries in Dutch waters, as well as preventing overfishing. The fishery law includes regulations on fishing equipment and tackle, vessel requirements, permits that fishermen must pose to be granted permission for fishing and rules for the leasing of fishing waters. In the Uitvoeringsregeling Visserij (2008) (Fishery implementation regulation), specific areas closed for certain fisheries are designated.

National Planning Decree Wadden Sea

Since 1980 the Dutch Wadden Sea has been protected according to a National Planning Decree document Wadden Sea (PKB Waddenzee). The PKB is a national physical planning decree defining the overall objectives of conservation, management and use of the Wadden Sea. The PKB is a specific integrated physical planning instrument of the Spatial Planning Act (Wet ruimtelijke ordening: Wro 2008) and its objectives and conditions are binding for all state, regional and local authorities. The most a recent one is the 'Derde Nota Waddenzee' (2007), later called the Wadden Sea Structural Vision (Structuurvisie 2012). The Dutch Wadden Sea Conservation Area comprises the PKB area (ca. 271.753 ha). The Natura 2000 area and the PKB area are mainly overlapping. The main differences are Polder Breebaart (at Termunterzijl) and Eastern Ras (De Plaat near West-Terschelling), which are part of the Natura 2000 area but not of the PKB area.

The main objective of the Structural Vision is a '*sustainable protection and development of the Wadden Sea as a nature reserve and preservation of the unique open landscape*'. The

assessment frameworks and objectives of both the Water Framework Directive (WFD) and the BHD are leading in this regard. The Structuurvisie forms an important base for the Natura 2000 management plan. As soon as the Environment and Planning Act (Omgevingswet 2023) comes into effect, the government will no longer draw up a separate (national) structural vision for the Wadden Sea. To jointly implement the protection and development of the Wadden area, the government and the regional authorities decided in 2017 to work with the parties in the region to develop a joint agenda for the Wadden area: Agenda Waddengebied 2050 (Min. IenW 2020). The agenda forms the policy framework for, among other things, the protection and development of the Wadden Sea as a nature reserve. The main objective of the Wadden Sea remains in full force.

Authorities and enforcement

For the Dutch Wadden Sea, the Ministry of Infrastructure and Water Management (IenW), with Rijkswaterstaat (RWS) as the executive body, establish the management plan in collaboration with other authorities involved. Based on the Wnb, the Ministry of IenW and RWS are also responsible for implementing the measures aimed at the conservation objectives (Art. 2.10). The three Wadden Provinces (North Holland, Friesland and Groningen) are mainly responsible for granting permits and exemptions with regard to Natura 2000 area protection. The provinces are also responsible for supervision and enforcement. When there are national interests or activities in areas that are not provincially classified, such as trawling, non-manual shellfish fishing and mineral extraction, the competent authority is transferred to the Ministry of Agriculture, Nature and Food quality (hereafter, LNV).

Supervision and enforcement in the Wadden Sea can be divided into three parts, namely enforcement communication, preventive presence and control/detection and inspection. In the Wadden Sea, enforcement of the Nature Protection law (2017) and the Fishery law (1963) is executed by the aldermen of the National Wadden Unit of the Ministry of LNV (Art 1.3). Additionally in some areas, the Wadden Unit is assisted by the authorized investigating officers of the various departments, provinces and site management organization. Violations of the Wnb are punishable with a fine or prosecution under the Economic Offenses Act (Wet op de Economische Delicten 1950). The duty of care (Article 1.11 of the Wnb) can be enforced under administrative law, with administrative coercion or an order subject to a penalty.

3.2 Legally protected areas

Within the boundaries of the total Dutch Wadden Sea Conservation Area the total area in the Dutch Wadden Sea that has a form of additional legal protection, comprises of 114.140 ha (excl. overlap) and consists of the Reference area, areas closed according to the Nature Protection law (2017) (art. 2.5, also called TBB-area & art. 2.7) as well as the Fishery implementation regulation (2008). In Figure 3-1, these areas are visualised with underlying ecotopes. For more detailed maps, see Appendix 2 and 3.

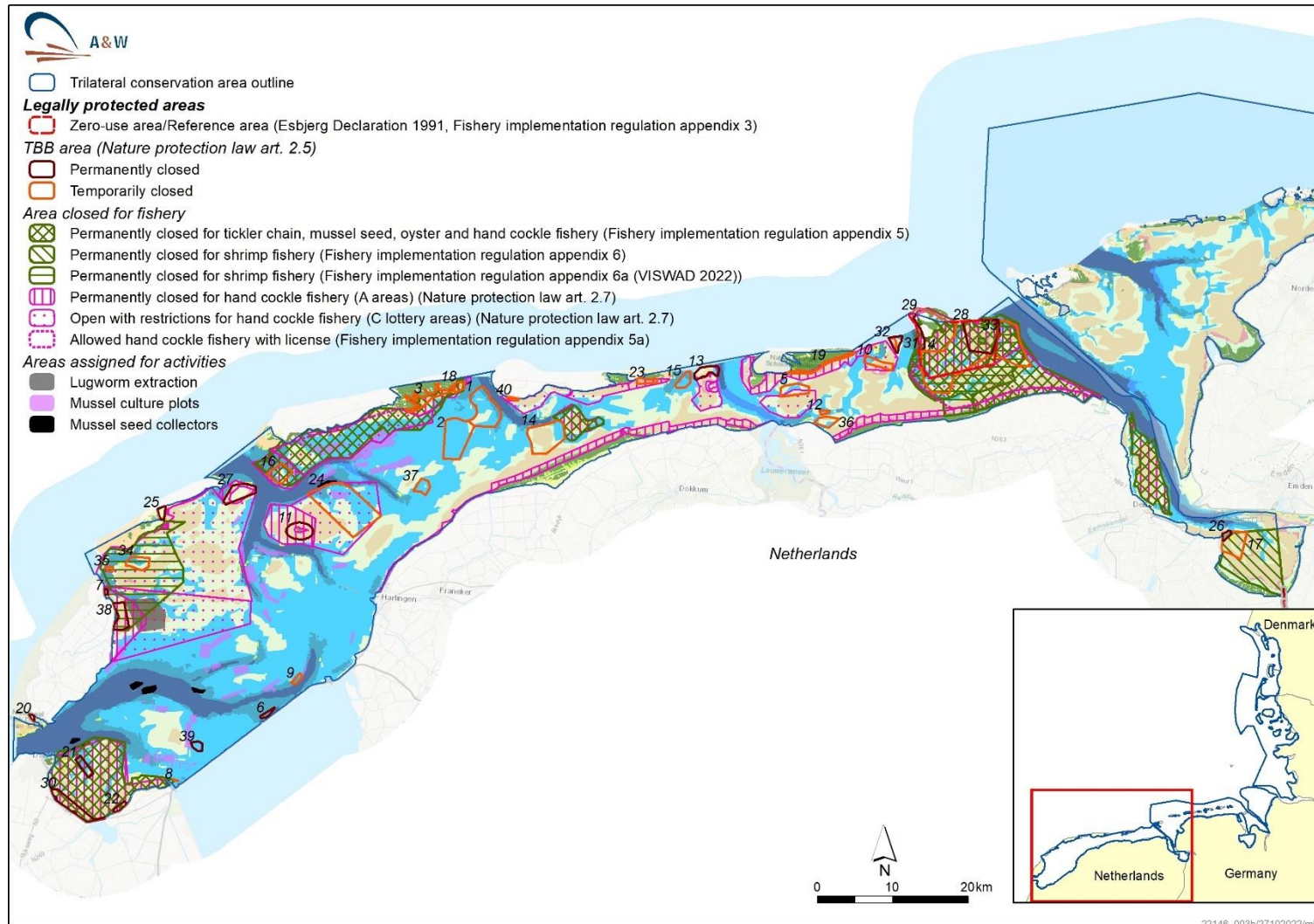


Figure 3-1 Overview legally protected areas within the Dutch Wadden Sea conservation area. (numbers refer to the 'TBB-areas' in Appendix 2). See Appendix 3, 9 and Figure 2-1 for a more detailed map, sources of the map content and a description of the ecotope colours, respectively.

3.2.1 Reference area

Designation and legal protection

Since November 2005 a small part of the Dutch Wadden Sea was assigned as a Reference area in order to monitor the development of the marine fauna in the Wadden Sea when they are not disturbed by human activities (See Figure 2-1 and 3-1). The area is located in the eastern Wadden Sea and includes the since 1965 uninhabited islands of Rottumeroog and Rottumerplaat and the area south of these islands and covers 7.390 ha (about 3% of the Dutch Wadden Sea Conservation Area). The area was chosen because it contains the necessary characteristic elements from the Wadden Sea and many activities were already banned under the Natuurbeschermingswet 1998. Additionally, in the area all bottom-disturbing activities were banned, originally noted in the 'Structuurnota Zee- en Kustvisserij' (1993) and later on in 'Beleidsbesluit Schelpdiervisserij' (2004) and the 'Uitvoeringsregeling Visserij' (2008). The originally proposed boundaries of the area were slightly adjusted so that it would be part of the area already closed for shrimp fisheries (Staatscourant no. 224, November 17th, 2005).

Since 1981 the islands Rottumerplaat and Rottumeroog including the direct adjacent Wadden area were already permanently closed for the public under the then ruling Nature protection law designation as natural state monument. In 2006 they were officially assigned as protected areas under article 20 of the new Nature Protection law (1998) (now art. 2.5, Wnb 2017). In the PKB Waddenzee it was indicated that there should be '*room for natural dynamics without disturbance*'. Reasons for permanent closure of the Rottum area are to provide absolute rest during the suckling period for young seals, protection of birds during the breeding season and to guarantee rest at high tide bird refuges.

Time of closure and activities

Before closure in 2005, bottom-disturbing fishing activities occurred in the Reference area, such as mechanical and manual cockle fishing, mussel (seed) fishing and shrimp fishing. After 2005, the gullies and mudflats as part of the Reference area are permanently closed for all types of fisheries.

The islands Rottumerplaat and Rottumeroog are permanently closed for the public and the gullies, Boschwad and Schilt are temporarily closed for the public from 15th of May till the 1st of September to protect the conservation status of birds and seals. Though, a limited and fixed number of guided touristic tours over the mudflat (to Rottumeroog) is permitted by the Province of Groningen. Damage to the mud flat is expected to be minimal for this activity. The tours take place after the breeding season (1st of august) during low tide, to not disturb high tide bird refuges. Furthermore, sometimes temporary permits are issued for research purposes, as far as the research cannot be carried out elsewhere and is beneficial to the policy and management of the islands (Beheerregeling Rottum, RWS 2010). Flying above areas protected by the Wet natuurbescherming (Wnb) is limited. For flying lower than 450 meters (1500ft) a permit is required.

Management and monitoring

The islands of Rottumerplaat and Rottumeroog are managed by Staatsbosbeheer (since 1978) and Rijkswaterstaat (since 1976). Staatsbosbeheer monitors disturbance, keeps the islands clean, makes inventories of the flora and fauna and provides information. Two birdwatchers from Staatsbosbeheer are stationed on both islands from April to July. Rijkswaterstaat monitors the coastal development. Since 1991 no active coastal management takes place anymore to give space to the natural dynamics (Beheerregeling Rottum, RWS 2010).

In 2002, three years before closure of the area in 2005 monitoring of the (marine) Reference area started by Wageningen Marine Research (WMR). During this initial period the monitoring consisted of taking sediment samples to identify and describe the benthic fauna in the gullies and sampling the demersal fish using trawl nets. Since 2005 sediment- and benthos samples were taken yearly in the autumn. Later on, the monitoring was extended with demersal fish sampling (Glorius *et al.* 2018; Glorius & Meijboom 2020). Furthermore, birds and seals are monitored. These are part of the TMAP monitoring. Members of the Wadden Unit assist in the monitoring.

Land-sea gradients

The area has a land-sea gradient and contains small islands, primary dunes, salt marsh and a tidal basin with gullies, mudflats and drainage channels. The gully system consists of two main gullies, Boschwad and Schild. Both gullies are dynamic and relatively shallow (2 and 4 m deep respectively). The region subsists of largely littoral low dynamic and with a few low littoral high dynamic regions. The salt content of the area is stable, and the sediment consists largely of fine sand.

Remarks

In the Reference area, any exploitation of disturbing activities is not allowed. However, based on surveillance and enforcement of the WaddenUnit (pers.comm), anecdotal illegal shrimp fishing does take place in the gullies of the Reference area (ca. 1-2 times a year).

3.2.2 TBB-areas

Designation and legal protection

In 2000, article 20 of the Natuurbeschermingswet 1998, came into force, currently effectuated in article 2.5 of the Wet natuurbescherming (2017). On ground of Article 2.5, a so-called access restriction decision (ToegangsBeperkendBesluit (TBB)) can be taken to close off sub-areas to human activities within a Natura 2000-area, if that is necessary to comply with the obligation to take measures for the benefit of the conservation objectives and to prevent deterioration of habitat quality and significant disturbance of species. Moreover, TBBs can be applied following the precautionary principle¹. No specific definition is given for these areas. The Minister of LNV is responsible for the assignment of areas under central government control. For other areas, the province is the competent authority. TBB-areas be applied to the protection of all habitat types and species. Variations in TBB decisions are possible. Areas can be closed all year round, but also temporary for certain activities or under certain conditions. This depends on the function of the area for the respective protected natural value (Min. LNV 2020).

For the Dutch Wadden Sea, there is one basic TBB closing areas since 2006 and various subsequent amendment decisions which together form the formal decision including currently 38 TBB-areas (Figure 3-1). The Wadden Sea TBB's are designated due to their importance for breeding birds, migratory birds (high tide refuge) and seals (resting, whelping and nursing). In total, the surface area of these TBB's is 25.950 ha (9,55 % of the Dutch WCA), of which ca. 29% is permanently closed. Furthermore, two TBB's (Vlieter 2009 and Breezanddijk 2010) are designated due to their special importance for the conservation of habitat type H1110A²,

¹ The precautionary principle enables decision-makers to adopt precautionary measures when scientific evidence about an environmental or human health hazard is uncertain and the stakes are high

² Sandbanks which are slightly covered with sea water all the time

including musselbeds. Together these areas are covering 230 ha. See Appendix 2, Table 2-1 and Figure 2-1 for an overview.

Boundaries of the areas can be made visible with buoys and on hydrographic charts. Due to the (natural) dynamics of the area, updating and adjustment of the boundaries and the period of closure of these areas is necessary almost every year. This is done according to the Guideline access restriction Wadden Sea (2020) (Min. LNV 2020).

Time of closure and activities

The TBB-areas can be closed off for certain activities all-year round and all-day round, but also temporarily or within a specific time frame during the day (Min. LNV 2020). Table 2-1 Appendix 2 gives an overview of all TBB-areas and their characteristics. According to the TBB Waddenzee (2006), being located, entering, navigating or falling dry or being in the air column up to 450 m within a TBB area is considered to be disturbing per definition. Therefore, the exercise of non-professional activities (including recreational sailing, entering or falling dry) within the TBB-areas is prohibited. Professionally performed activities for which the closed area must be entered or sailed on or fallen dry on within the area may be permitted if a permit under the Wnb 2017 has been granted. In the license to be granted, further regulations are attached to protect the natural values of the particular area.

In practice permits are granted within the closed period in some TBB-areas for i.e. (mudflat and sailing) excursions, seal tours, sports fishing by private individuals and working on mussel culture plots. Furthermore, hand cockle and oyster fisheries are permitted in some TBB Wadden Sea areas outside their closing time. Moreover, shrimp fisheries are allowed within the subtidal parts of the TBB Wadden Sea areas, provided that will be complied with rules including among others, no disturbance caused with regard to seals and birds and no fisheries of mussel beds (Wnb permit 2016). Furthermore, some permits are granted with regard to research and monitoring. On the contrary, TBB's Vlieter and Breezanddijk are only closed for bottom disturbing activities, specifically shrimp and mussel seed fishing and except anchoring with fixed gear.

Management and monitoring

Most of the TBB-areas are not actively managed to facilitate the natural development of the ecosystem. Though, for some areas such as Griend, Balgzand and Vogelpolle, management is specifically aimed at preserving the areas for their breeding function for shorebirds. Furthermore, (regular) monitoring and research is carried out within the national monitoringsprogrammes with regard to e.g. birds, seals, fish, macrofauna and vegetation. In the TBB-areas Vlieter and Breezanddijk, specific monitoring takes place to follow the developments of the benthic ecosystem and musselbeds (Mosselwad 2009-2015; PRODUS 2006-2010; MEGMA 2015-2024).

Land-sea gradients

Only a few TBB-areas contain land-sea gradients as they cover both land and sea, like Rottum, the Posthuiswad on Vlieland, Richel, Griend, and the Rif. All other TBB's contain a variety of sublittoral and littoral habitats, with shallow and deep and low and high dynamic areas.

Remarks

Based on AIS monitoring of boating recreation (Meijles 2019), it seems that in general the recreational boaters adhere to the rules fairly well in the Wadden Sea. A low percentage of ships are in TBB-areas during the prohibition period and people generally adhere to the speed limit. However, according to the Wadden Unit (pers. Comm), disturbance of TBB-areas does sometimes take place by e.g. boats/people/kitesurfers that do not take enough distance to birds

or seals. In general TBB-areas are properly enforceable. However, enforcement of disturbance outside TBB-areas is difficult in practice, since the Wnb does not explicitly prohibit disturbance and legally it is difficult to demonstrate a significant effect on the conservation status.

3.2.3 Fishery implementation regulation areas

Designation and legal protection

Besides the closure of areas for activities under the Nature protection law (2017), some areas are closed off for specifically fisheries under the Visserijwet (1963) and Uitvoeringsregeling Visserij (2008) (Fishery implementation regulation). In 1994 ca. 26% the littoral part of the Dutch Wadden Sea was closed for most bottom disturbing activities (mussel seed fishery, cockle fishery, fisheries with bottom fishing gear with tickler chains), known as the '26% areas' or 'structuurnota' areas.

The '26% areas' are legally anchored in Article 35 of the Fishery implementation regulation (2008), and outlined in appendix 3: (Reference area, see § 3.2.1; surface area 7.390 ha (ca. 2,72% of CA)) and appendix 5 (surface area 41.649 ha (ca. 15,33% of CA)) of the Fishery implementation regulation (Figure 3-1). Furthermore, the outlines consolidated in Appendix 6 (surface area 5.193 ha; 1,91 % of CA) and 6a (surface area 16.783 ha; 6,18% of CA) refer to respectively a closed area in the Southern Dollard and the newly designated VISWAD areas of the 2nd tranche, that will be officially added to the Fishery implementation regulation (2008) on the 1st of October 2022. (see also § 3.3.2). See Figure 3-1 for an overview.

Time of closure and activities

The areas of Appendix 5 of the Fishery implementation regulation, are permanently closed for:

- trawl nets with tickler chains;
- collection of shellfish and;
- fishing with fishing gear suitable for catching shellfish (mussel seed).

In areas closed to bottom-disturbing fisheries, shrimp fishing and mussel seed fishing is not allowed in the littoral areas. Fishing with other trawl nets - whether or not equipped with tickler chains - is not permitted on littoral areas in the entire PKB area (PKB derde nota Waddenzee 2006).

However, there is an exemption in the Appendix 5 areas for those who manually collect shellfish and have licence for fishing on the relevant shellfish (mussel) parcels, or who have received prior written permission from the holder of the fishing rights to manually collect shellfish on those parcels (See details Appendix Figure 3-1).

In areas of Appendix 5a (surface area 14.598 ha; 5,37% of CA), a licence may be granted for hand cockle fisheries (See § 3.2.4). In the area enclosed in Appendix 6, there is a permanent ban on shrimp fisheries. There is no ban on other activities in these areas (except for the areas that cover other additionally protected areas such as TBB's). The area of Appendix 6a is closed for specifically shrimp fisheries.

Management and monitoring

Some of the Fishery implementation regulation-areas cover TBB-areas and are managed and monitored accordingly (see § 3.2.2). No specific management measures are taken for the rest of the area. In the former 26%-areas, developments in shellfish stocks are annually monitored in

WOT surveys (Wetenschappelijke Onderzoeks Taken). Furthermore, the whole littoral part of the Wadden Sea is sampled for benthos by the SIBES (Synoptic Intertidal Benthic Survey) monitoring program since 2008. Since 2019, in the context of the research project Waddenmozaiek, also the subtidal parts of the Wadden Sea are monitored (SUBES). Furthermore, the areas closed for shrimp- and mussel seed fisheries are monitored within the Mosselwad (2009-2015), PRODUS (2006-2010) and MEGMA (2015-2024) programmes (Troost *et al.* 2018;2019).

Land-sea gradients

Fishery areas only cover gradients across littoral and sublittoral areas. Only the Reference area covers a land-sea gradient (See § 3.2.1).

3.2.4 Hand cockle fishery areas

Designation and legal protection

Since 2005, the mechanical fishing of cockles in the Wadden Sea was banned based on the Shellfish Fisheries Policy Decree (Min. LNV 2004) as a result of the studied effects of mechanical cockle fisheries on natural values of the Wadden Sea. Since then, a limited number of licenses are issued. The quota that can be fished annually is a legally determined percentage (2,5%, Program towards a Rich Wadden Sea 2011) of the so-called 'harvestable stock' of densities higher than 50 per m². The quota of 2.5% was laid down in the Multi-Year Agreements for Hand Cockle Fisheries in the Wadden in 2011 by nature organizations, fisheries, the ministry and NGO's. In this agreement also was determined which areas are permanently closed (so-called A areas) to hand cockle fisheries or are open only for certain license holders by means of a lottery (so-called C areas) (See Figure 3-1) (Beleidsregel meerjarenafpraak handkokkelvisserij 2019). The agreements are legally binding by the implementation in the Nature Protection law (2017) permit for hand cockle fisheries (Vergunning Wnb handkokkelvisserij 2017).

Time of closure and activities

As mentioned, the A-areas with a total area coverage of 59.669 ha (21,96% of CA) are permanently closed for hand cockle fisheries. Furthermore, fisheries in the C-areas are restricted to only a couple of licence holders (Figure 3-1). Besides the areas mentioned in the Multi-Year Agreements, hand cockle fisheries are also prohibited in the Appendix 5 areas of the Fishery implementation regulation (2008) and permanent and temporarily closed TBB-areas during the period of closure (Meerjarenafpraak 2019). The same agreements hold for the manual collection of oysters (Beleidsregel meerjarenafpraak oesterrapen 2018). There is no specific closure in the before mentioned areas for other activities, other than the bans on activities in e.g. overlapping TBB-areas. Furthermore, additional rules apply e.g. the prohibition of fishing within 40 m of musselbeds and seagrass areas.

Management and monitoring

No active management measures are carried out in the areas closed for hand cockle fisheries, other than would be carried out in overlapping TBB-areas. With regard to monitoring, no specific survey is set up to monitor the areas closed for hand cockle fisheries. General monitoring of shellfish in the littoral part of the Wadden Sea is carried out under the WOT (legal investigative task nature and environment) survey and SIBES programme. The cockle stock is estimated annually based on annual spring sampling by WMR based on the WOT obligation.

Land-sea gradients

Cockle regulation areas cover only littoral areas and gradients here in.

3.3 Voluntary agreements

Within the boundaries of the total Dutch Wadden Sea Conservation Area, the total area in the Dutch Wadden Sea that has additional protection by means of voluntary agreements in covenants, is 66.720 ha and divided in two categories depending on fishery type (shrimp and mussel fishery). In Figure 3-2, these areas are visualised with underlying ecotopes. For more detailed maps, see Appendix 4.

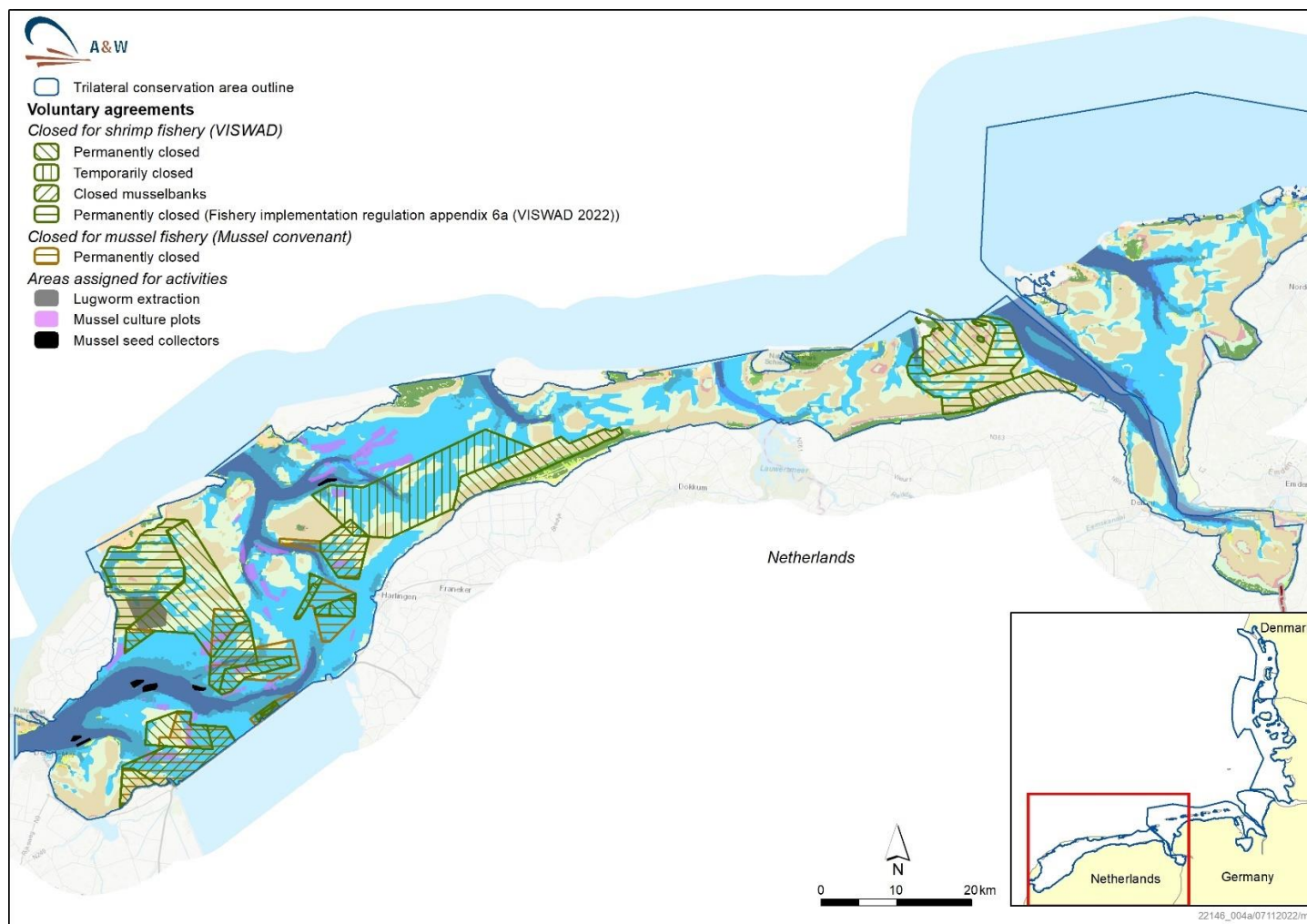


Figure 3-2 Overview voluntary agreement areas within the Dutch Wadden Sea conservation area. N.B. the VISWAD 2nd tranche areas are officially/legally included in appendix 6a of the Fishery implementation regulation (see also Figure 3-1). The areas of the fourth closure step of the Mussel Covenant (July 2022) are not included in this map. See Appendix 4, 9 and Figure 2-1 for a more detailed map, sources of the map content and a description of the ecotope colours, respectively.

3.3.1 Mussel Covenant areas

Designation and legal protection

In 2008, the Covenant transition mussel sector and nature restoration Wadden Sea, was agreed upon by the mussel sector, Ministry and nature organizations in the Wadden Sea. The goal of the covenant is to:

- gradual phase out the mussel seed fishery in the sublittoral of the Wadden Sea with the result that mussel beds can develop undisturbed;
- develop alternative sources for mussel seed which enables profitable cultivation of mussels.

In the context of the Mussel Agreement, in the first step of the transition, 20% of the mussel seed banks have been closed in the Vlieter and Breezanddijk under the Nature protection since 2009/2010 (See § 3.2.2). Subsequently, in 2014/2015, as a result of follow-up steps in the covenant, an expansion of the closed areas has taken place by closure of areas for mussel seed fishery in the Eierlandsegat, Westkom/Gat van Stompe, Molenrak West, Molenrak Oost and Omdraai corresponding to 28% of the total mussel seed fishery (spring and autumn combined). In the third step an additional area closure of 35.7% of the mussel seed fishery in 2021 was effectuated (Figure 3-2). The areas were explicitly not licensed in Wnb permits because the applicant specifically left them out of the application. According to article 14 of the covenant, the covenant itself is not legally enforceable.

Hereafter in 2020, an Addendum to the covenant (for the period 2021-2029) was operated. The Addendum has been added as a supplement to the covenant because the ambition of ending the mussel seed fishery by 2020 has not been achieved. The addendum contains follow-up agreements, including three steps based on area closures combined with a quota:

- By 2022 a closure of up to a total of 50% of the fishing area, with it to be fished quota is capped at 50% of 40 million kg = 20 million kg (= step 4)³;
- By 2026 a closure of up to 65% of the fishing area, plus a quota of 35% of 40 million kg of soil seed = 14 million kg (= step 5). In this phase it will be forecasted what is necessary to achieve the ambition for 2029 of a 100% closure combined with a sustainable economic mussel sector.
- In 2029, a decision will be taken on a sixth (final) step, depending on the outcome of this forecast

Contrary to the Mussel Covenant (2008), the Addendum (2020) now is legally enforceable.

Time of closure and activities

The Mussel Covenant areas, with a surface area of 24.981 ha (9,19% of CA) are permanently closed for mussel seed fisheries. Furthermore, mussel beds within the Mussel covenant areas are also permanently closed for shrimp fisheries 11.784 ha; 4,34% of CA), though shrimp fisheries are allowed in the area surrounding the mussel beds with a distance of 40 m. Moreover, if a mussel bed has disappeared, shrimp fisheries are permitted to take place in that area again.

Management and monitoring

No specific management measures are carried out with regard to the Mussel Covenant areas. In the period 2006-2012, research was carried out within PRODUS (Project Sustainable Shellfish

³ From July 2022 onward the fourth closure step was implemented, resulting in an additional closure of 10.325 ha of which 3.454 ha is subtidal. Due to the recent addition, this area was not included in the current study.

Culture) monitoring program into the effects of mussel seed fisheries on the natural values in sublittoral areas in the western part of the Wadden Sea (Smaal *et al.* 2013). Developments in benthic fauna in the sublittoral area of de Vlieter and Breezanddijk have been evaluated in the PRODUS and subsequently in the Mosselwad project (Glorius *et al.* 2014). Furthermore, to monitor the developments of the subsequent closures, The MEGMA monitoring program (Monitoring Effectiveness Area Protection Measures) started in 2015, after the closure of areas in the western Wadden Sea for mussel seed and/or shrimp fishery (Troost *et al.* 2019). In this program the development of the benthic community is monitored.

Land-sea gradients

The Mussel Covenant areas do not cover complete land-sea gradients. They mainly cover sublittoral low dynamic areas and partly littoral areas.

3.3.2 VISWAD areas

Designation and legal protection

In 2014, the fishing industry, nature organizations and the authorities involved made agreements about making shrimp fisheries in the Wadden Sea more sustainable. The ambitions are described in the VISWAD covenant (2014). The main goals are to promote nature restoration and to offer lasting economic prospects for part of the shrimp fleet. One of the steps in the transition is to establish protected areas. Part of the approach is to reduce the number of license holders by 20 to 30% by by-out by the Wadden Fund. The closure of areas is integrated by means of a step-by-step approach, based on ecological grounds (opportunities, expected recovery time, natural values) and with mutual consultation. The measures were designed in close connection with other measures such as the ones that were developed in the context of the Mussel covenant (§ 3.4.2). This should result in the permanent of ca. 11.3% of the fishable areas for shrimp fishing.

In 2015, the first areas (62.068 ha; 22,84% of CA) of the covenant (1st tranche) were 'closed', but on a voluntary basis. The areas were explicitly not licensed in Wnb permits because the applicant specifically left them out of his/her application (PRW 2014). In line with the covenant, recently in 2022 two more areas (The Eierlandse Gat and Oostwad) of in total 16.783 ha (% of CA) were added (2nd tranche) to be closed for shrimp fisheries, to comply with the former VISWAD areas (PRW 2021). These areas will be officially added as closed areas in Appendix 6a of the Uitvoeringsregeling Visserij (2008) on the 1st of October 2022, to ensure the areas are the same for all licence holders (See § 3.2.3, Figure 3-2). The total hectares include both littoral as well as sublittoral areas.

Time of closure and activities

Of the 1st tranche areas closed for shrimp fisheries, 16.525 ha (26,62% of CA) is temporarily closed for shrimp fisheries only in August, due to the moulting period of Shelduck. Furthermore, the mussel beds in the areas that are permanently closed for mussel seed fishery are also closed for shrimp fisheries. However, when the mussel beds have disappeared, shrimp fisheries are allowed in those areas again (Troost *et al.* 2019). No other activities within these areas are specifically restricted, though have to be appropriately assessed under the Nature protection law.

Management and monitoring

No specific management measures are taken in the VISWAD areas. In order to be able to evaluate whether the area closures of both the VISWAD and Mussel covenant (See § 3.3.2) lead to the desired goals, a start was made in 2015 on monitoring benthic organisms on basis of joint consultation of parties involved (MEGMA monitoring program). The monitoring is still continuing, since the effects were not yet clear enough (Troost *et al.* 2019).

Land-sea gradients

The closed areas of the 1st tranche do not cover a land-sea gradient. The main parts of the 2nd tranche areas encompass a tidal basin with no connection to the mainland or islands. Both high and low dynamic sublittoral and littoral areas are represented with fine and coarse sand. The closed area of the eastern part of the Wadden Sea comprises gullies and tidal flats both mainly low dynamic with silt and fine sand. This area also has a land-sea gradient comprising a part of the coastal salt-marsh (PRW 2021; Baptist 2021).

Remarks

In 2017 it became mandatory for shrimp fishing vessels to carry a black-box on board. These black-boxes were introduced to the shrimp fishery to regulate and control the fisheries in a more accurate matter. The aim of the black-boxes was to monitor the vessels movement and type of movement (driving/fishing) performed within the Wadden Sea. The data provided by the black-boxes should be used by the shrimp fishing industry for self-regulation, and where necessary self-sanctioning (Min. LNV 2019).

However, it turned out that the NVWA (Dutch Food Safety Authority) concluded in a 2019 report that monitoring and self-regulation proved to be insufficient and that the system is prone to fraud. Moreover, the capacity of enforcement may be not sufficient (Min. LNV 2019; pers. comm. W. van der Heij).

Another aspect to keep in mind with regard to the closure of areas for shrimp fisheries, is that some shallow areas are not accessible for shrimp cutters in the first place. With regard to percentage calculations of area closures, this is something to keep in mind (pers. comm. S. Holthuijsen).

3.4 Main findings / highlights

In Table 3-1 a summary is given of the information with regard to legally protected areas and voluntary agreements within the Dutch Wadden Sea Conservation area. Based on the information on areas for which stricter protection is applied, the following points stand out:

- There is no specific definition on stricter protected areas or areas closed for certain activities
- There are many different regulations and laws covering areas which are overlapping
- 'Closed' areas (i.e. TBB's, Fishery implementation regulation areas, and closed areas based on voluntary agreements) are not really closed for all activities, since there are many exceptions on permits
- More than half of the TBB areas are closed on temporary basis
- Shrimp and mussel seed fisheries are banned from littoral areas
- Shrimp fishing in areas closed for shrimp fisheries are in some parts technically impossible due to depth
- There are many exceptions for activities. Only the Reference area Rottum and the TBB Griend turn out to be closed for all activities besides monitoring, research and necessary management.
- Enforcement turns out sometimes to be difficult in practice, due to definitions in law, lack of capacity and technical issues
- Many areas are relatively small and fragmented (not covering entire tidal basins)
- New VISWAD (2nd tranche) areas cover tidal basins, but no land-sea gradients
- Only a couple small areas cover full land-sea gradients

Table 3-1 Overview table of characteristics of stricter protected areas divided by protection category in the Netherlands. N.B. Overlap in area's are not taken into account in the total area calculations, other than specifically mentioned).

Type of area	Total area (ha)	Time of closure	Years installed	Dynamic closure	Legal protection	Activities banned	Exceptions / permits*	Specific monitoring	Land-sea gradient
Total PKB (CA) area	271.753		40	Yes	Spatial planning act (2008), Nature protection law (2017)	Mechanical cockle fisheries	Commercial, exploitation, recreation etc.	Yes	Yes
Legally protected									
Reference area Rottum	7.390	Permanent	>15	No	Nature protection law (2017), Fishery implementation regulation (2008)	Disturbance, bottom disturbance	(mudflat)excursions	Yes	Yes
TBB-areas Wadden Sea (excl. Simonszand west, Vlieter /Breezanddijk)	7.585 18.365	Permanent Temporarily	>10	Yes, some only for a timeframe during the day	Nature protection law (2017)	Anchoring, entering, falling dry	Excursions, seal tours, shrimp fishery, recreational fisheries, work on mussel culture plots	Yes	Some
TBB-areas Vlieter / Breezanddijk	230	Permanent	>10	No	Nature protection law (2017)	Bottom disturbing activities; shrimp- and mussel seed fishery	Anchoring with fixed gear	Yes	No
PKB areas (Appendix 3 Reference area), appendix 5)	49.039	Permanent	>20	No	PKB; Fishery implementation regulation (2008)	Mussel seed fishery, tickler chain fishery, hand cockle /oyster fisheries	All other activities, permits for hand cockle fisheries (Appendix 5)	Yes	No
Fishery regulation-area (Appendix 6)	5.193	Permanent	>20	No	Fishery implementation regulation (2008)	Shrimp fishery	All other activities	Yes	No

VISWAD-areas 2 nd tranche (Appendix 6a)	16.783	Permanent	1	No	Fishery implementation regulation (2008)	Shrimp fishery	All other activities	Yes	No
Hand cockle fishery (closed areas A)	59.669	Permanent	>15	No	Nature protection law (2017); Fishery implementation regulation (2008)	Hand cockle fisheries	Depending on location	Yes	No
Hand cockle fishery (restricted / lottery areas C)	37.782	Permanent	>15	Yes, depending on stock	Nature protection law (2017); Fishery implementation regulation (2008)	Hand cockle fisheries	Depending on location	Yes	No
Voluntary agreements									
Mussel Covenant areas	24.981	Permanent	>10	Yes	Partly: Addendum (2021-2029) now legally enforceable	Mussel seed fishery, shrimp fishery on mussel beds	All other activities	Yes	No
VISWAD-areas 1 st tranche (excl. mussel banks)	33.759 16.525	Permanent Temporarily	>5	Yes	Voluntary agreements	Shrimp fishery	All other activities	Yes	No

*Other than research, monitoring and management

4 Germany

In this chapter, the general legal framework on protected areas applied in the whole of Germany is introduced. In the subparagraphs more details on zoning protection regimes are described for each of the three federal states of Lower Saxony (§ 4.2), Hamburg (§ 4.3) and Schleswig-Holstein (§ 4.4). In the last paragraphs of each subsection of a federal state, the main findings / highlights are described and summarized in an overview table.

4.1 Main legal framework on protected areas

Federal law

In Germany the federal states are responsible for the implementation of the Federal Nature Conservation Act (2009) (BNatSchG). The Federal Nature Conservation Act is a federal framework act for nature conservation which includes provisions for the establishment of nature reserves and National Parks. Main habitats of the Wadden Sea are, amongst others, legally protected by § 30 of the Federal Nature Conservation Act. Actions that could lead to the destruction or other significant adverse effects are prohibited.

German Wadden Sea National Parks

According to the Federal Nature Conservation Act (2009) (§ 24), National Parks are larger areas of national importance of which the major part is undisturbed and qualify to be designated as a nature Conservation Area (see Appendix 1)). The aim is to safeguard, in the greater part of the area concerned, undisturbed ecosystem interactions and their natural dynamic processes to the extent possible. The protection objectives of the German Wadden Sea National Parks covering the German part of the trilateral Conservation Area are to protect the Wadden Sea and its natural development. Schleswig-Holstein, Niedersachsen and Hamburg established National Parks in respectively 1985, 1986 and 1990 which are located in the extent of the trilateral Conservation Area. The objectives of the National Parks are to protect the Wadden Sea and allow natural process to take place with a minimum degree of disturbance and other detrimental effects of human activities.

The National Parks have been divided into two or three zones of which the zone I includes the ecologically most valuable areas. Therefore, strict regulations apply to the zone I, including extensive restrictions to public admittance. In zone II, utilization and activities are allowed under such conditions that the overall protection objectives are not impaired.

It is explicitly stated, however, that coastal defence measures and measures undertaken in conjunction herewith are not to be restricted. However coastal protection measures are projects according to the definition of the habitats directive and thus subject to appropriate assessments. All issues of use and exploitation must be impartially considered in the light of the overall protection aims of the National Parks and individual cases. The conservation of nature by the National Park should lead to an improvement of the living and working conditions of the human population living within the region through positive repercussions on tourism and the reputation of the region.

Order on the Navigation on the Federal Waterways

The marine North Sea area of the German part of the Trilateral Conservation Area is a federal waterway. Navigation is hence only to be regulated by Order of the Federal Ministry for Digital

and Transport. An Order was issued in 1992 and amended in 1995 and 1997 (NPNordSBefV). This is a federal ordinance and it is legally binding.

The current order⁴ has established speed limits for navigation in the National Parks and closed areas comprising seal haul out sites, and breeding and moulting areas for birds.

Authorities and enforcement

In Germany, most of the enforcement measures lie within the responsibility of the federal states, the Länder. The most important responsibility in the Wadden Sea directly assigned to the federal level is the competence for regulating and enforcing all measures connected to shipping because the marine area of the protected areas is a federal waterway. Navigation regulations therefore kept under the surveillance of the Federal Ministry for Digital and Transport through its federal shipping agencies.

At state level generally regulations are legally implemented through the regular terrestrial and water-based police forces of the State Ministries of the Interior. The State Ministries responsible for e.g. nature conservation, coastal defence and protection, water management, fisheries and economic affairs act directly through their respective regional authorities. Schleswig-Holstein and Niedersachsen have their own federal laws on fisheries that are regulating fisheries within the sovereign waters and the protected areas of the Wadden Sea.

Each National Park is managed by a regional National Park authority which is responsible for the implementation of the provisions of the National Park instruments (CWSS 2012). They are differing from state to state and are supported by rangers, volunteers and NGO's.

4.2 Germany – Lower Saxony (Niedersachsen)

Within the German Wadden Sea Conservation Area of Lower-Saxony the total area that has additional protection by means of zonation comprises of 345.307 ha divided in three different zones. In Figure 4-1, these areas are visualised with underlying ecotopes. For more detailed maps, see Appendix 6.

⁴ A revision of the order with new regulations regarding activities in the protected areas is currently in progress. Changes with the locations of the closed areas are expected so a presentation of the present regulations and locations of the areas is disregarded within this report.

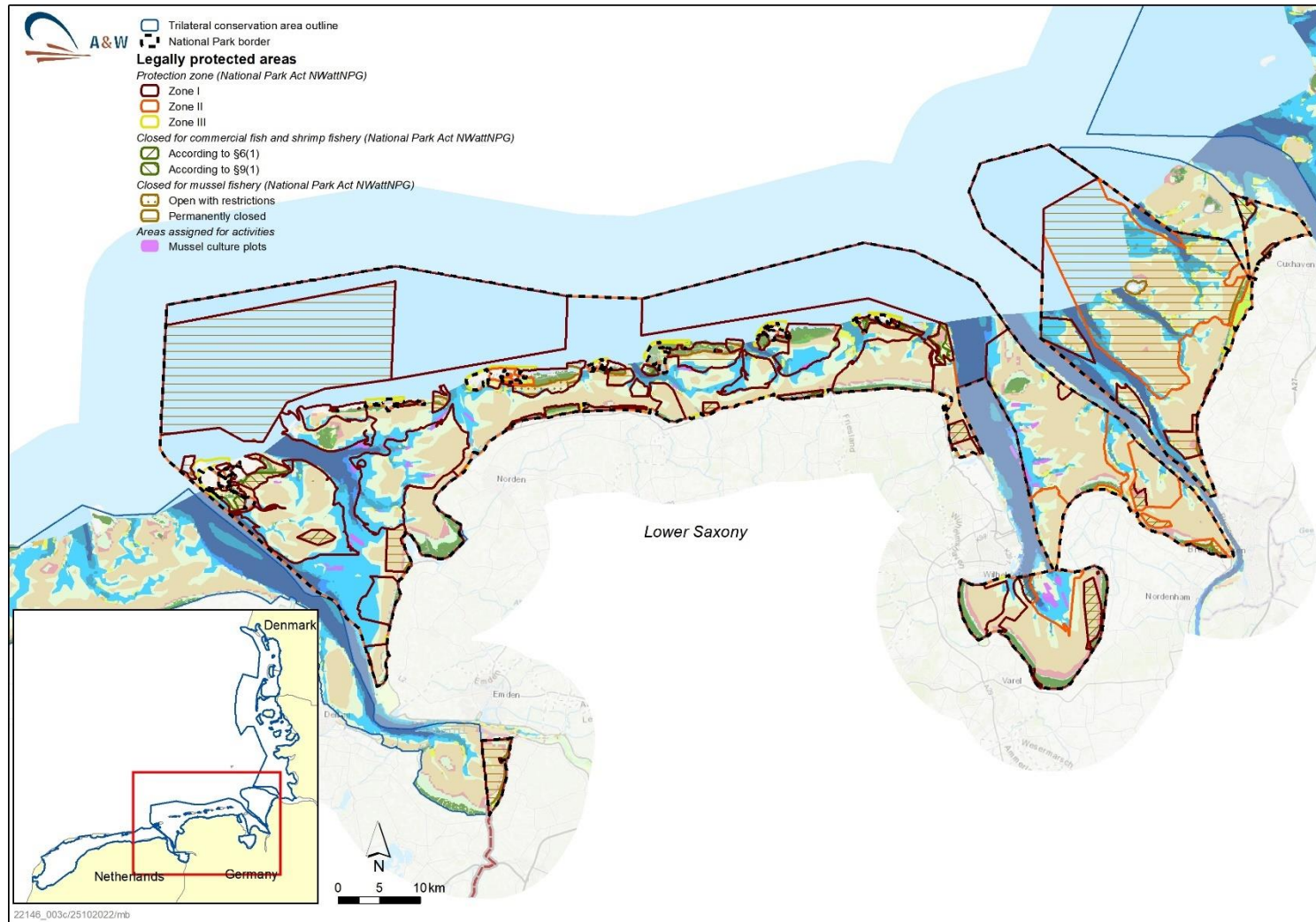


Figure 4-1 Overview legal protection zones within the Lower-Saxony Wadden Sea Conservation area. See Appendix 5, 9 and Figure 2-1 for a more detailed map, sources of the map content and a description of the ecotope colours, respectively.

4.2.1 Legal framework

The implementation of the Federal Nature Conservation Act (BNatSchG) in the legal framework of the federal state of Niedersachsen is fulfilled with the “Lower Saxony Implementation Act to the Federal Nature Conservation Act” (NAGBNatSchG) from 2010. The law includes further regulations that supplement the Act on the National Park “Wadden Sea of Lower Saxony” with regards on interventions in nature and landscape and the protection of wildlife and plants, their habitats, biotopes and regulations regarding Natura 2000 area protection.

National Park Lower Saxony

Before the establishment of the National Park, nature reserves designated to protect areas within the Lower-Saxony Wadden Sea and the east Frisian islands already existed. They mostly enclosed small terrestrial areas important for breeding birds or dune habitats. The Nature Reserve centred on the Island of Memmert stood out by covering the surrounding mudflats and therefore enclosed all Wadden Sea habitats within the protected area.

The overall area of the Lower Saxony part of the Trilateral Conservation Area is protected under the Status of National Park. The inhabited islands, except for the villages, are part of the National Park. The National Park was first established by statutory order in 1986. The first State Act on the protection of the area as a National Park was introduced in 1999. The legal framework regarding the boundaries and protection zones today is set within the Act on the National Park “Wadden Sea of Lower Saxony” of July 2001 (NWattNPG 2010).

The purpose of the National Park is to preserve and protect the Wadden Sea’s unique natural assets and landscape, including the characteristic appearance of its landscape, in the Wadden Sea region of Lower Saxony. The natural processes in these habitats are to remain in force. The diversity of the plant and animal species in the area of the National Park is to be conserved. In total an area of approximately 345.307 ha is currently declared as National Park in Lower Saxony.

Zoning protection regime

The Lower Saxony Wadden Sea National Park is divided into three zones (paragraphs 4.2.2 t/m 4.2.4), in which different activities are allowed or prohibited. A second major amendment in 2010 extended the area of the National Park to include large parts of the offshore belt. The full legal protection regime for the core zone (Zone I) applies for the extension area well.

Cockle fishery, as a ground damaging activity, has not been carried out since 1992 (Nationalpark Wattenmeer 2022). General exceptions are made for the dumping of sand from maintenance dredging in accordance with national regulations which refer to OSPAR and London Convention requirements, recreational fishery and, as far as the protection goals are not contradictory hereto, the extraction of sand for coastal protection purposes and the construction of cables and pipelines (CWSS 2012).

Management, monitoring and enforcement

Management, monitoring and enforcement in the whole area of the National Park is carried out by the state authorities of the federal state Lower Saxony. The management of the National Park is carried out by the National Park Administration which is directly subordinated to Ministry for Environment, Energy, Construction and Climate Protection of Lower Saxony. The National Park Administration serves as the lower conservation authority for the designated area of the National Park. The lower nature conservation authorities of the districts and the city of Cuxhaven are working together with the National Park Authority and approve exceptions and grant exemptions in respect of areas in Zone III and Zone II lying in their territory.

Most of the area of the National Park is managed passively in accordance with the protection objectives to allow natural processes to take place with a minimum degree of disturbance. Supervision in the Lower Saxony area is carried out by rangers employed at the National Park authority, wardens employed at the Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency (NLWKN) and volunteers of the NGO 'Mellumrat'. They work together within the environmental supervision of the National Park and visitor management. Scientific monitoring activities regarding TMAP are coordinated and carried out by the National Park Authority based in Wilhelmshaven. Activities regarding fisheries are managed and monitored by the state fisheries department of lower saxony in Bremerhaven. The police forces play a significant role in terms of law enforcement in the Lower Saxony part of the Wadden Sea (CWSS 2012).

4.2.2 Protection zone I

Zone I is the strictest protection zone and covers around 240.779 ha (69,73 %) of the National Park (Figure 4-1). Areas designated as Zone I include the ecologically most valuable areas and therefore are serving as the Core Zone. All activities which destroy, damage or change the National Park and its components are prohibited. Public admittance is prohibited with the exception on assigned paths and designated mud flat routes.

Zone I is subdivided into 52 areas. Each subarea has a special protection purpose and, if for a certain area applicable, permitted uses are stated in the NWattNPG (2010).

Time of closure and activities

In general, all actions are prohibited that destroy, damage or change the National Park or any of its components. Some human activities (farming, hunting on parts of the islands and fishing) are still possible, if permissible within the NWattNPG (2010). For example, the entrance in zone I/9 Borkum – Nordstrand on foot is allowed from July 16 till first of march. The area is closed for public admittance the rest of the year. Hunting on waterfowl is strictly regulated by direct agreements for each island. The majority of the area of Zone I is closed all year for entrance.

Areas closed for fish and shrimp fishery

Closed areas for fish and shrimp fisheries within Zone I are defined within the NWattNPG. Fish and shrimp fisheries are not allowed in eight areas of zone I, in which the activities could lead to destruction, damage or change in the soil, its vegetation or any *Sabellaria spinnulosa*. Summed up a surface area of 3.672 ha is closed for ground disturbing fisheries (NWattNPG 2010).

Furthermore another 10 subareas within Zone I are closed for fishing on fish and shrimp with static nets. The surface area closed for this type of fishery is stated with 2.510 ha. These areas are also closed for blue mussel fishery. In total an area of 6.182 ha is free from any kind of ground disturbing fishery and could be referred to as 'zero-use' areas.

Blue mussel fishery

The legal framework for blue mussel fishery is given by the Lower Saxony Fisheries Act (Nds. FischG), the Lower Saxony Coastal Fishery Ordinance (NküFischO) and the NWattNPG (2010).

Blue mussel fishing has been carried out since 1999 on basis of a management plan drawn up by mutual agreement between the Lower Saxony Ministry for Rural Areas, Food, Agriculture and Consumer Protection and the Ministry for the Environment to avoid significant interference with the Wadden Sea ecosystem. Areas in the Core Zone, in which commercial mussel fishing, and

establishment of mussel farms are permitted are stated within the NWattNPG. The rest of the Core Zone, which covers an area of 87.370 ha, is closed for blue mussel fishery.

In areas open for mussel fisheries, the collection of stock mussels is only permitted within the framework of the management plan issued by the highest fisheries authority together with the highest nature conservation authority. The areas are updated every five years, regarding the protective purpose of the National Park Act. Fishery on mussels from wild mussel beds for human consumption is only permitted if the mussel beds are located in the sublittoral area.

Potential zero-use areas

Large areas within the National Park e.g. the islands Memmert and Mellum, and tidal flats, the 'Hohe Knechtsand' are mostly without any resource use and disturbances by recreational activities (Kloepper *et al.* 2017).

Fishery is not entirely prohibited within the mentioned areas. The area I/39 around Mellum is not excluded from fisheries by the NWattNPG (2010). The area I/47, that also includes the sandflat 'Hoher Knechtsand' is closed for mussel fishery by the NWattNPG (2010). However, shrimp fishery is not restricted by the NWattNPG (2010) within this area and therefore the three subareas are not part of the 6.182 ha free of ground disturbing fisheries.

Land-sea gradients

Most of the areas within Zone I enclose a wide habitat gradient from the mudflats to salt marshes or sandy dunes on the inhabited islands. The area closed for fishing activities in these areas is small. On the other hand, areas that are known for the occurrence of *Sabellaria spinulosa* (e.g., Varel channel) are not enclosing a land sea gradient. The area I/48 Eitzensand is directly intersecting to the eastern part of the zero – use zone of the Hamburg National Park and encloses tidal creeks and sand flats.

In connection to each other several areas that are designated as Zone I, show a wide extend from salt marshes at the shoreline, over mixed, sandy tidal flats to the open North Sea. The western part of Juist for example is connected via a second subzone to the uninhabited island Memmert and covers typical Wadden Sea habitat as tidal flats, a tidal creek system, salt marshes and sand dunes. The three subareas, Leybucht, Leybucht Sands and Greetsieler Nacken, are located south of Juist and enclose a saltmarsh, mudflat to tidal creek system gradient.

It is concluded that adjacent subareas of Zone I in the Lower-Saxony Wadden Sea National Park cover all aspects of a land-sea gradient of the Wadden Sea.

4.2.3 Protection zone II

Zone II – the intermediate zone – covers around 102.636 ha which represents 29,72 % of the total area (Figure 4-1). In deviation to the core zone, exemptions for certain uses are given provided that the protection aims of the National Park are not threatened.

Time of closure and activities

Public admittance is allowed in the areas of Zone II, with the exception of the salt marshes during the breeding season for birds from 1 April until 31 July.

Fishery

The whole area is generally open to fish-, shrimp and blue mussel fisheries. Within the management plan on blue mussel fisheries 12 blue mussel locations covering an area of 518 ha

are closed within zone II for the collection of wild- and stock mussels. On five additional locations the mussel fishers relinquish the use on voluntary basis which is noted within the management plan.

Land-sea gradients

The intermediate zone covers all aspects of land sea gradients of the Wadden Sea.

4.2.4 Protection zone III

Protection Zone III covers 1.871 ha (0,54 %) of the total area of the National Park (Figure 4-1). Protection Zone III encompasses areas on the inhabited islands that mainly serve for recreational purposes. Especially for activities such as walking, camping, swimming, sitting in beach baskets, horseback-riding, fishing, collection of mussels, kite-flying and sports activities.

Time of closure and activities

Use of motorised vehicles and the set-up of facilities are permitted to the extent required to make the mentioned uses possible.

Land-sea gradients

Zone III covers mainly island habitats and to a smaller extent littoral habitats adjacent to the coast.

4.2.5 Main findings / highlights

In Table 4-1 a summary is given of the information with regard to different protection zones within the Lower-Saxony Wadden Sea Conservation area. Based on the information on areas for which stricter protection is applied, the following points stand out:

- The National Park is divided into three zones
- Zone I: all activities which destroy, damage or change the National Park and its components are prohibited;
- Fish, blue mussel and shrimp fishery are allowed in parts of zone I, though many areas within Zone I are free from bottom disturbing fisheries (zero-use). These areas are not officially assigned as 'zero-use / reference' areas and are fragmented over the whole area
- Public access is prohibited in Zone I with exception of assigned paths and routes
- Zone II: exemptions for certain activities provided that the protection aims of the National Park are not threatened; allows for public admittance (except breeding season) and fisheries
- Zone III: recreational activities are allowed.
- No cockle fisheries are allowed in the whole of Lower-Saxony
- (Law) Enforcement is managed by the regional National Park authority and the police authorities
- Surveys for the Trilateral Monitoring and Assessment Program is carried out in the whole extend of the National Park on various locations
- Numerous volunteers are integrated with monitoring tasks, supervision and environmental education in the National Park.
- No complete tidal basins are closed for resource usage
- Zone I and II cover land sea gradients

Table 4-1 Overview table of characteristics of zonation protection regimes in the Lower-Saxony Wadden Sea Conservation area. N.B. Overlap in area's are not taken into account in the total area calculations, other than specifically mentioned).

Zone of National Park	Total area (ha)	Time of closure	Years installed	Dynamic closure	Legal protection	Activities banned	Exceptions / permits*	Specific monitoring	Land-sea gradient
National Park Wadden Sea Lower Saxony (TCA)	345.307	Permanent	>35		BNatSchG, NAGBNatSchG, NWattNGP,	all activities which destroy, damage or change the NP	Economically necessary / viable activities	Yes	Yes
Zone I	240.799	Permanent	>35	Yes	BNatSchG, NAGBNatSchG, NWattNGP,	Public admittance	On designated paths, shrimp, fish and mussel fisheries	Yes	Yes
Closed for any fishery within the National Park	6.182	Permanent	>20.	No	BNatSchG, NAGBNatSchG, NWattNGP,	All ground disturbing activities		Yes	Partly
Areas closed for blue mussel fishery	87.370	Permanent	>20	No	BNatSchG, NAGBNatSchG, NWattNGP, Nds. FischG	Blue mussel fishery	Shrimp fishery	Yes	Yes
Zone II	102.636	Permanent	>20	Yes	BNatSchG, NAGBNatSchG, NWattNGP,	all activities which destroy, damage or change the NP, partly restricted areas	Designated areas for farming, dog walking, recreational fishing,	Yes	Yes
Areas closed for blue mussel fishery by management plan	518	Temporarily, revision every 5 years	>20	Yes	BNatSchG, NAGBNatSchG, NWattNGP, Nds. FischG	Blue mussel fishery		Yes	Yes
Areas voluntarily not fished by mussel fisheries	122	Revision management plan every 5 years	>20	Yes	BNatSchG, NAGBNatSchG, NWattNGP,	Not relevant	Not relevant	Yes	Not relevant

Zone III	1.871	Permanent	>20	Yes	BNatSchG, NAGBNatSchG, NWattNGP	Any activity that is against the protection purpose	Recreational activities	Yes	Not relevant
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**Other than research, monitoring and management*

4.3 Germany – Hamburg

Within the German Wadden Sea Conservation Area of Hamburg the total area that has additional protection by means of zonation comprises of 13.681 ha divided in two different zones. In Figure 4-2, these areas are visualised with underlying ecotopes.

4.3.1 Protection zone I

Zone I is reserved for the establishment and succession of natural dynamics and covers about 12.505 ha (91,40 %) of the total area of the Hamburg National Park (Figure 4-2).

Time of closure and activities

Zone I is closed for public admittance all year except for two marked mud flat paths from Cuxhaven to the island of Neuwerk and from Neuwerk to the dune island Scharhör. Entrance to Scharhör is restricted to guided tours to visit the ornithological warden of 'Verein Jordsand' who is in charge with supervision and monitoring activities on the uninhabited islands of Scharhör and Nigehör. For such activities as monitoring special permissions for the entrance of Zone I are handed out to scientists and the employees of the NGO Jordsand.

The tidal flats northeast of the island Neuwerk ("Kleiner Vogelsand") are part of Zone I but open to public admittance and activities as horse riding and walking. (WattMG HA Act 2017 § 5 (3) Nr. 9). Entry points to access this area are on the north of the island. Motorized vehicles are prohibited within this area.

Commercial fishery is forbidden with the exception of shrimp fishery along three narrow shipping routes (less than 1 % of the area) and in the area of the seaward extension of 2001.

Zero-use zone (Reference area)

Within the legal framework given in the WattMG HA (Art. 2-5), an area of approximately 10.400 ha (76,02 % of the NP) was designated to be practically free from any resource use to protect the undisturbed development of high tidal flats and semi-natural dune islands including their biological communities (Kloepper *et al.* 2017). This area is set within the extend of Zone I before the seaward extension in 2001 and had been designated with the establishment of the National Park in 1990. The sublittoral habitats within the tidal creeks used as shipping lanes are excluded from the area. The legal set status of this area free of exploitation is in accordance with the stated condition in within the Esbjerg Declaration of 1991 as a Reference area (See Figure 2-1).

Time of closure and activities

Navigation is only allowed in this part of zone I on the marked shipping lanes. Though, shrimp fishery is allowed along the three shipping routes that cross the area from east to west.

Land-sea gradients

Zone I and the included zero-use area show typical habitats of an open Wadden Sea area. Estuary flats with silt, mixed, sand tidal flats around the island Neuwerk. Tidal creek systems draw through the protected area. The area includes the dune islands Scharhör and Nigehör.

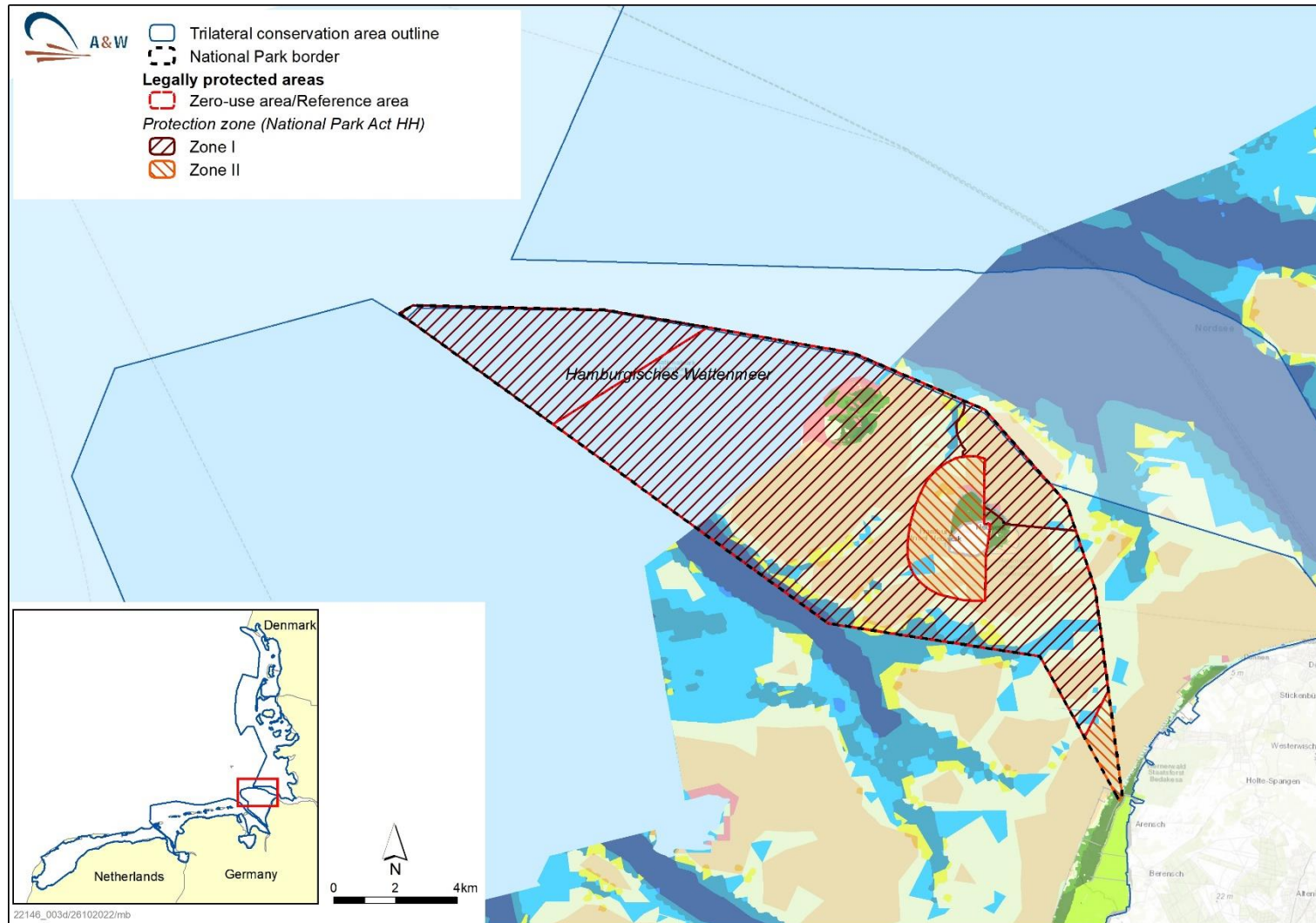


Figure 4-2 Overview legal protection zones within the Hamburg Wadden Sea Conservation area. See Appendix 10 and Figure 2-1 for sources of the map content and a description of the ecotope colours, respectively.

It is concluded that the zero use area of Zone I of the Hamburg National Park covers all aspects of land-sea gradients of the Wadden Sea.

4.3.2 Protection zone II

Zone II covers 1.176 ha (8,60 %) of the total area of the National Park (Figure 4-2). The general protection purposes and the resulting prohibitions are applicable to this area, which is mostly located on the inner parts of the island Neuwerk and an area between the coastline and the tidal creek "Sahlenburger Loch".

Time of closure and activities

Zone II is reserved for recreation, sustainable tourism and nature experience activities which are in line with the National Park aims. Farming activities, mostly by maintaining the small-scale-structured landscape of the island Neuwerk, are carried out by the inhabitants of the island.

Land-sea gradients

Zone II mainly covers the inhabited island of Neuwerk and the southern tip of the National Park adjacent to the coastline of Lower Saxony. A small land-sea gradient exists around Neuwerk, as Zone II extends into the mudflat and tidal creeks.

4.3.3 Main findings/highlights

In Table 4-2 a summary is given of the information with regard to different protection zones within the Hamburg Wadden Sea Conservation area. Based on the information on areas for which stricter protection is applied, the following points stand out:

- The National Park is divided into two zones
- Zone I: covers the largest portion of the National Park including the reference area / zero-use area and is closed for public admittance all year except for two marked mud flat paths
- Shrimp fisheries are not allowed in Zone I, except for three navigational channels through the reference area, diminishing the sublittoral habitats from strict protection and zero use
- Zone II: allows recreational activities
- In both zones, commercial fisheries (except shrimp) and hunting are forbidden
- (Law) Enforcement and supervision is managed by the regional National Park Authority and the police authorities.
- Monitoring for the Trilateral Monitoring and Assessment Program is carried out in the whole extent of the National Park on certain locations
- Volunteers are integrated with monitoring tasks, supervision and environmental education in the area of the National Park
- The National Park does not cover a whole tidal basin but does cover land-sea gradients

Table 4-2 Overview table of characteristics of zonation protection regimes in the Hamburg Wadden Sea Conservation area. *N.B.* Overlap in area's are not taken into account in the total area calculations, other than specifically mentioned).

Zone of National Park	Total area (ha)	Time of closure	Years installed	Dynamic closure	Legal protection	Activities banned	Exceptions / permits*	Specific monitoring	Land-sea gradient
National Park Wadden Sea Hamburg (TCA)	13.681	Permanent	>30	No	BNatschG, HmBNatSchAG, WattMG HA, WaStrG	that could cause destruction, damage, change or cause lasting disturbance		TMAP	Yes
Zone I (zero – use-(Reference) area)	10.400	Permanent	>30	No	BNatschG, HmBNatSchAG, WattMG HA, WaStrG	All resource use fully prohibited. fishery prohibited public admittance prohibited, falling dry	Shrimp fishery along in shipping lanes (100 m width) Mud flat hiking on marked paths and area north of Neuwerk	TMAP Macrofauna, seals, seabirds	Yes
Zone I (seaward extension)	1.992	Permanent	~20	No	Yes	that could cause destruction, damage, change or cause lasting disturbance, falling dry	Fishery allowed	TMAP	Yes
Zone II	1.176	Permanent	>30	Yes	BNatschG, HmBNatSchAG, WattMG HA, WaStrG	that could cause destruction, damage, change or cause lasting disturbance.	Designated areas for farming, dog walking, recreational fishing,	TMAP	Yes

*Other than research, monitoring and management

4.4 Germany – Schleswig-Holstein

Within the German Wadden Sea Conservation Area of Schleswig-Holstein the total area in the has additional protection by means of zonation comprises of 438.030 ha divided in two different zones. In Figure 4.3, these areas are visualised with underlying ecotopes. For more detailed maps, see Appendix 6.

4.4.1 Legal framework

The implementation of the Federal Nature Conservation Act (BNatSchG) in the legal framework of the federal state of Schleswig-Holstein is given within the Landesnaturschutzgesetz (LNatschG), last revised in 2022. The LNatschG gives the legal framework for establishing protected parts of nature and landscape. Before the establishment of the 'National park Schleswig-Holsteinisches Wattenmeer' most areas had already been protected as nature reserves. The designation and protection of Natura 2000 areas is regulated within section II of the LNatSchG.

National Park Schleswig-Holstein

In 1999 the amended state law "Act for protection of the Wadden Sea of Schleswig Holstein" (National Park Act, NPG) came into effect. The protection purpose is to protect the Wadden Sea and its natural development. Natural processes shall be permitted to take place as unimpededly as possible. The National Park, covering an area of 438.030 ha, shall be conserved as a habitat for the plant and animal species that occur in it naturally, as well as for the relationships occurring between such species and their habitats. Nature in its entirety, including its natural development, and including all plants, animals and ecosystems, has a value in itself and must be protected as such (NPG; 1999). Before the establishment of the National Park several nature reserves served the purpose of protecting the Schleswig-Holstein part of the Wadden Sea. Most of these areas are merged now within the area of the National Park. Compared with the 1985 NPG, the amended law entails a seaward extension to the 12-nautical mile line, including the designation of a small Cetacean Conservation Area west of the islands Sylt and Amrum, a new definition of the protective objective and the introduction of a new zoning system, including a zero-use area.

Zoning protection regime

The Schleswig-Holstein National Park is divided into two zones, in which different activities are prohibited (paragraphs 4.4.2 and 4.4.3, Figure 4-3). The overall protection provisions apply to Zone I and II (Art. 5 (1) NPG). All actions, apart from permitted measures and uses, are prohibited that could destroy, damage, change or lastingly disturb the protected area or its components. Certain disturbing activities, as driving motorized vehicles, hunting, unleash dogs, camping, disturbing animals, cockle & razor clam fishery, erect and operate wind power systems and oil exploitation is generally prohibited in both zones.

Overall permissible activities include mainly activities necessary to maintain infrastructure, fulfil supply management of the islands and clearance of tidal channels for drainage inland areas or for harbour access (Art. 6 (1) NPG).

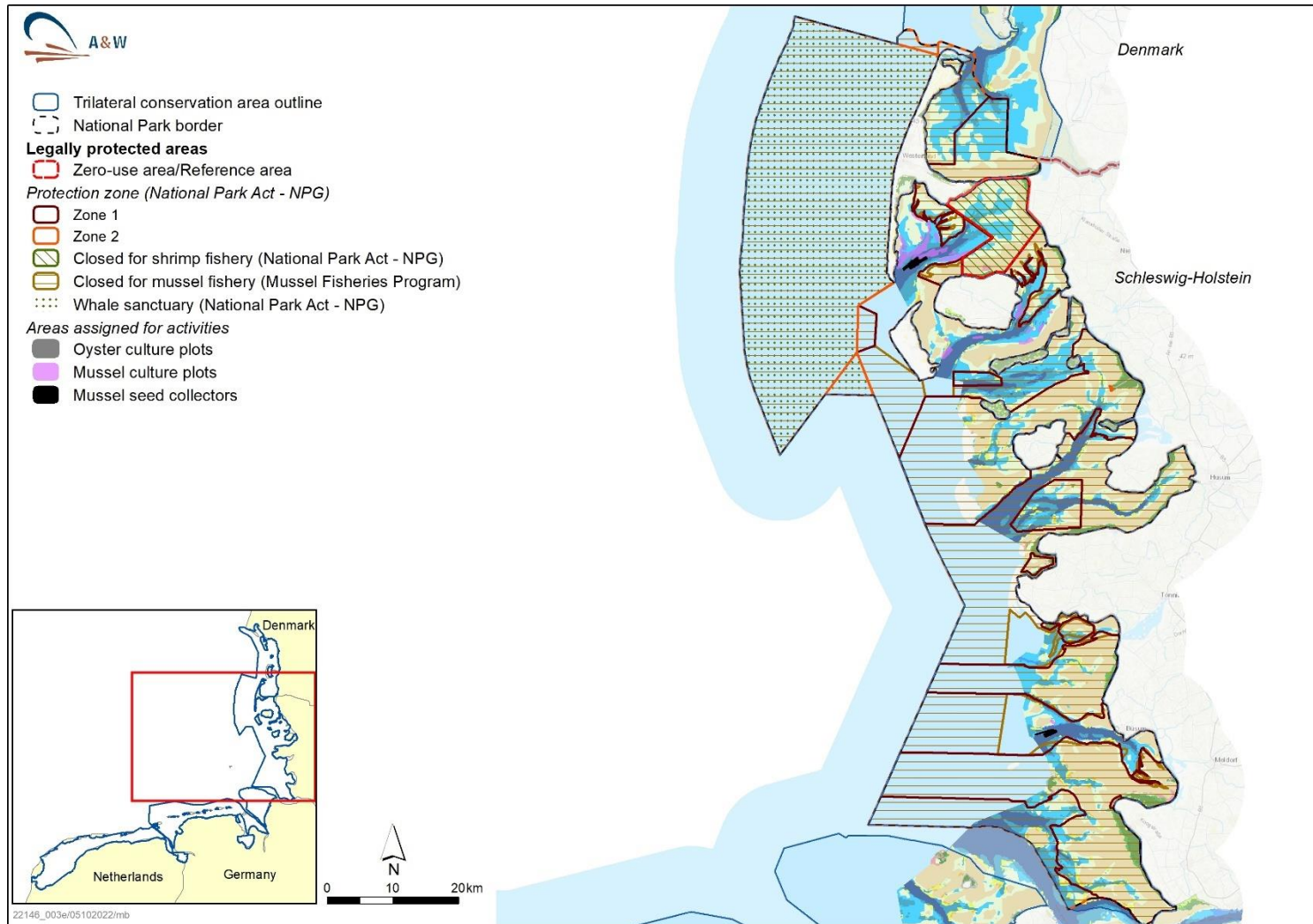


Figure 4-3 Overview legal protection zones within the Schleswig-Holstein Wadden Sea Conservation area. See Appendix 6, 9 and Figure 2-1 for a more detailed map, sources of the map content and a description of the ecotope colours, respectively.

Management, monitoring and enforcement

The National Park Authority which is a part of the Schleswig-Holstein Agency for Coastal Defence, National Park and Marine Conservation (LKN) executes the management of the National Park. Management, monitoring, and enforcement is carried out and coordinated by LKN in close cooperation with caretaking NGOs as NABU, Verein Jordsand, Schutzstation Wattenmeer, Öömring, Naturschutzgemeinschaft Sylt, Naturschutzverein Südtondern and Wiedingharder Naturschutzverein. Rangers employed at the National Park Administration, wardens and volunteers of the above-mentioned organisations work together in the field of disturbance monitoring, environmental monitoring (TMAP) and environmental education.

Most of the area is, according to the protection purpose, free of active management measures. Protective and development measures that are in accordance with the protection purpose are permissible by the National Park Authority.

The whole area is included with the monitoring according to the TMAP. Surveys, that are regularly carried out for the whole area of the National Park, are also carried out within the area of the zero-use zone. Among others, surveys of seals, fish, roosting and breeding birds, blue mussel beds, salt marshes, eelgrass and macroalgae are carried out as part of the TMAP by the staff of the National Park Authority, universities, consulting companies via contract and volunteers of NGO's. The bird islands Trischen, Norderoog and Hallig Habel are manned with ornithological wardens from the areas responsible NGO from spring to fall.

Activities regarding fisheries are managed and monitored by the superior fishery authorities of Schleswig-Holstein. Law enforcement and supervision of fisheries is carried out by the police forces of the state of Schleswig-Holstein.

4.4.2 Protection zone I

Zone I is the strictest protection zone and constitutes the core-zone of the protected area within the Schleswig-Holstein Wadden Sea and includes the ecologically most valuable areas. Zone I comprises coherent tidal basins and covers about 157.951 ha (36,06 %) of the total area of the National Park.

Time of closure and activities

In Zone I, no blue mussel fishery or pacific oyster cultivation is allowed (see Zone II). The present commercial fishery for brown shrimp and fish is allowed within zone I and II, excluding the zero-use-zone (Art. 6 (2) NPG).

In Zone I public access is prohibited, with the exception of e.g. tidal areas adjacent to the coastline, tidal flat walking routes, and commercial fishery (Art. 6 (2) NPG). Exemptions for guided mud flat tours within zone I are handed out by the National Park Administration individually for qualified tour guides with a limitation of attendees and tours for each summer season. A few permissions are handed out for a pleasure craft to land on the southern tip of Norderoogsand. Within seaward areas of the adjacent municipalities also exceptions for non-commercial collection of lugworms, mussels and the picking of plants are made.

Voluntary agreement

A voluntary agreement based on Art. 4 (4) NPG between the shrimp fishers association on the west coast of Schleswig-Holstein and the National Park authority was made in 2003 to protect moulting shelducks from disturbance in the area of the Elbe estuary and east of the island of Trischen. The shrimp fishers agreed not to enter these areas three hours before and after high tide during the months July and August. Fishery is not prohibited (Freiwillige Vereinbarung nach § 4 Satz 4 Nationalparkgesetz). A similar agreement was made with hobby fishers.

Land-sea gradients

The Zone I of the Schleswig-Holstein National Park is subdivided into six larger units that partly include a complete land-sea gradient from the mainland shore including salt marshes, mud, mixed and sand flats, shallow and deep sublittoral habitats tidal creeks and the open North Sea. Three subunits extend from the mainland coast in the east to the open North Sea in the west. These areas include important roosting and breeding habitat for shorebirds, saltmarshes, seal haul sites, large connected mud flats and tidal creeks.

For example, the subzone “Rummelloch” extends from the shore in between the Olanddamm in the north to the northern Edge of the “Holmer Siel” in the east with a heading south west into the open north sea. This subzone includes the important seabird breeding habitats “Hallig Habel”, “Hallig Norderoog”, and the sandflats Japsand, Norderoogsand and Sürderoogsand and covers approximately an area of 45.000 ha.

Zero-use zone (Reference area)

With the amendment of the NPG in 1999 as a part of Zone I, an area of the tidal basin ‘Hörnuntief’ south of the Hindenburg causeway covering 12.614 ha (2,88 % of the NP) has been declared as a zero-use zone in which all resource use has been fully prohibited (Art. 5 (3) NPG). The legal set status of this area free of exploitation is in accordance with the stated condition in within the Esbjerg Declaration of 1991 as a Reference area (See Figure 2-1).

Time of closure and activities

Additional to the to the protection provisions valid for Zone I any use of resources is prohibited within the zero-use area (§ 6 (2) NPG). Commercial fishery on fish and shrimp therefore is not allowed. Navigation of trespassing vessels is only allowed along navigational routes. As today no permissions for mud flat hikes through this area are handed out.

Land-sea gradients

The zero-use area consists of an inner tidal basin with silt, mixed sand tidal flats and tidal creek systems, island and mainland salt marshes and primary dunes. The majority of the area consists of mudflats and a tidal creek system. The area covers approximately half of the tidal basin of the Hörnuntief’ and is characterized by back-barrier tidal flats.

Remarks

Assessment of VMS Data of beam trawlers conducted by a WWF study showed that the fishable areas within the zero-use zone are fished in the same intensity as the surrounding areas (Kuechly et al. 2016). Violations of prohibitions of fisheries in the zero-use zone are filed by the responsible authorities. Charges against the violating fishers were not imposed yet, whereas a verification of the violation was not possible to achieve by VMS Data or sightings of beam trawlers within the closed area (comment interview with NP administration)

4.4.3 Protection zone II

The overall protection measures of Art.5 (1) of the NPG apply to the areas designated as Zone II. Zone II covers about 280.079 ha (63,94 %) of the total area of the National Park. Part of Zone II is the porpoise protection area west of the island Sylt and Amrum created to protect small whales and seabirds. It was established as the first European whale sanctuary with the amendment of the National Park Act in 1999. The area is known for its high proportion of mother-calf pairs of porpoises.

Time of closure and activities

Zone II is generally open to the public all year, though some areas are permanently or temporarily closed.

Shrimp fishery

The present commercial fishery for brown shrimp and fish is allowed within zone II. Fishery in the whale sanctuary must be carried out by the regulations on protection of juvenile marine animals (European directive Nr.850/98) and the treaty on the preservation of small cetaceans. Therefore speed limits are established and fishery with bottom-set gillnets is prohibited.

Mussel and oyster fishery

Fishing for mussels is regulated in the framework of Art- 40 (1) and 41 of the state fisheries act (Landesfischereigesetz) and shall be conform to the National Park's purpose. Therefore, mussel fishery in the Schleswig-Holstein Wadden Sea is regulated since 1997 based on a management program of the Ministry of Energy Transition, Climate Protection, Environment and Nature. The most recent program of 2017 states that Within the 3-mile -zone of the coastal waters and within boundaries of the National Park the commercial use is limited to blue mussels and oysters. Cockle and razor clam collection is prohibited (NP Act 1999 Section 5). The area outside of the 3-mile-line is according to this program free of any mussel economic use.

The overall aim of the Program is to reduce seed mussel fisheries from natural beds and stock the mussel cultures with seed mussels from spat collectors which then grow to a consumption size before they are harvested. No fisheries on consumption mussels from natural beds is allowed. Seed mussels may neither be exported nor imported from other areas. The collection of seed mussels by spat collectors is limited to four districts in the sublittoral of four tidal basins within the zone II (Hörnnum Tief, Norderaue, Eidermündung, Piep). With the current management regime 87% of the National Parks area is free of any blue mussel fishery.

The area for the blue mussel culture districts is limited to a size of 1.700 ha which also includes the areas (up to 250 ha) for seed mussel farms. Two-third of this area (170 ha) should preferably be located within the Hörnumtief, the 80 ha left over are preferably placed within the tidal catchment area "Piep". Deterrence of sea ducks and other seabirds off the mussel cultures is not allowed. The number of licenses for blue mussel fishery is limited to eight. These licenses are temporarily granted till the 31st of December in 2031.

The pacific oyster is cultivated in one culture district of 30 ha located in front of List/Sylt. Additional licenses are given to collect pacific oysters to stock the culture or direct consumption.

Land-sea gradients

Similar to the extent of Zone I, the subunits of Zone II stretch from the mainland coastline along the tidal creeks to the open sea in the west. The extend of the whale sanctuary west of the islands of Sylt and Amrum reaches out to the 12 nautical mile line of the territorial coast waters.

4.4.4 Main findings / highlights

In Table 4-3 a summary is given of the information with regard to different protection zones within the Schleswig-Holstein Wadden Sea Conservation area. Based on the information on areas for which stricter protection is applied, the following points stand out:

- The National Park is divided into two protection zones
- Zone I (incl. zero-use / reference area): public access is prohibited (with some exceptions) and commercial fishery for shrimp and fish is allowed, except in the zero-use/reference area where both mussel and shrimp fisheries are prohibited
- Fishing within the Reference / zero-use area does take place now and then, but this is hard to prove
- Zone II: recreational activities are allowed and shellfish fishery is only allowed in defined areas in Zone II (blue mussel & pacific oyster)
- (Terrestrial) areas within Zone II can be temporarily closed with regard to breeding birds
- Voluntary agreements between shrimp fishers exist
- Law enforcement and supervision of fisheries is carried out by the police forces of the state of Schleswig-Holstein.
- Monitoring for the Trilateral Monitoring and Assessment Program is carried out in the whole extent of the National Park on numerous locations.
- Numerous volunteers are integrated with monitoring tasks, supervision and environmental education in the National Park.
- Both protection zones cover land-sea gradients and enclose complete tidal basins

Table 4-3 Overview table of characteristics of zonation protection regimes in the Schleswig-Holstein Wadden Sea Conservation Area (CA). N.B. Overlap in area's are not taken into account in the total area calculations, other than specifically mentioned).

Zone of National Park	Total area (ha)	Time of closure	Years installed	Dynamic closure	Legal protection	Activities banned	Exceptions / permits*	Specific monitoring	Land-sea gradient
National Park Wadden Sea Schleswig-Holstein (TCA)	438.030	Permanent	>30	No	BNatschG, LNatSchG, NPG, LFischG, WaStrG	That could destroy, damage, change or lastingly disturb the protected area or its components		Yes	Yes
Area free from mussel fishery within the National Park (Zone I & II)	~ 381.086	Permanent	>5	No	BNatschG, LNatSchG, NPG, LFischG, WaStrG, mussel programme 2017	Mussel fishery is not taking place within this area. Regulations for the respective zone apply	Regulations for the respective zone apply	Yes	Yes
Zone I	157.951	Permanent	>20	No	BNatschG, LNatSchG, NPG, LFischG, WaStrG	No public admittance to the majority of the area	Entry around inhabited islands and parts of mainland for mudflat hikes and recreational fishing (1000 m agreements) and for guided tours into zone I. Shrimp fishery	Yes	Yes
Zero-use zone (Reference area)	12.614	Permanent	>20	No	BNatschG, LNatSchG, NPG, LFischG, WaStrG	Addition to general protection regime All resource use prohibited	Open to navigation on marked shipping lanes, monitoring	Yes	Yes

Voluntary agreement areas around Elbe estuary & Trischen	~ 8.798	Temporarily	>20	July & August 3 hours before and after high tide	BNatschG, LNatSchG, NPG, LFischG, WaStrG,	Commercial fishers are committed to not disturb moulting shelducks within the Klotzenloch and Flackstrom creeks and the adjacent tidal creeks	Shrimp fishery	Yes	No
Zone II	280.079	Temporarily	>30	Yes	BNatschG, LNatSchG, NPG, LFischG, WaStrG	See above	Oil exploitation restricted to existing site Mussel fishery in 4 tidal areas	Yes	Yes
Whale sanctuary	122.438	Permanent	>20	No	BNatschG, LNatSchG, NPG, LFischG, WaStrG	Addition to 1 To disturb whales significantly, bottom-fixed gillnets, speed limits	s.a.	Yes	No

**Other than research, monitoring and management*

5 Denmark

In this chapter, the Danish legal framework on protected areas is described, followed by a description on the different protection zones with regard to the research questions. In § 5.3 the main findings are described and summarized in overview Table 5-1.

5.1 Main legal framework on protected areas

National law

Nature Conservation Act

Since the 1st of October 2009, the Nature Conservation Act entered into force in Denmark. The purpose of this act is to contribute to safeguarding nature and environment in Denmark, thus ensuring sustainable social development in respect of human conditions of life as well as the protection of flora and fauna. The objective of the act is to protect nature with its stock of wild animals and plants and their habitats as well as its scenic, cultural historic, natural science and educational values. The act furthermore aims to improve and restore or create areas of significance for wild animals and plants and for landscape and historical interests and to provide access to nature and to improve opportunities for open-air-recreation (CWSS 2012).

The Statutory Order for the Danish Nature and Wildlife Reserve

The Danish Wadden Sea is subject to a comprehensive protection within the framework of the Statutory Order of the Nature and Wildlife Reserve Wadden Sea established in 1979 and 1982, merged into one Statutory Order in 1992, and amended in 2007. It is part of the overall trilateral Conservation Area. The Wadden Sea order specifically intends to promote the sustainable management of the Wadden Sea and preserve the area as a coherent natural area of national and international importance and as a habitat for seals and populations of waterfowl. Obligations of Natura 2000 are ensured within the order.

National Park Vadehavet

The Wadden Sea National Park was established in 2010. The National Park stretches from the Danish-German border to Blåvandshuk and has an area of 146.000 ha, of which 30.000 ha is terrestrial and covers the extend of the Wildlife and Nature Reserve in the Danish Wadden Sea. The National Park, even as the Nature and Wildlife Reserve area, broadly coincides with the Natura 2000 area for the Wadden Sea (mim.dk). The Statutory Order on the Wadden Sea National Park (2010) is based on the Danish National Parks Act (2007). The purposes of the Wadden Sea National Park are to conserve, strengthen and develop nature, its diversity, cohesion and dynamics, particularly for shallow waters of international significance, tidal waters, salt marshes and other coastal nature area. Regulations on activities and areas within the extend of the Wadden Sea part of the area are made within the Order on the Nature and Wildlife Reserve.

The National Park plan for the Wadden Sea National Park is anticipated to reinforce the management of the area and to ensure the necessary stakeholder support for and involvement in the management on the basis of the principles of cooperation and voluntary engagement.

Authorities and enforcement

In the Danish Wadden Sea, the Nature Agency of the Ministry of the Environment is the competent authority for the implementation on the Statutory Order. All activities in the protected area require a permit or an exemption from the Agency. In cases where the Agency is not the legal competent authority e.g. with regard to fisheries or coastal protection measures, the Agency must be consulted and approve of a permit or a measure (CWSS 2012).

The enforcement of the rules and regulations is executed primarily by the staff of the responsible local state forest district which is also responsible for the management of the state-owned areas. The forest district also liaises with user groups and other interest organizations to ensure an effective management of the area. Fisheries are managed and monitored by the authority of the Ministry of Food, Agriculture and Fisheries of Denmark.

5.2 Danish Nature and Wildlife Reserve

Within the Danish Wadden Sea Conservation Area the total area that has additional protection by means of zonation comprises of 124.792 ha divided in different zones in the Danish Wadden Sea Nature and Wildlife Reserve which regulate admittance and use of the area within the protection regime. In Figure 5-1, these areas are visualised with underlying ecotopes and they will be described in the following paragraphs.

The area of the reserve is delimited landwards and on the three inhabited islands Rømø, Mandø and Fanø by the sea walls, or where the sea walls are absent the highest daily water level including high sands and state-owned parts of the islands, and the land reclamations. Offshore the reserve is delimited by the 3 nautical sea mile boundary. In the south, the state boundary between Denmark and Germany constitutes the boundary of the protected area. In the north the area includes the peninsula of Skallingen and the Ho Bay.

Zoning protection regime

The protection measures, such as areas closed for entrance and prohibition of certain activities, are introduced to conserve and protect the ecological processes and its flora and fauna. In general, navigation through the Wadden Sea part of the reserve must not exceed 10 nautical knots. Exceptions are stipulated for the navigation channels.

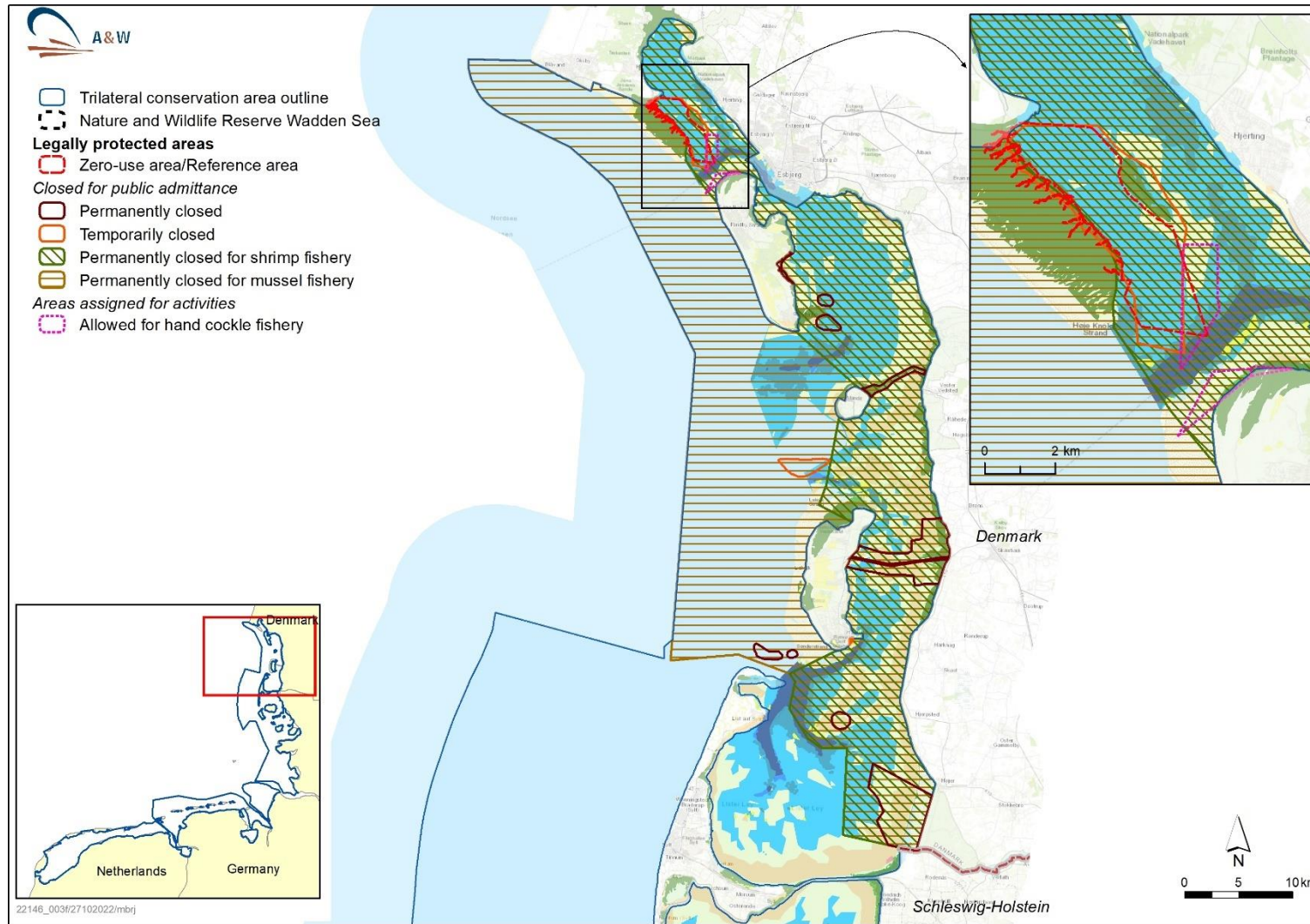


Figure 5-1 Overview legal protection zones within the Danish Wadden Sea Conservation area. See Appendix 10 and Figure 2-1 for sources of the map content and a description of the ecotope colours, respectively.

5.2.1 Zone closed for public admittance

Time of closure and activities

Ten areas of a total of ca. 8.660 ha (6,94 %) within the Nature and Wildlife Reserve are closed for access to the public. Most of the areas are closed all year for public admittance and no activities are meant to take place. The statutory order gives information on the location and the extend of the areas or lines that are closed for entrance (Annex 1 and map sheets). These zones were designated to protect certain natural values within the reserve such as sandflats that are seal haul out sites and forelands and saltmarshes that are breeding sites for shorebirds. Also hunting is strictly prohibited.

The foreland "Helmsödde" is closed for access during the breeding season from 1st of April till the 31st of August. A seal protection zone is defined each year on the 1st of April on Kore Sand by the Danish Forest- and Nature Authority. For more details on the area between the Skallingen Peninsula and Langli see paragraph 5.2.2.

Land-sea gradients

The areas vary in size and the extend of the covered habitat types. The smaller sites closed for public admittance are the forelands at Albuebugten on Fanø and Helmsödde on Rømø. These areas enclose mainly saltmarshes adjacent mud flats. Larger areas, e.g., the area between Skallingen and Langli (see Reference area) in the north and the Margrethe-Kog in the south cover a habitat gradient from saltmarshes, mud flats and tidal creek systems. It is concluded that at least the larger areas closed for public admittance cover all Wadden Sea habitat types to a certain extent.

5.2.2 Reference area

In 1982, an area of approximately 1.232 ha around the island of Langli was acquired by the State of Denmark to be turned into a nature reserve to safeguard the dynamics of flora and fauna, the structural diversity and natural processes. The legal set status of this area free of exploitation is in accordance with the stated condition in within the Esbjerg Declaration of 1991 as a Reference area (See Figure 2-1). The area is legally closed for entering and navigation under the Danish Wildlife Reserve Act.

Time of closure and activities

Additionally, to the overall protection measures for the Nature and Wildlife Reserve, public admittance of the Reference area is prohibited all year. The Reference area is located east of the shrimp line and inside an area that is closed for mussel fisheries. The island of Langli and a zone 300 m north, east and south the island is open for entrance and navigation from July 16 till September 15. Recreational activities, such as walking on Langli and the surrounding mudflats are allowed within this timeframe. The area between Langli and the Skallingen peninsula stays closed and is only entered by researchers for monitoring activities.

Management and monitoring

A Skallingen field laboratory was founded by Copenhagen University in 1935 for geomorphological research and is still used for field courses and research projects (CWSS 2012).

Since 1983, regular monitoring of breeding and migratory birds has been carried out on Langli and is included in the TMAP (breeding birds since 1991, spring tide counts of migratory birds

since 1994). The field station was run 1983-2002, manned by 1-2 persons over the whole year. Since 2002, monitoring has been carried out during regular visits. In addition, biological and geological research studies have been carried out on Langli by universities and other institutes. The intertidal part of the Reference area is also a site of the blue mussel monitoring program (Klopper *et al.* 2017).

Land-sea gradients

The Reference area covers western parts of the island of Langli, the tidal flat between Langli and the Skallingen peninsula. The area represents typical tidal and island habitats covering one tidal basin with silt, mixed sandy flats, creeks and sublittoral areas, island and mainland with salt marshes and sandy beaches.

5.2.3 Regulations on fisheries

Fishery at river mouths

Within the Statutory order special fishing regulations and conservation zones are declared in the Danish Wadden Sea and in some streams in southern Jutland. The order is based on the Danish fisheries act, which provides the overarching framework for regulating fishing in saltwater and freshwater, creating a coherent set of rules for commercial fishing and recreational fishing.

The order on fishing and conservation in the Danish Wadden Sea specifically aims to ensure that migratory fish moving from rivers into the sea area allowed to do so without hindrances. Therefore, conservation zones, where fishing is prohibited, are put in places around river mouths of rivers and streams flowing into the Danish Wadden Sea. Most of the cover a radius of 500 m from the point where the river or stream flows into the ocean.

Shrimp fishery - the shrimp line

Shrimp fishery is regulated by the statutory order for shrimp by the West coast of Jutland. Due to conservation concerns, the entire Danish Wadden Sea area, east of the so-called shrimp line, was closed to fishing in 1977 and the regulation is still in force after the last amendment of the order in 2022. The area closed for shrimp fisheries is approximately 61.220 ha which is ca 50 % of the area of the Nature and Wildlife Reserve in the Danish Wadden Sea.

Mussel and cockle fishery

A blue mussel fishery management scheme was first introduced in 1994 in the Danish Wadden Sea that regulated fishing vessels, fishery quota, set-aside for mussel-eating birds and established zones closed to mussel fishery. The assessment of these management measures showed a further reduction in the blue mussel biomass and blue mussel bed areas in zones closed to fishery (Laursen *et al.* 2010). The assessment was carried out in the whole area of the protected area.

Based on this assessment a ban on blue mussel and cockle fishery in the whole Natura 2000 area in the Danish Wadden Sea was established in 2008 and is still in force. The area closed for blue mussel and cockle fishery covers the full extent of the Nature and Wildlife Reserve in the Danish Wadden Sea (Baer *et al.* 2017).

In 2013 a new Danish shellfish policy has been implemented, which allows small-scale trial fisheries. Also, a permit for trial fishery of pacific oysters was initiated in 2015 to investigate if a cost-efficient and beneficial fishery could be established and at the same time fight the invasive pacific oyster. However, after only a few days of fishing the results showed that due to the reef-structure of the pacific oysters the fishery was not cost-efficient and was therefore stopped (Baer

et al. 2017). Another trial fishery on cockles was carried out from 15 January to 29 February 2016. The cockle fishery was initiated on 3 February 2016 and restricted to three defined areas, where cockle fishery is allowed in the Danish Wadden Sea (BEK 867 of 21/06/2007). Though, at the moment cockle fisheries are not carried out.

Management and monitoring

Since September 2013 all permits (test or regular) for any fishery for mussels, oysters or cockles in Natura 2000 site require the installation of a black box system on each of the fishing vessels. The black box consists of a GPS-system, which logs the position of the boat every ten seconds, and a sensor on the winch that registers any activity e.g. starting or ending of fishing time. By monitoring the fishing activity and position, information on where the fisheries have taken place and also the extent of the areas affected are registered. The analysis of the black box data has not been processed and therefore no further analysis of the cockle trial fishery has been reported yet (Baer *et al.* 2017).

Land-sea and habitat gradients

The area east of the shrimp line is within the designated Nature and Wildlife Reserve in the Danish Wadden Sea and therefore encloses the typical habitats of this part in the Wadden Sea including land and sea habitats.

5.3 Main findings / highlights

In Table 5-1 a summary is given of the information with regard to different protection zones within the Danish Wadden Sea Conservation area. Based on the information on areas for which stricter protection is applied, the following points stand out:

- Several areas within the Nature and Wildlife Reserve are closed for public admittance and hunting
- The shrimp line is a powerful measure that prohibits shrimp fishery in half of the Danish Conservation Area
- Due to the ongoing Natura 2000 assessments of mussel fishery on the Wadden Sea, the whole Danish part of the Trilateral conservation area is free of commercial mussel fishery since 2008.
- Currently hand cockle fisheries are not carried out
- Enforcement on illegal fishing takes place via a black box system (on boat)
- Scientific monitoring for the TMAP is carried out in the whole Trilateral Conservation Area in the Danish Wadden Sea
- The protected areas of the Danish Wadden Sea cover most land-sea gradients

Table 5-1 Overview table of characteristics of zoning protection regimes in Denmark

Type of area	Total area (ha)	Time of closure	Years installed	Dynamic closure	Legal protection	Activities banned	Exceptions / permits*	Specific monitoring	Land-sea gradient
Danish Nature and Wildlife Reserve (TCA)	124.792	Permanent	40	Yes	Nature Protection Act of Denmark, Statutory	Disturbance, bottom disturbance	(mudflat)excursions, hunting,	TMAP	Yes
Reference area	1.232	Permanent	40	No	Statutory order of the Nature and Wildlife Reserve Wadden Sea	Entering, navigation, fishing, recreational activities	Research and monitoring	TMAP	Yes
Area closed for mussel fishery	124.792	Permanent	>10	No	Assessment according to EU-Habitat Directive	Blue mussel fishery	Recreational activities	TMAP	Yes
Areas closed for mussel fishery	28.180	Permanent	>30	No	Statutory order of the Nature and Wildlife Reserve Wadden Sea, Statutory order on special fishing regulations and conservation zones in the Wadden Sea and in some streams in southern Jutland	Blue mussel fishery		TMAP	Yes
Areas closed for public admittance	8.660	Permanent	40	Yes	Statutory order of the Nature and Wildlife Reserve Wadden Sea, Statutory order on special fishing regulations and conservation zones in the Wadden Sea and in some streams in southern Jutland	General entry ban		TMAP	Yes, depending on are
Areas east of "shrimp line"	61.220	Permanent	45	No	Statutory order of the Nature and Wildlife Reserve Wadden Sea, Statutory order for shrimp by the West coast of Jutland	Shrimp fishery		TMAP	Yes

Areas open for hand cockle fisheries	400	Permanent	15	Yes	Statutory order of the Nature and Wildlife Reserve Wadden Sea	Access limited to area south of Langli due to temporary closed area	Hand cockle fisheries allowed.	TMAP	No
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6 Discussion and overview

The purpose of this study was to picture the current situation, knowledge status and facts on the stricter protected area regimes within the trilateral Conservation area, for which the following research questions were posed:

1. *In what way have the Wadden Sea countries currently implemented more strictly protected areas and different zoning regimes?*
 - a. *Which protected areas exist, do they have a definition and does this differ per country?*
 - b. *Where are the areas located, what is their surface area, and how are they assigned?*
 - c. *What are the legal obligations with regard to these areas?*
 - d. *Which activities are prohibited and which activities are allowed in these areas? (do illegal activities still take place?)*
 - e. *How is the management arranged in these areas? (passive or active)*
 - f. *How is surveillance and enforcement arranged in these areas?*
 - g. *For how long have the areas been closed and does monitoring take place?*
2. *To what extent do the protected areas cover land-sea gradients?*
3. *What policy developments, besides the EU biodiversity strategy, might be expected in the next few years in relation to protected areas (including zoning and gradations within them)?*

In the following paragraph, a summary of the main findings and highlights for each country (and federal state) are given. Furthermore in paragraph 6.2 the main similarities and differences between the three countries with regard to research question 1 and 2 are shortly pointed out. With regard to research question 3, no other policy developments related to protected areas (including zoning and gradations in protection) other than the EU Biodiversity Strategy came up during this study, so this question will not be discussed any further. A short discussion is given in paragraph 6.3 with regard to the definitions of strictly protected areas referred to in paragraph 1.1 with a comparable overview matrix per country and final remarks regarding the findings of this study.

6.1 Summary

The Netherlands

In the Netherlands, the Wadden Sea is divided in different protection areas on a legal basis that are partly overlapping: the Reference area Rottum (also part of the TBB), TBB-areas that are mainly focused on the protection of birds and seals and can be temporarily or permanently closed based on the Nature protection law (2017); and areas that are permanently closed for fisheries (most important mussel and shrimp) based on the Fishery implementation regulation (2008) and areas that are specifically closed for hand-cockle fisheries (Natura protection law 2017). Moreover, on littoral mudflats bottom-disturbing fisheries (mussels and shrimps) are not allowed. Additionally, in the context of fisheries agreements additional protected areas have been defined in Covenants, partly on a voluntary basis: closed areas for mussel seed fishing, closed areas for shrimp fishing (temporarily and permanent) and closed areas for both mussel seed fishing and shrimp fishing. Furthermore, there is a ban on mechanical lugworm mining with the exception of

two locations in the western part of the Wadden Sea. The following findings / highlights are concluded:

- There is no specific definition on stricter protected areas or areas closed for certain activities
- There are many different regulations and laws covering areas which are overlapping
- 'Closed' areas (i.e. TBB's, Fishery implementation regulation areas, and closed areas based on voluntary agreements) are not really closed for all activities, since there are many exceptions on permits
- More than half of the TBB areas are closed on temporary basis
- Shrimp and musselseed fisheries are banned from littoral areas
- Shrimp fishing in areas closed for shrimp fisheries are in some parts technically impossible due to depth
- There are many exceptions for activities. Only the Reference area Rottum and the TBB Griend turn out to be closed for all activities besides monitoring, research and necessary management.
- Enforcement turns out sometimes to be difficult in practice, due to definitions in law, lack of capacity and technical issues
- Many areas are relatively small and fragmented (not covering entire tidal basins)
- New VISWAD (2nd tranche) areas cover tidal basins, but no land-sea gradients
- Only a couple small areas cover full land-sea gradients

Germany

In Germany, National Parks have been installed in the federal states of Lower-Saxony, Hamburg and Schleswig-Holstein. National Parks are larger areas of national importance of which the major part is undisturbed and qualify to be designated as a nature Conservation Area. The aim is to safeguard, in the greater part of the area concerned, undisturbed ecosystem interactions and their natural dynamic processes to the extent possible. All parks have been divided into two (SH and HH) or three zones (LS) of which the zone I includes the ecologically most valuable areas. Stricter regulations apply to the zone I, including extensive restrictions to public admittance. However, some exceptions are possible on defined areas, specific times of the year and under strict regulations (i.e. farming, hunting on parts of the islands (LS), fishing, guided mudflat walks). Moreover, within zone I, zero-use zones are designated. In Schleswig Holstein and Hamburg these zones were declared as a Reference area under the Esbjerg Declaration (1991). In zone II, utilization and activities are allowed under such conditions that the overall protection objectives are not impaired. In Schleswig-Holstein, part of zone II is the porpoise protection area west of the island Sylt and Amrum created to protect small whales and seabirds. In zone III in Lower Saxony, only recreational activities and health resort activities are allowed there.

Lower Saxony

- The National Park is divided into three zones
- Zone I: all activities which destroy, damage or change the National Park and its components are prohibited;
- Fish, blue mussel and shrimp fishery are allowed in parts of zone I, though many areas within Zone I are free from bottom disturbing fisheries (zero-use). These areas are not officially assigned as 'zero-use / reference' areas and are fragmented over the whole area
- Public access is prohibited in Zone I with exception of assigned paths and routes
- In a large area of Zone I shipping is prohibited for the protection of birds / seals

- Zone II: exemptions for certain activities provided that the protection aims of the National Park are not threatened; allows for public admittance (except breeding season) and fisheries
- Zone III: recreational activities are allowed.
- No cockle fisheries are allowed in the whole of Lower-Saxony
- (Law) Enforcement is managed by the regional National Park authority and the police authorities
- Surveys for the Trilateral Monitoring and Assessment Program is carried out in the whole extend of the National Park on various locations
- Numerous volunteers are integrated with monitoring tasks, supervision and environmental education in the National Park.
- No complete tidal basins are closed for resource usage
- Zone I and II cover land sea gradients

Hamburg

- The National Park is divided into two zones
- Zone I: covers the largest portion of the National Park including the reference area / zero-use area and is closed for public admittance all year except for two marked mud flat paths
- Shrimp fisheries are not allowed in Zone I, except for three navigational channels through the reference area, diminishing the sublittoral habitats from strict protection and zero use
- Zone II: allows recreational activities
- In both zones, commercial fisheries (except shrimp) and hunting are forbidden
- (Law) Enforcement and supervision is a managed by the regional National Park Authority and the police authorities.
- Monitoring for the Trilateral Monitoring and Assessment Program is carried out in the whole extent of the National Park on certain locations
- Volunteers are integrated with monitoring tasks, supervision and environmental education in the area of the National Park
- The National Park does not cover a whole tidal basin but does cover land-sea gradients

Schleswig-Holstein

- The National Park is divided into two protection zones
- Zone I (incl. zero-use / reference area): public access is prohibited (with some exceptions) and commercial fishery for shrimp and fish is allowed, except in the zero-use/reference area where both mussel and shrimp fisheries are prohibited
- Fishing within the Reference / zero-use area does take place now and then, but this is hard to prove
- Zone II: recreational activities are allowed and shellfish fishery is only allowed in defined areas in Zone II (blue mussel & pacific oyster)
- (Terrestrial) areas within Zone II can be temporarily closed with regard to breeding birds
- Voluntary agreements between shrimp fishers exist
- Law enforcement and supervision of fisheries is carried out by the police forces of the state of Schleswig-Holstein.
- Monitoring for the Trilateral Monitoring and Assessment Program is carried out in the whole extent of the National Park on numerous locations.
- Numerous volunteers are integrated with monitoring tasks, supervision and environmental education in the National Park.
- Both protection zones cover land-sea gradients and enclose complete tidal basins

Denmark

In Denmark, the Wadden Sea Conservation area is comprised of different protection zones within the Nature and Wildlife Reserve. Also, a Reference area (Langli) was designated under the Esbjerg Declaration (1991). Access and hunting are strictly prohibited in some 10% of the reserve for the protection of birds and seals. These areas are closed for access the whole or part of the year. Outside these strictly protected areas, access and resource use is allowed on the condition that the area and its ecological and landscape values are not adversely affected. In addition, several activities are regulated in time and space. West of the barrier islands shrimp fisheries are prohibited. Blue mussel fishery is prohibited in consequence of the assessment in accordance with the Habitat Directive. Trials on hand cockle fishery are defined to 3 smaller areas around the shipping lane to Esbjerg.

- Several areas within the Nature and Wildlife Reserve are closed for public admittance and hunting
- The shrimp line is a powerful measure that prohibits shrimp fishery in half of the Danish Conservation Area
- Due to the ongoing Natura 2000 assessment of mussel fishery on the Wadden Sea the whole Danish part of the conservation area is free of commercial mussel fishery since 2008.
- Currently hand cockle fisheries are not carried out
- Enforcement on illegal fishing takes place via a black box system (on boat)
- Scientific monitoring for the TMAP is carried out in the whole Trilateral Conservation Area in the Danish Wadden Sea
- The protected areas of the Danish Wadden Sea cover most land-sea gradients

6.2 Main similarities and differences

Main similarities

- The trilateral Wadden Sea is overall legally protected by the Natura 2000 policy and legislation
- In all three countries areas are restricted for certain activities to protect seals and birds and mussel beds
- Zero-use areas exist in each country
- Both in the Netherlands and in Germany (Lower-Saxony / Schleswig-Holstein), some areas are closed for mussel or shrimp fisheries based on voluntary agreements. In the Netherlands these areas are explicitly stated in a Covenant.
- Generally in all three countries, management of the marine areas are passive. The terrestrial areas are only actively managed if that is necessary to comply with the obligation to take measures for the benefit of the conservation objectives and to prevent deterioration of habitat quality and significant disturbance of species
- TMAP monitoring takes place in all three countries. Besides this, in the Netherlands other monitoring programmes have been installed that specifically focus on the effects of the area closures for shrimp- and mussel fisheries.

Main differences

- Germany and Denmark have designated littoral and sublittoral parts of the Wadden Sea as a National Park or Wildlife Reserve under specific conservation acts and enforcement. In the Netherlands only the island of Schiermonnikoog is installed as National Park.

- Only Germany has a specific zoning system for regulating activities where in Zone I activities are banned which 'destroy, damage or change the National Park and its components'
- In The Netherlands area restriction is covered by many different regulations, where borders are partly overlapping or differ instead of clear zoning as is the case in Germany
- On the contrary to the Netherlands and Germany, in Denmark no mussel fishery is allowed since 2008 and closure for shrimp fisheries covers relatively the largest area compared to Netherlands and Germany.
- The additional protected areas / zones that cover land-sea gradients are mainly located in Germany and Denmark. In the Netherlands only a selection of small areas cover land-sea gradients (e.g. Rottums, Griend, het Rif)
- Spatial data are stored and accessible via data portals of the Federal states in Germany, in contrast to the Netherlands and Denmark, where some data is not easy accessible at one central point.

6.3 Strict protection: overview and discussion

As stated in Chapter 1, an important target of the EU Biodiversity Strategy (2020) is to 'Strictly protect at least a third of the EU's protected areas'. The strategy states that the designation of additional protected and strictly protected areas will be a responsibility of the Member States. In this context, on a Wadden Sea scale, further trilateral agreements are probably needed concerning strictly protected areas for the coming years. In this respect, the question has arisen to what extent the current protection regimes comply to the EU Biodiversity Strategy definition of strict protection (See Appendix 1 for full definitions).

To give a first general indication for answering this question, we created an additional overview matrix (Table 6-1) to couple some of the main characteristics from the definition on 'strictly protected' areas of the EU Biodiversity strategy as well as the Reference area of the Esbjerg Declaration (1991) in relation to the findings of this study. We therefore focussed on areas with the most strict restrictions with regard to public admittance and bottom disturbing fisheries. Figure 6-1 gives an overview of these areas in a trilateral perspective (for more detailed maps, see Appendix 8). The indicative results are discussed in the next paragraphs.

The following characteristics of the definitions were chosen to be compared:

'Strictly protected' areas (EU Biodiversity Strategy 2020):

1. *Fully and legally protected*
2. *Biodiversity-rich natural area*
3. *Essentially undisturbed⁵ natural processes*

Reference areas (Esbjerg Declaration 1991):

4. *Entire tidal basin (land-sea gradients)*
5. *Spread evenly over the Wadden Sea*
6. *Free of exploitation and disturbance*

⁵According to the Strategy, scientific research, natural disaster prevention, invasive alien species control, non-intrusive activities and installations, non-intrusive and strictly controlled recreational activities, are compatible with the conservation objectives

Table 6-1 Comparative indicative overview of areas (in ha and % of the concerned Conservation Area) with 'strict' protection (permanent restriction) with regard to public admittance and bottom disturbing fisheries and their indicative score (green: sufficient; orange: partly sufficient, red: insufficient) of their indicative compliance with the definitions of strictly protected areas (EU Biodiversity Strategy 2020) / reference areas (Esbjerg 1991). N.B. Overlap in surface areas are not taken into account in the area calculations, other than specifically mentioned and information given can only be used as an estimate).

	Area (ha)	% of CA	Strictly protected			Reference area		
			1	2	3	4	5	6
'Strict' protection area's (permanently restricted)								
Zero-use / Reference area (Total surface area)	7.390	~2,7%	Green	Green	Green	Green	Green	Green
NL TBB-area's ¹	7.586	~2,8%	Green	Green	Orange	Green	Green	Green
Areas closed for bottom disturbing fisheries ²	~34.887	~12,8%	Green	Green	Red	Green	Green	Red
Zero-use / Reference areas	29.196	~3,7%	Green	Green	Orange	Green	Green	Green
DE Zone I	411.142	~51,6%	Green	Green	Red	Green	Green	Red
Areas closed for bottom disturbing fisheries ³	29.196	~3,7%	Green	Green	Orange	Green	Green	Green
Zero-use / Reference area	800	~0,6%	Green	Green	Green	Green	Green	Green
DK Areas closed for public admittance	8.660	~6,9%	Green	Green	Orange	Green	Green	Green
Areas closed for bottom disturbing fisheries	61.220	~49 %	Green	Green	Orange	Green	Green	Green

1. excl. TBB's Vlieter/Breezanddijk, incl. Rottums

2. Appendix 5 areas Fishery implementation regulation, Reference area, TBB's Vlieter/Breezanddijk and Covenant areas closed for both musselseed and shrimp fisheries

3. Zero-use areas (LS); Reference area (HH); Reference area (SH)

Areas closed for public access

In the Netherlands, about 2,8% of the Dutch Conservation Area is permanently closed for public admittance by means of a 'Toegangsbeperkendbesluit' (TBB). The Reference area falls for a part also within this surface area. The southern part of the Reference area is temporarily closed for public access, therefore it may be argued that it is not 'fully' protected and only the permanently closed Rottums (3852 ha) and Griend (625 ha) (together making up 1,42% of the Conservation Area) comply to the definitions of Strict protection. Though, the Reference area complies mainly with characteristics 2, 3 and 4 since the Rottums have biodiversity value, are essentially undisturbed and cover land-sea gradients. However, in practice, shrimp fisheries does sometimes take place within the area leaving it not entirely free of exploitation. The permanently closed TBB areas comply with the definitions for "Strictly protected" and "Reference area", in the sense they are fully and legally protected, biodiversity rich areas and spread evenly across the Dutch Wadden Sea. However, only a few cover real land-sea gradients and if technically feasible, shrimp fisheries are legally allowed.

In Germany about 51,6% of the German Conservation Area is permanently closed for public admittance by Zone I, of which about 7% is a zero-use or Reference area. Zone I is fully and legally protected, has biodiversity value, spread evenly over the German Wadden Sea and covers land sea gradients and entire tidal basins. However, many exceptions for entrance exist, even so shrimp, fish and mussel fisheries are permitted in certain areas within Zone I in some federal states which is not complying with the definitions on strict protection. Furthermore, the zero-use zones in Germany do cover large land-sea gradients, but not all cover entire tidal basins. Besides, not all zero-use zones are entirely free of exploitation since in Hamburg shrimp fishing is allowed along the shipping lanes.

In Denmark, about 7,5% of the Danish Conservation Area is permanently closed for public admittance and the areas comply with most of the characteristics of the definitions. While the areas do cover land-sea gradients, only the Reference area covers a small tidal basin.

Areas closed for bottom disturbing fisheries

In the Netherlands, about 18% of the Dutch Conservation Area is theoretically for the main part free from bottom disturbance by tickler chain fisheries, musselseed fisheries, oyster fisheries and hand cockle fisheries. However, in some parts, licence holders for cockle fisheries and mussel parcels are still allowed. Furthermore in the sublittoral parts of the area, shrimp fisheries are also allowed, except in the Covenant areas (closed for shrimp + mussel; green line in Figure 6-1). Though, the Covenant areas that are closed for both shrimp and mussel fisheries cover about 3% of the Conservation area and there is no specific ban on hand cockle fisheries in these areas (apart from fishing close to mussel or seagrass beds).

In practice, it therefore turns out that roughly only less than 12%⁶ of the area is closed for all bottom disturbing fisheries. Furthermore, only a small part of the areas cover specific land-sea gradients. Though on the eastern part of the Reference area, part of tidal basins are covered.

In Germany, all bottom disturbing fisheries are banned in about 3,7% of the German Conservation Area, which are the zero-use or Reference areas. In this case, in Hamburg, shrimp fishing is allowed along the shipping lanes in (<1% of the CA), diminishing in that part the sublittoral habitats from strict protection.

In Denmark about 49% of the Danish Conservation Area is free of bottom disturbing fisheries, which is fully and legally protected, has biodiversity value and covers land-sea gradients and tidal basins. Though, officially cockle fisheries are allowed at certain specific areas (ca. 0,3% of the CA), but they do not take place.

Lastly, there is no specific ban on other resource exploitation, such as mining, dredging or sand extraction, other than will be legally evaluated in light of Natura 2000 permitting.

⁶ Roughly calculated by summing surface areas of the littoral part of Appendix 5 areas (incl. the reference area and Vlieter within this border), Breezanddijk (incl. sublittoral parts), and Covenant areas (incl. sublittoral parts).

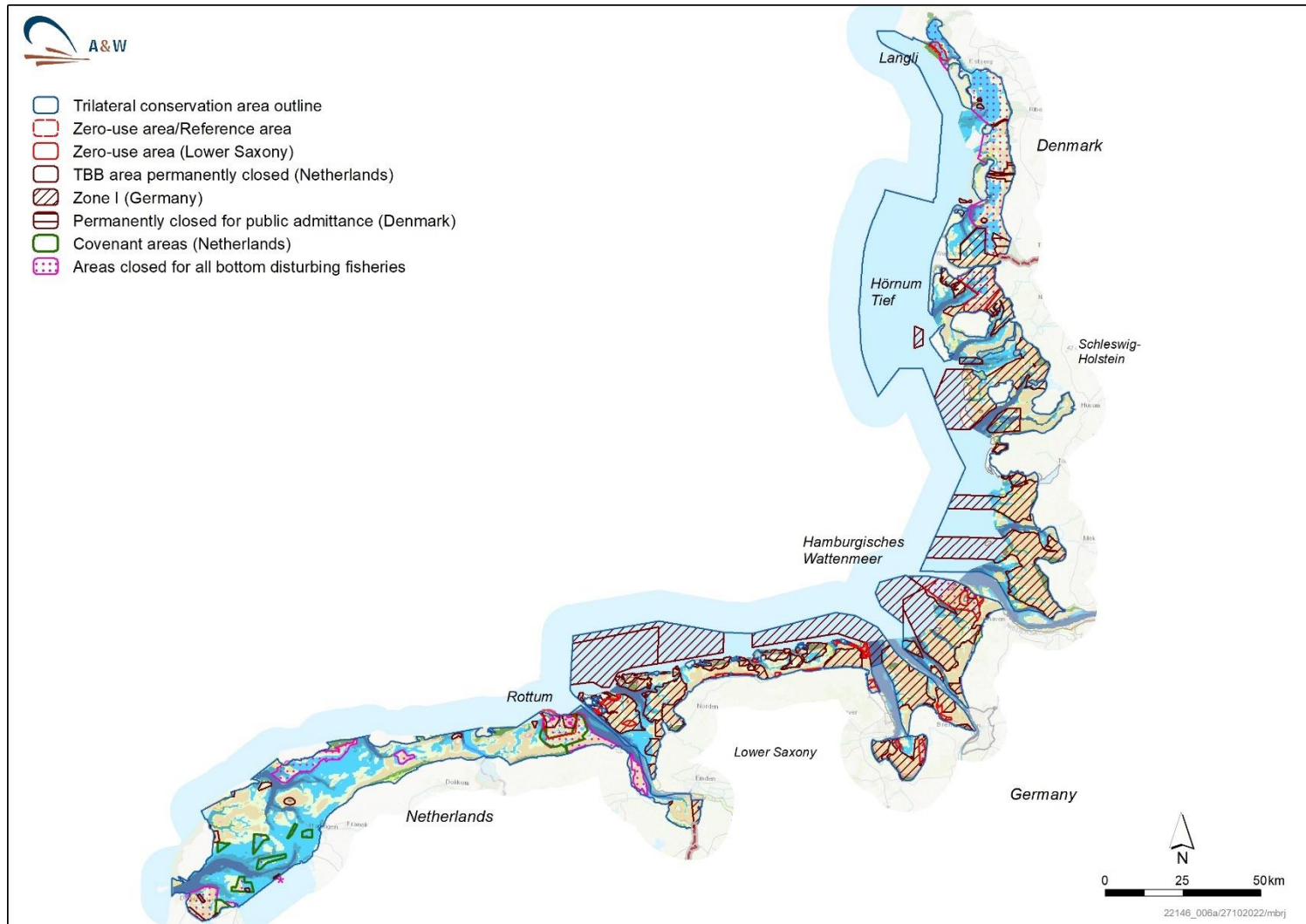


Figure 6-1 Overview map of 'strict' protection areas (permanently restricted) within the Trilateral Conservation Area with regard to public admittance and bottom disturbing fisheries. See Appendix 8, 10 and Figure 2-1 for a more detailed map, sources of the map content and a description of the ecotope colours, respectively.

Final discussion and remarks

Based on the overview and indicative comparisons in the former chapters, it can be argued that the current restrictions for protected areas in the Trilateral Conservation Area of the Wadden Sea may not completely comply yet to the targets and definition of Strictly protected areas of the EU Biodiversity strategy (2020), even as to the definition of Reference area of the Esbjerg Declaration (1991). In this respect, some steps forward will have to be made with regard to area protection within the Trilateral Conservation Area.

An important aspect to keep in mind is that the level of protection in time and space should comply to the purpose of protection for the type of natural value to be protected. From an ecosystem perspective, such as a highly dynamic Wadden Sea system, large protected areas connecting different ecotopes, habitats and gradients herein may have longer lasting ecosystem benefits than protecting specific species within small patches within a temporary timeframe.

Furthermore, the measures taken have to comply to the purpose. If the purpose is to protect sublittoral areas, then regulations should be adapted and enforced accordingly to besides fishing exclude also other types of bottom disturbing activities without exceptions that frequently and/or intensely impact these areas, like dredging, spreading dredging material and extractions and suppletions. Naturally, the concerning areas should be taken into account when calculating percentages for protection purposes.

In practice, significant effects on a natural value caused by human activities are hard to proof and in some cases assessments may be done and activities are permitted without sufficient scientific knowledge present. However, in the light of the Precautionary Principle⁷, measures to prevent environmental degradation should not be postponed in order to get scientific evidence on significant effects.

Moreover, on a trilateral perspective natural values may benefit from drawing one common line in which the existing common protection purposes as well as new ones are clearly defined and enforceable boundaries for each area with common applicable rules are designated. Practically, for conservation purposes it would be convenient to make information about protected areas more accessible through more centralized databases.

Lastly, to be able to get a straight answer on what is needed for the Wadden Sea countries to meet the minimum surface area requirements for strict protection by the EU Biodiversity Strategy, a closer analysis may be necessary on protected areas including the exact surface areas (without overlap), location of biodiversity hotspots, ecotopes, sublittoral and littoral areas with regard to locations of human activities to make more clear decisions on protection regulations.

⁷ The precautionary principle states that if a product, an action, or a policy has a suspected risk of causing harm to the public or to the environment, protective action should be supported before there is complete scientific proof of a risk

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Appendix 1 Overview definitions on stricter area protection

Appendix Table 1-1. Overview definitions on strict area protection

Source	Definitions	
EU Biodiversity Strategy (2020)	<i>Strictly protected areas</i>	Fully and legally protected areas designated to conserve and/or restore the integrity of biodiversity-rich natural areas with their underlying ecological structure and supporting natural environmental processes. Natural processes are therefore left essentially undisturbed from human pressures and threats to the area's overall ecological structure and functioning, independently of whether those pressures and threats are located inside or outside the strictly protected area'
Guidelines for applying the IUCN protected area management categories (2019)	<i>Strict nature reserve</i>	Strictly protected for biodiversity and also possibly geological/ geomorphological features where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values. Such protected areas can serve as indispensable Reference areas for scientific research and monitoring
	<i>Wilderness area</i>	Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition'
	<i>National Parks</i>	Protected areas are large natural or near natural areas set aside to protect largescale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities
Esbjerg Declaration (1991)	<i>Reference area</i>	Sufficiently large areas, spread evenly over the Wadden Sea, where all exploitation and all disturbing activities are banned and which can serve as Reference areas for scientific purposes
Nature Protection law (2017) (NL)	<i>TBB-area* (Article 2.5 Wnb)</i>	A Natura 2000 or a part of a Natura 2000 site for which access can be prohibited or restricted by the authorities, if necessary in view of the conservation objectives for that site.
Federal Nature Conservation law (2009) (DE)	<i>National Parks</i>	National Parks are areas that have been designated in a legally binding manner, that are to be protected in a consistent way and that: 1) are large, largely unfragmented and have special characteristics; 2) fulfil the requirements for a nature conservation area in the greater part of their territory, and 3) in the greater part of their territory, have not been affected by human intervention at all, or to a limited extent only, or are suitable for developing, or being developed, into a state which ensures the undisturbed progression, as far as possible, of natural processes in their natural dynamics. The purpose of National Parks is to serve as areas, in the greater part of their territory, in which it is assured that natural processes, in their natural dynamics, can take place in the most undisturbed manner possible. Provided this is compatible with the purpose of protection, National Parks may also serve the purposes of scientific environmental monitoring, nature education, and enabling the general public to experience nature. National Parks are to be protected in the same manner as nature conservation areas, taking account of their special protection purpose and the exceptions necessary in light of their large size and use for settlement.

*No official definition, but description in law

Appendix 2 Overview TBB-areas (NL)

Appendix Table 2-1. Overview characteristics TBB-areas in the Dutch Wadden Sea. Numbers refer to the map in Appendix Figure 2-1.

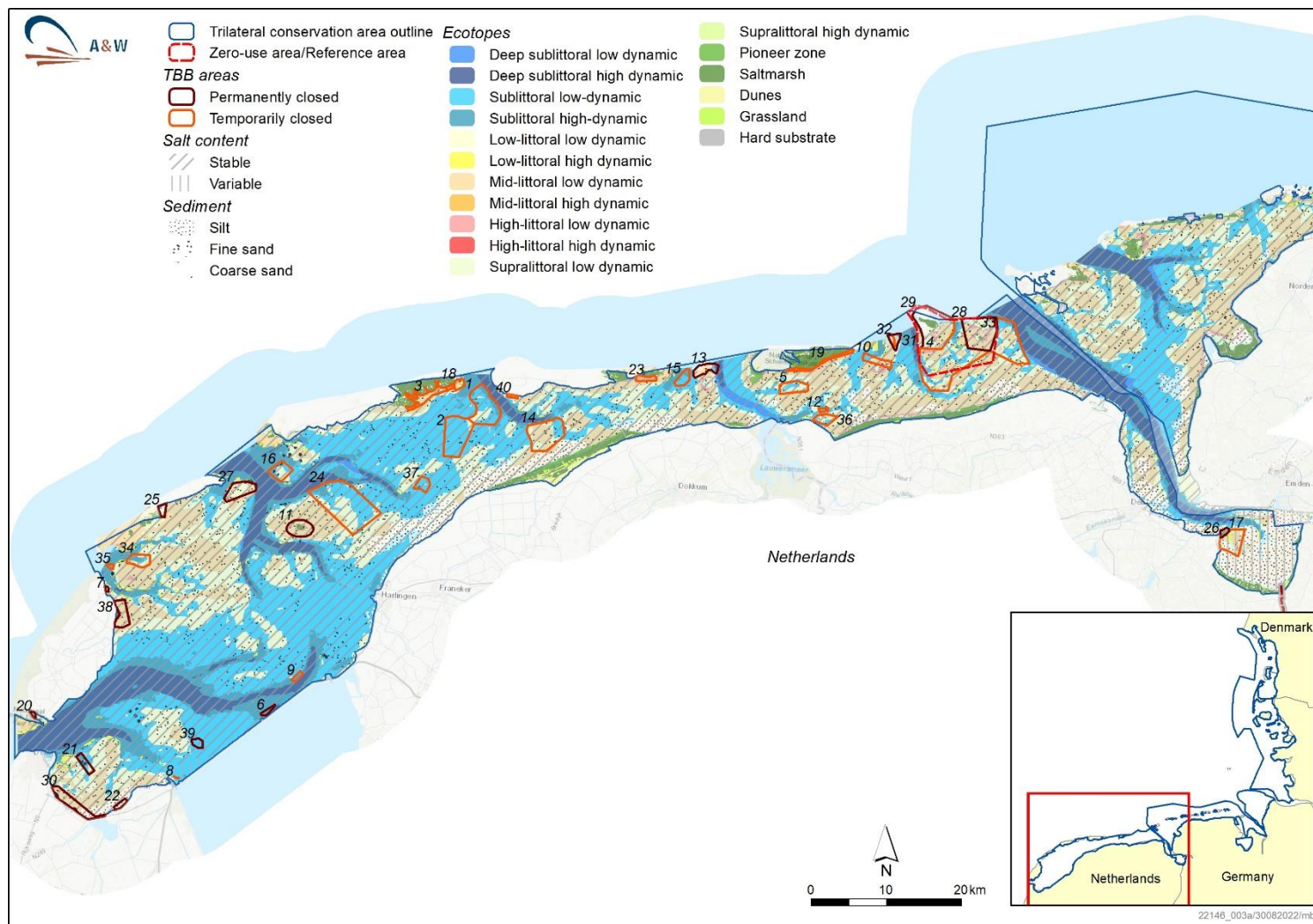
Map number	Area name	Surface area (ha)	Closed since	Closure type	Closure timing	Closure goal	Permitted activities
1	Blauwe Balg noord ¹	1.480	2006	Temporarily	01/04-01/09	Breeding birds, migratory birds, high tide refuge, seals	Seal tours
2	Blauwe Balg zuid	1.599	2006	Temporarily	15/05-01/10	Breeding birds, migratory birds, high tide refuge, seals	Seal tours
3	Boschplaat	528	2006	Temporarily	15/03-15/08	Breeding birds, migratory birds, high tide refuge	
4	Boschwad-Schild	3.840	2006	Temporarily	15/05-01/09	Seals	
5	Brakzandstergat	493	2006	Temporarily	15/05-01/09	Seals	Recreational fisheries
6	Breezanddijk	87	2010	Permanently	01/01-31/12	Musselbeds	Everything except bottom disturbing activities / fishing
7	De Cocksdorp	29	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge	
8	Den Oever leidam	4	2006	Temporarily	01/03-15/08	Spoonbill	
9	Doove Balg	93	2006	Temporarily	15/05-01/09	Seals	
10	Eilanderbalg	321	2006	Temporarily	15/05-01/09	Breeding birds, migratory birds, high tide refuge, seals	
11	Griend	625	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge	
12	Groninger Balg	52	2006	Temporarily	15/05-01/09	Seals	
13	Het Rif ²	358	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge	
14	Hoge Wier	1.564	2006	Temporarily	15/05-01/09	Migratory birds, Seals	
15	Holwerderbalg	274	2006	Temporarily	15/05-01/09	Seals	
16	Jacobsruggen	485	2006	Temporarily	15/05-01/09	Seals	
17	Kerkeriet	796	2006	Temporarily	15/05-01/09	Seals	
18	Koffieboonenplaat	144	2006	Temporarily	15/03-01/11	Breeding birds, migratory birds, high tide refuge, seals	
19	Kwelder Schiermonnikoog	200	2006	Temporarily	15/04-15/07	Breeding birds, migratory birds, high tide refuge	
20	Mokbaai	44	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge	

21	Mosselgaatje	250	2006	Permanently	01/01-31/12	Seals	Work on mussel culture plots	
22	Normerven	110	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge		
23	Oerd / Hon	164	2006	Temporarily	15/03-15/09	Breeding birds, migratory birds, high tide refuge		
24	Oude Zuidmeep	3.475	2006	Temporarily	15/05-01/09	Seals	Work on mussel culture plots	
25	Posthuiswad	130	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge		
26	Punt van Reide	90	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge	Excursions	
27	Richel	663	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge, seals		
28	Rottumeroog	1.701	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge, seals	Excursions	
29	Rottumerplaat	2.151	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge, seals		
30	Schorren Balgzand	712	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge	Work on mussel culture plots	
31	Simonszand ²	208	2006	Permanently	01/01-31/12	High tide refuge, seals		
32	Simonszand west ³	(80)	2006	Temporarily	15/05-01/09	Breeding birds, migratory birds, seals		
33	Sparregat-Hornsbornzand	1.773	2006	Temporarily	15/05-01/09	Seals		
34	Steenplaat oost	411	2006	Temporarily	15/05-01/09	Seals		
35	Steenplaat west	48	2006	Temporarily	15/05-01/09	Seals		
36	Vierhuizergat	296	2006	Temporarily	15/05-01/09	Seals		
37	Vingegat	273	2006	Temporarily	15/05-01/09	Seals		
38	Vlakte van Kerken	514	2006	Permanently	01/01-31/12	Breeding birds, migratory birds, high tide refuge		
39	Vlieter	143	2009	Permanently	01/01-31/12	Musselbeds	Everything except bottom disturbing activities / fishing	
40	Vogelpolle	52	2006	Temporarily	15/03-15/08	Breeding birds, migratory birds, high tide refuge	Excursions	
Total ha.		26.180						

¹ Passage allowed between 3 hours before and 2 hours after high tide

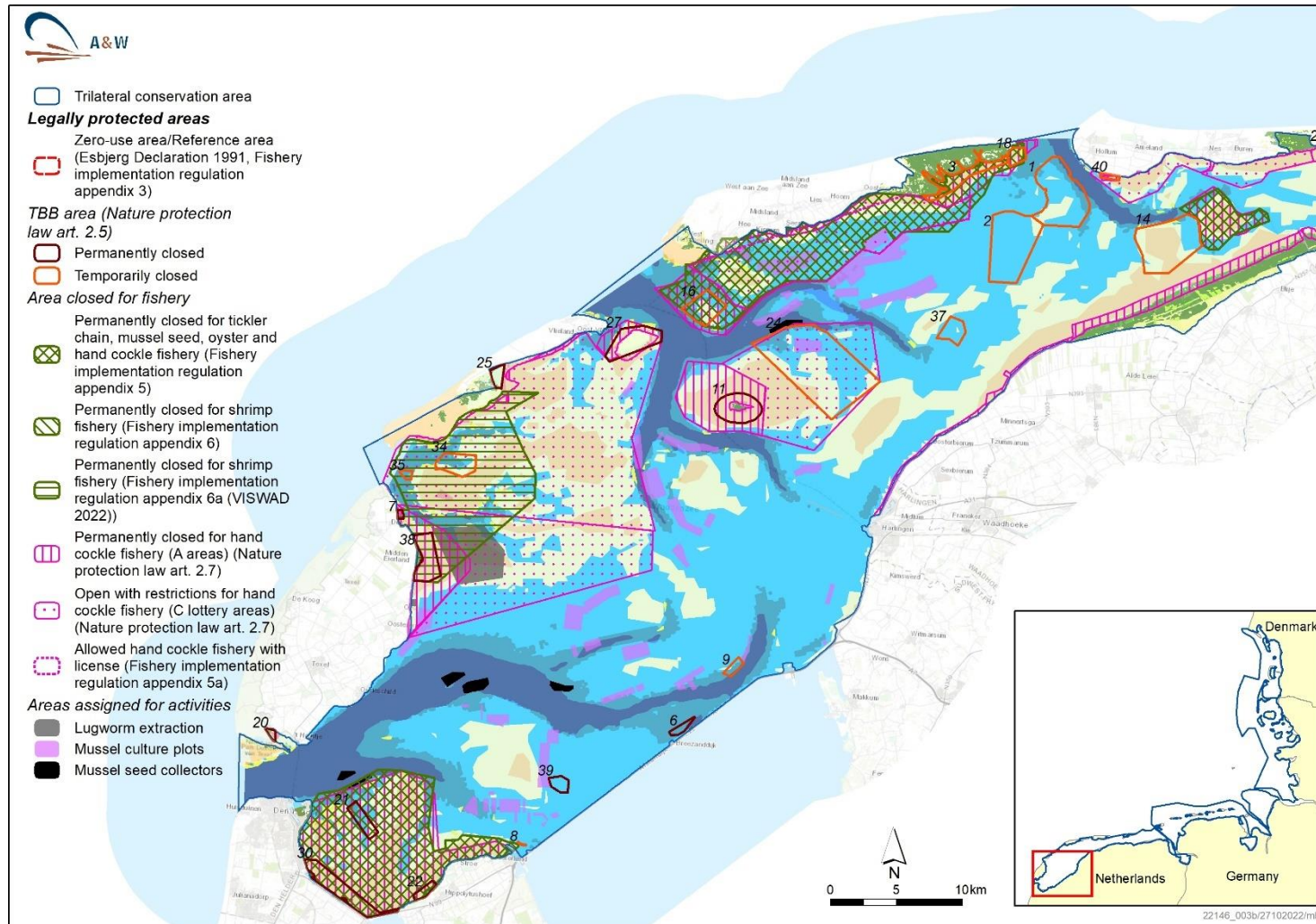
² Passage allowed between 3 hours before and 3 hours after high tide

³ This area lies completely in (overlaps with) map number 31 and is therefore not included in the calculation of surface area per closure type

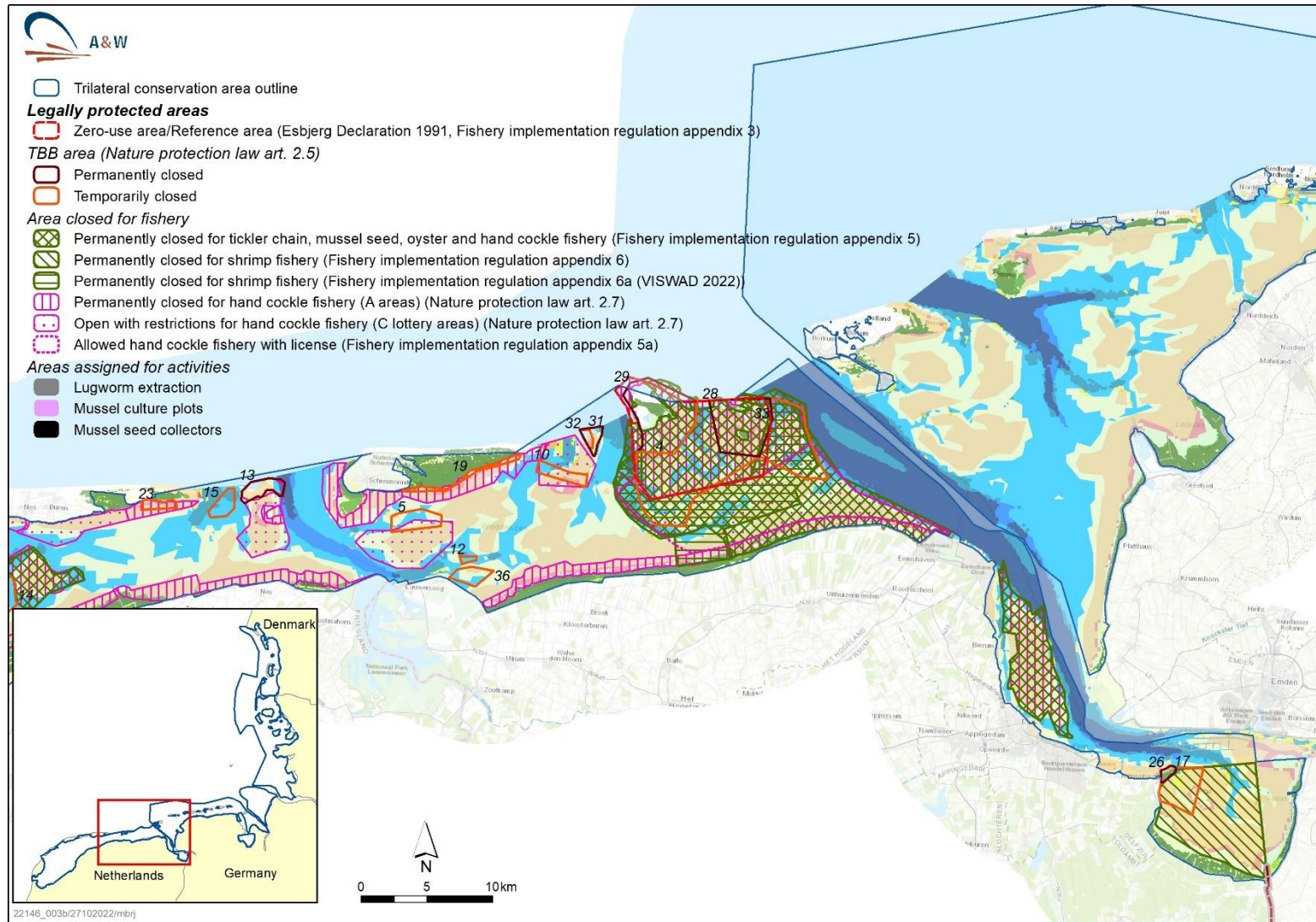


Appendix Figure 2-1 Overview location TBB-areas in the Dutch Wadden Sea Conservation area that are permanent and temporarily closed. The numbers in the map refer to the area characteristics in Appendix table 3-1.

Appendix 3 Detailed legally protected areas map NL

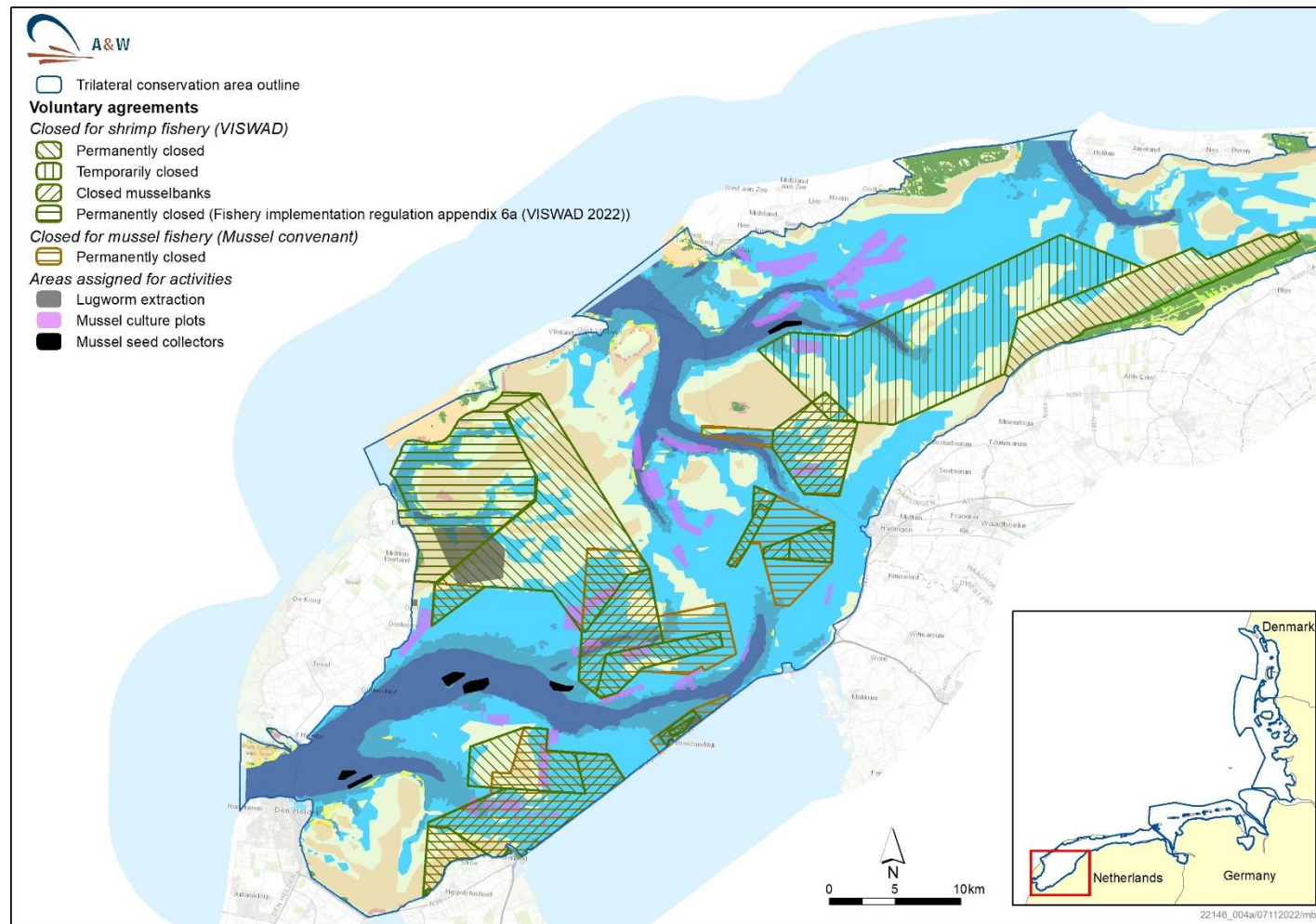


Appendix Figure 3-1. Overview legally protected areas in the western part of the Dutch Wadden Sea Conservation area

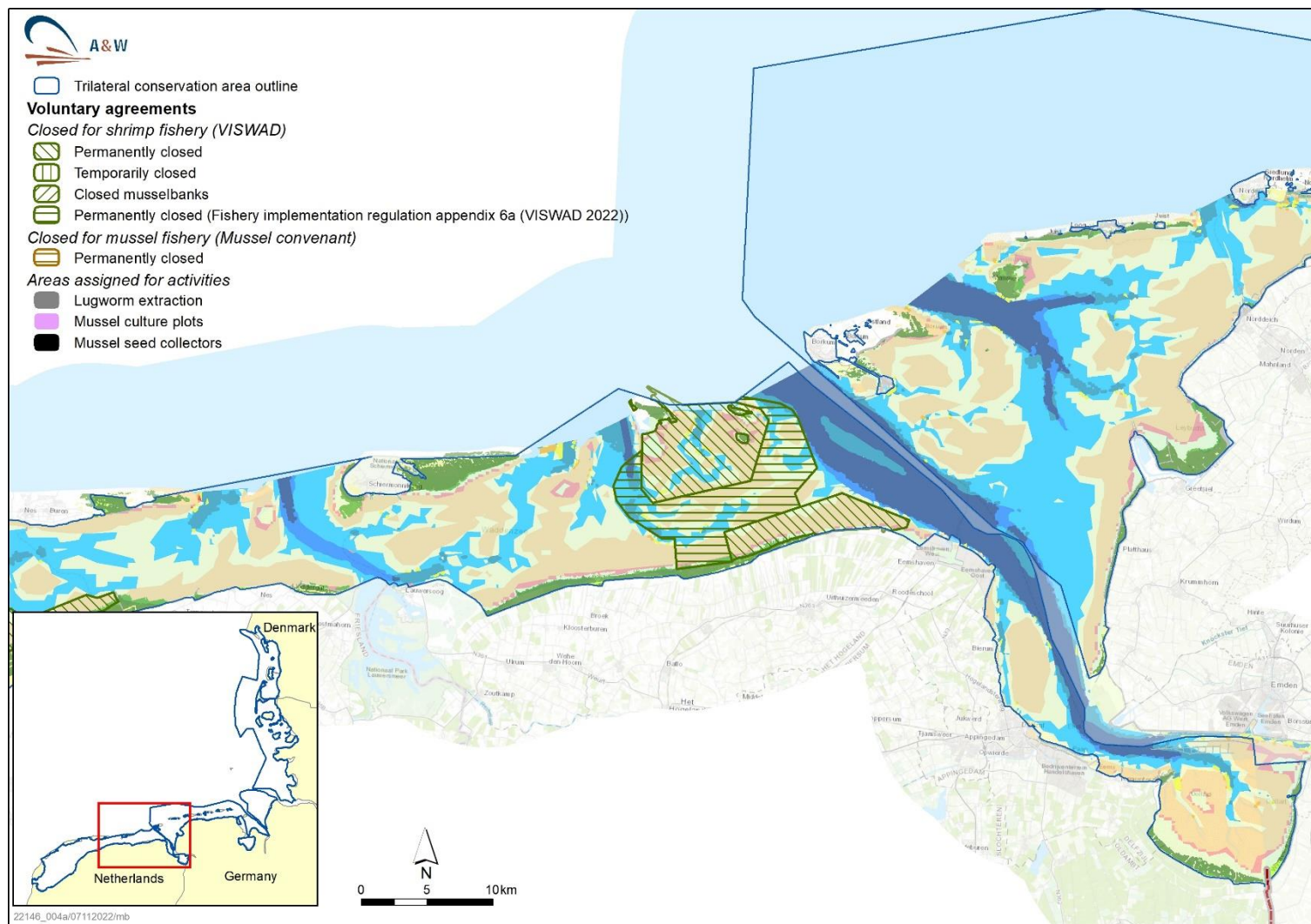


Appendix Figure 3-1. Overview legally protected areas in the eastern part of the Dutch Wadden Sea Conservation area

Appendix 4 Detailed voluntary agreements map NL

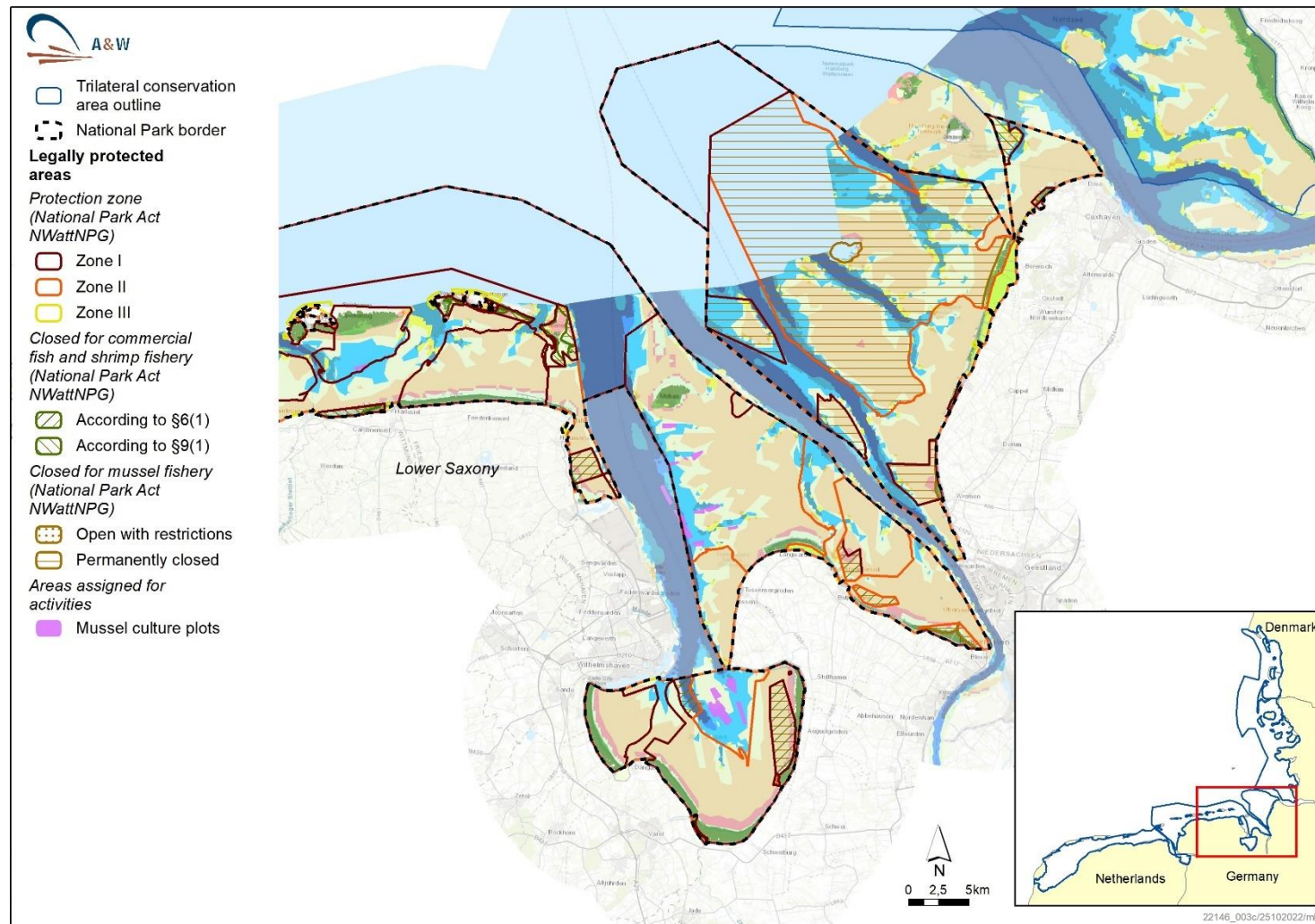


Appendix Figure 4-1. Overview voluntary agreement areas in the western part of the Dutch Wadden Sea Conservation area. *N.B.* the VISWAD 2nd tranche areas are officially/legally included in appendix 6a of the Fishery implementation regulation (see also Figure 3-1). The areas of the fourth closure step of the Mussel Covenant (July 2022) are not included in this map.

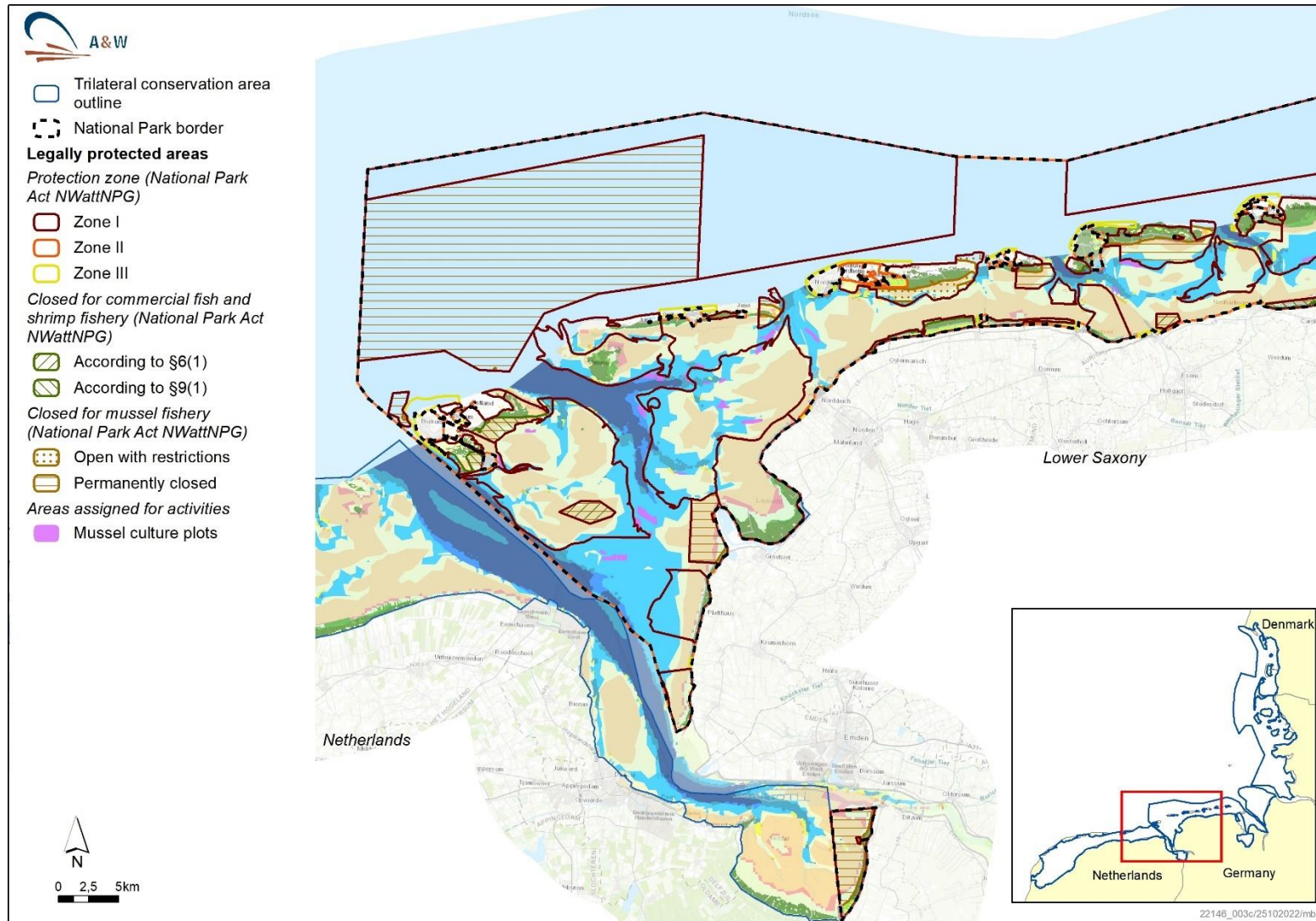


Appendix Figure 4-2. Overview voluntary agreement areas in the eastern part of the Dutch Wadden Sea Conservation area. N.B. the VISWAD 2nd tranche areas are officially/legally included in appendix 6a of the Fishery implementation regulation (see also Figure 3-1). The areas of the fourth closure step of the Mussel Covenant (July 2022) are not included in this map.

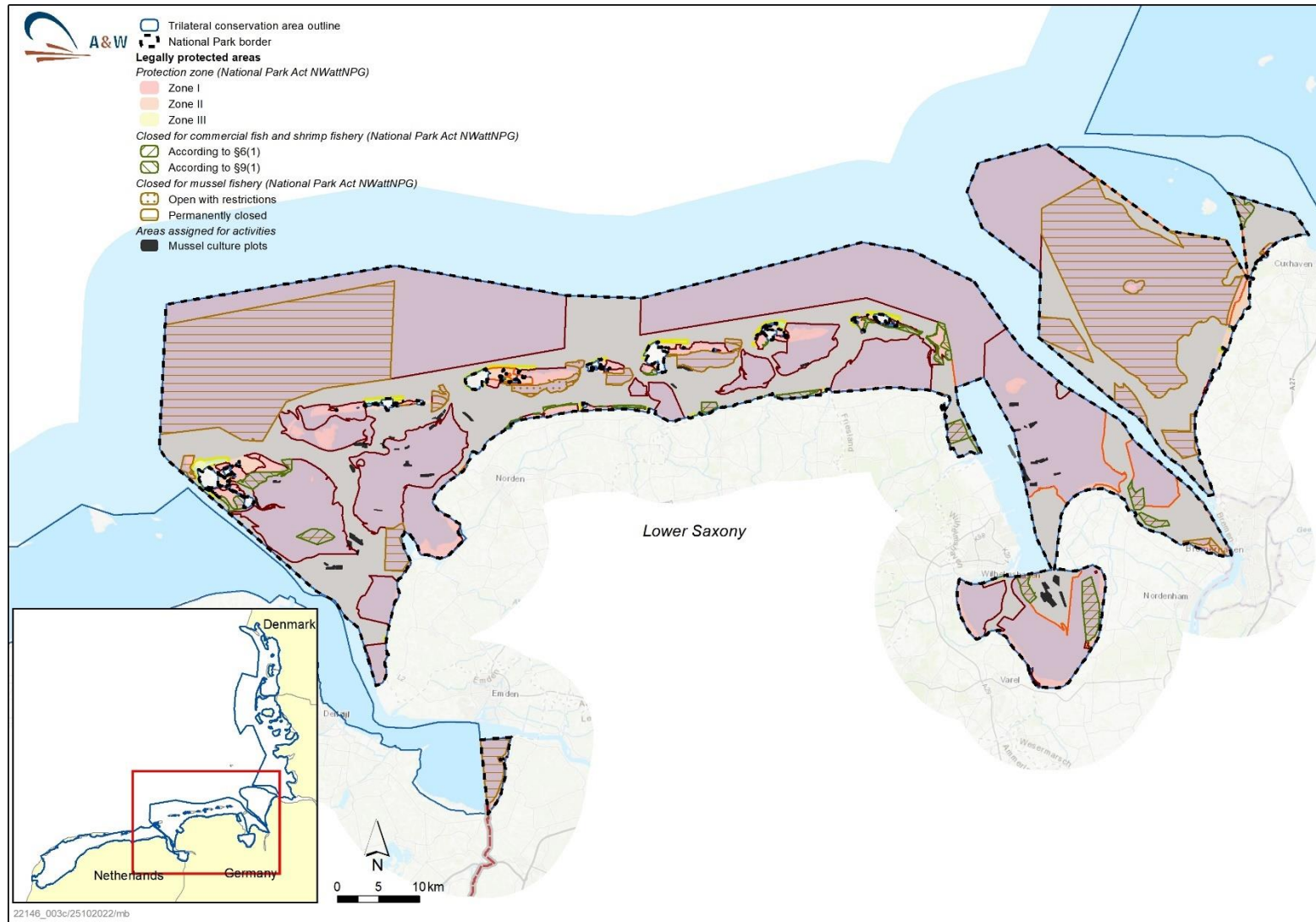
Appendix 5 Detailed zonation protection regime LS



Appendix Figure 5-1. Overview zonation protection ecotope map in the western part of the Lower Saxony Wadden Sea Conservation area

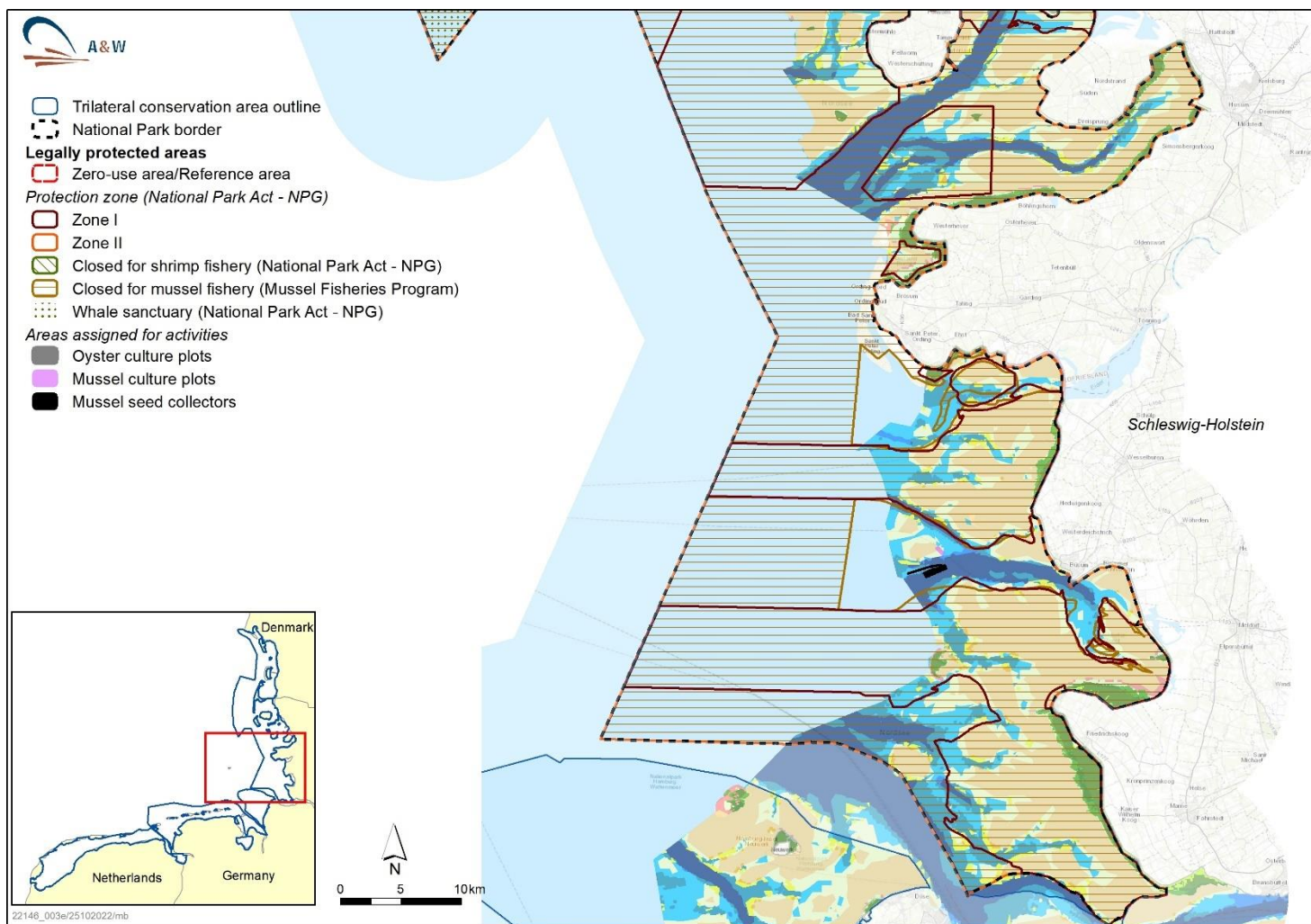


Appendix Figure 5-2. Overview zonation protection ecotope map in the eastern part of the Lower Saxony Wadden Sea Conservation area

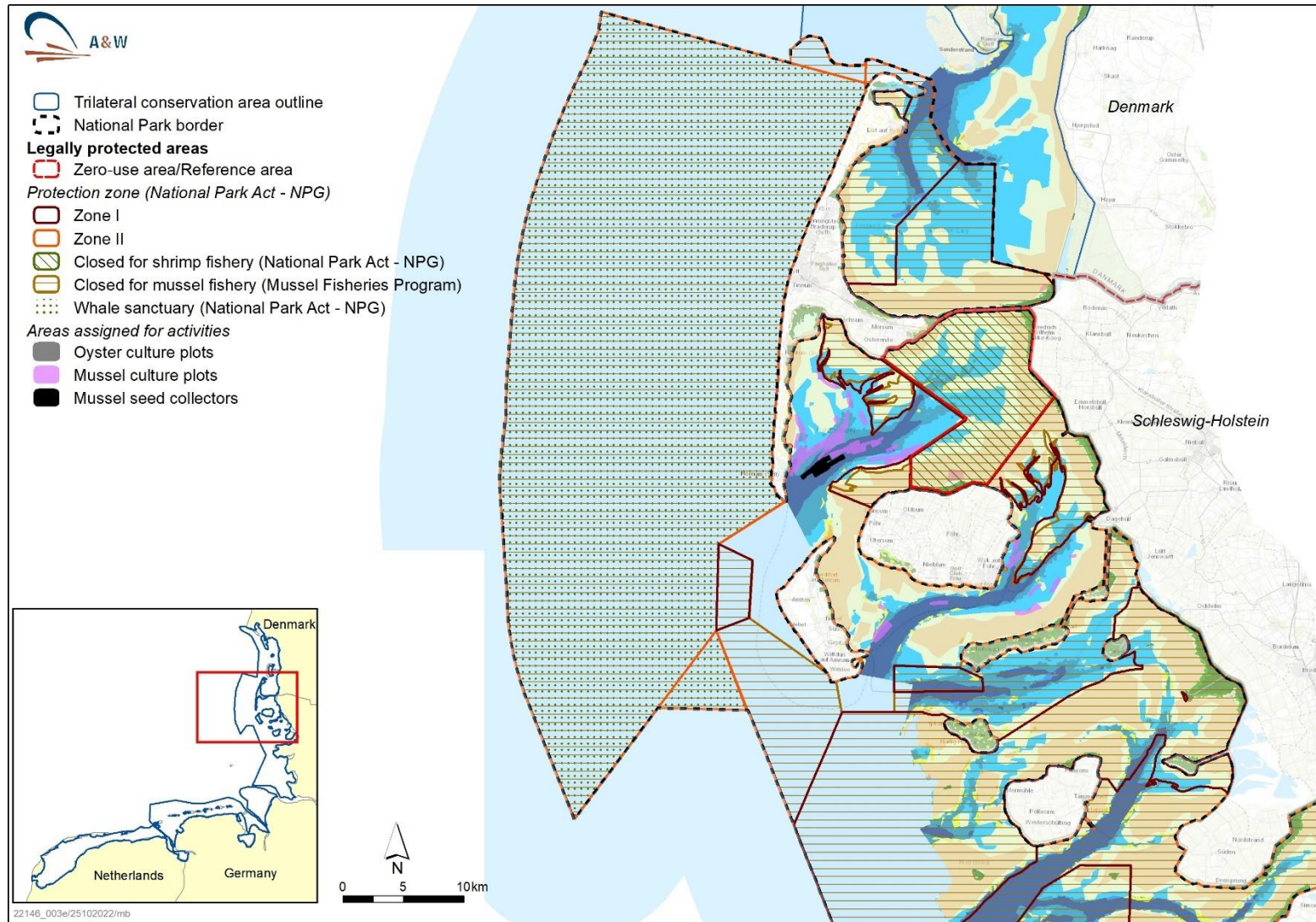


Appendix Figure 5-3. Overview zonation protection of the Lower Saxony Wadden Sea Conservation area

Appendix 6 Detailed zonation protection regime SH



Appendix Figure 6-1. Overview zonation protection ecotope map in the southern part of the Schleswig-Holstein Wadden Sea Conservation area

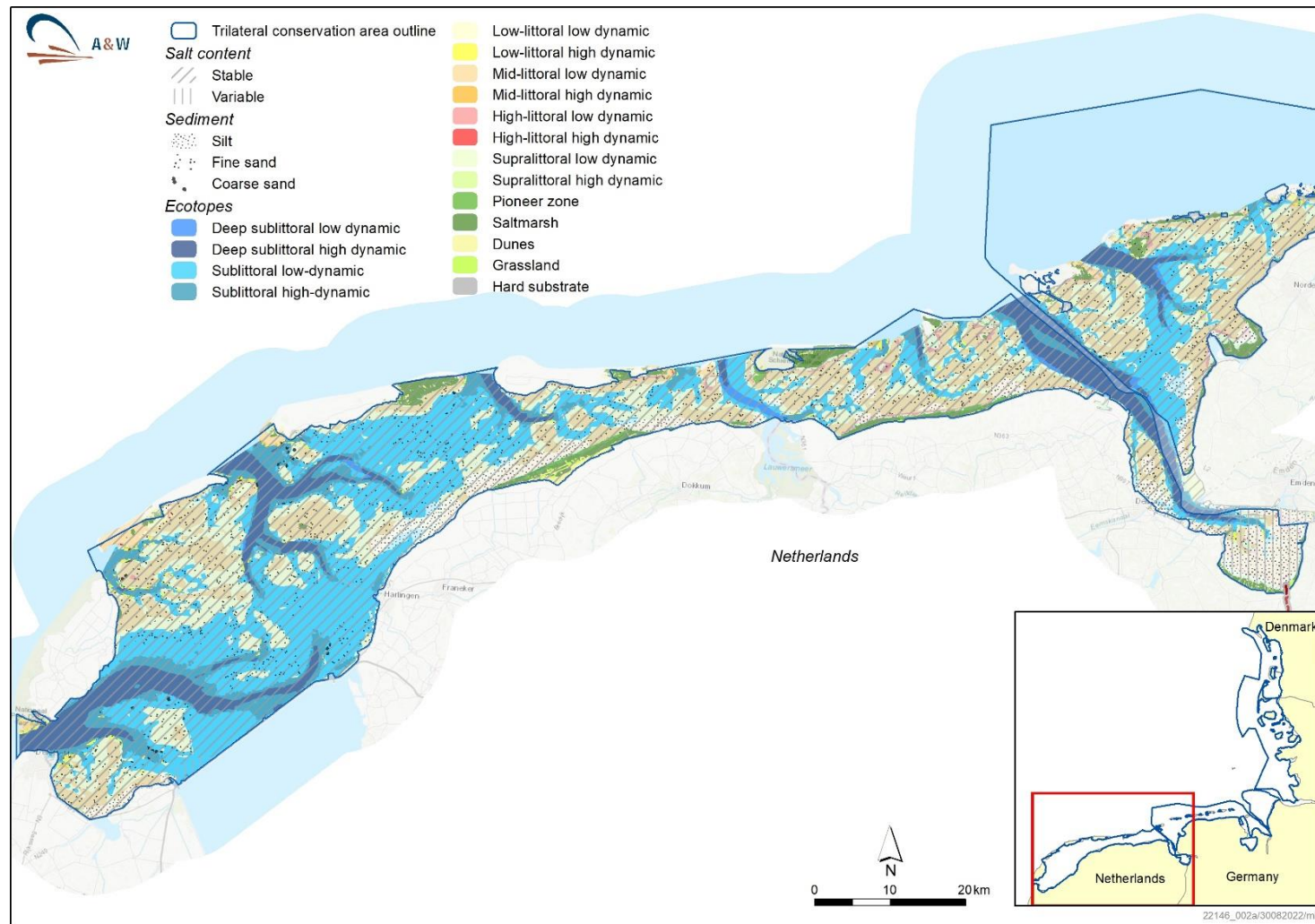


Appendix Figure 6-2. Overview zonation protection ecotope map in the northern part of the Schleswig-Holstein Wadden Sea Conservation area

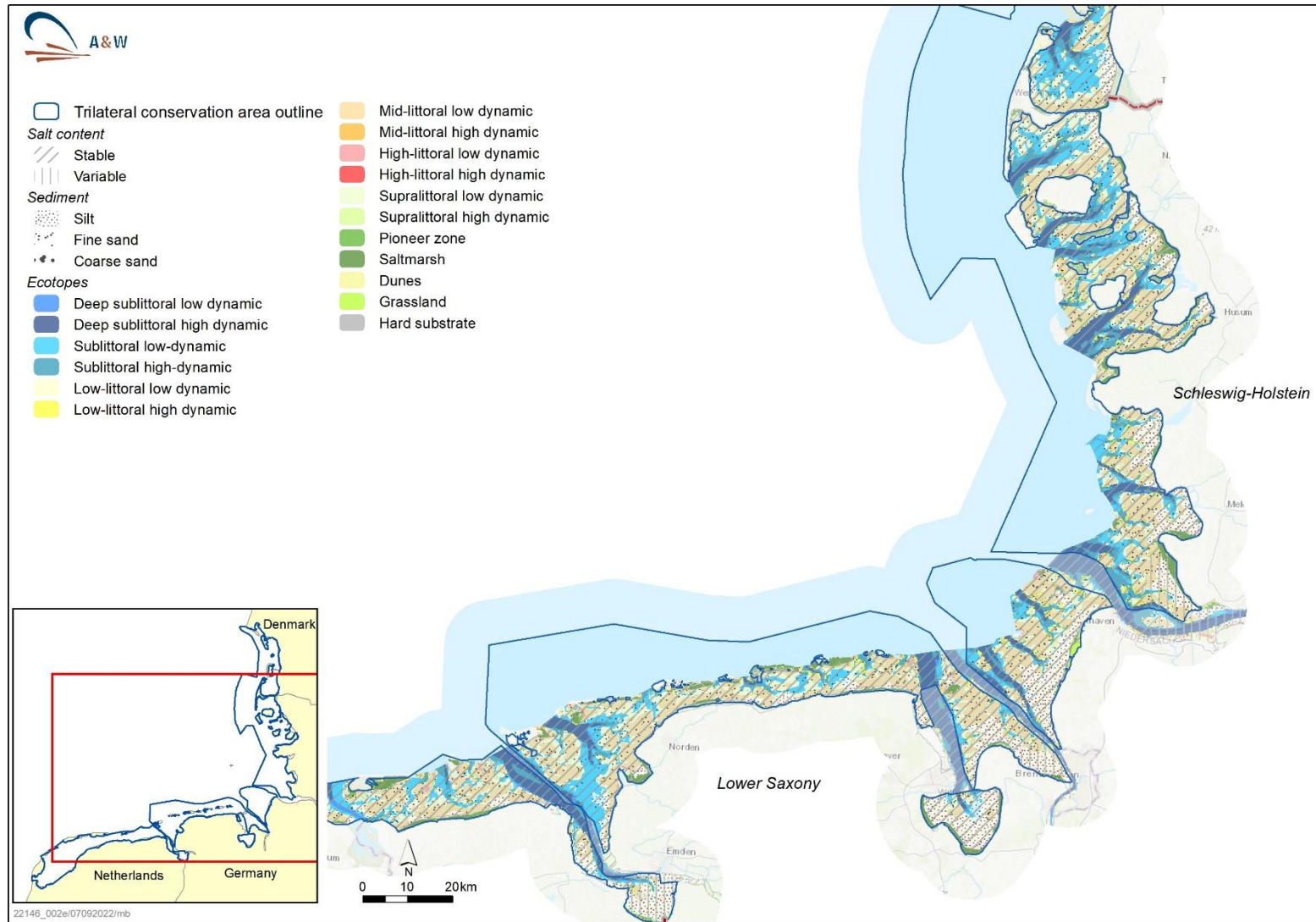


Appendix Figure 6-3. Overview zonation protection in the northern part of the Schleswig-Holstein Wadden Sea Conservation area

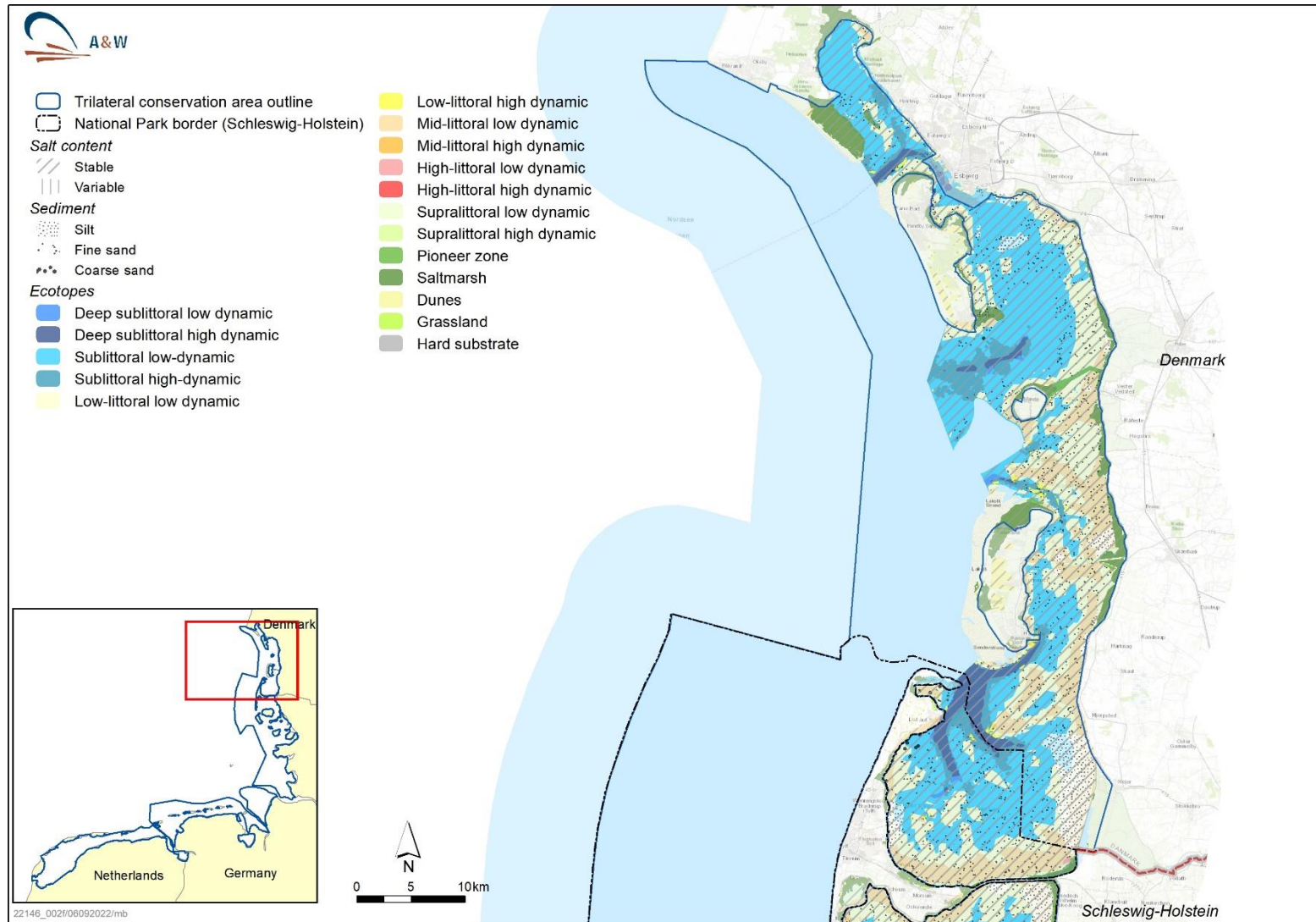
Appendix 7 Trilateral ecotope map



Appendix Figure 7-1. Overview ecotopes within the Dutch Conservation area

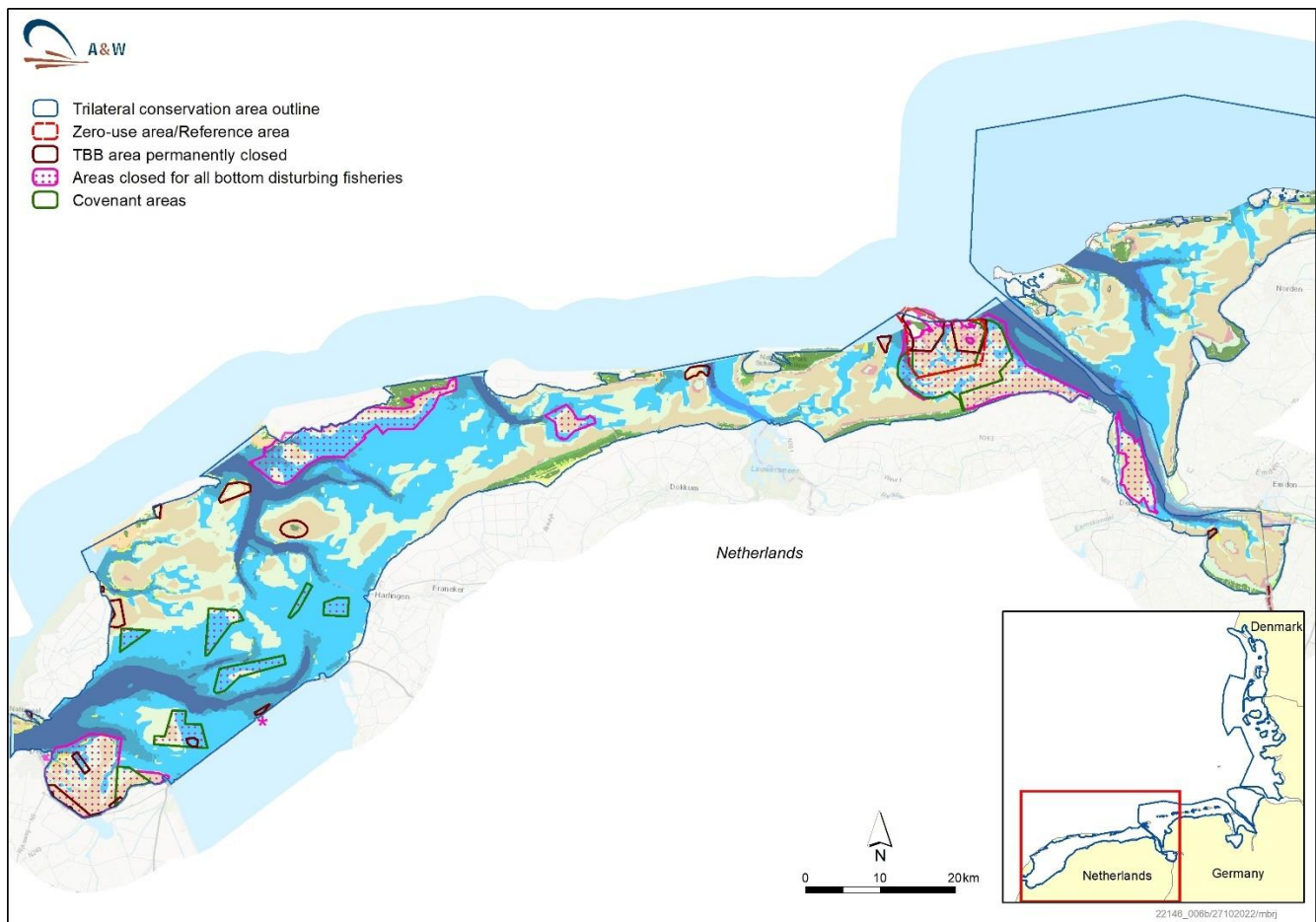


Appendix Figure 7-2. Overview ecotopes within the German Conservation area

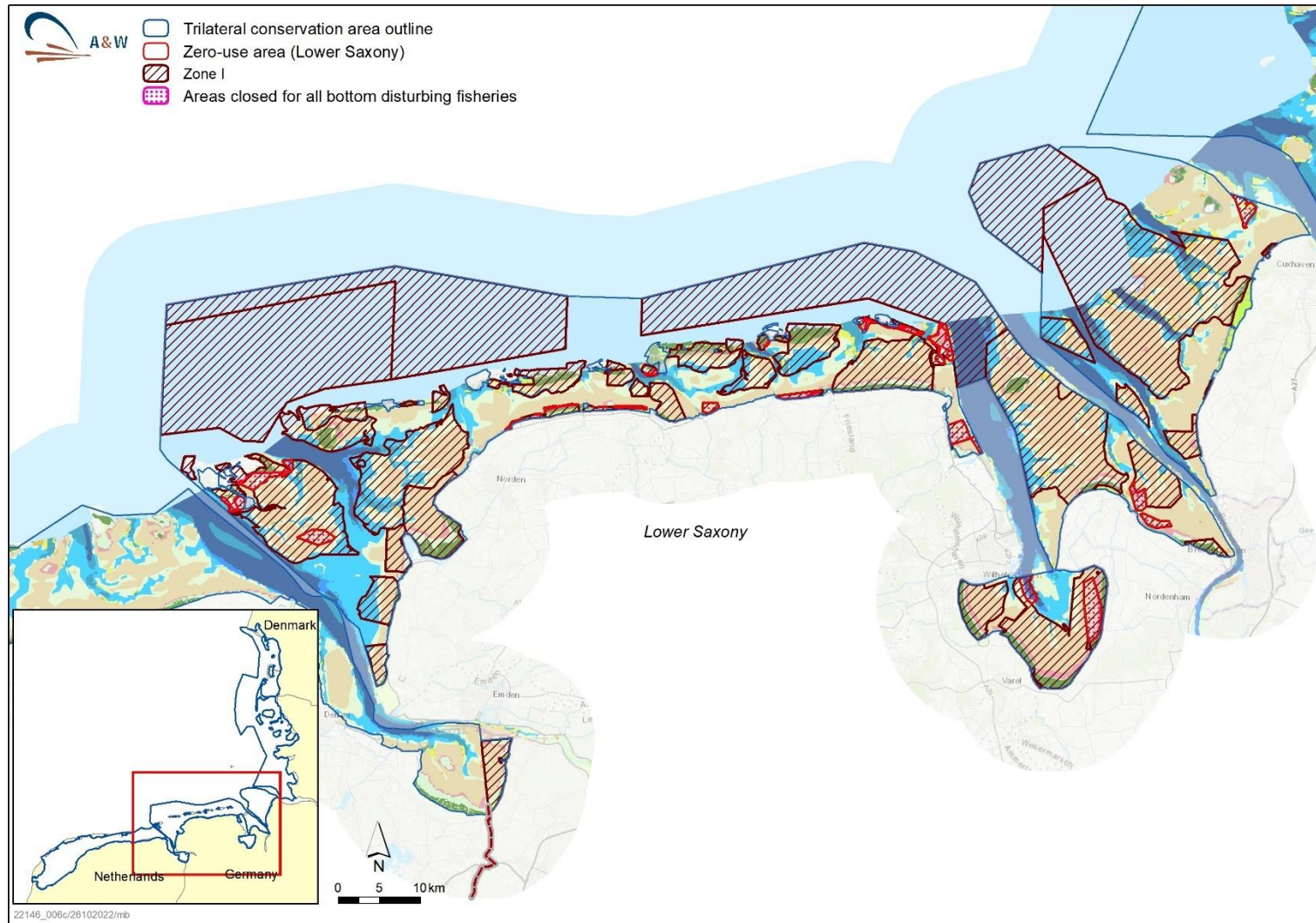


Appendix Figure 7-3. Overview ecotopes within the Danish Conservation area

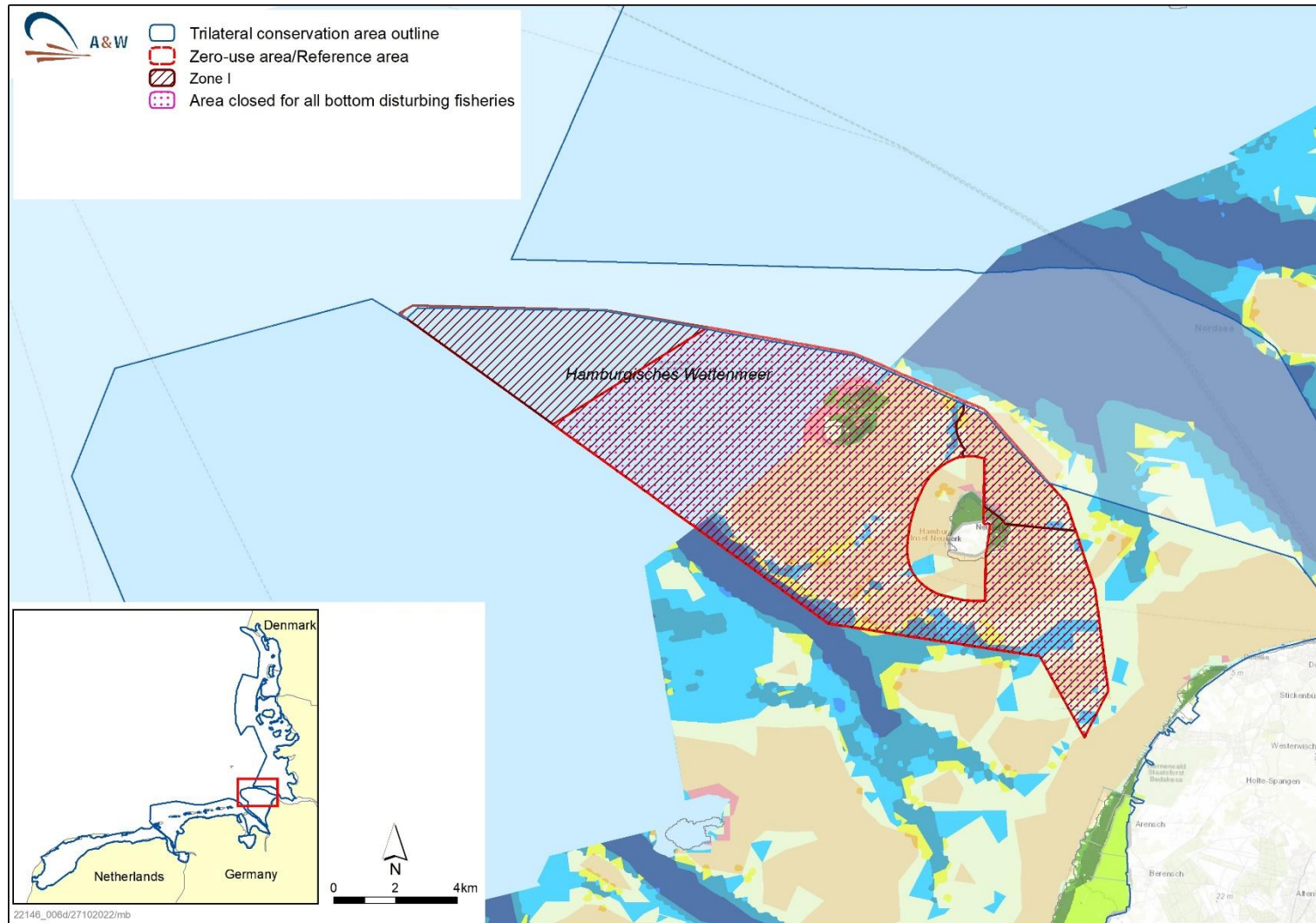
Appendix 8 Detailed comparative overview map



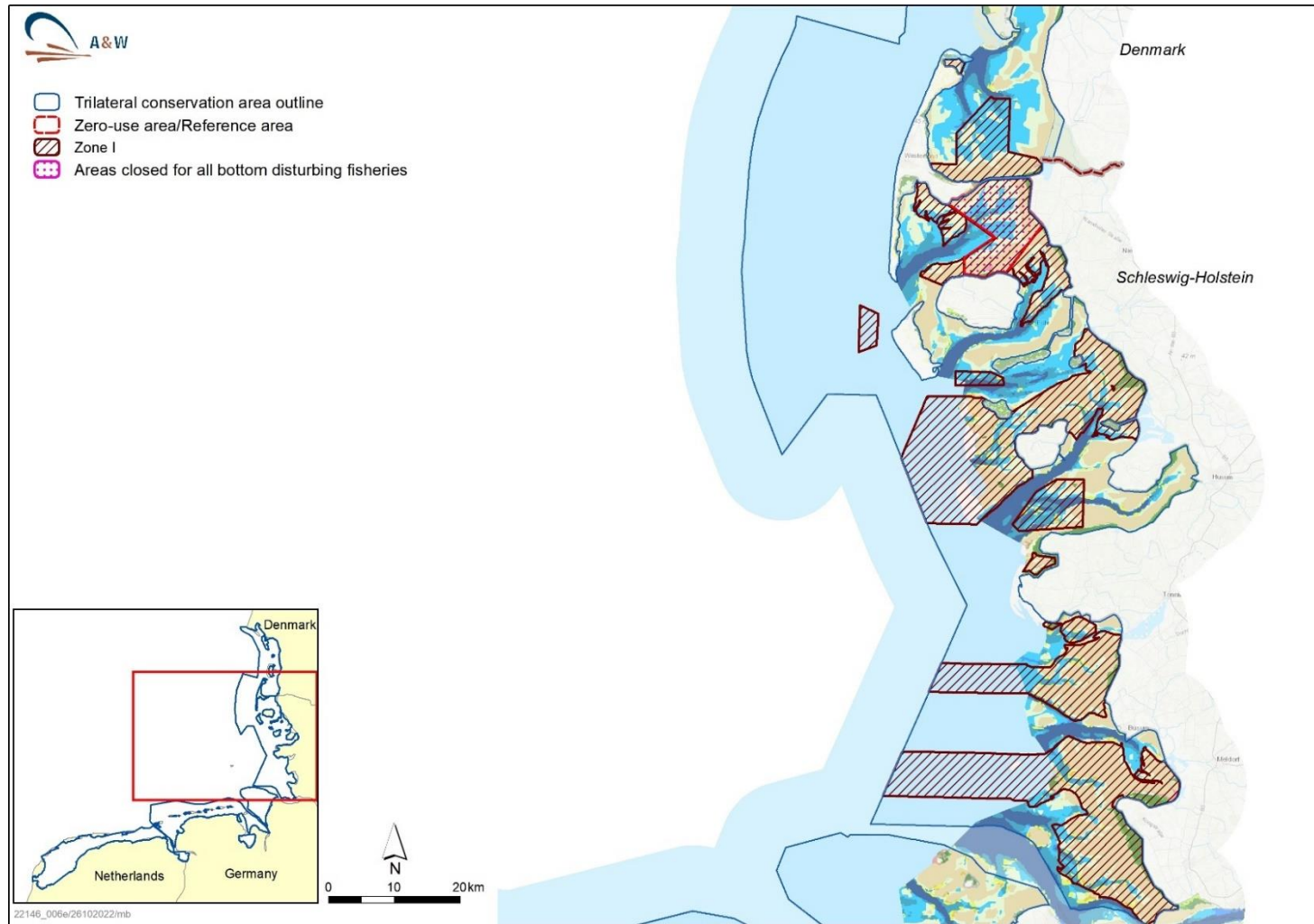
Appendix Figure 8-1. Overviewmap 'strict' protection areas within the Dutch Conservation area. Areas are shown that are permanently closed: Reference area, TBB areas, Appendix 5 Fishery implementation regulation areas, Covenant areas.. N.B. TBB Vlieter and Breezanddijk (*) are both closed for shrimp and musselseed fisheries. Covenant areas are shown that are both permanently closed for musselseed and shrimp fisheries (cockle fisheries allowed) (The Covenant 2nd tranche area is cut off within the borders of Appendix 5 area of the Fishery implementation regulation). Cockle fisheries, activities on mussel parcels and shrimp fishing in sublittoral parts of Appendix 5 areas are permitted. Shrimp fishing also allowed in sublittoral parts of TBB areas.



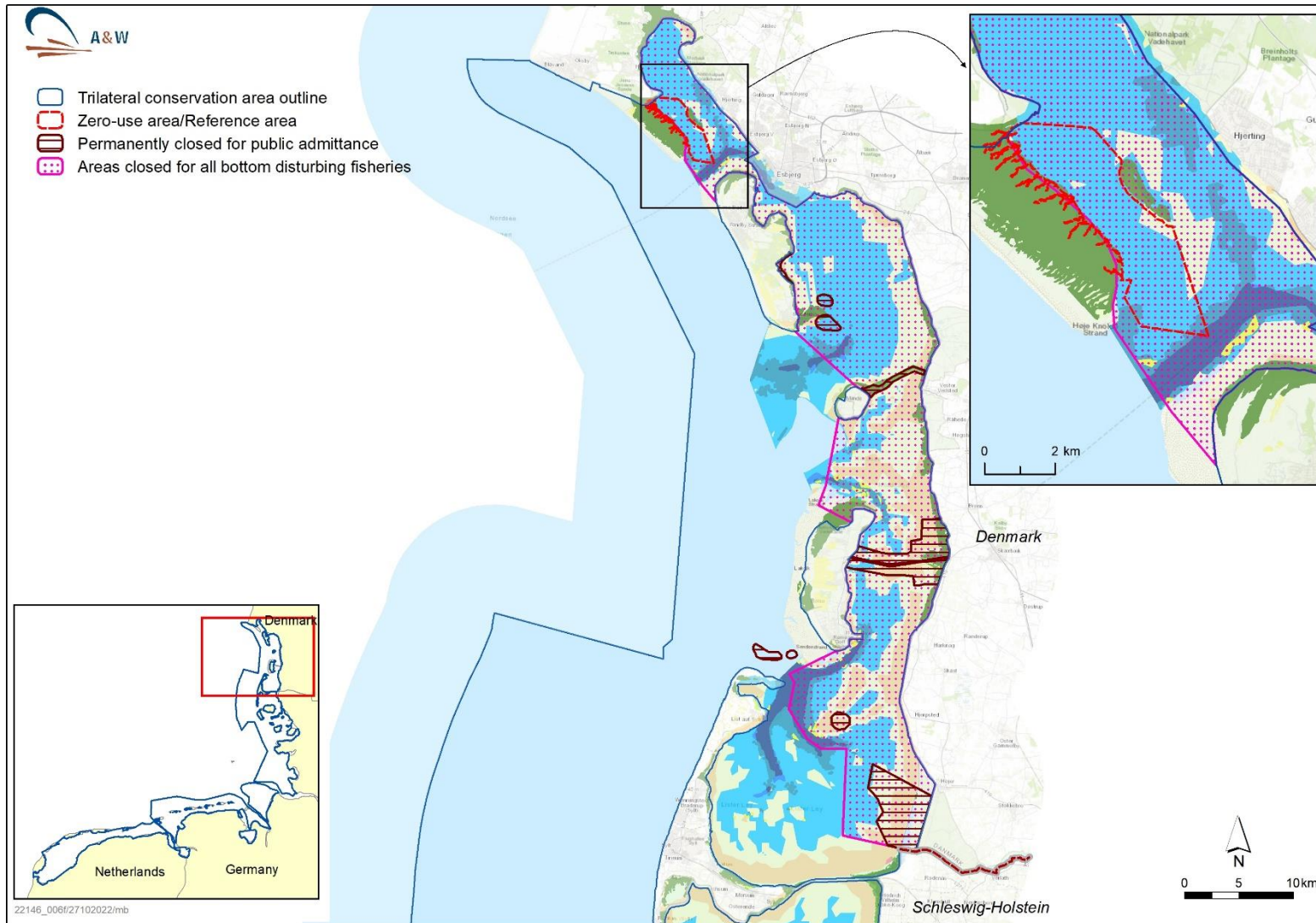
Appendix Figure 8-2. Overviewmap 'strict' protection areas (permanently closed) within the Lower Saxony Conservation area. N.B. Within Zone I 'zero-use' areas (red line) are shown that are closed for bottom disturbing fisheries. In other areas shrimp and/or mussel fisheries are permitted.



Appendix Figure 8-3. Overviewmap 'strict' protection areas (permanently closed) within the Hamburg Conservation area. N.B. Within Zone I and the Zero-use / Reference area (red dashed line) only shrimp fisheries are permitted in <1% of the area.



Appendix Figure 8-4. Overviewmap 'strict' protection areas (permanently closed) within the Schleswig-Holstein Conservation area. N.B. Shrimp fishing is allowed in Zone I (no mussel and oyster fisheries).



Appendix Figure 8-5. Overviewmap 'strict' protection areas (permanently closed) within the Danish Conservation area.

Appendix 9 Interviewed / consulted contacts

Appendix Table 9-1 Overview interviewed / consulted contacts

Country	Federal State	Contact	Organisation	Expertise / info	Interviewed / Consulted at
NL		Sharon van Dijk Verna de Groes Angelo Kouwenhoven	Ministry of Agriculture, Natura and Food quality (LNV)	TBB-areas, legal status Fishery policy	23-06-2022 24-09-2022
NL		Wouter van der Heij	Waddenvereniging	Fisheries	07-06-2022
NL		Arjen Dijkstra Nico Laros	Wadden Unit	Surveillance and enforcement, TBB-areas, 26% (structuurnota) areas	13-06-2022 23-08-2022
NL		Oscar Franken Kasper Meijer	Royal Netherlands Institute for Sea Research (NIOZ) / University of Groningen (RUG)	Shrimp fisheries	09-06-2022
NL		Sander Holthuijsen	NIOZ	Wadden Sea ecosystem	04-06-2022
NL		Marnix van Stralen Ronald Lanfers	Marinx Wing	Mussel / Shrimp fishery areas	08-06-2022
NL		Martin Baptist	Wageningen University and Research (WUR)	Ecotope map	15-06-2022
NL		Province of Groningen	Province of Groningen	Permits	15-06-2022
NL		Province of Friesland	Province of Friesland	Permits	15-06-2022
NL		Province of Noord-Holland	Province of Noord-Holland	Permits	15-06-2022
DE	Schleswig-Holstein	Kai Eskildsen	Nationalparkverwaltung Schleswig-Holsteinisches Wattenmeer (LKN)	Monitoring	15 -07-2022
DE	Schleswig- Holstein	Britta Diederichs	Nationalparkverwaltung Schleswig-Holsteinisches Wattenmeer (LKN)	Protection and development	15 -07-2022
DE	Schleswig-Holstein	Christian Fischer	Nationalparkverwaltung Schleswig-Holsteinisches Wattenmeer (LKN)	Fishery	15 -07-2022
DE	Schleswig Holstein	Marina Sanns	Nationalparkverwaltung Schleswig-Holsteinisches Wattenmeer (LKN)	Trilateral cooperaion	15 -07-2022

DE	Schleswig-Holstein	Christian Wiedemann	Nationalparkverwaltung Schleswig-Holsteinisches Wattenmeer (LKN)	Permits, management	Several phonecalls August & Septemberr
DE	Hamburg	Janne Lieven	Behörde für Umwelt, Klima, Energie und Agrarwirtschaft (BUKEA)	Protection, Monitoring, Surveillance and enforcement National Park Hamburg	10-06-2022
DE	Niedersachsen	Bernd Oltmanns	Nationalparkverwaltung Niedersächsisches Wattenmeer	Management, nature conservation	05-09-2022
DE	Niedersachsen	Margrita Sobottka	Nationalparkverwaltung Niedersächsisches Wattenmeer	Trilateral cooperation	Several phonecalls August & September
DE	Niedersachsen	Anna Appel	Nationalparkverwaltung Niedersächsisches Wattenmeer	GIS Data on mussel locations	18-08-2022
DE	Niedersachsen	Manuela Melle	Niedersächsische Muschelfischer GbR	Blue mussel fishery lower saxony	18-08-2022
DK		Henrik Jørgensen	Miljøministeriet DK	Protection, Monitoring, Surveillance and enforcement Danish Wadden Sea	15-06-2022
DK		Lasse Ørsted Jensen	Miljøministeriet DK	Geodata Denmark	Email August & September

Appendix 10 Figure and GIS sources

Appendix Table 10-1 Overview Figure and GIS sources

Subject	Figure	Country/federal state	Source name	Source link
Trilateral conservation outline	2-1, 3-1, 3-2, 4-1, 4-2, 4-3, 5-1	NL, DK, DE	CWSS (Common Wadden Sea Secretariat)	
Trilateral ecotope map	2-1, 3-1, 3-2, 4-1, 4-2, 4-3, 5-1	NL, DK, DE	Baptist, Martin; van der Wal, Jan Tjalling; Gräwe, Ulf; Folmer, Eelke; Elschoot, Kelly (2021). Data for: An ecotope map of the trilateral Wadden Sea, Mendeley Data, V2, doi: 10.17632/27mysx289g.2	https://data.mendeley.com/datasets/27mysx289g/2
Dutch PKB border	x	NL	Overheid.nl (2022)	https://data.overheid.nl/dataset/9470-grens-van-het-gebied-pkb-waddenzee#panel-description
Reference area	2-1, 3-1, 3-2	NL	Uitvoeringsregeling Visserij, article 11, appendix 3	https://wetten.overheid.nl/BWBR0024539/2021-10-09#Hoofdstuk3_Paragraaf3.1_Artikel11
TBB area's	3-1	NL	Min. EZK (2022)	Email by Verna Groes, Min. EZK (04.08.2022)
Fishery implementation regulation	3-1	NL	Uitvoeringsregeling Visserij (2008), article 11, appendix 5, 5a, 6, 6a	https://wetten.overheid.nl/BWBR0024539/2021-10-09#Hoofdstuk3_Paragraaf3.1_Artikel11
VISWAD areas	3-1, 3-2	NL	Marnix van Stralen, PRW	https://rijkewaddenzee.nl/nieuws/2e-tranche-sluiting-garnalenvisserij-waddenzee/ Email by Ronald Lanfers, Wing (08.06.2022)
Mussel Covenant areas	3-2	NL	Marnix van Stralen, PRW	https://rijkewaddenzee.nl/nieuws/2e-tranche-sluiting-garnalenvisserij-waddenzee/ Email by Marnix van Stralen, Marinix (08.06.22)
Hand cockle fishery areas	3-1	NL	WaddenUnit, Ministry LNV (Ministeries of Agriculture, Nature and Food Quality)	Email by Arjen Dijkstra, Wadden Unit Min. LNV (16.06.2022)
Mussel banks	3-1, 3-2	NL	Min. LNV	A&W database
Lugworm extraction	3-1, 3-2	NL	Fey-Hofstede, Frouke; Smit, Cor J. (2009). Passende beoordeling mechanische winning van pieren door VOF Zeeaashandel Arenicola op de Vlakte van Kerken (Waddenzee). Imares rapport C112/09.	https://edepot.wur.nl/143450
Mussel culture plots		NL	PDOK	https://www.pdok.nl/downloads/-/article/schelpdierenpercelen

National Park Lower Saxony Zonation	4-1	DE, LS	NPW_Zonen.shp	https://www.umweltkarten-niedersachsen.de/Download_OE/GSG/NPW_Zonen.zip
Fischerei Zonierung Niedersachsen	4-1	DE, LS	Fischerei_Zonierung_AA04082021.shp	email by Anna Appel , NLPV Lower Saxony cia Jullia Busch CWSS
Mussel culture plots	4-1	DE, LS	Muschelkulturen Nordsee (SFA, 2018) WFS	https://mdi.niedersachsen.de/geoserver/Human-Activities/wfs
National Park border	4-2	DE, HH	NPHW2001_shapes.zip	Email by Julia Meyer, BUKEA (13.06.2022)
Reference area HH	2-1, 4-2	DE, HH	NPHW2001_shapes.zip	Email by Julia Meyer, BUKEA (13.06.2022)
Protection zones	4-2	DE, HH	NPHW2001_shapes.zip	Email by Julia Meyer, BUKEA (13.06.2022)
National Park Schleswig Holstein Zonation	4-3	DE, SH	ubgkzo2017b.shp	https://mdi-sh.org/nokiscsw/geo.php?uid=5f2aeb4f-a5ec-4a0d-8a11-9f90fe4c7bee
Zero-use /Reference area SH	2-1, 4-3	DE, SH	ubgkzo2017b.shp	https://mdi-sh.org/nokiscsw/geo.php?uid=5f2aeb4f-a5ec-4a0d-8a11-9f90fe4c7bee
Blue mussel culture plots	4-3	DE, SH	Miesmuschelwirtschaftsgebiete Nordsee SH (LKN, 2017) WFS	http://www.mdi-sh.org/geoserver_lkn/mdi-ha/wfs?version=1.3.0
Mussel seed collectors	4-3	DE, SH	Saatmuschelgewinnung Nordsee SH (LKN, 2017) WFS	http://www.mdi-sh.org/geoserver_lkn/mdi-ha/wfs?version=1.3.0
Oyster culture plot	4-3	DE, SH	Genehmigte Flächen für Austernaquakultur Nordsee SH (LKN, 2017)	http://www.mdi-sh.org/geoserver_lkn/mdi-ha/wfs?version=1.3.0
Nature and Wildlife Reserve border	5-1	DK	natur_vildt_reservat_wfs	https://miljoegis.mim.dk/tmp/natur_vildt_reservat_wfs-9F35F534-E761-402C-84FC-86E5CAB4678.zip
Ref Area Denmark	2-1, 5-1	DK	Ref-area-DK_SH_HH.shp	email Julia Busch CWSS
Closed for public admittance	5-1	DK	DK	Digitized from map material supplied by mst dk
Mussel fishery area	5-1	DK	DK	Digitized from map material supplied by mst dk
Hand cockle fishery area	5-1	DK	DK	Digitized by coordinates from material supplied by mst dk
Shrimp line	5-1	DK	DK	Digitized by coordinates from material supplied by mst dk



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