# Proposal for Fisheries Conservation Measures in the Marine Protected Areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank in the Kattegat

Proposal for Fisheries Conservation Measures under articles 11 and 18 of Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC

# 1. Introduction

The marine protected areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank, are Natura 2000 sites (SE0520189) as well as OSPAR and HELCOM marine protected areas, and are located in the Kattegat. The areas are mainly offshore shallow banks with species and habitats of high conservation value. The areas were designated as Natura 2000 sites for reef structures (habitat code: H1170 - reefs and H1180 – submarine structures made of leaking gases), sandbanks (H1110), harbour porpoise (*Phocoena phocoena)* in 2003 (Fladen, Lilla Middelgrund) and 2008 (Stora Middelgrund och Röde bank and Morups bank). The areas are also part of the OSPAR and HELCOM networks of marine protected areas. Several habitats and species included on OSPAR's list of threatened and/or declining species and habitats[1] are found in the areas. In addition, several HELCOM underwater biotopes are identified in the areas[2].

The areas are furthermore fishing grounds for Swedish and Danish fisheries.

Under the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, Sweden is obliged to ensure favourable conservation status of designated habitats and species within their Natura 2000 sites. In order to fulfil recommendations accepted under the OSPAR and HELCOM conventions, Sweden is also responsible for the protection of designated OSPAR and HELCOM habitats and species. Sweden has therefore decided to incorporate, where necessary, the recommendations to protect the designated OSPAR and HELCOM habitats and species accepted under the OSPAR and HELCOM conventions in the proposed measures in order to establish an ecologically representative network of marine protected areas in accordance with the Marine Strategy Framework Directive. See also 2.4.

The Swedish proposal on fisheries conservation measures, aiming at ensuring adequate protection of designated habitats and species of the areas, is based on a proposal from the County Administrative Board of Halland. In Sweden, the County Administrative Boards are responsible for the management of the Natura 2000 sites, where the Swedish Agency for Marine and Water Management is the authority implementing the proposed fisheries measures. In general, the Government has the responsibility for conducting international negotiations within the Common Fisheries Policy framework. Through a Government assignment, the Swedish Agency for Marine and Water Management has been given a mandate from the Government to conduct the international negotiations on the basis of articles 11 and 18 in the Common Fisheries Policy with concerned Member States with the aim of formulating a joint recommendation for the marine protected areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank.

The proposal includes the establishment of no-take areas and zones where only fishery with handheld gears like rod and line, fishing for crustaceans with pots and fishing with pelagic floating trawls are allowed. It also includes a zone with compulsory use of AIS for all vessels fishing in the area to ensure efficient control.

# 2. Legal framework

### 2.1 Common Fisheries Policy

According to the Common Fisheries Policy (Regulation (EU) No 1380/2013 (The Basic Regulation)) Article 11, Member States are empowered to adopt conservation measures not affecting fishing

[1] OSPAR ref. 2008-6

[2] HELCOM 2013. Red List of Baltic Sea underwater biotopes, habitats and biotope complexes. Baltic Sea Environmental Proceedings No. 138

vessels of other Member States that are applicable to waters under their sovereignty or jurisdiction and that are necessary to comply with their obligations under Article 13(4) of Directive 2008/56/EC, Article 4 of Directive 2009/147/EC or Article 6 of Directive 92/43/EEC.

Where a Member State ("initiating Member State") considers that measures need to be adopted for the purpose of complying with the obligations referred to above, and other Member States have a direct management interest in the fishery to be affected by such measures, the European Commission shall be empowered to adopt such measures, upon request, by means of delegated acts. For this purpose cooperation between Member States having a direct management interest is foreseen with a view to formulating a joint recommendation in agreement on draft fisheries conservation measures to be forwarded to the Commission.

The initiating Member State shall provide the Commission and the other Member States having a direct management interest, with relevant information on the measures required, including their rationale, scientific evidence in support and details on their practical implementation and enforcement. Member States shall also consult the relevant Advisory Councils.

The initiating Member State and the other Member States having a direct management interest may submit a joint recommendation within six months from the provision of sufficient information. The Commission shall adopt the measures, taking into account any available scientific advice, within three months from receipt of a complete request (Regulation 1380/2013, Articles 11 and 18).

The Common Fisheries Policy framework valid from the 1 January 2014 is thus the basis for this proposal. In addition, Sweden has also taken account of the 11 information items of the Commission´s guidelines from 2008 concerning development of proposals for fisheries conservation measures in marine Natura 2000 sites (see appendix 7).

### 2.2 Access to the marine protected areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank

According to the Basic Regulation[3] Denmark has historical fishing rights within the 12 nautical miles zones in the Swedish part of the Skagerrak and the Kattegat area. Denmark also has fishing rights in the Swedish EEZ. Denmark has consequently provided fishery data for fishery activities carried out in the concerned areas. Denmark has stated that they will participate in the process of formulating a joint recommendation.

As concerns German fishery activities in the marine protected areas, the analysis from the German authorities of available electronic data (VMS etc.) has shown that there are no major German fisheries taking place in the area and the few efforts that occur will not be released due to confidentiality reasons. However, since the marine protected areas are part of ICES division III a (Skagerrak and Kattegat), Germany has fishing opportunities for a number of target species (i.e. herring, cod, haddock, saithe – see Annex 1a of regulation 2015/106 – "TAC´s and Quotas 2015") in the concerned area.

### 2.3 Implementation of Environmental protection directives in Sweden

#### 2.3.1 Birds and Habitats Directives

Designation of Natura 2000 sites is undertaken with the support of two EU directives: The Birds Directive (European Parliament and Council Directive 2009/147 / EC of 30 November 2009 on the conservation of wild birds) and the Habitats Directive (Council Directive 92/43 / EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora).

The Swedish Environmental Code is the main legal framework for implementing the Birds Directive and the Species and Habitats Directive in Sweden (7 Chapter section 27-28 Environmental Code[4]). The two directives have been fully implemented in Swedish legislation since 1 July 2001. The Swedish Environmental Protection Agency has a central responsibility for all protected areas in Sweden (7 Chapter Environmental Code), including the Natura 2000 sites.

The Swedish Environmental Protection Agency is also responsible for the reporting according to the Birds Directive and the Habitats Directive - the practical work for the task of reporting on the two directives however, is assigned to the Swedish Species Information Centre. The Swedish Agency for Marine and Water Management has a central guidance responsibility for aquatic protected areas.

The 21 County Administrative Boards (regional authorities) are responsible for the more practical management of the protected areas in their county. They are responsible for the protection and management of the sites as well as for implementing the Natura 2000 management plan.



[3] (EU) No 1380/2013 of the European Parliament and of the Council on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC

[4] Environmental Code (1998:808)

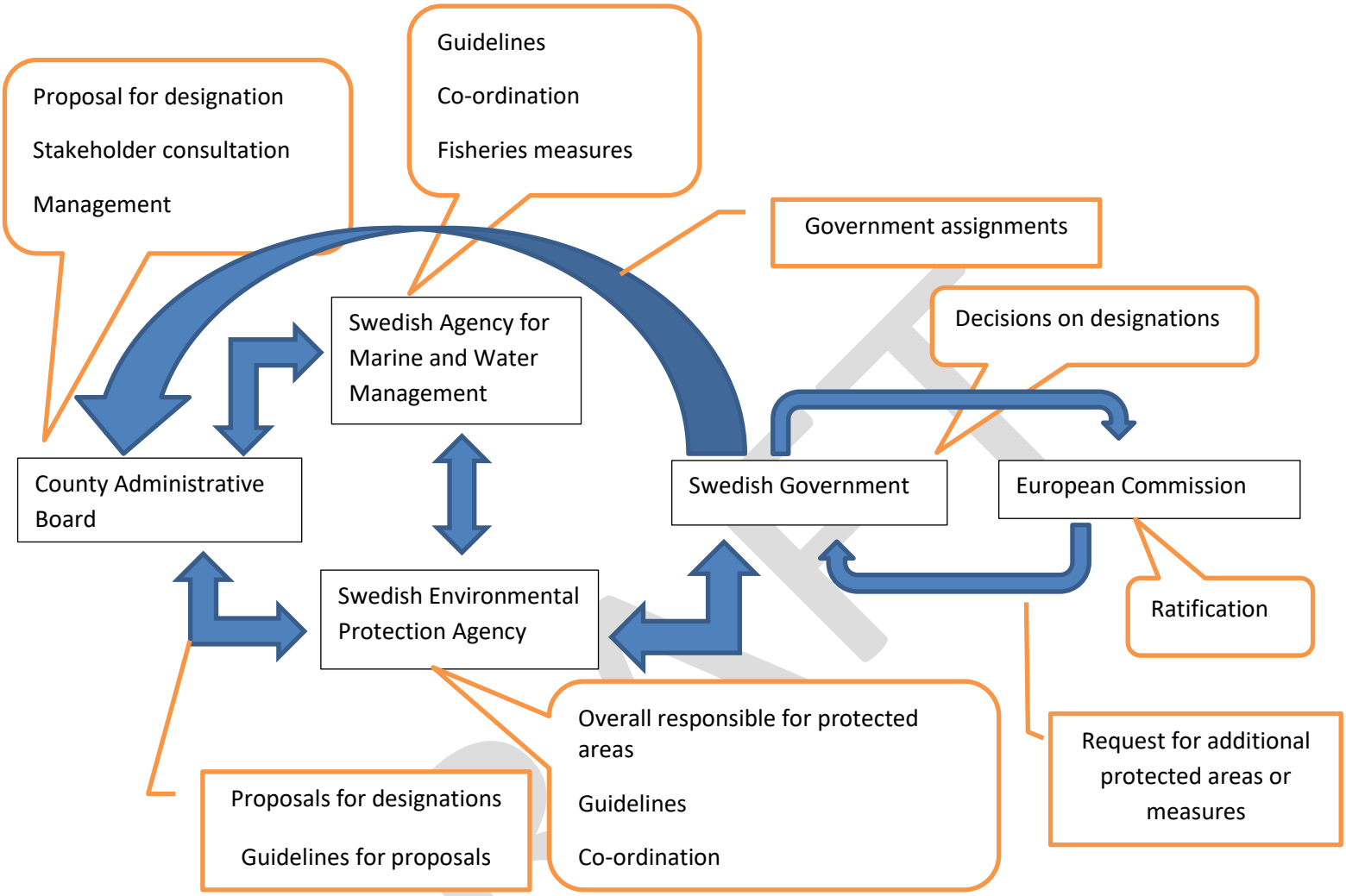



***Figure 1**. Schematic picture on roles and responsibilities in the process in the designation of Natura 2000 sites.*

**2.4 Marine protected areas in Sweden and their contribution to reaching good environmental status according to obligations under the Marine Strategy Framework Directive (MSFD)**

In Sweden, there are around 320 Natura 2000 sites with listed marine species and/or habitats (Appendix 5, figure 5.1). Some of these protected areas are also OSPAR and/or HELCOM marine protected areas (Appendix 5, figure 5.1). In Sweden, there are 10 OSPAR marine protected areas and 28 HELCOM marine protected areas. The national designations of marine protected areas also include nature reserves, national parks, biotope protection areas. By the end of 2016, 13.6 % of the Swedish marine waters were protected. According to the Swedish environmental objectives and the milestone target on protected areas, it has been decided by the Swedish Parliament that by 2020, at least 10 % of the Swedish marine waters should be protected in an ecologically representative and connected system of protected areas. The system of protected areas should be well integrated in the surrounding landscape and effectively managed. “The Swedish system” is therefore based on both

national targets and obligations from EU-law, as well as global conventions like the Convention of Biodiversity (CBD), including the Aichi targets and the goals concerning sustainable development. The existing protected areas contribute to coherent and representative networks of marine protected areas and are a part of the Swedish transposition of the MSFD. In order to achieve good environmental status, Member States must identify which measures are needed and suitable in order to meet their obligations (for further detail on how Sweden has implemented the MSFD, see appendix 6).

In order to achieve an ecologically representative and connected system of marine protected areas Sweden has identified the need to also include species and habitats on the OSPAR list of threatened and/or declining species and habitats. Sweden has therefore decided to incorporate, where necessary, the recommendations to protect the designated OSPAR habitats and species accepted under the OSPAR convention as well as HELCOM underwater biotopes identified under the HELCOM convention, in the proposed measures in order to establish an ecologically representative network of marine protected areas in accordance with the Marine Strategy Framework Directive.

## 3. Knowledge base; mapping of the marine protected areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank

In 2006 the report on mapping of marine habitats on offshore banks was published. The survey of the offshore banks was one of the first systematic surveys of marine habitats in Sweden. All four marine protected areas included in this proposal were part of the survey together with 15 other offshore banks in Swedish waters. In 2003 the Geological Survey of Sweden got the assignment to provide information on the seabed. At the same time Swedish Meteorological and Hydrological Institute would provide data on hydrology of the offshore banks. A survey was made in 2004 for Fladen and Lilla Middelgrund with the purpose of investigating fish and crustaceans in the areas. The overall marinebiological survey for the four marine protected areas was conducted in 2004 and 2005 (Naturvårdsverket, 2006).

The offshore bank survey was extended in 2007-2010 and an additional report was published in 2010 including an assessment of biological and ecological values carried out separately for fish, seabirds, benthic flora and fauna (Naturvårdsverket, 2010). To some extent, the assessment also included marine mammals, for which data were taken directly from expert evaluations of seals and porpoises. Furthermore, maps of habitats and species distributions have been modelled based on the inventories from 2004- 2005, bathymetry and geology (Naturvårdsverket 2012).

## 4. Rationale

### 4.1 The link between article 11 of the Basic Regulation and the EU Environmental Law Directives

Article 11, first paragraph, of the Basic Regulation states the following. - Member States are empowered to adopt conservation measures not affecting fishing vessels of other Member States that are applicable to waters under their sovereignty or jurisdiction and that are necessary for the purpose of complying with their obligations under article 13(4) of the MSFD, article 4 of the Birds Directive or article 6 of the Habitats Directive. It must be provided that those measures are compatible with the objectives set out in article 2 of the Basic Regulation, meet the objectives of the relevant union legislation that they intend to implement, and are at least as stringent as measures under union law.

Member States are responsible for ensuring favourable conservation status of designated marine habitats and species in their respective Natura 2000 sites and for taking appropriate steps to avoid the deterioration of the habitats and species as well as the disturbance of the species for which the Natura 2000 site has been designated. Furthermore, according to article 13.4 of the MSFD, the programmes of measures established pursuant to this article shall include spatial protection measures, contributing to coherent and representative networks of marine protected areas, adequately covering the diversity of the constituent ecosystems, such as special areas of conservation. These areas may have been designated within the framework of the Habitats Directive and/or Birds Directive (Natura 2000 network) as well as in relation to international or regional agreements to which they are parties (for further details on how Sweden has implemented the MSFD, see appendix 6).

Regional agreements include regional sea conventions as defined in article 3.10 of the MSFD, where for example OSPAR and HELCOM are mentioned.

In accordance with the MSFD, the EU Member States should achieve or maintain good environmental status in their marine waters by 2020 at the latest. They should also define a number of environmental targets with indicators to guide progress in achieving good environmental status. The environmental targets should be based on, among other things, the definition of good environmental status and should take into account identified pressures and impacts.

### 4.2 Legal basis for the article 11-process

The marine protected areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank are marine protected areas and hosts valuable Natura 2000-, OSPAR- and HELCOM-habitats/biotopes and species[5]. The ongoing regional process is the valid process to implement conservation measures for fisheries in such areas. For Sweden to fulfill the obligations under EU-law, both with regard to habitats and in order to reach good environmental status by year 2020, all relevant habitats and species, both Natura 2000, OSPAR and HELCOM, shall be included in the same proposal for fisheries conservation measures.

The Swedish proposal for a programme of measures under the MSFD includes first cycle-measures addressing impacts from fisheries in marine protected areas.

### 4.3 The need for fisheries conservation measures in the marine protected areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank

Based on identified threats from fisheries to the designated habitats and species (see chapter 8), there is a need for fisheries conservation measures in the marine protected areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank. No-take zones as well as zones where fishing with pelagic floating trawls, handheld gears like rod and line and fishing for crustaceans with pots (restrictive fishing zones) are therefore proposed. It also includes a zone with compulsory use of AIS for all vessels fishing in the area. Buffer zones are included along the borders of all the marine protected areas and follow the advice from the International Council of the Exploration of the Sea (ICES) for buffer zones with respect to gear position in relation to vessel position and depth (ICES 2013) i.e. three times the depth.

[5] See relevant GIS-layers at the Swedish Environmental Protection Agency website: www.skyddadnatur.naturvardsverket.se.

Furthermore, to limit the risk of disturbance due to sedimentation of particles suspended by demersal trawling, the buffer zones are also established to reduce coarse particles to settle on designated habitats and species. The fine particles typically found in suspension following trawling soft seafloors, however will stay in solution for periods of up to several days (Linders et al. 2017) and are consequently not taken into account.

The proposed fisheries conservation measures should apply generally, i. e. also include recreational fisheries.

To ensure adequate protection of the proposed restrictive fishing zones and the no-take zones, better monitoring of real time position of vessels fishing in the area is needed. If VMS and the present 1-hour sampling rate of vessel positions would be the only system of monitoring, no-take zones would have to be substantially larger in size in order to secure efficient control. The proposal therefore involves mandatory AIS for fishing vessels when entering the area, increasing the frequency of GPS positioning of fishing vessels and thus allowing for more accurate control.

### 4.4 Peer review of proposal

The rationale and principles applied in the present proposal has been peer reviewed by The Swedish University of Agricultural Science, Department of Aquatic Resources (SLU Aqua). A peer review of the proposal ensures that, the proposed fisheries conservation measures, alongside the rationale and principles, on which the proposal builds, are scientifically sound. A peer review has also increased the scientific evidence in terms of references and ensured that relevant scientific studies have been included.
The outcome of the peer review can be summarized to:

- Scientific assessment of the documentation of conservation status in the marine protected areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank.
- Scientific assessment of the rationale for all fishing activities in particular with mobile bottom contacting gear in areas mapped as:
    - Hard bottoms (Natura 2000 habitat: 1170 Reef),
    - Sandbanks (Natura 2000 habitat 1110),
    - Maerl (OSPAR habitat),
    - Bubbling reefs (Natura 2000 habitat: 1180 Submarine structures made by leaking gases, Natura 2000 habitat: 1170 Reef),
    - Soft bottom with sea pens (OSPAR habitat: Sea pens and burrowing megafauna) and relevant HELCOM underwater biotopes
- The ecological role of large fish species connected to reefs in relation to the documented conservation status.
- Conservation status of birds feeding in the areas during autumn and winter and the interaction with fisheries
- Conservation status of harbour porpoise and the interaction with fisheries

## 5. Process

In Sweden, the County Administrative Boards are responsible for the management of the marine protected areas. To ensure adequate protection of conservation targets, the County Administrative Board of Halland has developed the management plans for the marine protected areas and the proposed fisheries measures are expected to contribute to improved conservation status for Natura 2000 habitas such as Reefs (1170), Sandbanks (1110) and Submarine structures made by leaking gases (bubbling reefs; 1180), as well as listed OSPAR habitats and HELCOM underwater habitats. The

same is expected for Natura 2000 species and OSPAR listed species like the harbour porpoise, the razorbill, the common guillemot and the black-legged kittiwake.

In 2009, Greenpeace placed stone blocks in Fladen and Lilla Middelgrund with the purpose of protecting the sea floor from trawling. In 2011, Greenpeace also registered a formal complaint to the EU Commission concerning insufficient fisheries conservation measures in Fladen and Lilla Middelgrund.

In 2013, the Swedish Agency for Marine and Water Management (SwAM) received a government assignment to investigate the need for fisheries conservation measures in order to reach the conservation objectives in Swedish marine protected areas. In the report following the assignment SwAM concluded that fisheries conservation measures was prioritized for 30 of a total of more than 300 marine protected areas. In the report Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank were identified as areas in need of fisheries conservation measures in order to reach the conservation objectives.

The proposal for fisheries measures was developed by the County Administrative Board of Halland. In parallel with this local process, the national dialogue forum with representatives from the fisheries sector, conservation NGOs and scientists were informed and invited to discuss the proposal.

In the process of developing the proposal, the County Administrative Board of Halland held separate meetings with local fishermen, conservation NGOs, the Anglers association.

In April 2017, a formal request for establishing fisheries conservation measures was sent from the County Andministrative Board of Halland to the SwAM.

In May 2017, SwAM sent a formal referral on the proposal.

On the 13 December 2017, an invitation to a pre-consultation meeting in Göteborg on 19 January 2018 was sent out broadly (for example Nature and Fisheries Directors and the European Commission).

The draft proposal was sent out on the 4 January 2018.

*Description of upcoming dialogue.*

# 6. The Marine Protected Areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank

## 6.1 Description

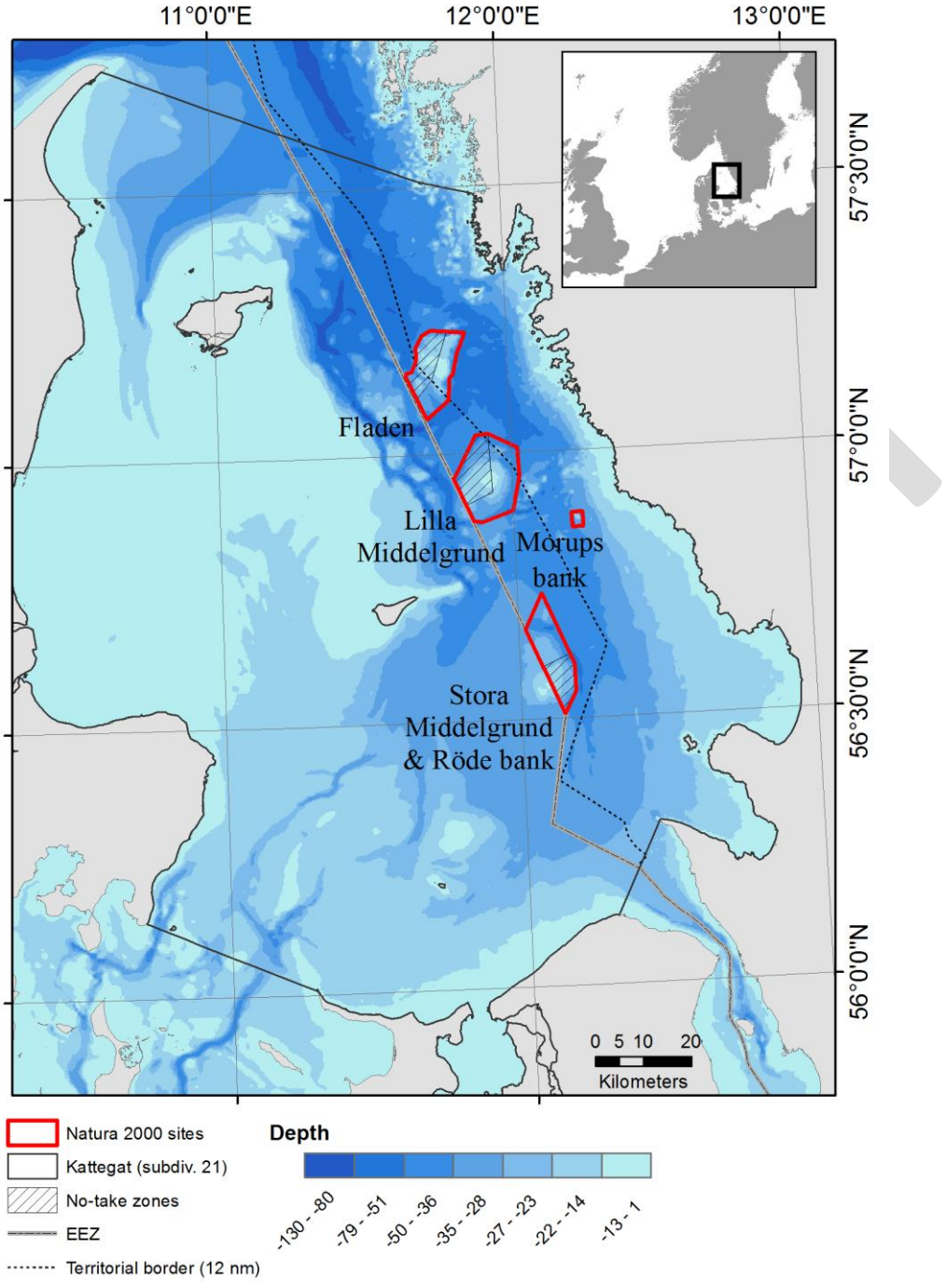
The marine protected areas in this proposal are located in the Swedish EEZ as well as in Swedish territorial waters (12 nm) in the Kattegat (Figure 2). Fladen and Lilla Middelgrund were designated as Natura 2000-sites in 2003. Stora Middelgrund and Röde Bank, and Morups bank were designated as Natura 2000-sites in 2008. The areas are also part of OSPAR's and HELCOM´s network of marine protected areas (Table 1). Minor parts of the marine protected areas are covered by areas of national interest for Swedish commercial fisheries according to the Swedish Environmental Code (3 Ch. 5 §).

The Kattegat is a marine area between the west coast of Sweden and east coast of Denmark that is dominated by soft seafloor. The marine protected areas in this proposal are all offshore banks emerging from the deeper seafloor areas of the Kattegat, and the shallower parts of the banks are mainly comprised of rocks, boulders and coarse sediments. Hydrographic conditions over the offshore banks influence the large-scale circulation in the Kattegat. The large-scale flows of low saline water of Baltic origin are diverted through the deeper channels between banks and mixing is enhanced immediately above and over the sides of the banks. This, coupled with the effect of waves lead to the frequent resuspension of fine material, including organic detritus and the shallower areas are more or less free from fine sediments (Naturvårdsverket, 2006).

**Table 1.** Designation of the marine protected areas Fladen, Lilla Middelgrund, Stora Middelgrund & Röde bank and Morups bank as Natura 2000-sites, OSPAR MPA and/or HELCOM MPA.

| | **Natura 2000 (pSCI)** | **Natura 2000 (SCI)** | **Natura 2000 (SAC)** | **Natura 2000 (SPA)** | **OSPAR MPA** | **HELCOM MPA** |
|---|---|---|---|---|---|---|
| **Fladen** | 2003 | 2004 | 2011 | - | 2006 | 2008 |
| **Lilla Middelgrund** | 2003 | 2004 | 2011 | 2003 | 2006 | 2008 |
| **Stora Middelgrund och Röde bank** | 2008 | 2009 | 2017 | - | 2008 | 2009 |
| **Morups bank** | 2008 | 2009 | 2017 | - | 2010 | 2009 |

**Figure 2.** *The location of the marine protected areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank in the Kattegat. The marine protected areas have restrictive fishing zones and some of the areas include no take zones.*




## 6.2 Fladen

### 6.2.1 Conservation targets - Fladen

The marine protected area Fladen is 13 446 hectares with depths ranging from 5 to 65 meters. The seafloor consist of blocks, stones, gravel, sand and gravel with shell down to about 30 m depth where muddy bottoms prevail. The area has a diverse macro-algal flora including several rare species

(Pedersén & Snoeijs 2001). One of Fladen´s most important habitats are well-developed kelp forests which form a three-dimensional structure, creating favourable conditions for a high species diversity. The presence of maerl beds (loose calcium calcerous encrusted red algae, *Phymatolithon calcaraeum*) in the north part of Fladen, together with the occurrence of maerl in Lilla Middelgrund, is unique in Sweden (Naturvårdsverket 2012; Appendix 1). Carbonate structures forming bubbling reefs (1180 Submarine structures made by leaking gases) have been found in the western parts of Fladen (Naturvårdsverket, 2006).

The invertebrate fauna is diverse (439 species) and according to the management plan and information from surveys from Fladen, 28 red listed species of invertebrates have been found in the area. These results indicate the importance of the area as a refug for rare and sensitive species that are less common in coastal shallow habitats in the Kattegat (Naturvårdsverket, 2010).

Fladen is an important area for fish diversity. 55 species have been documented and 11 of these are redlisted (Naturvårdsverket 2010a; Artdatabanken 2015). Furthermore, at Fladen the fish species leopard spotted-goby has been documented (Naturvårdsverket 2006). In Sweden the leopard spotted-goby is a rare species and has only been documented in a few places in the Skagerrak. The area is also important for large numbers of guillemots and razorbills as a feeding area during autumn and winter (Skov et al. 1995; Naturvårdsverket, 2010b).

Harbour porpoises are observed in the area and the concentration of porpoises is especially high during the period March – May (Sveegaard et al, 2011).

**Table 2**. The table presents the conservation targets, Natura 2000-habitats and the species and habitats on the OSPAR list of threatened and/or endangered species that the area was designated for, in order to contribute to an ecologically representative network of MPAs (MSFD).

| **Target** | **Natura 2000** | **MSFD (OSPAR and HELCOM)** |
|---|---|---|
| Hard bottoms | 1170 Reefs | OSPAR:<br>Modiolus modiolus beds<br>HELCOM:<br>Baltic photic rock and boulders dominated by perennial foliose red algae<br>Baltic photic rock and boulders characterized by perennial algae<br>Baltic photic rock and boulders characterized by mixed epibenthic macrocommunity<br>Baltic aphotic rock and boulders characterized by epibenthic cnidarians<br>Baltic aphotic rock and boulders dominated by soft corals (Alcyonacea)<br>Baltic aphotic rock and boulder characterized by mixed epibenthic macrocommunity |
| Sandbanks<br>Maerl | 1110 Sandbanks which are slightly covered by sea water all the time | OSPAR:<br>Maerl beds<br>HELCOM:<br>Baltic photic maërl beds |

| | | |
|---|---|---|
| | | Baltic photic shell gravel characterized by mixed epibenthic macrocommunity<br>Baltic photic shell gravel characterized by mixed infaunal macrocommunity in fine sand-like shell fragments<br>Baltic photic coarse sediment characterized by perennial algae<br>Baltic photic coarse sediment characterized by mixed epibenthic macrocommunity<br>Baltic photic coarse sediment characterized by infaunal polychaetes<br>Baltic photic sand characterized by infaunal bivalves<br>Baltic photic sand dominated by ocean quahog (Arctica islandica)<br>Baltic photic mixed substrate characterized by perennial algae<br>Baltic photic mixed substrate dominated by foliose red algae<br>Baltic aphotic sand characterized by infaunal bivalves<br>Baltic aphotic mixed substrate characterized by epibenthic bivalves |
| Bubbling reefs | 1180 Submarine structures made by leaking gases, 1170 Reefs | |
| Soft bottom | | OSPAR:<br>Sea-pen and burrowing megafauna communities<br>HELCOM:<br>Baltic photic mixed substrate characterized by mixed epibenthic macrocommunity<br>Baltic aphotic muddy sediment characterized by mixed epibenthic macrocommunity<br>Baltic aphotic muddy sediment characterized by infaunal echinoderms<br>Baltic aphotic muddy sediment dominated by Amphiura filiformis<br>Baltic aphotic muddy sediment dominated by Brissopsis lyrifera and Amphiura chiajei |

| | | |
|---|---|---|
| | | Baltic aphotic mixed substrate characterized by epibenthic cnidarians<br>Baltic aphotic mixed substrate characterized by mixed epibenthic macrocommunity |
| Kelp forests | 1170 Reefs | HELCOM:<br>Baltic photic rock and boulders dominated by kelp<br>Baltic photic mixed substrate dominated by kelp |
| Marine mammals | 1351 Harbour porpoise | OSPAR:<br>Harbour porpoise |
| Cartilaginous fish such as sharks and rays | | OSPAR:<br>Spurdog *Squalus acanthias* |
| Large predatory fish | | OSPAR:<br>Cod *Gadus morhua* |
| Sea birds | A199 Guillemot *Uria aalge*<br>A200 Razorbill *Alca torda* | |

Findings of specific conservation targets are presented in Appendix 1.

### 6.2.2 Ecological recovery - Fladen

By introducing the no-take zones with a total area of 6297 hectares, parts of Fladen (47%) will be protected from any direct physical impact and all fishing activities. The ecosystem function in the area is anticipated to increase as large predatory fish will be protected from fishing mortality in these areas. The rest of the marine protected area will be open to fisheries with handheld gears like rod and line, fishing for crustaceans with pots and pelagic fishery with floating trawls. This will allow for protection and recovery of conservation targets like maerl and sea pen and burrowing megafauna while allowing for a continuation of fisheries not using mobile bottom contacting gears.

## 6.3 Lilla Middelgrund

### 6.3.1 Conservation targets – Lilla Middelgrund

Lilla Middelgrund with a total area of 17840 hectares, is a large shallow offshore bank with coarse sand, shell gravel and stones. Biodiversity, of flora and fauna is high, and the sea floor in many areas is covered by maerlbeds giving the sea floor a three-dimensional structure with high diversity and some associated species being rarely found elsewhere. The rich presence of maerl on Lilla Middelgrund and on Fladen is unique for Sweden. The area contains well-developed kelp forests, algal communities and 134 species of macro algae was found here (Pedersen and Snoejis 2001).

The fauna of the seabed is diverse and 374 species of invertebrates have been observed of which 20 are on the redlist. These results indicate the importance of the area as a refug for rare and sensitive species that are less common in coastal shallow habitats in the Kattegat.
In the area, great scallops (Pecten maximus) have been found in large numbers, both adult and younger individuals. Also, horse mussels (Modiolus modiolus) are present in large numbers, sometimes forming biogenic reefs.
Lilla Middelgrund is an important area for fish diversity. 41 species have been documented and 6 of these are redlisted (Naturvårdsverket 2010).

The central Kattegat with the offshore banks and in particular Lilla Middelgrund is during autumn- and winter time important feeding areas for seabirds in particular guillemots, razorbills and black-legged kittiwakes (Skov et al 1995; Skov et al. 2000; Naturvårdsverket 2010) and the marine protected area has also the status as an SPA area.

**Table 3.** The table presents the conservation targets, Natura 2000-habitats and the species and habitats on the OSPAR list of threatened and/or endangered species that the area was designated for, in order to contribute to an ecologically representative network of MPAs (MSFD).

| **Target** | **Natura 2000** | **MSFD (OSPAR and HELCOM)** |
|---|---|---|
| Hard bottoms | 1170 Reefs<br>1171 Biogenic reefs | OSPAR:<br>Modiolus modiolus beds<br>HELCOM:<br>Baltic photic rock and boulders characterized by perennial algae<br>Baltic photic rock and boulders dominated by perennial foliose red algae<br>Baltic photic rock and boulders characterized by mixed epibenthic macrocommunity<br>Baltic aphotic rock and boulders characterized by epibenthic cnidarians<br>Baltic aphotic rock and boulders dominated by soft corals (Alcyonacea)<br>Baltic aphotic rock and boulder characterized by mixed epibenthic macrocommunity |
| Sandbanks<br>-Maerl | 1110 Sandbanks which are slightly covered by sea water all the time | OSPAR:<br>Maerl beds<br>HELCOM:<br>Baltic photic maërl beds<br>Baltic photic shell gravel characterized by mixed epibenthic macrocommunity<br>Baltic photic shell gravel characterized by mixed infaunal macrocommunity in fine sand-like shell fragments<br>Baltic photic coarse sediment characterized by perennial algae<br>Baltic photic coarse sediment characterized by mixed epibenthic macrocommunity<br>Baltic photic sand characterized by infaunal bivalves<br>Baltic photic sand dominated by ocean quahog (Arctica islandica) |

| | | |
|---|---|---|
| | | Baltic photic mixed substrate characterized by perennial algae<br>Baltic photic mixed substrate dominated by foliose red algae |
| Soft bottoms | | OSPAR:<br>Sea-pen and burrowing megafaunacommunities<br>HELCOM:<br>Baltic photic coarse sediment characterized by infaunal polychaetes<br>Baltic photic mixed substrate characterized by mixed epibenthic macrocommunity<br>Baltic aphotic muddy sediment characterized by mixed epibenthic macrocommunity<br>Baltic aphotic muddy sediment characterized by infaunal crustaceans<br>Baltic aphotic muddy sediment characterized by infaunal echinoderms<br>Baltic aphotic muddy sediment dominated by Amphiura filiformis<br>Baltic aphotic muddy sediment dominated by Brissopsis lyrifera and Amphiura chiajei<br>Baltic aphotic mixed substrate characterized by epibenthic bivalves<br>Baltic aphotic mixed substrate characterized by epibenthic cnidarians<br>Baltic aphotic mixed substrate characterized by mixed epibenthic macrocommunity |
| Kelp forests | 1170 Reefs | HELCOM:<br>Baltic photic rock and boulders dominated by kelp<br>Baltic photic mixed substrate dominated by kelp |
| Marine mammals | 1351 Harbour porpoise | OSPAR:<br>Harbour porpoise |
| Cartilaginous fish such as sharks and rays | | OSPAR:<br>Spurdog *Squalus acanthias* |
| Large predatory fish | | OSPAR:<br>Cod *Gadus morhua* |
| Sea birds | A199 Guillemot *Uria aalge,*<br>A200 Razorbill *Alca torda* | OSPAR:<br>Black-legged kittiwake *Rissa tridactyla* |

Findings of specific conservation targets are presented in Appendix 1.

### 6.3.2 Ecological recovery - Lilla Middelgrund

By introducing the no-take zones of a total area of 7954 hectares, parts of Lilla Middelgrund will be protected from any direct physical impact and all fishing activities. The ecosystem function in the area is anticipated to increase as large predatory fish will be protected from fishing mortality in these areas. The rest of the marine protected area will be open to fisheries with handheld gears like rod and line, fishing for crustaceans with pots and pelagic fishery with floating trawls. These regulations will allow for protection and recovery of conservation targets like horse mussel beds, maerl and sea pen and burrowing megafauna. The risk of by-catch of birds will be greatly reduced, and the ecological function as feeding area in autumn and winter will be ensured as shallower parts of the area (the no-take zone) will be completely protected from fisheries.

## 6.4 Stora Middelgrund och Röde bank

### 6.4.1 Conservation targets – Stora Middelgrund och Röde bank

The marine protected area Stora Middelgrund och Röde bank consists of two offshore banks bordering to the Danish marine protected area Store Middelgrund. Röde bank is a comparatively deep offshore bank with the most shallow areas at a depth of 22 meters. Stora Middelgrund is a larger bank with the most shallow areas at a depth of 9 meters. The banks are mostly covered by the habitat type sandbanks (1110) and consist mainly of silt, sand and gravel but also with shell, stone and boulders. Areas dominated by boulders and stone are defined as reef habitats (1170). The area separating the two banks is mostly covered by soft mud down to around 50 meters depth (Appendix 1: fig 1c).

Other than the Natura 2000 habitats, sandbanks (1110) and reefs (1170) there is also a possibility that bubbling reefs (1180) exist in the area since bubbling reefs have been found on the Danish side of Stora Middelgrund.

Macroalgae communities are diverse and primarily cover the more shallow reef areas where they are dominated either by kelp forests or red algal communities. In the deep reefs, macroalgae are less common but occur down to 27 m depth as a result of the clear water. At Stora Middelgrund, 36 species of macroalgae have been observed, and at Röde bank 14 species. However, the kelp forests are not as developed as expected, which might be due to grazing by sea urchins (*Strongylocentrotus droebachiensis*) that are numerous on Stora Middelgrund.

The fauna of the seabed is diverse and 323 species of invertebrates have been observed of which 15 are redlisted (Artdatabanken 2015). These results indicate the importance of the area as a refug for rare and sensitive species that are less common in coastal shallow habitats in the Kattegat.

Stora Middelgrund has a rich community of horse mussels (*Modiolus modiolus)* that are found from 13 meters down to at least 30 meters. In shallow sand and gravel substrate the mussels are often buried halfway in the sediment but in deeper areas with finer substrate they are also found on the seafloor in clusters forming biogenic reefs (1171). Noteably, the pea crab (*Pinnotheres pisum)* has been found in several horse mussels on Stora Middelgrund. The pea crab, like its host, the horse mussel, are showing decreasing trends in Swedish coastal areas.

Stora Middelgrund is an important area for fish diversity. 37 species have been documented and 7 of these are redlisted (Naturvårdsverket 2010).

The area is also important for large numbers of guillemots and razorbills as a feeding area during autumn and winter (Skov et al. 1995; Naturvårdsverket 2010).

Stora Middelgrund is one of the most important areas for harbour porpoise in the Kattegat. Stora Middelgrund is used as a feeding area for breeding females as well as a migrational route. Offshore banks are productive areas and this together with the shallow depth could contribute to the function of the area as a feeding ground for females with calves (Carlström & Carlén 2016).

In some of the more shallow parts of Stora Middelgrund, historic artefacts from older stone age (9000 BP) have been found. The area has been above shoreline during and after the last ice age and it is possible that other relics could be found, e.g. remnants of ancient settlements.

**Table 4.** The table presents the conservation targets, Natura 2000-habitats and the species and habitats on the OSPAR list of threatened and/or endangered species that the area was designated for, in order to contribute to an ecologically representative network of MPAs (MSFD).

| **Target** | **Natura 2000** | **MSFD (OSPAR and HELCOM)** |
|---|---|---|
| Hard bottoms | 1170 Reefs<br>1171 Biogenic reefs | OSPAR:<br>*Modiolus modiolus* beds<br>HELCOM:<br>Baltic photic rock and boulders characterized by mixed epibenthic macrocommunity |
| Sandbanks | 1110 Sandbanks which are slightly covered by sea water all the time | HELCOM:<br>Baltic photic sand characterized by mixed epibenthic macrocommunity<br>Baltic aphotic sand characterized by mixed epibenthic macroscopic community |
| Soft bottom | | OSPAR:<br>Sea pen and burrowing megafauna communities<br>HELCOM:<br>Baltic photic mixed substrate characterized by mixed epibenthic macrocommunity<br>Baltic aphotic muddy sediment characterized by mixed epibenthic macrocommunity<br>Baltic aphotic muddy sediment characterized by infaunal crustaceans<br>Baltic aphotic muddy sediment characterized by infaunal echinoderms<br>Baltic aphotic muddy sediment dominated by *Amphiura filiformis* |

| | | |
|---|---|---|
| | | Baltic aphotic muddy sediment dominated by *Brissopsis lyrifera* and *Amphiura chiajei*<br>Baltic aphotic coarse sediment characterized by mixed epibenthic macrocommunity<br>Baltic aphotic mixed substrate characterized by mixed epibenthic macrocommunity |
| Kelp forests | 1170 Reefs | HELCOM: Baltic photic rock and boulders characterized by perennial algae |
| Large predatory fish | | OSPAR: Cod *Gadus morhua* |
| Sea birds | A199 Common Guillemot *Uria aalge*<br>A200 Razorbill *Alca torda* | |
| Marine mammals | 1351 Harbour porpoise *Phocoena phocoena* | |

Findings of specific conservation targets are presented in Appendix 1.

### 6.4.2 Ecological recovery – Stora Middelgrund och Röde bank

By introducing the no-take zone of a total area of 4787 hectares, parts of Stora Middelgrund and Röde bank will be protected from any direct physical impact and all fishing activities. The ecosystem function in the area is anticipated to increase as large predatory fish will be protected from fishing mortality in these areas e.g. increased cover of kelp forests through increased predation by cod on the grazing sea urchin *S. droebachiensis*. The rest of the marine protected area will be open to fisheries with handheld gears like rod and line, fishing for crustaceans with pots and pelagic floating trawls. These regulations will allow for protection and recovery of conservation targets like horse mussel beds and sea pen and burrowing megafauna. The risk of by-catch of birds will be greatly reduced, and the ecological function as a feeding area in the autumn and winter will be ensured as more shallow parts of the area (the no-take zone) will be completely protected from fisheries.

## 6.5 Morups bank

### 6.5.1 Conservation targets – Morups bank

The marine protected area is an offshore bank with a minimum depth of about 11 meters. The shallow parts, from 11 meters down to about 20 meters depth consists of reef habitats (1170) with blocks and stone as the dominant substrate and elements of gravel, shell and sand. Sublittoral sandbanks (1110) dominate between about 20 to 30 meters depth and the substrate consists of sand, gravel, shell gravel, silt and stone with elements of blocks. At 30 to 50 meters depth the seafloor is instead dominated by soft bottoms. Macroalgae dominate the reefs with kelp forests and diverse red algal communities. The algal commmunties are more sparse on the deeper sand habitats but extend down to around 26 meters depth. So far, 236 species of invertebrates have been found in the area, of which 9 are redlisted (Artdatabanken, 2015).
Morups bank is an important area for fish. In total, 44 different species of fish have been documented and 6 of these are redlisted (Naturvårdsverket 2010).

**Table 5.** The table presents the conservation targets, Natura 2000-habitats and the species and habitats on the OSPAR list of threatened and/or endangered species that the area was designated for, in order to contribute to an ecologically representative network of MPAs (MSFD).

| **Target** | **Natura 2000** | **MSFD (OSPAR and HELCOM)** |
|---|---|---|
| Hard bottoms | 1170 Reefs | OSPAR:<br>Modiolus modiolus beds<br>HELCOM:<br>Baltic photic rock and boulders characterized by perennial algae<br>Baltic photic rock and boulders dominated by perennial foliose red algae<br>Baltic photic rock and boulders characterized by mixed epibenthic macrocommunity |
| Sandbanks | 1110 Sandbanks which are slightly covered by sea water all the time | HELCOM:<br>Baltic photic coarse sediment characterized by mixed epibenthic macrocommunity<br>Baltic photic sand characterized by infaunal bivalves<br>Baltic photic sand dominated by ocean quahog (Arctica islandica)<br>Baltic photic mixed substrate characterized by mixed epibenthic macrocommunity |
| Soft bottoms | | OSPAR:<br>Sea pen and burrowing megafauna communities<br>HELCOM:<br>Baltic aphotic muddy sediment characterized by infaunal echinoderms<br>Baltic aphotic muddy sediment dominated by Amphiura filiformis<br>Baltic aphotic muddy sediment dominated by Brissopsis lyrifera and Amphiura chiajei<br>Baltic aphotic coarse sediment characterized by mixed epibenthic macrocommunity<br>Baltic aphotic mixed substrate characterized by epibenthic cnidarians<br>Baltic aphotic mixed substrate dominated by soft corals (Alcyonacea)<br>Baltic aphotic mixed substrate characterized by mixed epibenthic macrocommunity |
| Kelp forests | 1170 Reefs | HELCOM: |

| | | |
|---|---|---|
| | | Baltic photic rock and boulders dominated by kelp |
| Large predatory fish | | OSPAR:<br>Cod *Gadus morhua* |

### 6.5.2 Ecological recovery – Morups bank

By introducing the new regulations at Morups bank´s MPA the offshore bank will gain an enhanced protection from direct physical impact and fishing activities. The regulations will contribute to a diminishing sedimentation arising from bottom trawling and the ecosystem function in the area is anticipated to increase as large predatory fish will be protected to a greater extent, compared to the regulations before, from fishing mortality in this area. The regulations will allow for protection and recovery of conservation targets like sea pen and burrowing megafauna.

## 7. Fisheries

### 7.1 Fleet activity and annual landings 2013-2016 (Tables 6-8 and Appendix 3)

On the more shallow parts of the marine protected areas covered by reefs and sandbanks, net and line fisheries catch atlantic mackerel (*Scomber scombrus*), greater weever (*Trachinus draco*) and a mixture of flatfish and crustaceans. Few of the vessels in the fleets using nets, traps and lines are equipped with VMS and only the Swedish fishery indicate gear set positions in the logbooks. The analysis of the spatial distribution of these fisheries is thus uncertain. However, the dominating part (97 – 100 %) of the Swedish net and line efforts in the Kattegat are, according to the logbooks, deployed outside the marine protected areas, indicating limited importance of these areas for these fisheries considering the Kattegat as a whole. Greater weever is also caught in a targeted bottom trawl fishery at Lilla Middelgrund and Stora Middelgrund in shallow sand areas; some years in quanties amounting up to 250 tonnes i.e. 20 - 30 % of the total landings of the Swedish and Danish fisheries for this species. Since the fisheries with bottom trawl will be prohibited in the marine protected areas, the effort for greater weever is thus expected to increase in other shallow sandy areas in the Kattegat.
Pelagic trawling also occurs in the marine protected areas and according to the fishermen, the trawls are deployed safely in deeper areas, usually outside the banks and are then manoeuvred to target schools at the flanks of the banks but not shallower than 18 meters to avoid risking that the gear interacts with the seafloor. The target species are herring and sprat and landings originating from the Natura 2000 sites vary from 0 - 18 % of the total landings in the Kattegat in the Swedish fishery. The Danish pelagic trawl fishery is of less importance in the Natura 2000 sites (0 - 2 %).
The fishery with purse seining targeting sprat and herring varies considerably between years but in 2016, 38 % of the landings originated from Fladen. This gear will be prohibited in the marine protected areas and the effort with purse seining is thus expected to increase in other parts of the Kattegat. No Danish vessel use purse seining in the Kattegat.
In the deeper areas surrounding the banks within the marine protected areas and the area between Stora Middelgrund and Röde Bank, soft mud - sandy mud are dominant substrates. These border areas are fishing grounds for bottom trawlers, targeting demersal fish and Norway lobster. Trawl hauls in this fishery are generally long (3-6 hours) and the importance of the part of the effort deployed within the marine protected areas for this fishery is minor (< 3 %), in relation to the efforts in the Kattegat. However, according to the fishermen, certain important trawl hauls may be interrupted and thereby shortened due to a closure for this fishery in these areas. This applies in particular to the Swedish and Danish fishery in and around Lilla Middelgrund, and to the Danish fishery at Stora Middelgrund.

**Table 6.** Yearly Swedish landings (in total weight) relative to the proposed fisheries conservation measures in the marine protected areas between 2013 until 2016. (Values shown as 0.00% might include values <0.005%). Cells marked with **bold** values represent area-gear combinations affected by the proposal. Restricted fishing zone = RFZ; No-take zone = NTZ.

| Gear group | Year | *Fladen RFZ* | *Fladen NTZ* | *Lilla Middelgrund RFZ* | *Lilla Middelgrund NTZ* | *Morups bank* | *Stora Middelgrund & Röde bank RFZ* | *Stora Middelgrund & Röde bank NTZ* | *Kattegat outside MPA proposed measures* | *Total weight (kg)* |
|---|---|---|---|---|---|---|---|---|---|---|
| **Bottom trawls** | *2013* | **0.04%** | **0.00%** | **11.66%** | **8.70%** | **0.29%** | **0.38%** | **0.08%** | 78.8% | 1 288 318 |
| | *2014* | **0.01%** | **0.00%** | **8.26%** | **0.38%** | **0.21%** | **1.10%** | **0.00%** | 90.0% | 1 357 038 |
| | *2015* | **0.12%** | **0.05%** | **1.28%** | **2.49%** | **0.08%** | **0.28%** | **0.01%** | 95.8% | 526 579 |
| | *2016* | **0.06%** | **0.02%** | **0.62%** | **1.05%** | **0.92%** | **0.67%** | **0.00%** | 96.8% | 733 792 |
| **Nets** | *2013* | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.64%** | 99.4% | 164 302 |
| | *2014* | **0.00%** | **0.00%** | **0.05%** | **0.06%** | **0.00%** | **0.00%** | **0.60%** | 99.3% | 198 273 |
| | *2015* | **0.10%** | **0.00%** | **0.21%** | **0.00%** | **0.00%** | **0.00%** | **0.10%** | 99.6% | 174 371 |
| | *2016* | **0.00%** | **0.00%** | **0.00%** | **0.08%** | **0.00%** | **0.00%** | **0.00%** | 99.9% | 97 019 |
| **Purse seine** | *2013* | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | 100.0% | 592 000 |
| | *2014* | **4.32%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | 95.7% | 880 000 |
| | *2015* | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | 100.0% | 761 002 |
| | *2016* | **0.00%** | **37.62%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | 62.4% | 1 327 227 |
| **Lines** | *2013* | 0.00% | **0.00%** | 0.00% | **0.00%** | 0.00% | 0.00% | **0.00%** | 100.0% | 14 679 |
| | *2014* | 1.41% | **0.00%** | 0.00% | **0.00%** | 0.00% | 0.00% | **0.00%** | 98.6% | 27 329 |
| | *2015* | 0.79% | **0.00%** | 0.00% | **0.00%** | 0.00% | 1.43% | **0.00%** | 97.8% | 36 808 |
| | *2016* | 0.00% | **0.00%** | 0.00% | **1.54%** | 0.00% | 0.25% | **0.00%** | 98.2% | 59 296 |
| **Pelagic trawls** | *2013* | 0.00% | **0.00%** | 17.63% | **0.00%** | 0.00% | 0.00% | **0.00%** | 82.4% | 2 353 500 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *2014* | 3.05% | **0.00%** | 0.00% | **1.36%** | 0.00% | 0.00% | **0.00%** | 95.6% | 3 113 449 |
| | *2015* | 2.29% | **0.00%** | 0.00% | **0.00%** | 0.00% | 0.00% | **0.00%** | 97.7% | 3 376 091 |
| | *2016* | 1.40% | **0.00%** | 0.00% | **0.00%** | 0.00% | 0.00% | **0.00%** | 98.6% | 5 215 397 |
| **Traps** | *2013* | 0.00% | **1.98%** | 0.00% | **0.00%** | 0.00% | 0.00% | **0.06%** | 98.0% | 127 296 |
| | *2014* | 0.00% | **2.83%** | 0.04% | **0.00%** | 0.00% | 0.00% | **0.05%** | 97.1% | 114 426 |
| | *2015* | 0.00% | **1.89%** | 0.14% | **0.00%** | 0.00% | 0.00% | **0.02%** | 97.9% | 131 638 |
| | *2016* | 0.00% | **0.00%** | 0.28% | **0.00%** | 0.00% | 0.00% | **0.00%** | 99.7% | 117 716 |

**Table 7.** Yearly Swedish landings (in Euro) relative to the proposed fisheries conservation measures in the marine protected areas between 2013 until 2016. (Values shown as 0.00% might include values <0.005%). Cells marked with **bold** values represent area-gear combinations affected by the proposal. Restricted fishing zone = RFZ; No-take zone = NTZ.

| Gear group | Year | *Fladen RFZ* | *Fladen NTZ* | *Lilla Middelgrund RFZ* | *Lilla Middelgrund NTZ* | *Morups bank* | *Stora Middelgrund & Röde bank RFZ* | *Stora Middelgrund & Röde bank NTZ* | *Kattegat outside MPA proposed measures* | *Total Value (Euro)* |
|---|---|---|---|---|---|---|---|---|---|---|
| **Bottom trawls** | *2013* | **0.03%** | **0.00%** | **1.56%** | **3.16%** | **0.69%** | **0.30%** | **0.08%** | 94.2% | 4 814 430 |
| | *2014* | **0.01%** | **0.00%** | **1.61%** | **0.72%** | **0.89%** | **0.18%** | **0.00%** | 96.7% | 5 769 005 |
| | *2015* | **0.15%** | **0.04%** | **1.26%** | **1.80%** | **0.10%** | **0.14%** | **0.00%** | 96.7% | 4 487 763 |
| | *2016* | **0.07%** | **0.02%** | **0.71%** | **1.09%** | **1.08%** | **0.30%** | **0.00%** | 96.7% | 5 895 036 |
| **Nets** | *2013* | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.64%** | 99.4% | 832 384 |
| | *2014* | **0.00%** | **0.00%** | **0.11%** | **0.03%** | **0.00%** | **0.00%** | **0.50%** | 99.4% | 678 582 |
| | *2015* | **0.02%** | **0.00%** | **0.30%** | **0.00%** | **0.00%** | **0.00%** | **0.21%** | 99.5% | 392 969 |
| | *2016* | **0.00%** | **0.00%** | **0.00%** | **0.06%** | **0.00%** | **0.00%** | **0.00%** | 99.9% | 335 352 |
| **Purse seine** | *2013* | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | 100.0% | 313 327 |
| | *2014* | **4.31%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | 95.7% | 386 961 |
| | *2015* | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | 100.0% | 311 605 |
| | *2016* | **0.00%** | **41.95%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | 58.1% | 766 034 |
| **Lines** | *2013* | 0.00% | **0.00%** | 0.00% | **0.00%** | 0.00% | 0.00% | **0.00%** | 100.0% | 44 971 |
| | *2014* | 1.36% | **0.00%** | 0.00% | **0.00%** | 0.00% | 0.00% | **0.00%** | 98.6% | 69 173 |
| | *2015* | 0.59% | **0.00%** | 0.00% | **0.00%** | 0.00% | 1.26% | **0.00%** | 98.1% | 91 369 |
| | *2016* | 0.00% | **0.00%** | 0.00% | **2.75%** | 0.00% | 0.28% | **0.00%** | 97.0% | 179 927 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pelagic trawls** | *2013* | 0.00% | **0.00%** | 15.69% | **0.00%** | 0.00% | 0.00% | **0.00%** | 84.3% | 909 231 |
| | *2014* | 3.51% | **0.00%** | 0.00% | **3.91%** | 0.00% | 0.00% | **0.00%** | 92.6% | 1 037 476 |
| | *2015* | 3.52% | **0.00%** | 0.00% | **0.00%** | 0.00% | 0.00% | **0.00%** | 96.5% | 995 346 |
| | *2016* | 1.58% | **0.00%** | 0.00% | **0.00%** | 0.00% | 0.00% | **0.00%** | 98.4% | 2 491 653 |
| **Traps** | *2013* | 0.00% | **5.85%** | 0.00% | **0.00%** | 0.00% | 0.00% | **0.41%** | 93.7% | 582 931 |
| | *2014* | 0.00% | **3.80%** | 0.01% | **0.00%** | 0.00% | 0.00% | **0.19%** | 96.0% | 1 222 119 |
| | *2015* | 0.00% | **4.90%** | 0.07% | **0.00%** | 0.00% | 0.00% | **0.13%** | 94.9% | 754 535 |
| | *2016* | 0.00% | **0.00%** | 0.13% | **0.00%** | 0.00% | 0.00% | **0.00%** | 99.9% | 946 357 |

**Table 8.** Yearly Danish landings (in total weight) relative to the proposed fisheries conservation measures in the marine protected areas between 2013 until 2016. (Values shown as 0.00% might include values <0.005%). Cells marked with **bold** values represent area-gear combinations affected by the proposal. Noticeable, no Danish fisheries are reported from Morups bank marine protected area, therefore, the area has been excluded from the table. Restricted fishing zone = RFZ; No-take zone = NTZ.

| Gear group | Year | *Fladen RFZ* | *Fladen NTZ* | *Lilla Middelgrund RFZ* | *Lilla Middelgrund NTZ* | *Morups bank* | *Stora Middelgrund och Röde bank RFZ* | *Kattegat outside MPA proposed measures* | Total weight (kg) |
|---|---|---|---|---|---|---|---|---|---|
| **Bottom trawls** | 2013 | **0.00%** | **0.00%** | **0.13%** | **0.22%** | **0.86%** | **0.17%** | 98.61% | 3 054 168 |
| | 2014 | **0.00%** | **0.00%** | **0.60%** | **0.02%** | **3.06%** | **0.07%** | 96.24% | 5 203 228 |
| | 2015 | **0.01%** | **0.00%** | **6.14%** | **0.09%** | **0.80%** | **0.13%** | 92.83% | 4 010 745 |
| | 2016 | **0.00%** | **0.00%** | **2.28%** | **0.08%** | **1.34%** | **0.52%** | 95.78% | 4 637 423 |
| **Nets** | 2013 | **0.00%** | **0.00%** | **8.07%** | **30.70%** | **1.12%** | **0.83%** | 59.28% | 10 193 |
| | 2014 | **0.00%** | **0.00%** | **0.16%** | **29.08%** | **0.00%** | **1.13%** | 69.64% | 7 363 |
| | 2015 | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | 100.00% | 6 914 |
| | 2016 | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.81%** | 99.19% | 23 126 |
| **Pelagic trawls** | 2013 | 0.00% | **0.00%** | 0.00% | **0.00%** | 0.00% | **0.00%** | 100.00% | 4 027 444 |
| | 2014 | 0.16% | **0.00%** | 0.00% | **0.00%** | 0.03% | **0.01%** | 99.81% | 10 057 163 |
| | 2015 | 0.00% | **0.00%** | 0.00% | **0.00%** | 0.00% | **0.00%** | 100.00% | 12 868 751 |
| | 2016 | 0.78% | **0.81%** | 0.00% | **0.00%** | 1.83% | **0.00%** | 96.58% | 6 331 019 |

**Table 9.** Yearly Danish landings (in Euro) relative to the proposed fisheries conservation measures in the marine protected areas between 2013 until 2016. (Values shown as 0.00% might include values <0.005%). Cells marked with **bold** values represent area-gear combinations affected by the proposal. Noticeable, no Danish fisheries are reported from Morups bank marine protected area, therefore, the area has been excluded from the table. Restricted fishing zone = RFZ; No-take zone = NTZ.

| Gear group | Year | *Fladen RFZ* | *Fladen NTZ* | *Lilla Middelgrund RFZ* | *Lilla Middelgrund NTZ* | *Morups bank* | *Stora Middelgrund och Röde bank RFZ* | *Kattegat outside MPA proposed measures* | Total value (EURO) |
|---|---|---|---|---|---|---|---|---|---|
| **Bottom trawls** | 2013 | **0.01%** | **0.00%** | **0.21%** | **0.39%** | **0.52%** | **0.22%** | 98.65% | 12 179 535 |
| | 2014 | **0.01%** | **0.01%** | **0.12%** | **0.06%** | **0.70%** | **0.08%** | 99.02% | 9 493 296 |
| | 2015 | **0.01%** | **0.01%** | **0.60%** | **0.23%** | **0.31%** | **0.11%** | 98.72% | 11 091 869 |
| | 2016 | **0.01%** | **0.00%** | **0.44%** | **0.18%** | **1.05%** | **0.15%** | 98.16% | 13 520 652 |
| **Nets** | 2013 | **0.00%** | **0.00%** | **11.19%** | **41.27%** | **0.53%** | **0.50%** | 46.51% | 52 806 |
| | 2014 | **0.00%** | **0.00%** | **0.08%** | **37.06%** | **0.00%** | **0.63%** | 62.24% | 32 904 |
| | 2015 | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | 100.00% | 23 785 |
| | 2016 | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **0.00%** | **1.69%** | 98.31% | 59 988 |
| **Pelagic trawls** | 2013 | 0.00% | **0.00%** | 0.00% | **0.00%** | 0.00% | **0.00%** | 100.00% | 1 345 795 |
| | 2014 | 0.25% | **0.00%** | 0.00% | **0.00%** | 0.04% | **0.02%** | 99.68% | 2 452 025 |
| | 2015 | 0.00% | **0.00%** | 0.00% | **0.00%** | 0.00% | **0.00%** | 100.00% | 3 227 235 |
| | 2016 | 1.33% | **1.30%** | 0.00% | **0.00%** | 3.06% | **0.00%** | 94.31% | 1 933 145 |

**Seasonal trends**

The conservation targets identified in need of protection in the area mainly consist of species with a sessile, adult stage that grow slowly and are long-lived, and consequently are most sensitive to the first physical impact of trawling. The exception is the seasonal importance for seabirds that utilize the offshore banks as feeding grounds during autumn and winter. However, seasonal trends in fishing effort are probably not relevant for the main conservation needs, and this analysis was therefore not conducted

# 8. Identified threats to habitats and species

## 8.1 Fisheries

### 8.1.1 Impacts on benthic organisms

The physical impact of fishing on the sea floor is dependent on gear type as well as the resilience of the habitat and species to disturbance. Gear types that mostly affect the sea floor are those that are mobile and in contact with the seabed, such as various demersal trawls (Eigaard et al. 2016). Sensitivity of benthic habitats tends to be lower in shallow, high energy areas with high levels of natural disturbance, than in deeper areas where physical disturbance by waves caused by wind driven energy, i.e. storms may not reach the seabed (van Denderen et al. 2015). Sensitivity of the fauna also differs between species depending on their biological traits and the mechanism of disturbance. Direct mortality of organisms and longer-term modification of habitats by mobile demersal fishing gear are most severe in vulnerable areas such as deep-water coral reefs and sponge communities where fragile species that build three-dimensional structures make up a significant component of the habitats (Fosså et al. 2002, Greathead et al. 2007). In these cases, the effect of the first impact is substantial (Cook et al. 2013).

Otter trawling is the most common mobile bottom contacting gear used in the Kattegat, and in general this gear removes 6 % of the biota and penetrates 2.4 cm down into the sediment (Hiddink et al. 2017). Other documented effects from demersal trawling in soft bottom habitats comprise of reduction of biomass and production (Queirós et al. 2006) and changes in species composition favouring abundance of mobile and scavenging species which may in turn affect ecosystem functioning (Tillin et al. 2006). Slow-growing, erect and fragile species in these habitats, such as sea pens (soft corals), are particularly sensitive to physical disturbance by demersal trawls (McConnaughey et al. 2000). Another effect from trawl interference in a longer time perspective is the risk of sediment homogenisation, which may negatively affect the re-colonisation of species (Handley et al. 2014).

In the Kattegat, shifts in soft seafloor macrofauna assemblage and a general decrease in number of species and indices of diversity at low to medium trawling intensities have been documented (Sköld et al. in press). Shifts in community composition of benthic fauna is, however, not only a consequence of the physical disturbance but also indirect effects linked to the food web (Collie et al. 2016). In the Kattegat, the dominant burrowing brittle stars species are resistant to bottom trawling and may even increase in response to trawling likely due to local reduction in predation by demersal fish and Norway lobster (Sköld et al. in press).

Although rock structures may provide some natural protection from trawling as fishermen claim to generally avoid these areas due to risks of gear entanglement, indications of trawling impacts on shallow reef areas are reported from the Stora Middelgrund (Dahl 2005).

### 8.1.2 Resuspension of sediment

Demersal trawling redistributes sediments and alters the morphology of the sea floor (Puig et al. 2012). Large amounts of sediment particles are resuspended into the water column when the gear is in contact with the seabed (Martin et al. 2014). The finer sediment particles that are typical of muddy seafloor sink very slowly (several days) and may be transported over long distances by prevailing currents (Bradshaw et al. 2012; Linders et al. 2017). Resupension of sediments by bottom trawling has been estimated on a large scale in the Kattegat which indicated that below the halocline the recurrence of wave induced resuspension is shortened by 75 – 90 % due to demersal bottom trawling (Floderus and Pihl 1990).

Effects on physiological, behavioural and ecological impacts from suspended sediment depend on levels of particles suspended and variation in sensitivity between organisms. Effects documented are for example reduced coral fertilization (Humphrey et al. 2008), reduced survival of coral larvae (Gilmour et al. 1999; Larsson et al. 2013), gill damage in fish larvae (Lake and Hinch 1999) and reduced survival rate of fish eggs and larvae (Westerberg et al. 1996; Griffin et al. 2009). Respiration may also shut down in sponges if sediment concentration is too high (Tjensvoll et al. 2013); in this case the frequency of disturbance is highly important.

### 8.1.3 Removal of predatory fish in relation to ecosystem structure and function

In the Kattegat and the Baltic, several studies indicate that cod is one of the most important top predator fish species that contribute to ecosystem services through the food chain by preying on small fish that prey on benthic herbivores and zooplankton. Through these trophic cascades, eutrophication related effects as increased algal blooms and overgrowth of epiphytic macroalgae are counteracted (Casini et al 2008; Eriksson et al. 2011; Baden et al. 2012). Cod is an important structuring predatory fish in the Kattegat and the stock is currently indicating slight recovery after being severly overfished since early 2000 (ICES 2017). Reef structures are favourable cod habitats and restoration projects in the Kattegat have shown that tagged cod spend significantly more hours per day and prolonged their residence time following restoration (Kristensen et al. 2017). Ensuring healthy cod stocks as well as reef structures are thus both important measures to safeguard ecosystem structure and function.

## 8.2 Other human activities

### 8.2.1 Recreational fisheries

The recreational fishery in the marine protected areas is mainly angling and arranged day-trips with vessels that can carry up to 48 persons. The recreational fishery target mackerel, plaice, cod, ling whiting and wolffish using hand line. The proposed fisheries conservation measures will also apply for recreational fisheries.

# 9. Proposed fisheries conservation measures

## 9.1 Purpose

The main purpose of the proposed fisheries conservation measures is to ensure adequate protection of designated and sensitive species and habitat types in the marine protected areas in the Kattegat:

According to Article 6 of the Habitats Directive, Member States shall take appropriate steps to avoid, in the special areas of conservation, the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated. Sandbanks (1110), reefs (1170), Submarine structures made by leaking gases (bubbling reefs 1180) and harbour porpoise (1351) were all reported to be in unfavourable conservation status in the Marine Atlantic region in the Swedish 2013 Habitats Directive Report (Article 17) (ArtDatabanken, SLU, 2013).

Noticeable, for sandbanks there were also a denotation for a negative trend in 2013 compared to its status assessed in 2007.

In order to ensure a representative network of marine protected areas there is a need to protect the habitats and species on the OSPAR List of Threatened and/or Declining Species and Habitats (OSPAR 2008-6) as well as relevant HELCOM underwater biotopes. In the framework of regional agreements, measures contributing to coherent and representative networks of marine protected areas should be established according to Article 13.4 of the Marine Strategy Framework Directive.

The measures to protect large predatory fish by excluding or reducing fisheries within zones of the marine protected areas is also necessary to preserve the quality of the habitats, as large resident fish species play a role for the ecosystem structure and functioning of these vulnerable habitats.

The proposed measures are considered necessary to remove current pressures and identified threats related to fishing inside the marine protected areas including the delineated no-take zones. The regulations will contribute so that the conservation targets listed above will be protected from harmful fishing activities, and conservation status is expected to shift from unfavorable to favorable in the Natura 2000 sites in the Kattegat.

From the Swedish fishermen organizations, there has been a requests for a corridor in the soft bottom areas between Stora Middelgrund och Röde bank to allow fishing vessels (bottom trawlers) to pass through. This request has not been implemented in the proposal since it would not be possible to ensure favorable status for the conservation targets in the area (Appendix 1: fig 1a and fig 1c; see also VMS tracks in Appendix 3: fig 3b and fig 3d). For Swedish bottom trawlers fishing in Stora Middelgrund och Röde bank (Appendix 3: Fig 3b), the catch volumes ranges between 0 to 1.1 % and values between 0 to 0.4 % compared to the landings in the whole Kattegat (Table 6 and 7). For Danish fisheries (Appendix 3: Fig 3c) the catch volume ranges between 0.07 to 5.2 % and value between 0.08 to 0.22 % compared to the landings in the whole Kattegat (Table 8 and 9). The proposed fishing regulations within Stora Middelgrund och Röde bank would thus result in a marginal loss to the fishery.

There were also requests regarding adjustments of the north-western and the western borders of Lilla Middelgrund to allow bottom trawlers to fish the soft bottoms close to the vicinity of the offshore bank. These requests have not been implemented in the proposal since it would not be possible to ensure favorable status for the conservation targets in the areas (Appendix 1: fig 1a; see also VMS tracks in Appendix 3: fig 3a and fig 3c). However, the boundaries for Lilla Middelgrund has been slightly adjusted in the southernmost tip.

The proposed fisheries conservation measures will protect sensitive fish species and important predators, such as gadoids and elasmobranchs in the no-take zones around e.g. reef habitats (see chapter 6.2; 6.5 on conservation targets and Appendix 3: fig 3a-3c). However, the proposed fisheries conservation measures in the rest of the marine protected areas, will also contribute to a significant protection for mobile species such as such as gadoids and elasmobranchs at the scale of the entire marine protected areas. Furthermore, the risk for by-catch of sea birds and harbour porpoises will also be significantly reduced since nets will be prohibited in the marine protected areas. Seabirds and harbor porpoises will thus be enabled to utilize the areas undisturbed for foraging during winter and feeding of calves during summer.

### 9.2 No-take zones

The proposed fisheries conservation measures in the marine protected areas Fladen comprise an area of 13 932 hectares, Lilla Middelgrund 18 514 hectares, Stora Middelgrund och Röde bank 11 816 hectares and Morups bank 686 hectares. For Fladen, Lilla Middelgrund and Stora Middelgrund och Röde bank, approximately 50 % of each area is proposed as no-take zones (Figure 2 and Appendix 1). In this proposal, the no-take zones are defined as areas where no fishing is allowed. As described in 8.2.1 recreational fishery could also pose a threat to designated species and habitats, and therefore in the no-take zones recreational fishery will also be banned.

The proposed no-take zones will affect fishing opportunities in the areas. However, with respect to prevailing fishing patterns the consequences for fishing opportunities will be rather small (Appendix 3: fig 3a-d). Within the boundaries of Fladen no-take zone and Stora Middelgrund och Röde bank no-take zone, only a few vessels per year have been fishing (Appendix 4: Tab 1a-1b). The majority of Swedish fishery effort within the no-take zones are from bottom trawlers. However, the total number of fishing hours in the no-take zones are low and contributes to less than 2 % of the total hours in Kattegat (Appendix 4: Tab 1a-1b). Purse seine fisheries sometimes uses the no-take zones for fishing and if so, may catch a large proportion of the yearly volume for that gear within these areas. Other Swedish fisheries such as pelagic trawling and passive gears (nets, lines and traps) are marginal in the areas. The landing information from Swedish fisheries is based on logbooks, which cover all the Swedish commercial fisheries. The pattern in the Danish fishery effort are similar to the Swedish fisheries effort. However, the Danish fishery effort is larger in the Kattegat in total, compared to Swedish fishery effort (Appendix 4: Tab 2a-2b). The coverage of effort by VMS is very good (> 90 %) for Danish bottom trawlers and pelagic trawlers. However, the coverage for Danish nets by VMS is low and the coverage of fishing activities in the no-take zones area in relation to the total Danish effort is not possible to analyse at this spatial scale.

**Table 10**. Size of no take zone, restricted fishing zoned and total area of the proposed fisheries conservation measures.

| | No take zone (hectares) | Restricted fishing zone (hectares) | Total area (hectares) |
|---|---|---|---|
| Fladen | 6 297 | 7 635 | 13 932 |
| Lilla Middelgrund | 7 954 | 10 560 | 18 514 |
| Stora Middelgrund och Röde bank | 4 787 | 7 029 | 11 816 |
| Morups bank | 0 | 686 | 686 |

### 9.3 Establishment of buffer zones

The establishment of the buffer zones was done according to ICES (2013) advice for buffer zoning in relation to manoeuvrability of the trawl gear to be three times the water depth for closures in areas where the depth is less than 500 m. In practice, this means that as long as the vessel´s position is outside the closed area, there should be no risk that the trawl reaches any part of protected habitats. However, around the marine protected areas in the Kattegat the depths varies and an average depth of 40 meters was used in order to calculate the width of the buffer zones. The boundaries for buffer zones is therefore proposed to be 120 meters wide and are in accordance with ICES advice.

Noticeable, the buffer zones are included in the boundaries for the marine protected areas presented in this proposal (Figure 2; Appendix 1; Appendix 3).

### 9.4 Requirement of AIS as a complement to VMS

The proposal includes mandatory AIS, class A transponder, transmitting the fishing vessel´s position every 30 seconds when entering the marine protected areas. Furthermore, to facilitate control and enforcement a large zone that covers all of the Natura 2000 sites in the Kattegat is proposed (Figure 4). Within the zone´s boundaries mandatory use of AIS is proposed. AIS is normally mandatory for fishing vessels from EU Member States that are 15 meters or more as of 31 May 2014. VMS is currently compulsory for fishing vessels over 12 meters. In this proposal, all fishing vessels are included in requirements of AIS, class A, within the marine protected area. For further information on the basis for the proposed AIS as a complement, see chapter 10 on control and enforcement.

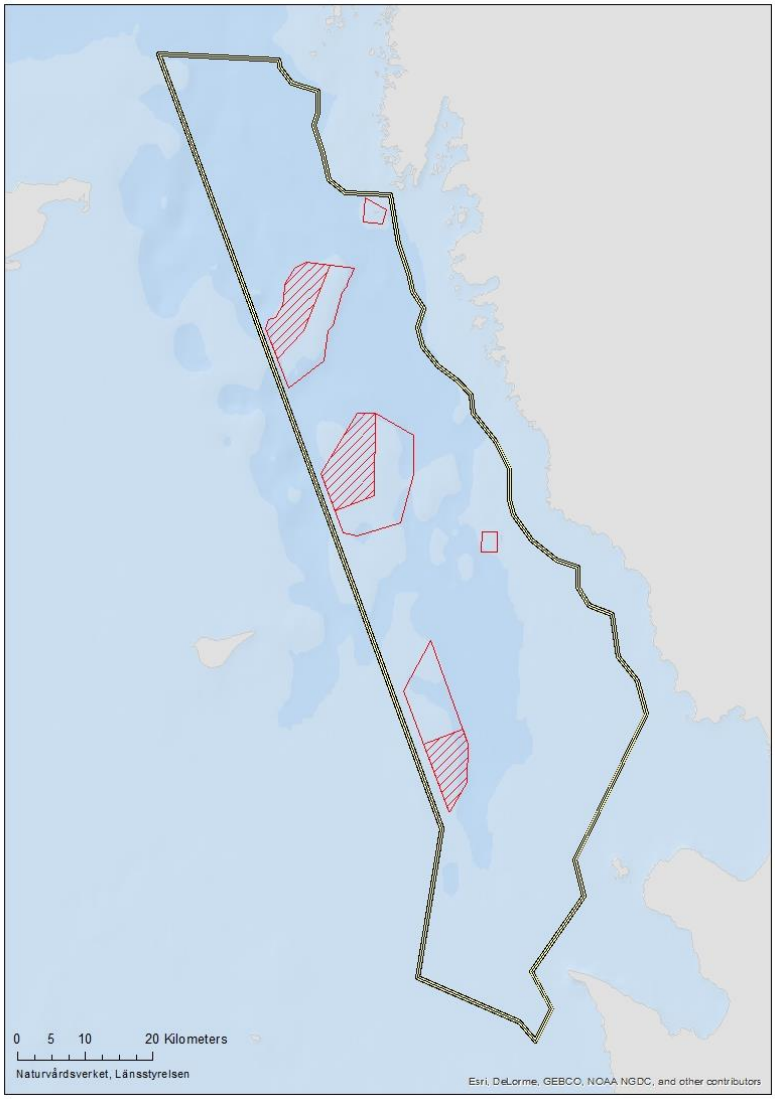



**Figure 4.** *Map of proposed zone where use of AIS is mandatory.*

### 9.5 Assessment of proportionality

Sweden is of the opinion that the proposed measures are necessary for the protection of designated habitats and species within the marine protected areas in the Kattegat. To achieve the conservation objectives for the areas, described in section 6.2; 6.5, it is essential to protect areas with identified occurrence of designated habitats and species from physical disturbance, reduce catches of large fish predators and reduce risk of by-catch of sea birds and harbour porpoises due to fishing activities.

Landings in weight and value for the marine protected areas in the Kattegat are found in section 7.1 (Table 6-9).

Mandatory AIS transponders for all fishing vessels inside the AIS-zone are necessary to ensure adequate control of small no-take zones, as would not be possible with VMS. The increased frequency of GPS positioning by the use of AIS does only marginally increase costs for fishing vessels, and only for small vessels that have not already installed transponders.

### 9.6 Displacement

The proposed fisheries conservation measures within the marine protected areas in the Kattegat reduces the potential grounds for fishery with nearly 45 000 hectares. However, by considering the spatial distribution of bottom trawling, the areas are mainly trawled in the outskirts of the offshore banks and not on them. This indicates that only part of the areas are regularly used by the commercial fisheries and therefore the proposed fisheries conservation measures only affect a small part of the landings. One exception to this would be the catches of greater weever. Some years the proportion of the volume of the total landings has been high, and the fishermen will be displaced to other areas outside the marine protected areas in the Kattegat. Since the fisheries with bottom trawl will be prohibited in the marine protected areas, the effort for greater weever is thus expected to increase in other shallow sandy areas in the Kattegat. A similar consequence can be seen for the purse seine fishery for sprat and herring that one year caught a large proportion of the landings within the marine protected area Fladen. However, this is not a regular pattern since the target species, sprat and herring, are mobile species and the fishermen target the schools of fish. Given the same effort, there will be increased effort in already fished areas, and fishermen may search for new grounds outside the marine protected areas. This effort increase is however marginal compared to the overall effort within the Kattegat. Displacement effects are thus likely to be marginal.

Since a lot of fishermen will no longer have access to fish within the marine protected areas in the Kattegat this may slightly change the routes for the vessels which potentially, but not necessarily may increase fuel costs. Hence, fishermen with specific fishing patterns in the Kattegat area may therefore have to alter these routes due to the protection of the marine protected areas or alternatively switch to gears that is not prohibited in the areas and that have less impact on the environment. During a transition phase, there may be an increased cost for these fishermen before new fishing patterns or methods have been established.

## 10. Control and enforcement

AIS transponders, transmitting the boats position every 30 seconds will be mandatory for fishing vessels when entering the marine protected area, would electronically supply fisheries authorities

with detailed real time information on vessels position, speed and course. The objective is to try to ensure that no-take zones are respected.

The proposal includes mandatory AIS, class A transponder, transmitting the fishing vessel´s position every 30 seconds when entering the marine protected area. AIS is mandatory for fishing vessels from EU Member States that are 15 meters or more as of 31 May 2014. VMS is currently compulsory for fishing vessels over 12 meters. In this proposal, all fishing vessels are included in requirements of AIS, class A, within the marine protected area. It should also be explicit that the AIS has to be functioning, turned on and transmitting positioning data during the whole fishing journey.

Clear evidence for being obliged to use no-take zones to enable effective and appropriate control, is developed in chapter 9.2. Several aspects of an effective control and surveillance can be covered by using AIS instead of VMS.

### 10.1 Arguments for applying AIS as a complement to VMS

#### 10.1.1 Vessel speed and geographical constraints of proposed areas

To better understand our proposal to control and enforce the Bratten by means of AIS with 30 second intervals, as opposed to VMS positions transmitted at 60-minute-intervals it is necessary to firstly, understand some basic aspects of the VMS system and secondly, understand the geographical constraints of the proposed protected areas.

- Speed is a function of distance and time and distance in turn can be extrapolated from the length between two VMS positions. This entails that depending on speed, the distance a vessel can travel in a specific time frame will consequently differ, see table 5 below. At a speed of 3 knots a vessel will in 10 minutes time travel 926 meters and 5 556 meters in 60 minutes time (red row in table).

| Speed (knots) | Distance (meters) as a function of time (minutes) | | | | | |
|---|---|---|---|---|---|---|
| | 10 min | 20 min | 30 min | 40 min | 50 min | 60 min |
| 0,5 | 154 | 309 | 463 | 617 | 772 | 926 |
| 1,0 | 309 | 617 | 926 | 1 235 | 1 543 | 1 852 |
| 1,5 | 463 | 926 | 1 389 | 1 852 | 2 315 | 2 778 |
| 2,0 | 617 | 1 235 | 1 852 | 2 469 | 3 087 | 3 704 |
| 2,5 | 772 | 1 543 | 2 315 | 3 087 | 3 858 | 4 630 |
| 3,0 | 926 | 1 852 | 2 778 | 3 704 | 4 630 | 5 556 |
| 3,5 | 1 080 | 2 161 | 3 241 | 4 321 | 5 402 | 6 482 |
| 4,0 | 1 235 | 2 469 | 3 704 | 4 939 | 6 173 | 7 408 |
| 4,5 | 1 389 | 2 778 | 4 167 | 5 556 | 6 945 | 8 334 |
| 5,0 | 1 543 | 3 087 | 4 630 | 6 173 | 7 717 | 9 260 |

**Table 11**. Illustration on distance and speed to clarify the distance a vessel can move when fishing between two VMS signals

Whether AIS signals can be recorded or not when a vessel is far off shore is not an issue as the different AIS base stations in Sweden more than adequately cover the Bratten area. Moreover, it should also be explicit that the AIS has to be functioning, turned on and transmitting positioning data inside the area.

### 10.1.2 Shortcomings of recording a fishing activity with VMS

Ultimately, when considering vessel speed and time, respectively in relation to the geographical constraints of the proposed no-take zones it becomes evident that VMS signals at 60-minute-intervals will not suffice to determine whether a vessel has been fishing within a no-take zone or not. This is further exemplified by a schematic picture of a fishing haul (green line) in a specific marine protected area, see figure 5. In the figure, two protected areas (A and B) are depicted. VMS signals between the set and haul positions at 60-minute-intervals are plotted (blue line). The figure shows two different possible situations as a result of recording VMS signals at 60-minute-intervals. In the first instance (A) a vessel has trawled in a no-take zone yet, the activity will not show up in the VMS record. In the second instance (B), the vessel has kept outside of the no-take zone yet, the VMS record will show the opposite. In both instances the VMS track records will result in an inaccurate representation of the fishing activity.

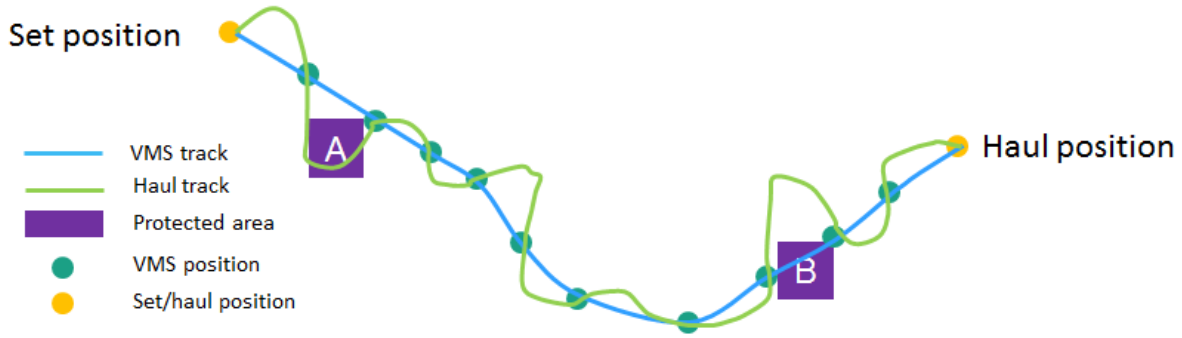



**Figure 5.** *Schematic picture of how VMS tracks a haul*

### 10.1.3 Benefits of recording a fishing activity with AIS-A

A schematic picture of the same fishing haul (green line) as mentioned above, but with AIS-A as tracking method instead, is shown in figure 6. The red dotted line depicts AIS-A signals at 30-second-intervals. The figure clearly shows how the AIS-A track closely adheres to the haul track, i.e. the vessels relative position to the no-take zones can be easily tracked. In contrast to the VMS track record, the AIS-A record is an accurate representation of the fishing activity.

**Figure 6.** *Schematic picture of how AIS tracks a haul*

#### 10.1.4 Tracking an actual haul as recorded in the electronic logbook

Swedish Agency for Marine and Water Management has developed a method of tracking a haul (as opposed to an entire fishing trip) as recorded in the electronic logbook. By correlating VMS/AIS signals to the set and haul positions and plotting the VMS/AIS signals corresponding to the time between these two positions, it is possible to track an actual haul whereby infringements can be detected.

### 10.2 Compliance

Compliance, i.e. the level of adherence to regulation can be assessed and achieved by detecting infringements, either in post-landing or real time, which in turn will result in different approaches to control and inspection

#### 10.2.1 Administrative control

As soon as haul details are recorded in the electronic logbook it is possible to cross-check these data with the vessels position data in order to obtain haul tracks. Thereafter as part of the daily routine within the administrative control process, infringements can be detected by analyzing the haul tracks, (see description of method above in 10.1.3). In the case of an infringement, criminal proceedings can be initiated. If the preliminary investigation is continued and the prosecutor decides to prosecute, there will be a trial at the Swedish district court that adjudicates in criminal cases as the court of first instance.

#### 10.2.2 Targeted inspections

Analyzing haul tracks will also provide the possibility to identify risk objects, i.e. vessels with deviating fishing patterns. These risk objects in turn constitute the basis for targeted sea and air borne surveillance and inspection activities.

#### 10.2.3 Real time surveillance

The studying of vessel-movements by means of VMS, AIS and radar in a real time surveillance system such as the Swedish system “Sjöbasis” (figure 7) provides two different approaches to detecting possible infringements and achieving compliancy, either preemptively or reactively. As the ultimate goal is to deter all infringements, a preemptive approach whereby a vessel when approaching a no-take zone may be informed in advance by the Swedish Coast Guard and Swedish Agency for Marine and Water Management, is preferable to the more reactive approach where infringements are detected and acted upon as they occur.

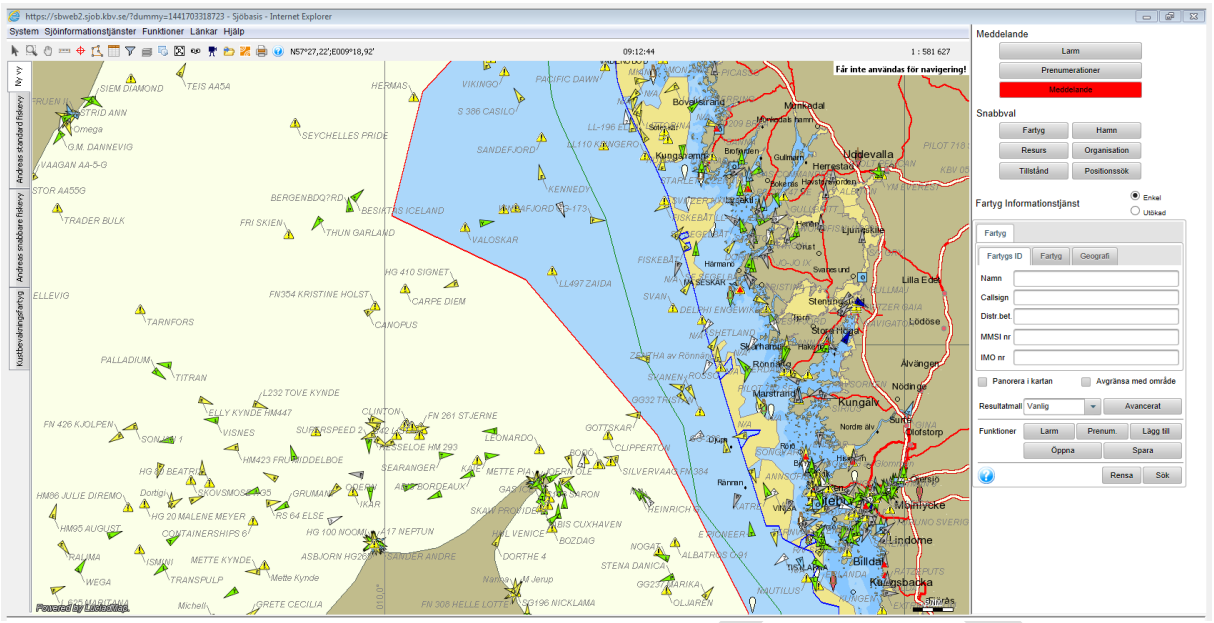



**Figure 7.** Sjöbasis is an IT system for real time surveillance of activities at sea (VMS, AIS, radar)

Ultimately, surveillance by using AIS-A tracking as a complement to traditional VMS-tracking will, with regards to the small areas and corridors in the Bratten area, provide authorities the opportunity to optimize surveillance and control efforts to target identified risk objects as well as the opportunity to better detect and consequently act upon infringements.

## 11. Monitoring

Through the Habitats Directive, the European Union sets requirements to maintain and/or restore a favourable conservation status for the habitat types and species covered by this Directive. Monitoring of the conservation status is an obligation arising from Article 11 of the Habitats Directive for all habitat types and species covered by this Directive. In the marine protected areas Fladen, Lilla Middelgrund, Stora Middelgrund och Röde bank and Morups bank these habitat types are Reefs (1170), Sandbanks which are slightly covered by sea water all the time (1110) and Submarine structures made by leaking gases (1180). However, this provision is not restricted to Natura 2000 sites and data need to be collected both in and outside the Natura 2000 network to achieve a full appreciation of the conservation status. The main results of this monitoring have to be reported to the Commission every six years according to Article 17 of the Directive.

In Sweden there is a national monitoring program. There is a plan to successively update the monitoring program to be more useful for several purposes. There is an ongoing work on developing a monitoring program for marine protected areas, thus the details on a specific monitoring program for the areas are not ready to be presented. However, monitoring of the area will most likely include studies on trawl tracks in combination with biological monitoring.

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## 13.Appendix

**Inventory of Appendices**

## Appendix 1: Maps of surveys and findings in the area.

**Figure 1.a:** All locations where species surveys have been performed since year 2000.

**Figure 1.b**: Findings of threatened species in the area.

**Figure 1.c:** Findings of sea fans (gorgonian type corals) and the brittle star Gorgonocephalus caputmedusae

**Figure 1.d**: Findings of sponge communities

**Figure 1.e**: Findings of sea pens (soft corals) and the brittle star Asteronyx loveni

**Figure 1.f**: Findings of lost fishing gear

**Figure 1.g**: Investigated pockmarks

## Appendix 2: Coordinates of breakpoints for the marine protected area Bratten and the proposed no-take zones.

## Appendix 3. Swedish and Danish fisheries data for the proposed no-take zones.

**Figure 3a.** Swedish VMS positions during 2011-2014, the whole area

**Figure 3b.** Swedish VMS positions during 2011-2014, focus on no-take areas

**Figure 3.c** Danish VMS positions during 2011-2014, the whole area

**Figure 3.d** Danish VMS positions during 2011-2014, focus on no-take areas

**Table 3.1.** Swedish landings (kg) from the proposed no-take zones during 2011-2014.

**Table 3.2.** Value of Swedish landings (euro) from the proposed no-take zones during 2011-2014.

**Table 3.3.** Danish landings (kg) from the proposed no-take zones during 2011-2014.

**Table 3.4** Value of Danish landings (euro) from the proposed no-take zones during 2011-2014.

**Table 3.5** Species landed (in kg) from the proposed no-take zones by Swedish fishery during 2011-2014.

## Appendix 4. Effort and number of vessels for the Swedish and Danish fleets in the marine protected area Bratten, and landings in value (euro) and weight (kg) for Swedish fisheries not included in the analysis.