

# OSPAR threatened and/or declining species and habitats in the Netherlands

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## Summary

In order to protect biodiversity, OSPAR has defined a list of 'threatened and declining species and habitats' that are in need of protection. This list is based upon nominations of species and habitats that were considered priorities for protection by Contracting Parties and observers to the Commission. In the past few years, for a number of species and habitats OSPAR recommendation have been adopted. Since the Dutch government has the obligation to take measures in accordance with the recommendations, an overview of the present occurrence, monitoring and measures was needed.

In this report we provide summary sheets per species or habitat type, in which the distribution and trends of each species in the Dutch part of the OSPAR area is shown. We also discuss whether the current measures and monitoring are sufficient, and which new monitoring is needed. We also suggest measures that are needed to overcome the weakest link towards restoration. An overview is given in Table 1.

Table 1. Overview of OSPAR threatened and/or declining species/habitats that are present in the Dutch OSPAR area and whether they are currently monitored, whether additional monitoring is required and whether additional measures are required to protect and/or restore the species/habitat in the Netherlands. *Shaded*=Species or habitat with an OSPAR recommendation.

Group	OSPAR name (shaded: with OSPAR recommendation)	Status	Currently monitored	Additional monitoring required	Measures currently in place	Additional measures needed
Invertebrates	Arctica islandica	rel. small pop	YES	YES	NO	YES
Invertebrates	Nucella lapillus	rel. small pop	YES	YES	YES	YES
Invertebrates	Ostrea edulis	rel. small pop	NO	YES	NO	YES
Seabirds	Rissa tridactyla	large pop.	YES	NO	YES	NO
Fish	Acipenser sturio	Absent (some individuals introduced)	YES	NO	YES	YES
Fish	Alosa alosa	rel. small pop	YES	NO	YES	YES
Fish	Anguilla anguilla	rel. small pop	YES	NO	YES	YES
Fish	Coregonus lavaretus oxyrinchus	introduced / rel. small pop.	YES	NO	YES	YES
Fish	Dipturus batis	Absent (sometimes caught by fishermen)	YES	NO	YES	YES
Fish	Raja montagui	rel. small pop	YES	NO	YES	YES
Fish	Gadus morhua	rel. small pop	YES	NO	YES	NO
Fish	Hippocampus guttulatus	Some records	NO	YES	YES	NO
Fish	Hippocampus hippocampus	Some records	NO	YES	YES	NO
Fish	Petromyzon marinus	rel. small pop	YES	NO	YES	YES
Fish	Raja clavata	rel. small pop	YES	NO	YES	YES
Fish	Salmo salar	reintroduced/rel small pop	YES	NO	YES	YES
Fish	Squalus acanthias	rel. small pop	YES	NO	YES	YES
Fish	Squatina squatina	Dissappeared	YES	NO	NO	NO
Fish	Thunnus thynnus	Dissappeared	YES	NO	NO	NO
Marine mammals	Eubalaena mysticus	Dissappeared	YES	NO	NO	NO
Marine mammals	Phocoena phocoena	large pop.	YES	YES	YES	YES
Habitats	Intertidal Mytilus edulis beds	large area	YES	NO	YES	YES
Habitats	Intertidal mudflats	large area	YES	NO	YES	YES
Habitats	Ostrea edulis beds	small area (if at all)	NO	YES	YES	YES
Habitats	Sea-pen and burrowing megafauna communities	large area	YES	YES	NO	YES
Habitats	Zostera beds	rel. small area	YES	NO	YES	YES

# 1 Introduction

## 1.1 Background

OSPAR has established a list of threatened and/or declining species and habitats in the North-East Atlantic (Figure 1) (OSPAR 2008). The list provides an overview of the biodiversity in need of protection in the North-East Atlantic and is being used by the OSPAR Commission to guide the setting priorities for further work on the conservation and protection of marine biodiversity under Annex V of the OSPAR Convention. The initial set of case reports developed to support the inclusion of species and habitats on the list have been extended by a series of background documents which provide further information on the status of each of the species and habitats as well as the threats they face and give recommendations on the actions and measures that could be taken to ensure the conservation of these species and to monitor the progress of this work. The UK are leading a programme to develop habitat maps showing the distribution of habitats on the OSPAR List of threatened and/or declining species and habitats (OSPAR 2008).

The list of species and habitats has been drawn up based upon nominations by Contracting Parties and observers to the Commission of species and habitats that they consider to be priorities for protection. Evidence in support of those nominations has been collectively examined by the OSPAR Commission on the basis of the relevant Texel/Faial criteria (OSPAR 2003) for the identification of species and habitats in need of protection and peer reviewed by the International Council for the Exploration of the Sea (ICES). The list seeks to complement, but not duplicate, the work under the EC Habitats and Birds directives and measures under the Bern Convention, the Bonn Convention and the Ramsar Convention and other relevant instruments.

The OSPAR Commission is working to ensure the protection of the species and habitats on the list either through its own programmes and measures or, where appropriate, through cooperation with other international authorities e.g. the list includes a number of commercial fish species. A first set of OSPAR Recommendations targeted at the protection of certain elasmobranchs, the orange roughy and a set of sea-bed habitats (*Lophelia pertusa* reefs, coral gardens, deep-sea sponge aggregations and sea-pen and burrowing megafauna communities) were adopted at the 2010 OSPAR Ministerial Meeting. A further OSPAR Recommendation aims to encourage the consideration of the listed species and habitats in assessments of the environmental impact of human activities in the OSPAR area. Since 2010 a further ten recommendations (7 bird species, long- and short-snouted seahorses and sea grass beds) have been adopted by OSPAR and the Biodiversity Committee is committed to develop further OSPAR programmes and measures for the protection of species and habitats on the OSPAR List.

OSPAR has the following three instruments (see [www.ospar.org](http://www.ospar.org)), of which both the first and the second are considered binding within the Dutch policy. This means that The Netherlands should take measures in line with the recommendations mentioned above.

- OSPAR Decisions (binding)
- OSPAR Recommendations: Binding within the Dutch policy
- OSPAR Agreements: not binding



## **1.2 Scope and purpose**

In the past few years, OSPAR recommendations have been adopted for a number of species and habitats. Since the Dutch government has the obligation to take measures in accordance with the recommendations, an overview of the present occurrence, monitoring and measures in the Netherlands was needed.

In this report we provide summary sheets per species or habitat type, in which the distribution and trends of each species in the Dutch Continental Shelf is shown. We also discuss whether the current measures and monitoring are sufficient, and which new monitoring and measures are needed. This report focuses on the most relevant information per species or habitat and provides references to background information.

## **1.3 Research questions**

Rijkswaterstaat (RWS) has asked IMARES the following research questions:

Question 1: where in the Dutch part of the OSPAR region do the OSPAR species and habitats occur?

Question 2: which measures are currently taken or planned for the protection of these species?

Question 3: Which additional measures and monitoring are needed?

Question 4: Which actions are needed for the species and habitats with an OSPAR recommendation?

Figure 1. OSPAR regions  
(www.noordzeeloket.nl)

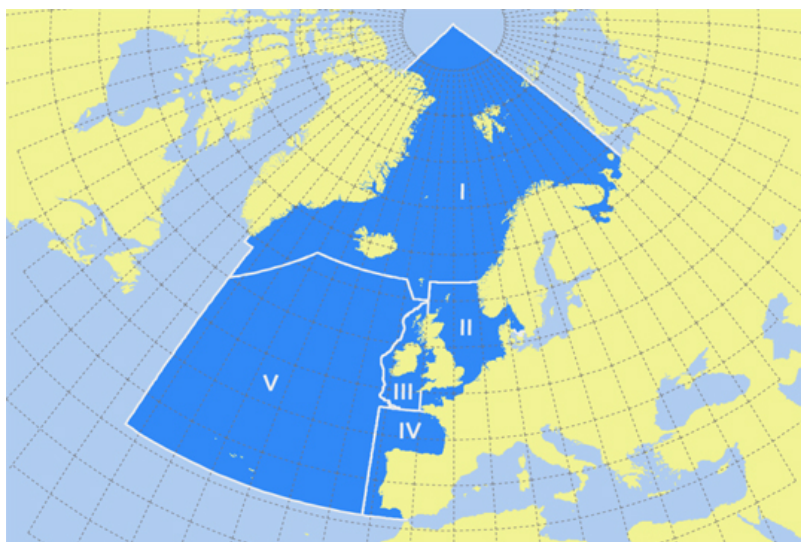
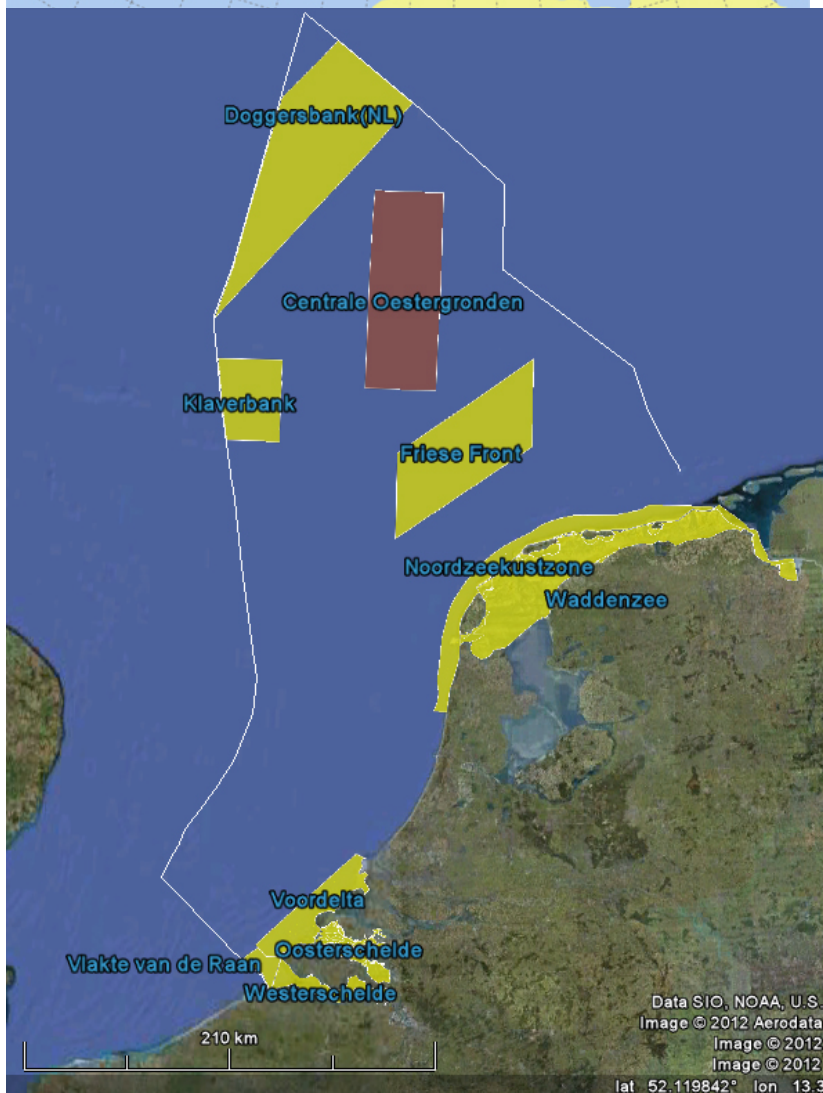


Figure 2. Dutch Continental Shelf. Green: Dutch Natura 2000 areas. Red: Central Oyster Grounds (important in this report). Map: © Google.



#### 1.4 Outline

In Chapter 3 we provide information on OSPAR species and habitats in the Netherlands. For each species or habitat we provide information on the distribution, trends, current monitoring, current measures, additional monitoring and additional measures that are needed. In Chapter 4 we summarise information

on the status, trends and distribution. In Chapter 5 we summarise information on the current monitoring and in Chapter 6 on the additional monitoring that is needed. In Chapter 7 we describe the current measures and in Chapter 8 recommendations for additional measures. Finally, in Chapter 9 we focus on the measures that need to be taken for species/habitats with an OSPAR recommendation.

### **1.5 Assignment**

The Dutch Ministry of Infrastructure and Environment (Rijkswaterstaat Noordzee) has asked IMARES to provide an overview of the occurrence of OSPAR species and habitats in the Dutch part of the OSPAR region, to analyse their current protection and their monitoring and to provide recommendations how to fulfil the OSPAR recommendations for a number of these species and habitats.

### **1.6 Disclaimer**

This project was a relative small project, so the amount of information that could be put into this review is limited. Therefore certain information may be very concise or even lack.

## 1.7 Glossary

ACTMON	Active Monitoring
BD	EU Birds Directive
BO	Beleidsondersteunend Onderzoek (Policy Supporting research: projects commissioned by the ministry of EL&I)
BTS	Beam Trawl Survey
CBD	Convention on Biological Diversity
CDNA	Commissie Dwaalgasten Nederlandse Avifauna (Dutch Rarity Committee)
CFP	Common Fisheries Policy
Cpue	Catch per unit effort
DCS	Dutch Continental Shelf
DFS	Demersal Fish Survey
EcoQo	Ecological Quality Objective (OSPAR)
EEZ	Exclusive Economic Zone
EL&I	Ministry of Economic Affairs, Agriculture and Innovation
ESAS	European Seabirds At Sea
EU indicator	Indicators defined by the EU in the MSFD
EUNIS	European Nature Information System
F	Fisheries mortality
FIMPAS	Fisheries Measures in Protected Areas (Dutch project)
GES	Good Environmental status
GIS	Geographical Information System
HD	EU Habitats Directive
IBTS	International Bottom Trawl Survey
ICES	International Council for the Exploration of the Sea
IMO	International Maritime Organization
Indicator	Indicator of biodiversity
JARKUS	JAaRlijke KUSTmeting (Annual Coast Measurement). Programme by Rijkswaterstaat.
KRW	Kaderrichtlijn Water (Water Framework Directive)
MSFD	Marine Strategy Framework Directive
MWTL	Monitoring Waterstaatkundige Toestand des Lands (group of state monitoring programmes to inform on Dutch waters)
NCP	Nederlands Continentaal Plat (Dutch Continental Shelf)
NIOZ	Royal Netherlands Institute for Sea Research
NL	Netherlands
OSPAR	Oslo Paris Convention
PASMON	Passive Monitoring
PIMP	Purperslakken Inventarisatie en Monitoring Project (Dog Whelk Inventory and Monitoring) (Stichting Anemoon)
Rijkswaterstaat	Directorate General of Public Works and Water Management, part of Dutch Ministry of Infrastructure and Environment
RWS	Rijkswaterstaat
SNS	Sole Net Survey
SOVON	SOVON Bird Research
Stichting Anemoon	Foundation Anemoon (volunteer network)
TAC	Total Allowable Catch
TBT	Tributyl-tin
VMS	Vessel Monitoring System
WOT	Wettelijke Overheids Taken (Legal Research Assignments)

## 2 Methods

In this report the emphasis is on the possible measures that need to be taken to restore species and habitats of the OSPAR list. To determine for which species/habitats these measures are needed, we have first composed fact sheets per species/habitat, showing the current status, distribution, trends and existing monitoring programmes and measures in the Netherlands. Only for those species and habitats that are still present in the Dutch part of the OSPAR area (in this report: Dutch North Sea, Wadden Sea, Oosterschelde, Westerschelde), and for which measures are meaningful, we have tried to identify the 'weakest link' in the way forward towards a good conservation status and proposed measures that should help to reach a good conservation status. Also additional monitoring is suggested where current monitoring is not sufficient.

### 2.1 General information, distribution and trends

In this report we have composed factsheets for all species / habitats that are listed on the OSPAR list. The aim was not to provide a fully detailed species/habitat profile, but to highlight the most important information. Information on the distribution and trends of species and habitats is based on a number of IMARES fishery datasets (see below) and literature research. For those habitats for which the definition is perhaps unclear, we have provided the OSPAR definition.

#### 2.1.1 Distribution

Most part of the Dutch OSPAR area is covered by the Marine Strategy Framework Directive (North Sea, see Figure 2) and a smaller part is covered by the Water Framework Directive (Wadden Sea, Oosterschelde, Westerschelde). We have made this distinction when indicating absence/presence of species/habitats.

#### 2.1.2 Trends

We have not calculated any trends. We have sketched how the abundance of the species/habitat has changed over a long period in the Netherlands (decades to centuries). For all species/habitats, we have described the (long term) trend. Only for the species/habitats that are currently present in the Netherlands, we have indicated whether they show a negative (-), neutral or variable (0), positive (+) or unknown trend for the last decade (see also Table 8).

### 2.2 Status

On the basis of the collected information, the current status of the species and habitats in the Netherlands was categorised as:

- Absent - currently not present in Dutch waters
- Vagrant - (for birds): sometimes observed in Dutch waters, which is outside their natural range
- Reintroduced - present in Dutch waters as a result of reintroduction
- Few records (not for birds) - present, but in very low (recorded) numbers.
- Rel. small populations - relative small populations present compared to potential distribution
- Large populations - 'normal' populations present, not per se in a favourable state.

## 2.3 Monitoring

Information on monitoring programs was obtained from a number of reports (e.g. Smit et al. 2010) and current projects on the development of a monitoring programme in the framework of Natura 2000 and the MSFD.

## 2.4 Additional monitoring

For species and habitats that are present (status: few records, relatively small population, large population) we have checked whether the current monitoring is sufficient, and we have proposed new monitoring programmes where a gap was observed.

## 2.5 Current measures

We have listed the existing measures (including conservation plan, management plans, EU policies, fishing measures, etc) which are currently in place in the Netherlands or that will be taken by the Dutch government or other parties in the (near) future, e.g. in the framework of Natura 2000 and the Dutch Marine Strategy (see Annex A).

## 2.6 Additional measures

In addition, we have suggested additional measures for the 'weakest links' that inhibit species/habitats to (fully) return. We have only provided measures for species/habitats that are still present in the Netherlands, and for species that have disappeared such as the sturgeon. The starting points for the proposed additional measures are the following:

- The measures target the weakest link(s) in the restoration process.
- Human built structures (dikes, sluices, etc.) are to be maintained, and can only partially be adapted at best.
- Human impacts can be managed and banned, including fisheries.
- Natural processes cannot be influenced.
- The result of the measures is probably only measurable on an ecological time scale, e.g. after >20 years. Equally, proposed measures could not work out at all, due to a permanently altered ecological situation compared to e.g. one or two centuries ago. In that case restoration is considered not to be possible.
- The measures are not described in detail, due to limited time resources within this project.
- The effectiveness of measures has not been tested, so the outcome is not known. They require further investigation and testing.

## 2.7 Species/habitats

### 2.7.1 Invertebrates

Information on invertebrates is based on literature research.

### 2.7.2 Seabirds

Most of the species under consideration are vagrants in the Netherlands. The documentation of records of vagrant birds are reviewed by the Dutch Rarity Committee (CDNA – Commissie Dwaalgasten Nederlandse Avifauna). The status of vagrants is extensively documented by Van den Berg & Bosman (1999). Records from years after the publication of Van den Berg & Bosman (1999) have been published in annual reports of the CDNA. Recently, a website has been launched presenting all records accepted by the CDNA ([www.dutchavifauna.nl](http://www.dutchavifauna.nl)). The overviews presented in 3.2 are based on these publications. In addition, ESAS data were analysed.

### 2.7.3 Fish

Several fish surveys are carried out annually by IMARES to collect information for fish stock assessments in the North Sea. A selection of the surveys are the IBTS, BTS, SNS and DFS (for abbreviations see 1.7

'Glossary') targeting demersal fish species and fyke (Dutch: fuik) registration for diadromous fish in the Wadden Sea. Even though these surveys are focussed on commercial fish species, all other non-commercial fish and benthos caught are recorded as well.

Besides the annual fish surveys, information on discards of commercial fisheries is also collected in observer programs. Furthermore, there are some unique monitoring programs performed once or only in a few years and we have historic data that were collected prior to the database systems and have no unique program name.

Combining all these data presents an idea of the potential (former) distribution of the species, however it limits comparability of the data over the years. This is because the presented effort is often not comparable between years. For example if a specific gear (e.g. gillnets) has only been used in a single year, than this year is likely to give a different idea of the distribution than all the other years. Similarly, when an area is intensely fished for an unique monitoring program, than there is a higher probability that rare species are found. The presented maps thus present only the potential/likely distribution and cannot be used for the interpretation of changes in distribution over the years. Only continuous long-term times-series can be used for that.

Because of their rarity and/or catchability, the surveys at sea provide little information about migratory fish. Special monitoring programs exist for these species in fresh and estuarine waters. Therefore, they are also considered in this report. These programs are:

- MWTL PASMOM
- MWTL ACTMON
- WOT Survey IJsselmeer and Markermeer
- WOT Oeverbemonstering IJsselmeer and Markermeer
- WOT Registration migrating and diadromous fish
- KRW Ankerkuilbemonstering Westerschelde

#### *2.7.4 Reptiles*

Information on invertebrates is based on literature research.

#### *2.7.5 Marine mammals*

Information on invertebrates is based on literature research.

#### *2.7.6 Habitats*

Information on invertebrates is based on literature research.

### 3 OSPAR species and habitats in the Dutch part of the OSPAR area

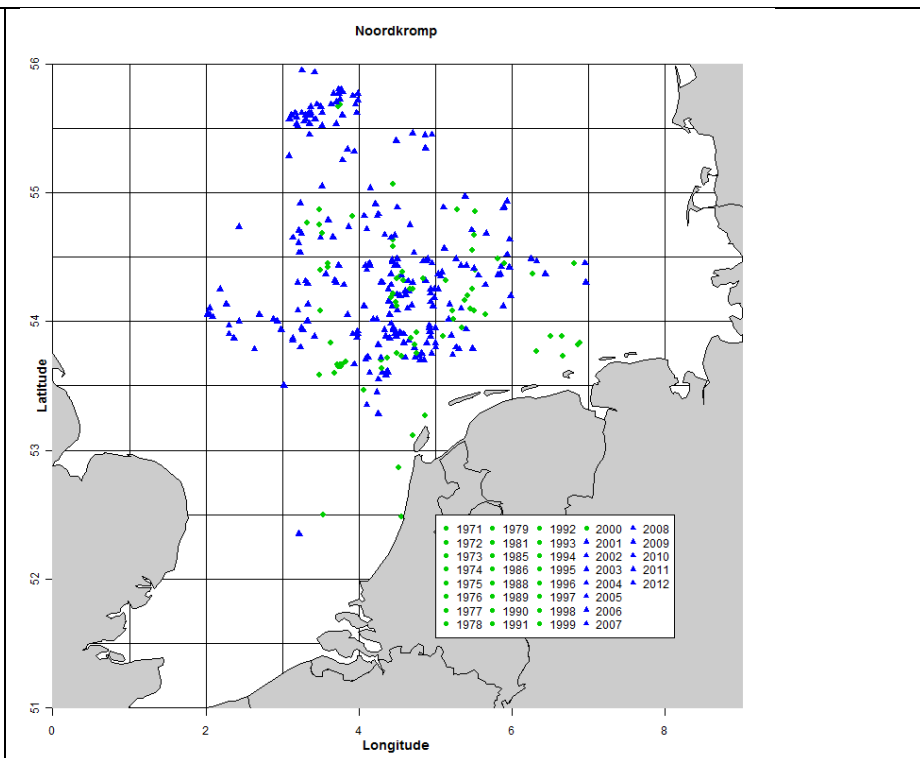
#### 3.1 Invertebrates

##### 3.1.1 *Arctica islandica*

Names									
NL		Noordkromp							
UK		Ocean quahog							
Scientific name		<i>Arctica islandica</i>							
Status									
Absent		Vagrant		Reintroduced		Few records	Rel. small population	X	Large population
Introduction									
<p>Many vulnerable benthic species including <i>Arctica islandica</i> in the Dutch North Sea have decreased significantly due to the increased bottom trawling in the 20<sup>th</sup> century (Rumohr &amp; Kujawski 2000).</p> <p>The ocean quahog is currently present in the deeper siltier parts of the Dutch Continental Shelf. The average density of the quahog (&gt;10 mm) in the south-eastern North Sea was 7 ind/100 m<sup>2</sup>. The highest abundance of spat, juveniles and adults was found in the deeper central section of the Oyster Grounds. Intensive bottom trawling is thought to have a major impact on the population structure (Witbaard &amp; Bergman 2003, Witbaard 2007).</p>									
Distribution									
North Sea (MSFD area)	X	Western Scheldt		Eastern Scheldt		Wadden Sea			
<p>Figure 19. Distribution of <i>Arctica islandica</i> in the Dutch part of the North Sea, based on NIOZ Triple-D dredge data (Lindeboom et al. 2008)</p>									



Figure 3. Distribution of *Arctica islandica*, based on IMARES fisheries data.



**Trends (long term)**

Compared to the beginning of the 20<sup>th</sup> century, the ocean quahog in the Netherlands has declined dramatically, based on a comparison of absence/presence data from the early 1900s with 1986 (Rumohr & Kujawski 2000). The species is still widely distributed but it is questioned whether intensive bottom trawling allows for a sustainable population (Witbaard & Bergman 2003).

**Trends (last decade)**

North Sea (MSFD area)	?	Western Scheldt		Eastern Scheldt		Wadden Sea
-----------------------	---	-----------------	--	-----------------	--	------------

**Current monitoring**

Within the coastal zone there are two long-lasting benthos monitoring programmes: MWTL and WOT. Outside the coastal zone, benthos is only surveyed within the MWTL programme. In this survey a box core is used for sampling. The box-core has as disadvantage that its spatial coverage is very poor. There is a reasonable chance, that a species like the ocean quahog is missed because of its low abundance. Within the framework of the MSFD, IMARES has advised the Dutch government to carry out complementary monitoring with a dredge in protected North Sea sites.

The NIOZ has carried out a monitoring program with a Triple-D dredge. Until 2011, over 360 samples have been taken, but each at different locations. The NIOZ will publish an atlas of these data (R. Witbaard, pers. Com.)

**Current measures**

- In the Dutch Marine Strategy, the Frisian Front and the Central Oyster Grounds are assigned as search areas for fisheries measures (I&M & EL&I 2012).
- The quahog is also proposed as a typical species for the Dutch part of the Dogger Bank under the Habitats Directive (Jak et al. 2009).
- Within the framework of FIMPAS (*Fisheries Measures in Protected Areas*) the Natura 2000 site Dogger Bank is assigned as search area for measures concerning the bottom trawl fisheries.

**Additional measures needed**

Many vulnerable benthic species including *Arctica islandica* in the Dutch North Sea have decreased significantly due to the increased bottom trawling in the 20<sup>th</sup> century (Rumohr & Kujawski 2000). In the Dutch Marine Strategy, the Dutch government aims at a closure of 10-15% of the Dutch Continental Shelf, part of which will be realised by closing parts of the Frisian Front and Oyster Grounds to bottom trawling. These measures specifically serve to protect vulnerable benthic species, including *Arctica*. It is not known when or where exactly these areas will be realised. The MSFD measures in theory offer an

excellent opportunity to protect *Arctica islandica*, if the protection measures involve a large scale ban of traditional beam trawling. Witbaard (2007) suggested to reduce mortality due to fisheries, and to artificially rear spat and transplant them to their habitat in case that natural recruitment would not occur.

- Weakest link: beam trawling (Lindeboom et al. 2005; p88, Witbaard 2007)
- Proposed measure: A ban of beam trawling in all areas where *Arctica islandica* occurs, notably in the deeper parts of the Frisian Front.

#### Additional monitoring needed

We recommend to extend the monitoring for this species. In the Dutch marine strategy, two areas (Frisian Front and Oyster Grounds) are proposed in which fishery measurements (closure to damaging bottom trawling) will be taken to protect vulnerable marine species such as the quahog (I&M & EL&I 2012) (see Annex A).

To monitor the effect of such measures, IMARES has advised to monitor the biodiversity of benthos with a dredge, in addition to the MWTL BIOMON monitoring that uses a boxcore (Paijmans et al. in prep.). It was also advised to start with a T0 measurement, to relate changes to proposed fisheries measures. The NIOZ has performed project-based monitoring with a dredge in recent years, but that is not part of a regular program. Whether or not additional monitoring for *Arctica* is needed will depend on the monitoring programme for Natura 2000 and the MSFD.



*Arctica islandica* - Ocean quahog

### 3.1.2 *Megabalanus azoricus*

NL Azoren zeepok. UK Azorean barnacle. Not present in the Dutch North Sea.

### 3.1.3 *Nucella lapillus*

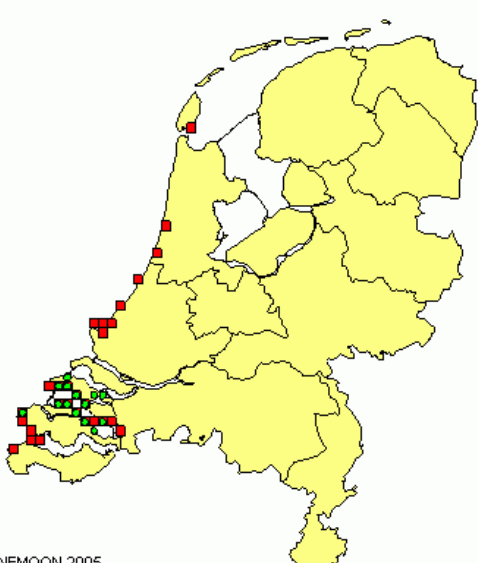
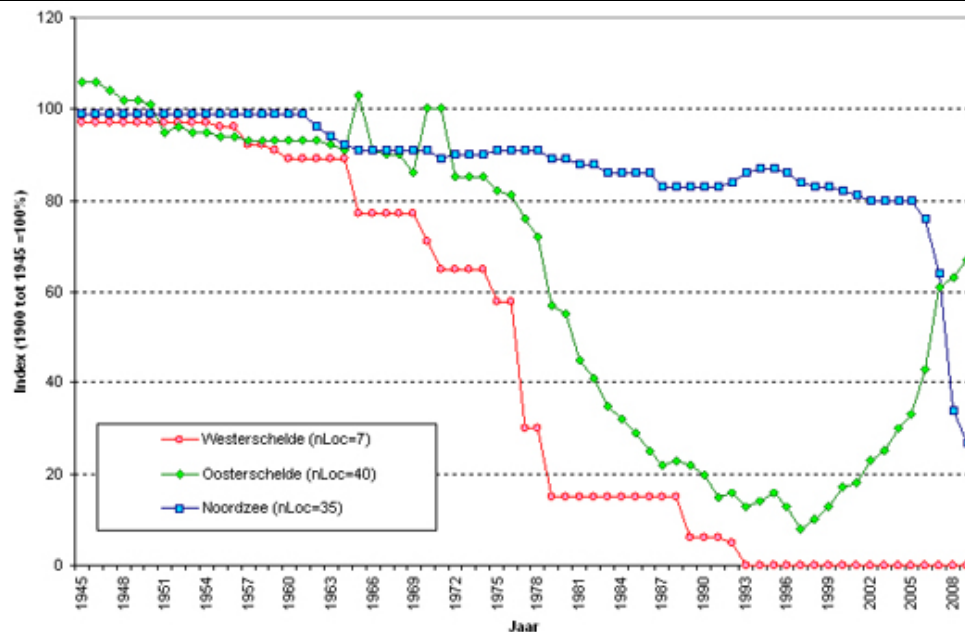
Names										
NL	Purperslak									
UK	Dog whelk									
Scientific name	<i>Nucella lapillus</i>									
Status										
Absent		Vagrant		Reintroduced		Few records		Rel. small population	X	Large population
Introduction										
Dog whelks are responding very sensitive on organotins in anti-fouling paint. Tributyl tin (TBT) causes female Dog whelks to suffer from imposex, which hampers the reproduction. The Dog whelk got close to extinction along the Dutch coast as a consequence of TBT poisoning .										
Distribution										
North Sea (MSFD area)	X	Western Scheldt	X	Eastern Scheldt	X	Wadden Sea	X			
Occurs on hard substrate along the Dutch North Sea coast, at several locations along the Delta coast and an isolated occurrence on Texel (Ten Hallers-Tjabbes & Gmelig Meyling 2009) ( <a href="http://www.anemoon.org">www.anemoon.org</a> ). TBT causes the condition known as imposex in female <i>N. lapillus</i> . In the Netherlands, in 1988, the effect of TBT was very strong. The same population appeared to be normal again with regard to imposex in 2007 and populations have increased (Kaag & Jol 2007).										
<p>Figure 20. distribution of <i>Nucella lapillus</i> along the Dutch North Sea coast. Red &lt;1990, Green =&gt;1990) (<a href="http://www.anemoon.org">www.anemoon.org</a>)</p>		 <p>© Stichting ANEMOON 2005</p>								
Trends (long term)										
Since 1970 there was a strong decline of the Dog whelk along the Dutch coast. Around 1995, the species was diminished to small numbers at a few locations. Since 1999, there is a clear increasing trend in the Oosterschelde (EU 2003, 2008a, Ten Hallers-Tjabbes & Gmelig Meyling 2009). The largest population could be found at Westkapelle, until 2008, when a sand nourishment covered the hard substrate on which the Dog whelk resided. This reduced the Dutch population to half the size (EU 2003, 2008a).										

Figure 21:  
Relative changes  
of the Dutch Dog  
whelk populations  
since 1945 (EU  
2003)(www.anem  
oon.org)



**Trends (last decade)**

North Sea (MSFD area)	-	Western Scheldt	?	Eastern Scheldt	+	Wadden Sea	?
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**Current monitoring :**

- Stichting Anemoon PIMP (Purperslakken Inventarisatie en Monitoring Project/ Dog whelk inventory and monitoring project ): systematic counts of Dog whelks by volunteers. Frequency is unknown.
- WOT: The presence of dog whelks and other marine snails on mussel and oyster banks are covered by the WOT monitoring programme on mussel- and oysterbeds (only in the Wadden Sea). When they are encountered in the coastal zone during the annual Ensis/Spisula survey, they are also noted. In the Oosterschelde there is hardly any attention for this species.

**Current measures**

The use of anti-fouling paint with TBT is prohibited since 1990 on the hulls of ships smaller than 25 meter. Since 2003 the use of anti-fouling paint containing TBT is worldwide prohibited. Since 2008 TBT has to be removed from the ship hulls (IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships) ([http://www.imo.org/about/conventions/listofconventions/pages/international-convention-on-the-control-of-harmful-anti-fouling-systems-on-ships-\(afs\).aspx](http://www.imo.org/about/conventions/listofconventions/pages/international-convention-on-the-control-of-harmful-anti-fouling-systems-on-ships-(afs).aspx)).

**Additional measures needed**

In the Netherlands, in 1988, the effect of TBT was very strong. The same population appeared to be normal again in 2007 and populations have increased (Kaag & Jol 2007). The current main threat is coastal works, such as sand nourishment or dike enforcement/repair, that kill local populations of the snail (Ten Hallers-Tjabbes & Gmelig Meyling 2009).

- Weakest link: sand nourishment, dike repair/enforcement (Ten Hallers-Tjabbes & Gmelig Meyling 2009)
- Proposed measure: displace and safeguard specimens before starting sand nourishment and dike construction works.

**Additional monitoring needed**

We recommend that monitoring of *Nucella* is continued, e.g. by the Anemoon Foundation.

3.1.4 *Ostrea edulis*

NL Gewone oester, platte oester. UK Flay oyster. See *Ostrea edulis* beds.

3.1.5 *Patella ulyssiponensis aspera*

NL Ruwe schaalhoorn. UK Azorean limpet. Not present in the Dutch North Sea.



*Rissa tridactyla* –black-legged kittiwake

### 3.2 Seabirds

#### 3.2.1 *Larus fuscus fuscus*

Names										
NL	Baltische kleine mantelmeeuw									
UK	Baltic gull (Lesser black-backed gull)									
Scientific name	<i>Larus fuscus fuscus</i>									
Status:										
Absent		Vagrant	X	Reintroduced		Few records		Rel. small population		Large population
Introduction										
<p>The Baltic Gull is currently treated as a vagrant in the Netherlands and records are therefore reviewed by the CDNA (Dutch Rarity Committee). Up to and including 2010, only 10 records were accepted (Ovaa et al. 2011). Due to the complex identification of Baltic Gulls, in particular its separation from northern Lesser Black-backed Gulls <i>Larus fuscus graellsii</i>/'intermedius', the CDNA currently only accepts birds ringed at the nest in breeding colonies of <i>fuscus</i> (Ovaa et al 2010). Therefore, the number of records probably greatly depreciates the true numbers. In a recent paper, Altenburg et al. (2011) showed that second calendar-year individuals can be safely identified in the field. As there have been individuals recorded in the Netherlands meeting the criteria of Altenburg et al (2011), this new insights will lead to the acceptance of an unknown number of records from past years.</p>										
Distribution										
North Sea (MSFD area)	X	Western Scheldt	X	Eastern Scheldt	X	Wadden Sea	X			
<p>Virtually all records originate from locations where gulls are extensively studied and where many rings are read: Amsterdam, Noord-Holland (2), Westkapelle, Zeeland (4), Hoornse Plas, Groningen (2), and IJmuiden, Noord-Holland (1). Another record comes from Vlieland, Friesland. From these locations, only Westkapelle and IJmuiden are directly bordering the North Sea.</p>										
Trends										

Given new insights in the identification of Baltic Gulls, the number of records may well increase over the coming years. However, this would only be an observer effect. Records are reviewed and archived by the CDNA.

**Current monitoring**

None

**Current measures**

None

**Additional monitoring needed**

None

3.2.2 *Pagophila eburnea*

Names									
NL	Ivoormeeuw								
UK	Ivory gull								
Scientific name	<i>Pagophila eburnea</i>								
Status									
Absent		Vagrant	X	Reintroduced		Few records		Rel. small population	Large population
Introduction									
Ivory Gull is an extremely rare visitor to the North Sea in general, and to The Netherlands in particular. Only three records of this species (see below) have been accepted by the CDNA (Dutch Rarity Committee) (Van den Berg & Bosman 1999)									
Distribution									
The three records were at Schiermonnikoog, Friesland, on 9 February 1987, at Goedereede, Zuid-Holland, from 9-19 February and at Bergen, Noord-Holland, on 17 May 1997 (Van den Berg & Bosman 1999).									
Trends									
Records are reviewed and archived by the CDNA.									
Current monitoring									
None									
Current measures									
None									
Additional monitoring needed									
None									

### 3.2.3 *Polysticta stelleri*

Names										
NL	Stellers Eider									
UK	Steller's Eider									
Scientific name	<i>Polysticta stelleri</i>									
Status										
Absent		Vagrant	X	Reintroduced		Few records		Rel. small population		Large population
Introduction										
Four out of six records originate from the Wadden Sea, within the province of Friesland: from 5 Juli – 2 August at Terschelling, on 13 April 1986 at Schiermonnikoog, from 11-12 January 1997 at Dongeradeel and at 29 September 2000 at Harlingen. A single records was at 28 January 1987 at Lelystad and another in the Westerscheldt near Hulst, Zeeland, from 20 May – 24 July 1996 (Van den Berg & Bosman 1999).										
Distribution										
In the Netherlands, Stellers Eider is a very rare vagrant with only six records (Van den Berg & Bosman 1999). Records are reviewed and archived by the CDNA (Dutch Rarity Committee).										
Trends										
None										
Current monitoring										
None										
Current measures										
None										
Additional monitoring needed										
None										

### 3.2.4 *Puffinus assimilis baroli* (auct.incert.)

Names										
NL	Kleine pijlstormvogel									
UK	Barolo Shearwater (Little Shearwater)									
Scientific name	<i>Puffinus assimilis baroli</i> (auct.incert.)									
Status										
Absent	X	Vagrant		Reintroduced		Few records		Rel. small population		Large population
Introduction										
No records of this species (or any of the species group this taxon belongs to) are currently accepted by the CDNA (cf. e.g., Van den Berg & Bosman 1999).										
Distribution										
None										
Trends										
none										
Current monitoring										
None										
Current measures										
None										
Additional monitoring needed										
Nono										



### 3.2.5 *Puffinus mauretanicus*

Names										
NL		Vale pijlstormvogel								
UK		Balearic shearwater								
Scientific name		Puffinus mauretanicus								
Status										
Absent		Vagrant	X	Reintroduced		Few records		Rel. small population		Large population
Introduction										
<p>Up to and including 1997, this species was considered a vagrant in the Netherlands and records from this period have been reviewed by the CDNA. Van den Berg &amp; Bosman (1999) list 60 records (64 individuals) for the period 1800-1996. Subsequently, 7 records from this period have been added to this list (OSPAR 2011a, b, 2012). During this period, the species was recorded annually from 1987 onwards and the number of records per year increased steadily. Since 1998, this trend has continued, and nowadays, the species is regarded as a scarce visitor, with over a hundred sightings entered in the online sighting database <a href="http://www.waarneming.nl">www.waarneming.nl</a> during 2008-2010. Individuals sighted by several observers make it difficult to extract the number of individuals involved, but this runs probably into many tens of birds. Most records in July- October. Recent sightings indicate that this period is somewhat extended into late autumn and winter (e.g. Van Dijk 2009). The increased number of records is probably caused by a northward expansion of this species range outside the breeding season (Wynn et al. 2007, Votier et al. 2008).</p>										
Distribution										
<p>Virtually all records come from land-based migration counts. Migration count sites with most records are Camperduin (Noord-Holland) Westkapelle (Zeeland) (Van den Berg &amp; Bosman 1999) and Scheveningen (Zuid-Holland) (<a href="http://www.trektellen.nl">www.trektellen.nl</a>). A few individuals have been recorded during ship-based surveys (ESAS database) or aerial surveys (MWTL surveys) further at sea.</p>										
Trends										
None										
Current monitoring										
<p>No dedicated monitoring program is in place, but land-based migration counts by members of the Dutch Seabird Group (Nederlandse Zeevogelgroep, NZG/CvZ) include effort data and are stored by <a href="http://www.trektellen.nl">www.trektellen.nl</a>. Records are maintained in several databases, such as <a href="http://www.waarneming.nl">www.waarneming.nl</a>, <a href="http://www.dutchbirdalerts.nl">www.dutchbirdalerts.nl</a> and databases maintained by SOVON.</p>										
Current measures										
None										
Additional monitoring needed										
None										

### 3.2.6 *Rissa tridactyla*

Names										
NL		Drieteenmeeuw								
UK		Black-legged Kittiwake								
Scientific name		Rissa tridactyla								
Status										
Absent		Vagrant		Reintroduced		Few records		Rel. small population	Large population	X
Introduction										
<p>In the Dutch sector of the North Sea, the Black-legged Kittiwake is an abundant seabird throughout the year, but particularly in autumn and winter. An estimated 100,000-150,000 individuals are present on the DCS between October and April (Camphuysen &amp; Leopold 1994). In some years, many are seen from coastal migration count sites, in particularly after storms. Such influxes may coincide with a wreck. During beached bird surveys, the species is commonly found and a large percentage of individuals is oiled (78.7%) (Bijlsma et al. 2001).</p> <p>In recent years, small colonies have established themselves at offshore platforms around the Frisian Front (Camphuysen &amp; De Vreeze 2005, Camphuysen &amp; Leopold 2007) and further south (Geelhoed et al. 2011b). However, at least part of these colonies are not long-lived due to maintenance work on the platforms</p>										
Distribution										
North Sea (MSFD area)	X	Western Scheldt	X	Eastern Scheldt	X	Wadden Sea	X			
<p>In Figure 4, the relative densities of Black-legged Kittiwakes are presented for October-April, based on ESAS data. Although uneven sampling effort over space, and uneven distribution of sampling effort over time may have biased values in this map, the Southern Bight, the Frisian Front and the Botney Cut area clearly show up as areas with higher densities. This is in accordance with earlier analyses of ESAS data (Camphuysen &amp; Leopold 1994, Bijlsma et al. 2001), but somewhat different from model predictions based on aerial surveys from the MWTL program for 2004-2009 (Arts 2010). These maps show high densities throughout the DCS during December-January and north of the Wadden Sea Isles, around the Brown Ridge and in the south-western part of the DCS in February-March. In April-May, densities are high at the Brown Ridge and the Dogger Bank.</p> <p>Most offshore platforms occupied by breeding Black-legged Kittiwakes are near the Frisian Front (Camphuysen &amp; De Vreeze 2005, Camphuysen &amp; Leopold 2007). A single colony was recently discovered further south (Geelhoed et al. 2011b) (Figure 5). No natural breeding sites have been recorded along the (sandy) Dutch coasts.</p>										

Figure 4. Relative mean density of Black-legged Kittiwakes during October-April, based on ESAS data (red dots) over 1979-2012. Background colouration represents effort (surveyed area), with darkest areas having most effort. No correction for imperfect detection has been applied, therefore this map only shows relative and not absolute density estimates. Moreover, note that within 10x10km blocks, effort may be unevenly distributed across months and years, which may lead to a biased value in such blocks.

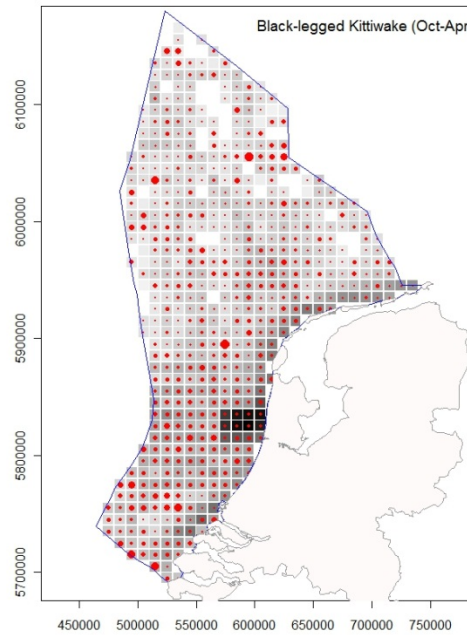
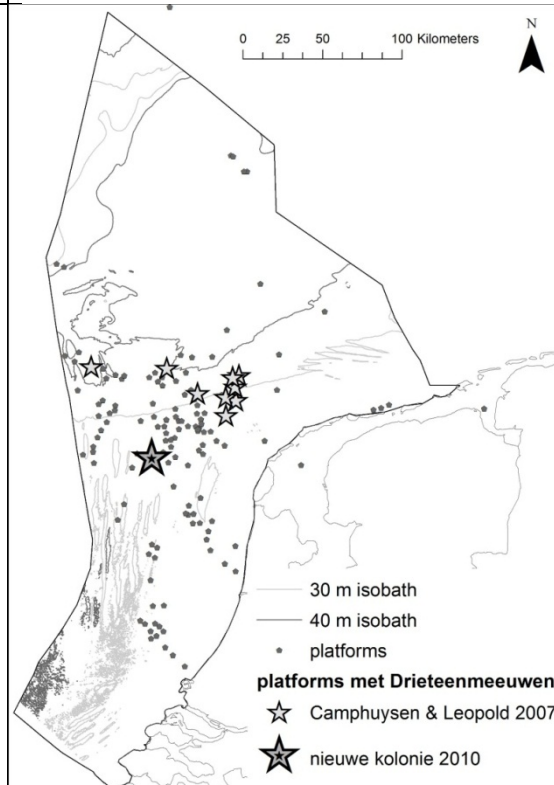


Figure 5. Distribution of offshore platforms and those occupied by breeding Black-legged Kittiwakes.



### Trends (long term)

Along the coast, the species seems to have increased since the 1970s (Camphuysen & Van Dijk 1983). Trend analysis of MWTL surveys, spanning 1992-2009 (Arts 2010) indicate that after a steady increase over the period 1992-2004, numbers dropped considerably over the period 2004-2009.

MWTL monitoring is currently continued and suitable for trend analysis. ESAS data is problematic for trend analysis, given the uneven distribution of effort over time and space. Land-based migration counts are heavily influenced by weather conditions and may not reflect abundances at sea for this pelagic species.

The recent colonization of platforms in the Dutch Sector of the North Sea is not followed in detailed due to logistic difficulties and financial and permission constraints.

An OSPAR Eco-Qo sea bird population trends is developed based on trends in abundance of breeding seabirds. The black legged kittiwake is one of the species that is looked at

**Trends (last decade)**

North Sea (MSFD area)	0	Western Scheldt	?	Eastern Scheldt	?	Wadden Sea	?
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**Current monitoring**

MWTL (see above)

**Current measures**

Birds Directive  
Flora and Fauna Act

**Additional measures needed**

None

**Additional monitoring needed**

None

3.2.7 *Sterna dougallii*

<b>Names</b>										
NL	Dougalls stern									
UK	Dougalls tern, roseate tern									
Scientific name	Sterna dougallii									
<b>Status</b>										
Absent		Vagrant	X	Reintroduced		Few records		Rel. small population		Large population
<b>Introduction</b>										
Dougalls Tern is a vagrant in the Netherlands. Records are reviewed by the CDNA (Dutch Rarity Committee), who accepted 33 records up to and including 2010. All of these concern adults. There have been breeding attempts of a female Dougalls Tern paired with a Common Tern <i>Sterna hirundo</i> in the Western Scheldt, from 1982-85. In 1982 and 1984, these attempts were successful. Although the first record originates from 1977, it is not unlikely that the species occurred more frequently before, as the European breeding population was much larger in the 19 <sup>th</sup> century and the 1960s. Some of the birds were ringed and turned out to originate from Ireland (Van den Berg & Bosman 1999).										
<b>Distribution</b>										
Most records come from the coast of Noord- and Zuid-Holland, where birds were often recorded from migration watch points. Several records originate from Zeeland, with a few, including the breeding female in 1982-85 in the Western Scheldt. Surprisingly, only one record originate from the Wadden Sea area: a bird seen on 15 September 1998 at De Marne, Groningen.										
<b>Trends</b>										
Records are reviewed and archived by the CDNA.										
<b>Current monitoring</b>										
No dedicated monitoring program exists , but given its status, any monitoring plan would be unrealistic.										
<b>Current measures</b>										
None										
<b>Additional monitoring needed</b>										
None										

### 3.2.8 *Uria aalge*

Names										
NL		Iberische zeekoet, zuidelijke zeekoet								
UK		Iberian murre, Iberian guillemot								
Scientific name		Uria aalge – Iberian population (syn: Uria aalge albionis, Uria aalge ibericus)								
Status										
Absent	X	Vagrant		Reintroduced		Few records		Rel. small population		Large population
Introduction										
The Iberian population of the guillemot is considered to be quasi-extinct (Munilla et al. 2007). No records of this species or species group are currently accepted by the CDNA (Dutch Rarity Committee) (e.g., Van den Berg & Bosman 1999). This is no surprise, considering identifying a vagrant individual of this taxon is impossible.										
Distribution										
Not applicable.										
Trends										
Not applicable.										
Current monitoring										
Any monitoring plan would be unrealistic.										
Current measures										
None										
Additional monitoring needed										
None										

### 3.2.9 *Uria lomvia*

Names										
NL		Kortbekzeekoet								
UK		Brünnich's Guillemot (thick-billed murre)								
Scientific name		Uria lomvia								
Status										
Absent		Vagrant	X	Reintroduced		Few records		Rel. small population		Large population
Introduction										
Brünnich's Guillemot is a very rare vagrant in the North Sea area, including the Netherlands (Van Bemmelen & Wielstra 2008). All but one record concerned birds washed ashore dead or moribund (Van den Berg & Bosman 1999). After 1999 one long(er) staying bird was observed in 2012. One individual was seen near Lauwersoog on 28 July, that was later seen in Den Helder, where it died on 13 August.										
Distribution										
All but one record concerned birds washed ashore along the coast of Noord- or Zuid-Holland – one of these was still alive but oiled and died a few days later (Van den Berg & Bosman 1999). The record from Schiermonnikoog, Friesland, concerned a fly-by record.										
Trends										
Records are reviewed and archived by the CDNA (Dutch Rarity Committee). No dedicated monitoring program exists, but given its status, any monitoring plan would be unrealistic. The decline in the number of records in the North Sea area may be real, considering the steep increase of observer effort over the last decades (Van Bemmelen & Wielstra 2008).										
Current monitoring										
No dedicated monitoring program exists, but given its status, any monitoring plan would be unrealistic.										
Current measures										
None										
Additional monitoring needed										
None										

### 3.2.10 Seabirds: overview

In Table 2 and Table 3 an overview is given of the status and monitoring programmes of seabirds.

Table 2. Status per species. This table shows the status of the species in some more detail than the overview tables.

Name_Sci	Vagrant	Occasional visitor	Common migrant and winter visitor	Breeding in NL
<i>Larus fuscus fuscus</i>	X	X?		
<i>Pagophila eburnea</i>	X			
<i>Polysticta stelleri</i>	X			
<i>Puffinus assimilis baroli</i> (auct.incert.)	X, but not recorded			
<i>Puffinus mauretanicus</i>		X		
<i>Rissa tridactyla</i>			X	X
<i>Sterna dougallii</i>	X			
<i>Uria aalge</i> – Iberian population (synonyms: <i>Uria aalge albionis</i> , <i>Uria aalge ibericus</i> )	X, but not recorded			
<i>Uria lomvia</i>	X			

Table 3. Overview of current monitoring programmes per species (ship/aircraft/land)

Name_Sci	ESAS	MWTL aerial surveys	No regular monitoring
<i>Larus fuscus fuscus</i>			X
<i>Pagophila eburnea</i>			X
<i>Polysticta stelleri</i>			X
<i>Puffinus assimilis baroli</i> (auct.incert.)			X
<i>Puffinus mauretanicus</i>	Few records	Few records	X
<i>Rissa tridactyla</i>	X	X	
<i>Sterna dougallii</i>			X
<i>Uria aalge</i> – Iberian population (synonyms: <i>Uria aalge albionis</i> , <i>Uria aalge ibericus</i> )			X
<i>Uria lomvia</i>			X



*Raja montagui* – Spotted ray

### 3.3 Fish

#### 3.3.1 *Acipenser sturio*

Names									
NL	Steur								
UK	Sturgeon								
Scientific name	<i>Acipenser sturio</i>								
Status									
Absent	Vagrant	Reintroduced	X	Few records	Rel. small population	Large population			
Introduction									
<p>Since 1955 the sturgeon has disappeared from Dutch rivers due to overfishing. Catches have declined since the 17-19<sup>th</sup> century (Van Emmerik 2004). It is estimated that a population of about 3000-4000 sturgeons lived in the Rhine from perhaps 1440-1900. They are vulnerable to fishing since males require about 8 years to reach sexual maturity and females 14 years (De Groot 2002). Between 1824-1852, on average 3000 sturgeons were caught per year. After 1960 no river catches of sturgeon in the Lower Rhine were reported (De Groot 2002). The combination of river pollution, river regulation and overfishing brought about the eventual collapse of the sturgeon population (refs in De Groot 2002).</p>									
Distribution									

Figure 6. Distribution of sturgeon, based on IMARES data.

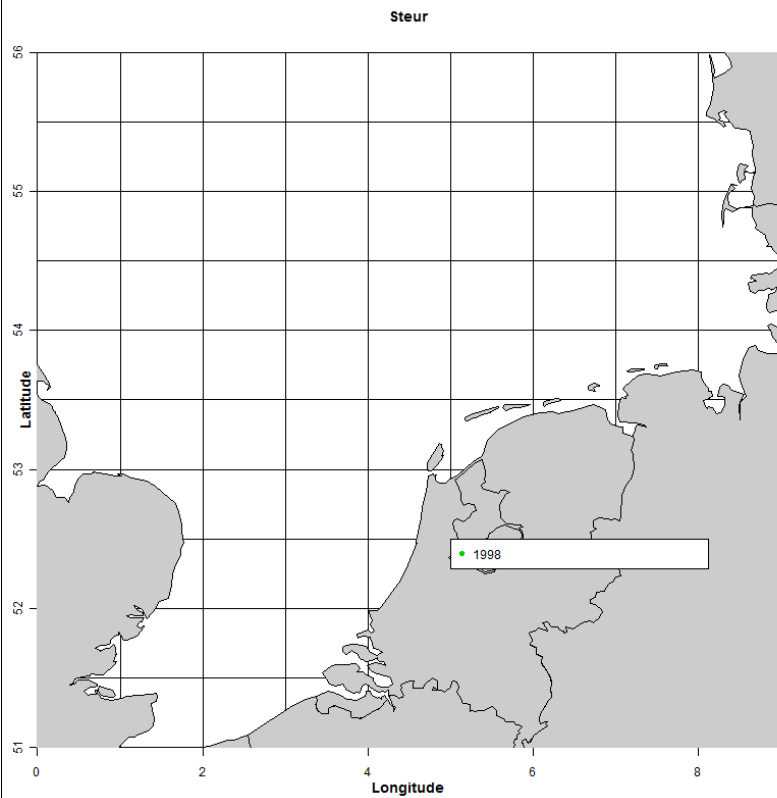
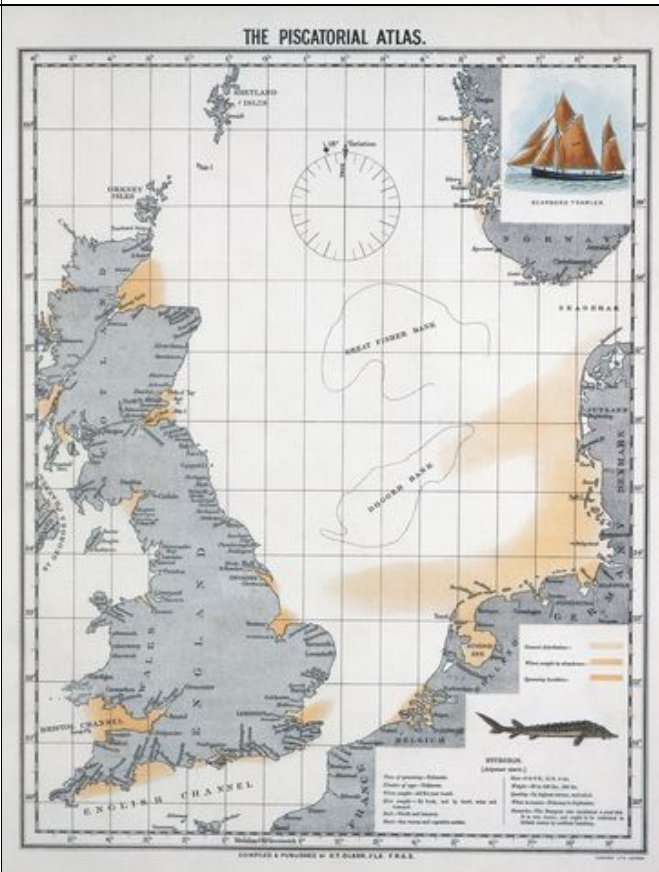


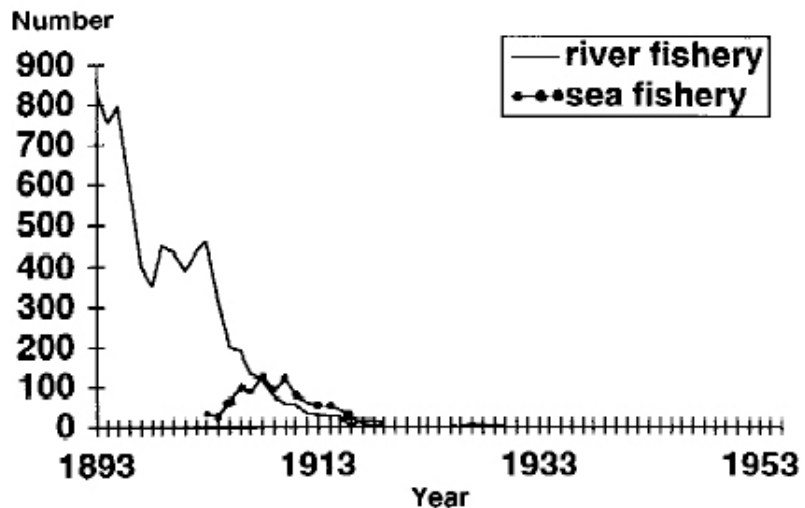
Figure 7. Distribution of sturgeon, as depicted by Olsen (Olsen 1883).



Trends



Figure 8. Number of sturgeon (*Acipenser sturio*) caught per year in the Lower Rhine and North Sea (De Groot 2002).



#### Current monitoring

- Several freshwater fish monitoring programmes will detect the sturgeon, if the population would increase.
- The sturgeons that were reintroduced in 2012 are detected via telemetry, to follow their migration routes.

#### Current measures

- Natura 2000 Annex II species
- There are some reintroduction programmes, but numbers of reintroduced sturgeons are low. For example in 2012, 47 sturgeons have been released in the Waal and Oude Maas rivers (<http://www.natuurbericht.nl/?id=8033>). Project information: [www.steureninederland.nl](http://www.steureninederland.nl)
- 

#### Additional measures needed

Recently a pilot introduction programme tries to rehabilitate the sturgeon in Dutch rivers, but we estimate that the combination of a long juvenile period (15 y for females) and a high fishing pressure in the coastal zone and North Sea, makes it unlikely that under the current situation this species will sufficiently survive to the reproductive stage (E. Winter, pers. com.). To get back the sturgeon in the Netherlands, we think that their reproduction habitat (riverine and estuarine) should be restored, migration barriers should be further removed, the fishery mortality in the North Sea should be lowered and sufficient numbers of individuals should be released as a starting stock.

- Weakest links: no stock present, mortality due to fisheries, riverine and estuarine habitat quality
- Proposed measure: reduce fisheries mortality as a precondition for next steps.

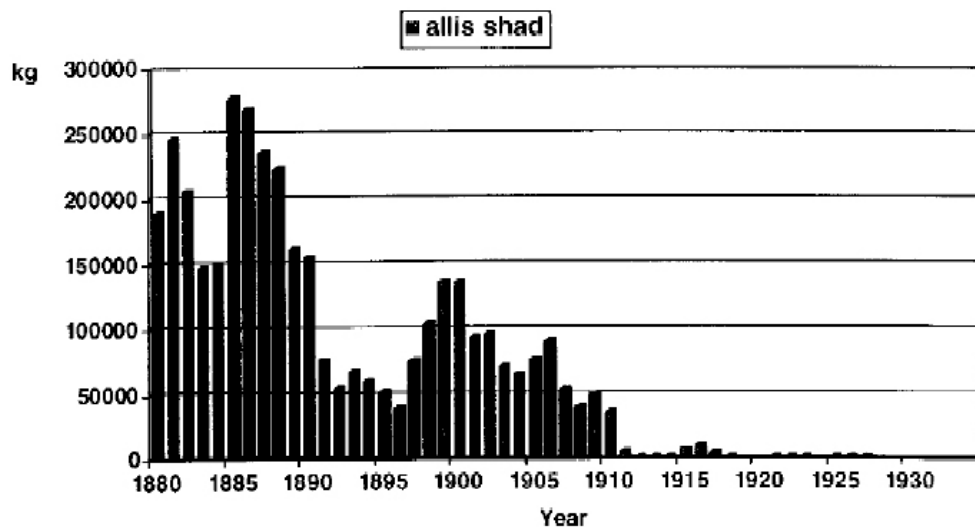
#### Additional monitoring needed

No

### 3.3.2 *Alosa alosa*

Names								
NL	Elft							
UK	Allis shad							
Scientific name	<i>Alosa alosa</i>							
Status								
Absent	Vagrant		Reintroduced		Few records	Rel. small population	X	Large population
Introduction								
<p>The allis shad used to be fished in rivers between the third week of March and the first week of June. (De Groot 2002). The species disappeared probably due to overfishing. Average landings for the Dutch river fisheries are: 207 423 individuals (1881–1890), 54 685 (1891–1900), 39 701 (1901–1910), 1249 (1911–1920) and finally 13 (1931–1936) individuals (Redeke 1938, De Groot 2002). In addition, spawning habitat destruction and pollution have negatively affected the population. The construction of the Delta works resulted in a destruction of nursery areas and limits migration. Another factor that may have contributed to the disappearance of the species is the hybridisation with twaite shad (refs in De Groot 2002).</p>								
Distribution								
North Sea (MSFD area)	X	Western Scheldt	X	Eastern Scheldt	X	Wadden Sea	X	
<p>Figure 9. Distribution of allis shad, based on IMARES data.</p>	<p style="text-align: center;"><b>Elft</b></p>							
	<p style="text-align: center;">Longitude</p>							
Trends (long term)								

Figure 10. Allis shad (*Alosa alosa*) landings in the Netherlands. (De Groot 2002)



**Trends (last decade)**

North Sea (MSFD area)	?	Western Scheldt	?	Eastern Scheldt	?	Wadden Sea	?
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**Current monitoring**

The allis shad is a species that is rare and therefore only caught in low numbers. It is a species which is difficult to identify, it can easily be confused with the much more abundant twaite shad (*Alosa fallax*). Population numbers based on catches can therefore be underestimated. When population numbers increase they would be caught in the current monitoring programs. The distribution can be measured with current monitoring programs, however, this is on a Dutch fresh water scale. The fish surveys at sea provide little information about these species, but they do give an indication of which coastal habitats are being used.

**Current measures**

Natura 2000 Annex II species

**Additional measures needed**

- Weakest link: river regulation works, Delta works (barriers to migration) and loss of habitat
- Proposed measure: improve conditions for migration (incl construction of fish passages) and riverine and estuarine habitat rehabilitation.

**Additional monitoring needed**

No

### 3.3.3 *Anguilla anguilla*

Names															
NL	Aal/paling														
UK	Eel														
Scientific name	<i>Anguilla anguilla</i>														
Status															
Absent	Vagrant	Reintroduced	Few records	Rel. small population	X	Large population									
Introduction															
The eel population has dramatically declined. The current glass eel recruitment is only 1-5% of what it used to be in the 1960-70s (Bierman et al. 2012). Current levels of mortality are not sustainable.															
Distribution															
North Sea (MSFD area)	X	Western Scheldt	X	Eastern Scheldt	X	Wadden Sea	X								
<p>Figure 11. Distribution of eel in marine waters, IMARES data.</p>	<p style="text-align: center;"><b>Aal</b></p>														
	<p><b>Trends (long term)</b></p> <p>The eel stock has dramatically declined: the current glass eel recruitment is only 1-5% of that in the 1960-70s (Bierman et al. 2012).</p>														
<p><b>Trends (last decade)</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #ff0000; color: white;">North Sea (MSFD area)</td> <td style="background-color: #ff0000; color: white;">-</td> <td style="background-color: #ff0000; color: white;">Western Scheldt</td> <td style="background-color: #ff0000; color: white;">-</td> <td style="background-color: #ff0000; color: white;">Eastern Scheldt</td> <td style="background-color: #ff0000; color: white;">-</td> <td style="background-color: #ff0000; color: white;">Wadden Sea</td> <td style="background-color: #ff0000; color: white;">-</td> </tr> </table>								North Sea (MSFD area)	-	Western Scheldt	-	Eastern Scheldt	-	Wadden Sea	-
North Sea (MSFD area)	-	Western Scheldt	-	Eastern Scheldt	-	Wadden Sea	-								
<p><b>Current monitoring</b></p> <p>Information about dispersion, stocks and trends can be derived from the annual fresh water fish monitoring programs (Kuijs et al. 2010).</p>															
<p><b>Current measures</b></p> <ul style="list-style-type: none"> <li>• EU Regulation for the Recovery of the Eel Stock (EC 1100/2007)</li> <li>• Dutch Eel Management Plan (Aal beheerplan) (Min EL&amp;I 2011)</li> <li>• Evaluation of management plan: Bierman et al. (2012)</li> </ul>															
<p><b>Additional measures needed</b></p>															

For eel, a number of measures are currently in place (Table 4), based on the eel management plan (Min EL&I 2011) that has been set-up according to the EU Regulation for the Recovery of the Eel Stock (EC 1100/2007). We consider the eel management plan as leading. However, as pointed out by Bierman et al. (2012), the plan has already been delayed. Of the 1800 most important migration barriers, 900 should have been solved before 2015 and the other 900 before 2027. Because of the financial crisis, this operation will be delayed.

- Weakest link: river regulation works, Delta works (barriers to migration)
- Proposed measure: prevent delay in the execution of the eel management plan (see above).

Table 4. Overview of measures for management of the Dutch eel (Min EL&I 2011, Bierman et al. 2012).

Nr	Measure	Period
1	Pumping stations/barriers Present: of the 1800 migration barriers, 900 will be solved before 2015 and the other 900 before 2027	present-2027
2	Hydroelectric plants: 35% reduction of mortality (for technical reasons, only 24% is possible)	2009
3	Fishery-free zones: realise a number of fishery free zones that are important for eel migration	2010
4	Sea angling: release eel alive	2009
5	Recreational fishery: ban on fishery with profession equipment in coastal waters	2011
6	Closure of eel fishery Sept-Dec	sept-dec 2009
7	Closed area to eel fisheries	2011
8	snigging	2009
9	restocking (glass eel and small eel)	2009
10	Angling inland waters: release eel alive	2009
11	Research artificial propagation	on-going
<b>Additional monitoring needed</b>		
No		

#### 3.3.4 *Centroscymnus coelolepis*

UK Portuguese dogfish, NL Portugese ijshaai. Not relevant, species does not occur in the Dutch part of the North Sea. No records were found in the IMARES database.

#### 3.3.5 *Centrophorus granulosus*

UK Gulper shark, NL Ruwe zwelghaai. Not relevant, species does not occur in the Dutch part of the North Sea. No records were found in the IMARES database.

#### 3.3.6 *Centrophorus squamosus*

UK Leafscale gulper shark, NL Schubzwelghaai. Not relevant, species does not occur in the Dutch part of the North Sea. Deep water species. No records were found in the IMARES database.

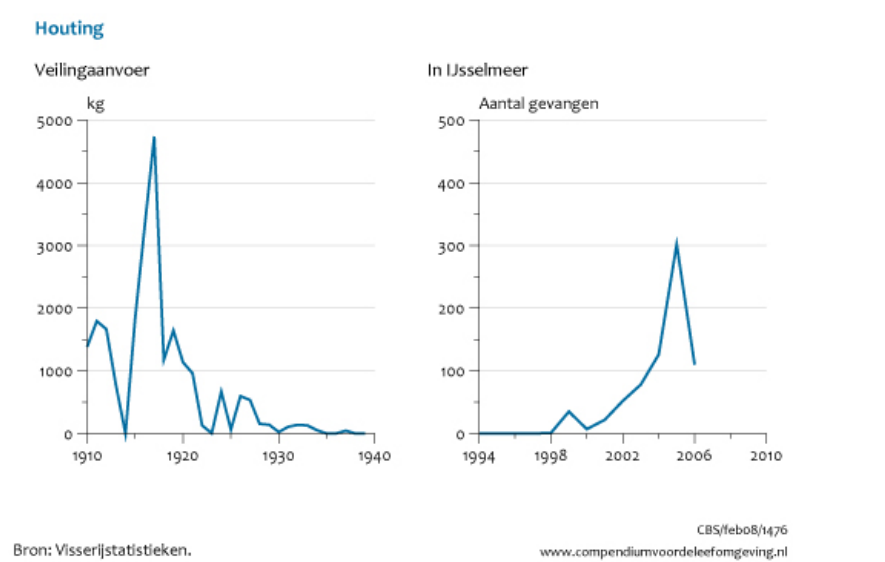
#### 3.3.7 *Cetorhinus maximus*

UK Basking shark. NL Reuzenhaai. Not relevant, species does not occur in the Dutch part of the North Sea. No records were found in the IMARES database.

### 3.3.8 *Coregonus oxyrinchus*

Names										
NL			Houting							
UK			Houting							
Scientific name			<i>Coregonus oxyrinchus</i>							
Status										
Absent		Vagrant		Reintroduced	X	Few records		Rel. small population		Large population
Introduction										
<p>The original population became extinct in the Netherlands in the 1940s due to fisheries, pollution, barriers and habitat loss. After successful reintroduction programmes in Germany (since the 1990s), the species now has successfully returned, although there is debate on the current status of the introduced houting (E. Winter pers com) (Borcherding et al. 2008, Borcherding et al. 2010).</p>										
Distribution										
North Sea (MSFD area)		Western Scheldt		Eastern Scheldt		Wadden Sea		X		
<p>Figure 12. Distribution of houting, based on IMARES data.</p>										
Trends (long term)										
Houting has gone extinct (see above) and is increasing.										

Figure 13. Data on houting. Left: auction data; left; catch data for Lake IJssel (<http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl1476-Houting.html?i=33-109>).



Trends (last decade)							
North Sea (MSFD area)		Western Scheldt		Eastern Scheldt		Wadden Sea	+
Current monitoring							
Freshwater monitoring programmes (Fyke).							
Current measures							
Natura 2000 Annex II species (but the species is not assigned to any Natura 2000 site in the Netherlands) (E. Winter pers. com)							
Additional measures needed							
<ul style="list-style-type: none"> <li>➤ Weakest link: river regulation works, Delta works (barriers to migration)</li> <li>➤ Measures: improve conditions for migration through construction of fish passages</li> </ul>							
Additional monitoring needed							
No							

3.3.9 *Dipturus batis*

Names										
NL	Vleet									
UK	Common skate									
Scientific name	<i>Dipturus batis</i>									
Status										
Absent (depleted)	X	Vagrant		Reintroduced		Few records		Rel. small population		Large population
Introduction										
The common skate used to be common in the Dutch part of the North Sea. The common skate is now considered to be depleted in the North Sea (ICES 2012).										
Distribution										
Not present										
<p>Figure 14. Distribution of common skate, based on IMARES data.</p>										



Figure 15.  
Distribution of  
common skate,  
as  
depicted by Olsen  
(Olsen 1883).



#### Trends

The common skate is not very common anymore. There are no records from the last 50 year in the fishery surveys. Probably the species is occasionally caught by fisherman (H.van Overzee, pers. com).

#### Current monitoring

Trends in catches within surveys and changes in distribution can be derived from the annual fish surveys. Due to low catch numbers it is however difficult to calculate population numbers.

#### Current measures

- EU Council regulation 43/2012 article 12.1 'It shall be prohibited for EU vessels to fish for, to retain on board, to tranship or to land the following species: common skate (*Dipturus batis*) in EU waters of ICES division IIa and ICES subareas III, IV, VI, VII, VIII, IX and X.' (EU 2012)
- EU Action Plan for the Conservation and Management of Sharks (Votier et al. 2008).
- Dutch Shark Action Plan
- In the Dutch Marine Strategy, one of the aims is to increase population size, population condition and distribution of vulnerable fish species including sharks, rays and skates (I&M & EL&I 2012).

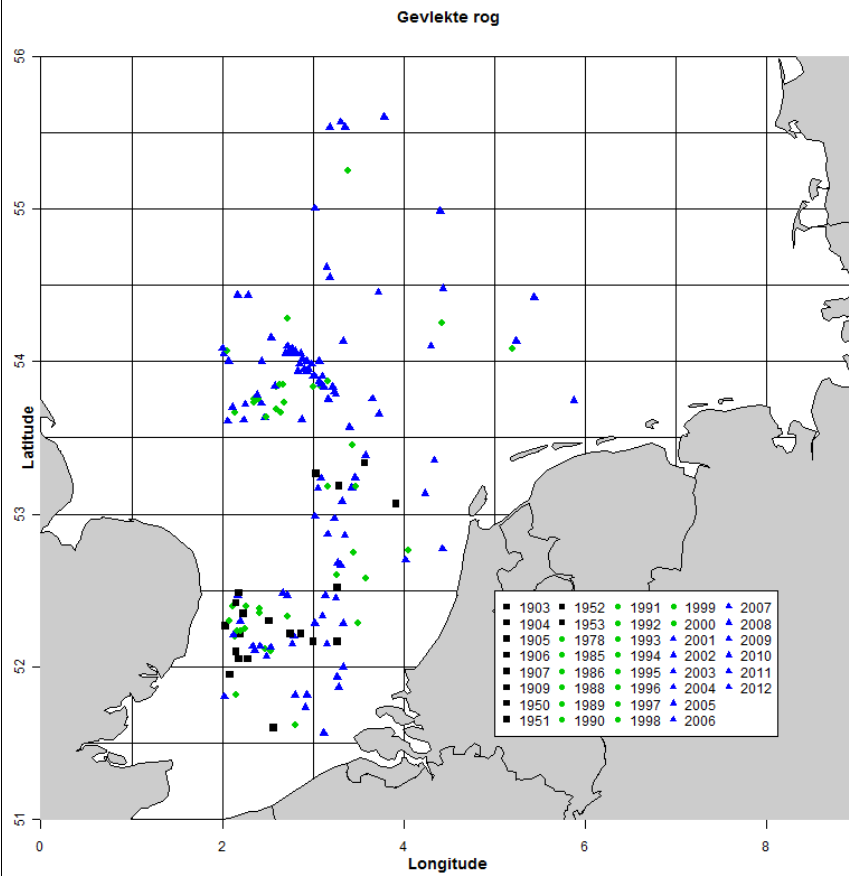
#### Additional monitoring needed

Potential improvements for monitoring this and other rare species are extensions to the observer programs on board commercial vessels, sampling the total catch for rare species. These observer programs have a much higher effort compared to the surveys and they occur year round.

3.3.10 *Raja montagui*

Names										
NL	Gevlekte rog									
UK	Spotted ray									
Scientific name	<i>Raja montagui</i> (syn. <i>Dipturus montagui</i> )									
Status										
Absent		Vagrant		Reintroduced		Few records		Rel. small population	X	Large population
Introduction										
Spotted ray and thornback ray are the most important commercial ray species in the landings of the Dutch beamtrawl fishery (Heessen 2010b).										
Distribution										
North Sea (MSFD area)	X	Western Scheldt				Eastern Scheldt			Wadden Sea	
<p>Figure 16. Distribution of spotted ray, based on fishery surveys (Daan et al. 2005).</p>										

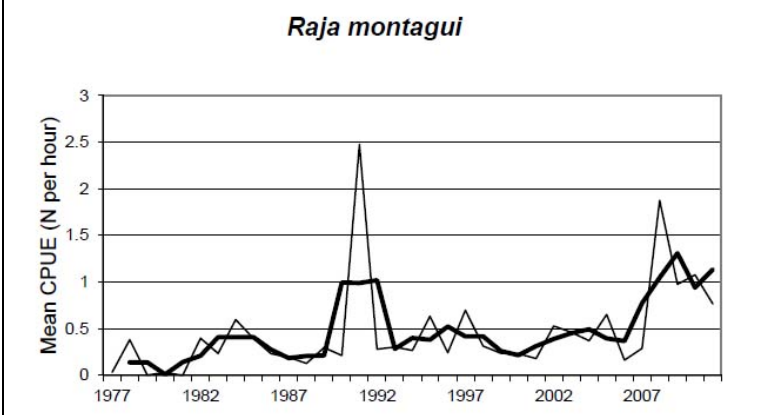
Figure 17. Distribution of spotted ray, based on IMARES data.



**Trends (long term)**

Spotted ray abundance is increasing since 2000 in the North Sea (Heessen 2010b, ICES 2012)

Figure 18. Average catch of spotted ray in the international North Sea during the IBTS survey (N/h) (ICES 2012).



**Trends (last decade)**

North Sea (MSFD area)	+	Western Scheldt		Eastern Scheldt		Wadden Sea	
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**Current monitoring**

Trends in catches within surveys and changes in distribution can be derived from the annual fish surveys. Due to low catch numbers it is however difficult to calculate population numbers.

**Current measures**

- Catches of this species have to be reported (EU 2012).
- EU Action Plan for the Conservation and Management of Sharks (Votier et al. 2008).
- Dutch Shark Action Plan
- In the Dutch Marine Strategy, one of the aims is to increase population size, population condition and distribution of vulnerable fish species including sharks, rays and skates (I&M & EL&I 2012).

**Additional measures needed**

The spotted ray is currently increasing in numbers (Heessen 2010b). A Dutch Shark Action Plan is made to implement the EU Action Plan for the Conservation and Management of Sharks (Votier et al. 2008). In the Dutch Marine Strategy, one of the aims is to increase population size, population condition and distribution of vulnerable fish species including sharks, rays and skates (I&M & EL&I 2012).

- Weakest link: fisheries
- Proposed measure: create protected areas without fisheries/reduce fisheries mortality

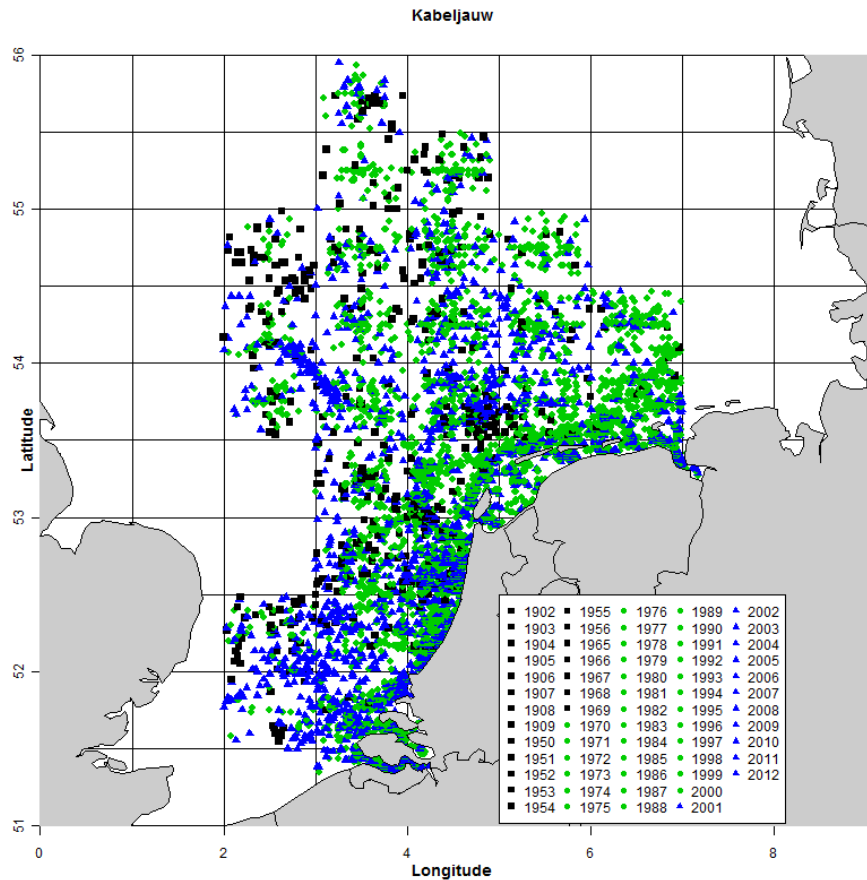
#### **Additional monitoring needed**

Potential improvements for monitoring this and other rare species are extensions to the observer programs on board commercial vessels, sampling the total catch for rare species. These observer programs have a much higher effort compared to the surveys and they occur year round.

3.3.11 *Gadus morhua*

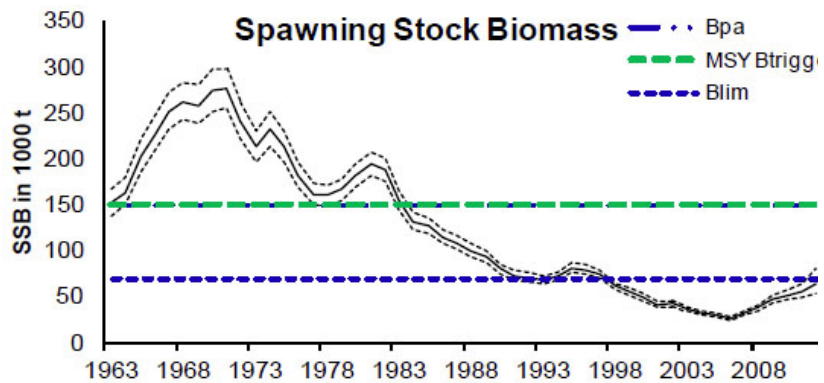
Names										
NL	Kabeljauw									
UK	Atlantic cod									
Scientific name	<i>Gadus morhua</i>									
Status										
Absent		Vagrant		Reintroduced		Few records	Rel. small population	X	Large population	
Introduction										
Important commercial fish species that has been overfished.										
Distribution										
North Sea (MSFD area)	X	Western Scheldt	X	Eastern Scheldt	X	Wadden Sea	X		X	

Figure 19. Distribution of cod, based on IMARES data.



Trends (long term)

Figure 20. Spawning biomass of Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak) from the 2012 ICES advice (<http://www.ices.dk/committe/acom/comwork/report/2012/2012/cod-347.pdf>).



There has been a gradual improvement in the status of the stock over the last few years. SSB has

increased from the historical low in 2006, but remains just below Blim and is still much lower than the historic stock.

Trends for cod are negative for the Dutch Continental Shelf (IBTS, 1991-2006), Wadden Sea (DFS 1980-2006) and Western Scheldt (DFS 1980-2006) (Meesters et al. 2009).

**Trends (last decade)**

North Sea (MSFD area)	0	Western Scheldt	0	Eastern Scheldt	0	Wadden Sea	0
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**Current monitoring**

Information about distribution, stocks and trends can be derived from the annual fish surveys.

**Current measures**

The EU–Norway agreement management plan was updated in December 2008 (Annex 6.4.2), and will be re-considered during 2012. The EU has adopted a long-term plan for this stock with the same aims (Council Regulation (EC) 1342/2008) (EU 2008a). In both plans fishing mortality (F) should be reduced to levels corresponding to 75% of F in 2008 in 2009 and 65% of F in 2008 in 2010. Until the long-term phase of the management plans has been reached, further annual reductions of 10% must be applied to achieve an F in 2013 equal to 35% of F2008.

**Additional measures needed**

No

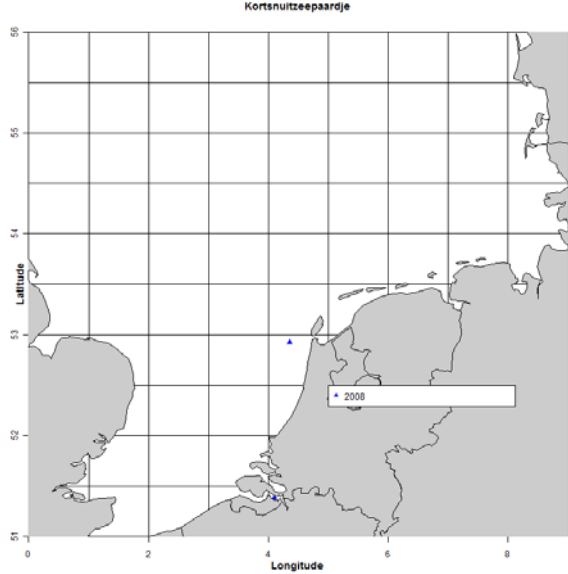
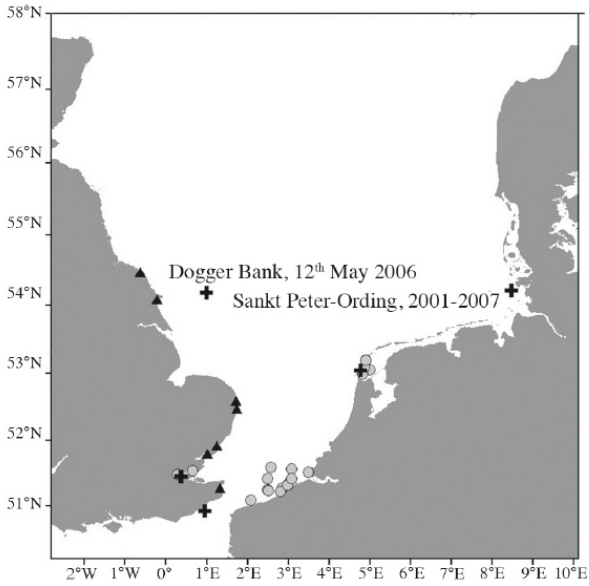
**Additional monitoring needed**

Cod is one of the target species of the survey programs and thus intensely monitored. However, cod is attracted by structures, e.g. rocks, wrecks and wind mills. Fish surveys do not monitor these locations, due to risks of damaging the nets. Monitoring near shore locations could be done by monitoring the catches of recreational fisheries on the wrecks.

### 3.3.12 *Hippocampus guttatus*

Names										
NL		Langsnuitzeepaardje								
UK		Long-snouted seahorse								
Scientific name		<i>Hippocampus guttatus</i> (syn <i>Hippocampus ramulosus</i> )								
Status										
Absent		Vagrant		Reintroduced		Few records	X	Rel. small population		Large population
Introduction										
Little is known for this species in the Netherlands. In former times (19 <sup>th</sup> century) it was confused with the short-snouted seahorse (Pinnegar et al. 2008). Some sightings have been reported for the Eastern Scheldt.										
Distribution										
North Sea (MSFD area)		Western Scheldt		Eastern Scheldt		X	Wadden Sea			
<p>Figure 21. Distribution of long-snouted seahorse (1 record), based on IMARES data.</p>										
Trends (long term)										
Not available										
Trends (last decade)										
North Sea (MSFD area)		Western Scheldt		Eastern Scheldt		?	Wadden Sea			
Current monitoring										
The species is not monitored. Stichting Anemoon reports sightings by scuba-divers.										
Current measures										
CITEX Annex II (restricted international trade) Flora and Fauna act										
Additional measures needed										
Probably measures taken for the restoration of seagrass beds will be beneficial for seahorses (see 3.6.16)										
Additional monitoring needed										
We recommend that systematic monitoring is set-up, e.g. by the Anemoon Foundation (scuba diving).										

### 3.3.13 *Hippocampus hippocampus*

Names									
NL		Kortsnuitzeepaardje							
UK		Short-snouted seahorse							
Scientific name		<i>Hippocampus hippocampus</i>							
Status									
Absent		Vagrant		Reintroduced		Few records	X	Rel. small population	Large population
Introduction									
<p>An overview of the distribution in the Central North Sea is given by Pinnegar et al. (2008). The Wadden Sea probably forms the northern distribution limit. Reports from the 19<sup>th</sup> century are confusing, since the species is mixed up with the other seahorse species. It is also not clear whether increased water temperatures due to climate have caused an increase in abundance of this southern species (Pinnegar et al. 2008).</p>									
Distribution									
North Sea (MSFD area)		X	Western Scheldt			Eastern Scheldt		X	Wadden Sea
									
<p>Figure 22. Distribution of short-snouted seahorse, based on IMARES data.</p>					<p>Figure 23. Distribution of short-snouted seahorse based on historical data (Pinnegar et al. 2008)</p>				
Trends (long term)									
<p>The Short-snouted seahorse is observed more often since the late 1980s, which is most likely related to the increase in water temperature and the lack of cold winters. Especially after 1997 (1996 was a very cold winter) till 2008 the observations had increased. The observations were mainly done by divers in the Eastern Scheldt and Western Scheldt, but also near the Zeelandbrug and in 2008 in surveys by IMARES (see map) and in the same year also by a commercial fishermen in the Wadden Sea. After the cold winters of 2009 and 2010 the number of observations dropped, but the Short-snouted seahorse was still seen in 2010 in the Oosterschelde (info Natuurbericht.nl door Stichting Anemoon), and a single observation is posted on www.waarneming.nl in 2011.</p>									
Trends (last decade)									
North Sea (MSFD area)		?	Western Scheldt			Eastern Scheldt		?	Wadden Sea
Current monitoring									
No monitoring on this species, only data available from scuba divers observations.									
Current measures									
CITEX Annex II (restricted international trade)									
Flora and Fauna act									
Additional measures needed									



Probably measures taken for the restoration of seagrass beds will be beneficial for seahorses (see 3.6.16)

**Additional monitoring needed**

We recommend that a systematic monitoring is set-up, e.g. by the Anemoon Foundation (scuba diving)

*3.3.14 Hoplostethus atlantius*

UK Orange roughy, NL Atlantische slijmkop. Not relevant, orange roughy is a deep sea species that does not occur in the Dutch part of the North Sea.

*3.3.15 Lamna nasus*

UK Porbeagle, NL Haringhaai. Not relevant, species does not occur in the Dutch part of the North Sea. One record is known from the IMARES database: one specimen caught in at 20 November 1903 at 52.317 N, 2.783 E.



*Petromyzon marinus* – sea lamprey

3.3.16 *Petromyzon marinus*

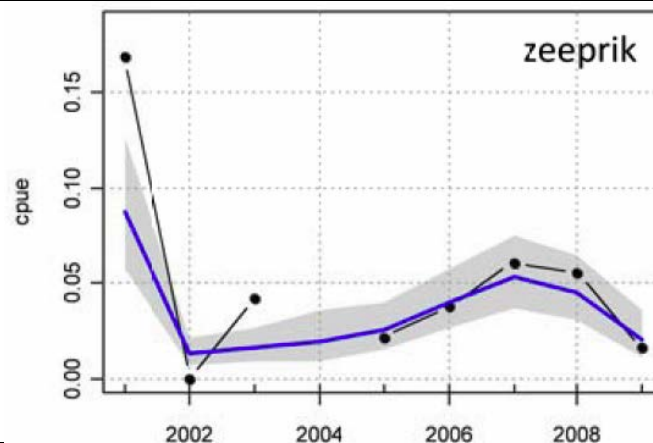
Names								
NL	Zeeprik							
UK	Sea lamprey							
Scientific name	<i>Petromyzon marinus</i>							
Status								
Absent	Vagrant	Reintroduced	Few records	Rel. small population	X	Large population		
Introduction								
The species has declined due to river regulation works, habitat destruction, etc. but seems to be stable now (Jansen et al. 2007). For more information, see the profile document ( <a href="http://www.synbiosys.alterra.nl/natura2000/documenten/profielen/soorten/profiel_soort_H1095.pdf">http://www.synbiosys.alterra.nl/natura2000/documenten/profielen/soorten/profiel_soort_H1095.pdf</a> )								
Distribution								
North Sea (MSFD area)	X	Western Scheldt	X	Eastern Scheldt	X	Wadden Sea	X	
<p>Figure 24. Distribution of sea lamprey, based on IMARES data.</p>		<p style="text-align: center;"><b>Zeeprik</b></p> <p>The map displays the distribution of sea lamprey (Zeeprik) in the North Sea region from 1973 to 2011. The y-axis represents Latitude (51 to 56) and the x-axis represents Longitude (0 to 8). Data points are marked with green circles and blue triangles. A legend indicates the years for each symbol: 1973, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1989, 1991, 1993, 1999, 2000, 2001, 2002, 2003, 2005, 2006, 2007, 2008, 2010, and 2011. The distribution is primarily concentrated along the Dutch coast and in the Wadden Sea area, with some points further north in the North Sea.</p>						
Trends (long term)								

The sea lamprey population in the rivers has declined after the construction of river regulation works. It was at its lowest point in the 1970s and 1980s. Since the 1990s the population is stable.

(refs in

[http://www.synbiosys.alterra.nl/natura2000/documenten/profielen/soorten/profiel\\_soort\\_H1095.pdf](http://www.synbiosys.alterra.nl/natura2000/documenten/profielen/soorten/profiel_soort_H1095.pdf))

Figure 25. Trend analyses for sea lamprey 2001-2009 for data from the monitoring of the Wadden Sea side of the Afsluitdijk (Kornwerderzand) (Kuijs et al. 2010). Cpue=catch per unit effort.



#### Trend (last decade)

North Sea (MSFD area)	0	Western Scheldt	0	Eastern Scheldt	0	Wadden Sea	0
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#### Current monitoring

The sea lamprey is a parasitic fish that attaches itself to bigger fish and sea mammals. Because of this, the catchability is low. In the younger life stages, they can easily escape through the nets because of their bodyshape. Population numbers based on catches can therefore be highly underestimated. The distribution can be measured with current fresh water fish monitoring programs, however, this is on a Dutch fresh water scale. The fish surveys at sea provide little information about these species, but they do give an indication of which coastal habitats are being used.

#### Current measures

Natura 2000 Annex II species.

#### Additional measures needed

- Weakest link: river regulation works, Delta works (barriers to migration).
- Proposed measure: improve conditions for migration

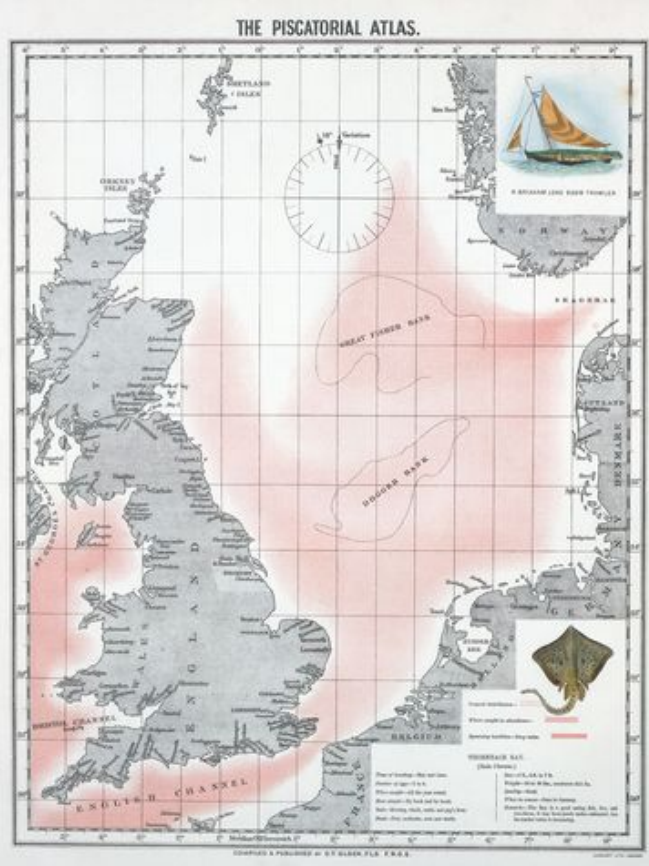
#### Additional monitoring needed

No

3.3.17 *Raja clavata*

Names										
NL		Stekelrog								
UK		Thornback ray								
Scientific name		<i>Raja clavata</i>								
Status										
Absent		Vagrant		Reintroduced		Few records		Rel. small population	X	Large population
Introduction										
<p>At the end of the 19<sup>th</sup> century the thornback ray was so common that it was targeted by Dutch fisheries. Until the first half of the 20<sup>th</sup> century, it was the most common ray species in the southern North Sea. On the Dutch Continental Shelf, they currently occur in small numbers and occasionally juveniles are caught in the coastal zone. Thornback ray and spotted ray are the most important commercial ray species in the landings of the Dutch beamtrawl fishery (Heessen 2010b).</p>										
Distribution										
North Sea (MSFD area)		X	Western Scheldt			Eastern Scheldt			Wadden Sea	
<p>Figure 26. Distribution of thornback ray, based on IMARES data.</p>										

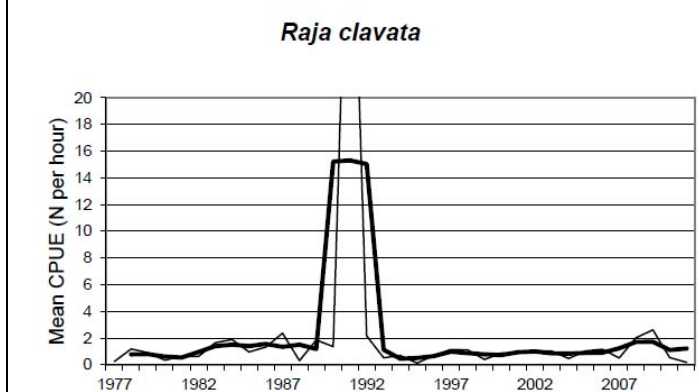
Figure 27. Distribution of thornback ray, as depicted by Olsen (Olsen 1883).



**Trends (long term)**

Since the 1970s numbers caught in the fish surveys are stable (ICES 2012)..

Figure 28. Average catch of thornback ray in the international North Sea during the IBTS survey (N/h). The 1991 peak is due to a single large catch (ICES 2012).



**Trends (last decade)**

North Sea (MSFD area)	0	Western Scheldt		Eastern Scheldt		Wadden Sea
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**Current monitoring**

Trends in catches within surveys and changes in dispersal can be derived from the annual fish surveys. Due to low catch numbers it is however difficult to calculate population numbers.

**Current measures**

- EU Action Plan for the Conservation and Management of Sharks (Votier et al. 2008).
- Dutch Shark Action Plan
- In the Dutch Marine Strategy, one of the aims is to increase population size, population condition and distribution of vulnerable fish species including sharks, rays and skates (I&M & EL&I 2012).

**Additional measures needed**

- Weakest link: fisheries
- Proposed measure: create protected areas without fisheries/reduce fisheries mortality

**Additional monitoring needed**

Potential improvements for monitoring this and other rare species are extensions to the observer programs on board commercial vessels, sampling the total catch for rare species. These observer programs have a much higher effort compared to the surveys and they occur year round.

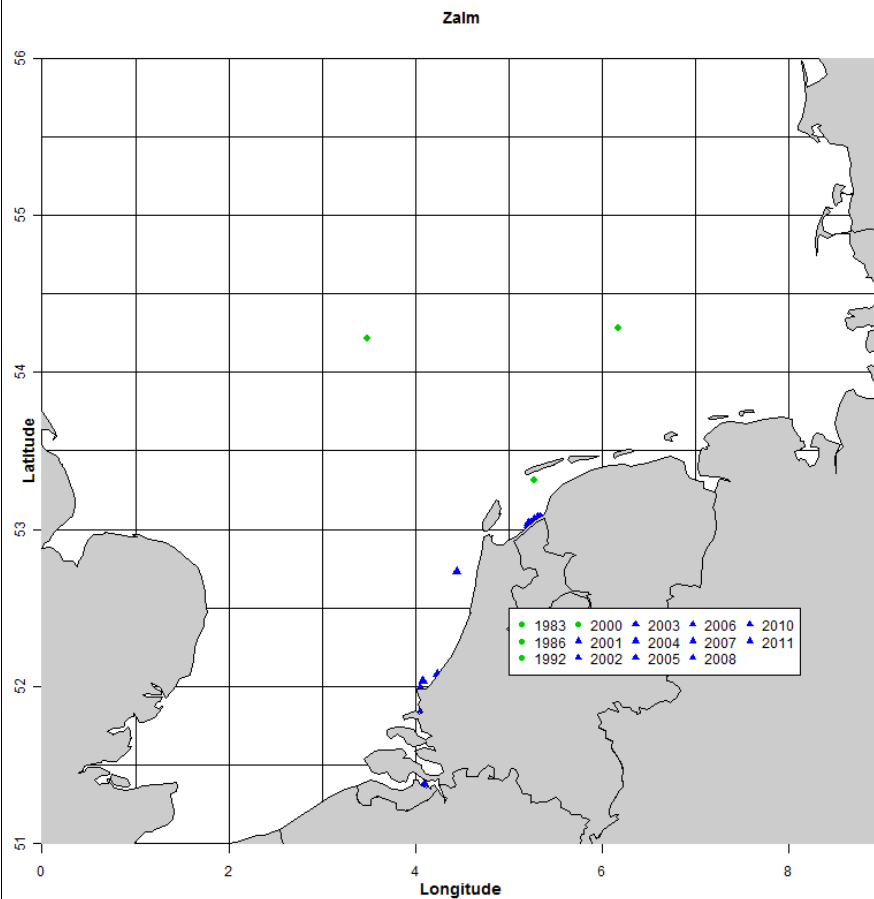
### 3.3.18 *Rostroraja alba*

UK White skate, NL Witte rog. Not relevant, species does not occur in the Dutch part of the North Sea. No records were found in the IMARES database.

### 3.3.19 *Salmo salar*

Names										
NL	Zalm									
UK	Salmon									
Scientific name	<i>Salmo salar</i>									
Status										
Absent		Vagrant		Reintroduced	X	Few records		Rel. small population		Large population
Introduction										
<p>The salmon catches strongly declined at the end of the 1920s. Experiments to rehabilitate the Rhine population started as early as 1861. After the ratification of the Salmon Convention in 1886, enormous numbers of fry and parr (young salmon) were released into the Rhine. In Switzerland and Germany, restocking operations involved about 160 million young salmon in the period 1879-1912, and in addition, about 13 million young salmon were rereleased into the Rhine in the Netherlands over the period 1861-1897 (De Groot 2002). The restocking programmes could not prevent a decline in the 20<sup>th</sup> century, when additional factors such as degradation of spawning and nursery areas, river correction for shipping, building of sluices and hydropower dams, extraction of gravel and sand, and pollution contributed to the disappearance of the species (De Groot 2002). See also the profile document: <a href="http://www.synbiosys.alterra.nl/natura2000/documenten/profielen/soorten/profiel_soort_H1106.pdf">http://www.synbiosys.alterra.nl/natura2000/documenten/profielen/soorten/profiel_soort_H1106.pdf</a></p>										
Distribution										
North Sea (MSFD area)	X	Western Scheldt	X	Eastern Scheldt		Wadden Sea	X			

Figure 29. Distribution of salmon, based on IMARES data.



**Trends**

The monitoring series near Korwerderzand (Wadden Sea) shows that salmon is caught in low numbers of less than 20/year and that trends are uncertain (Kuijs et al. 2010).

Figure 30. Dutch salmon catches in the river Rhine 1863-1953 (De Groot 2002).

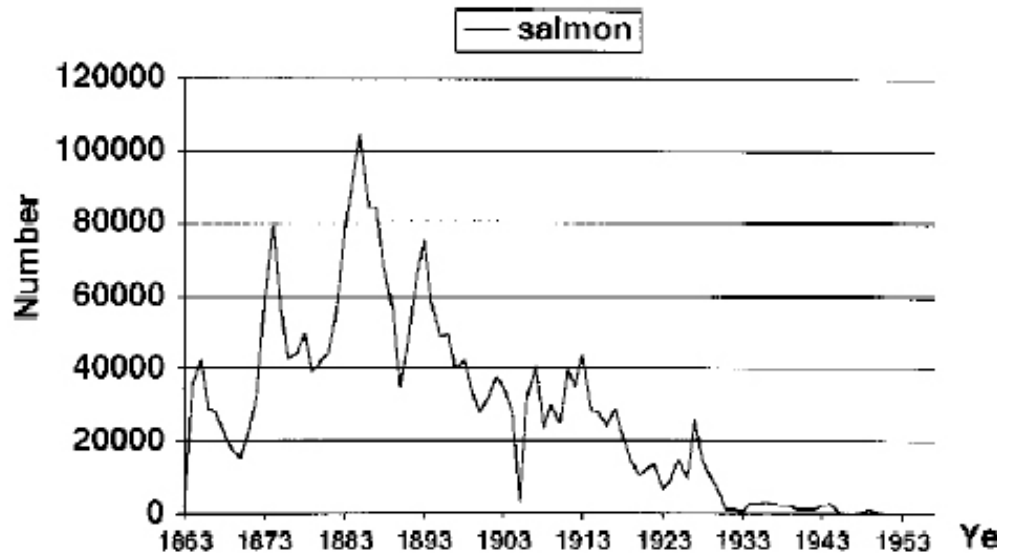
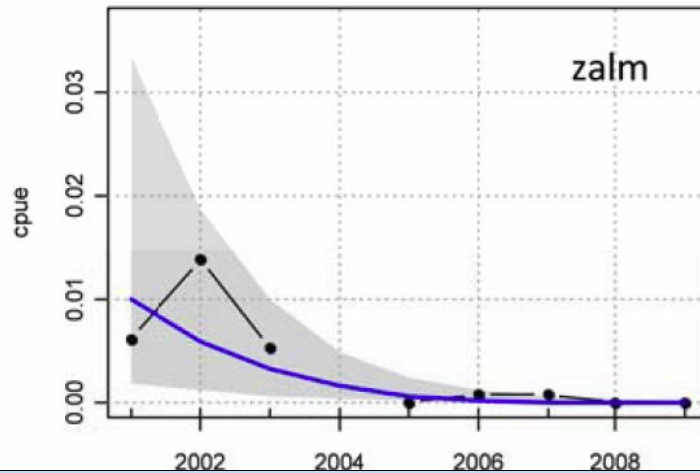


Figure 31. Trend analysis for salmon. Data from the monitoring of the Wadden Sea side of the Afsluitdijk (Kornwerderzand) 2001-2009. Cpue=catch per unit effort.



**Trends (last decade)**

North Sea (MSFD area)	?	Western Scheldt	?	Eastern Scheldt		Wadden Sea	?
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**Current monitoring**

Freshwater monitoring

**Current measures**

Natura 2000 Annex II species

**Additional measures needed**

The past years the water quality in the river Rhine has considerably improved and migratory opportunities past barriers were improved.

The restocking possibilities depend on a number of factors. First, the abiotic conditions in the rivers should be suitable. In addition, large quantities of suitable young salmon should be released. Since indigenous fish are more suitable for rearing than fish originating from e.g. Norway or other countries, it is important to choose the right stock (De Groot 2002). To restore populations of salmon current barriers on migration routes should be opened (see also eel).

- Weakest link: river regulation works, Delta works (barriers to migration), bycatch in fisheries
- Proposed measure: improve conditions for migration, reduce bycatch in fisheries.

**Additional monitoring needed**

No



Erwin Winter

*Salmo salar* – Atlantic salmon



### 3.3.20 *Squalus acanthias*

Names									
NL		Doornhaai							
UK		Spiny dogfish/spurdog							
Scientific name		<i>Squalus acanthias</i>							
Status									
Absent	Vagrant		Reintroduced		Few records		Rel. small population	X	Large population
Introduction									
Until the 1960-1970s the spurdog was the most common shark in the Dutch part of the North Sea (Heessen 2010b). After that period, the population size has strongly decreased.									
Distribution									
North Sea (MSFD area)		X	Western Scheldt		Eastern Scheldt		Wadden Sea		
<p>Figure 32. Distribution of spurdog, based on IMARES data.</p>									
Trends (long term)									
Catches and population sizes have strongly decreased since the 1960s (Heessen 2010b).									
Trends (last decade)									
North Sea (MSFD area)		-	Western Scheldt		Eastern Scheldt		Wadden Sea		
Current monitoring									
<p>Trends in catches within surveys and changes in distribution can be derived from the annual fish surveys. It is however difficult to calculate population numbers due to low catch numbers in surveys and species misreporting that may occur in landings.</p> <p>ICES provides advice for the spurdog stock in the North East Atlantic based on survey results and catch data. Given that spurdog spawning biomass and recruitment are currently the lowest observed and that spurdog is a long-lived, slow-growing, and late-maturing species and therefore particularly vulnerable to fishing mortality, ICES advises on the basis of the precautionary approach that there should be no targeted fishery in 2012 and that catches in mixed fisheries should be reduced to the lowest possible level</p>									

(ICES 2012).

#### Current measures

- EU Council regulation 43/2012: Catches are not allowed: 'When accidentally caught, these species shall not be harmed. Specimens shall be promptly released' (EU 2012).
- EU Action Plan for the Conservation and Management of Sharks (Votier et al. 2008).
- Dutch Shark Action Plan
- In the Dutch Marine Strategy, one of the aims is to increase population size, population condition and distribution of vulnerable fish species including sharks, rays and skates (I&M & EL&I 2012).

#### Additional measures needed

A Dutch Shark Action Plan is made to implement the EU Action Plan for the Conservation and Management of Sharks (Votier et al. 2008). In the Dutch Marine Strategy, one of the aims is to increase population size, population condition and distribution of vulnerable fish species including sharks, rays and skates (I&M & EL&I 2012).

- Weakest link: fisheries
- Proposed measure: create sufficiently large protected areas without fisheries/reduce fisheries mortality.

#### Additional monitoring needed

As long as spurdog stays a low abundant species, monitoring of the species will be difficult as is the case with most rare species. In this case the survey catches of the species will be low, but the surveys will show an increase if that occurs. Potential improvements for monitoring this and other rare species are extensions to the observer programs on board commercial vessels, sampling the total catch for rare species. These observer programs have a much higher effort compared to the surveys and they occur year round.



*Squalus acanthias* - spurdog

### 3.3.21 *Squatina squantina*

UK Angel shark, NL Zee-engel. Not relevant, species does currently not occur in the Dutch part of the North Sea (Heessen & Ellis 2009). No records were found in the IMARES database.

### 3.3.22 *Thunnus thynnus*

Names									
NL		Blauwvin tonijn							
UK		Bluefin tuna							
Scientific name		<i>Thunnus thynnus</i>							
Status									
Absent (disappeared)	X	Vagrant		Reintroduced		Few records		Rel. small population	Large population
Introduction									
Species does not occur in the Dutch part of the North Sea. In the first half of the 20 <sup>th</sup> century, however, schools of tuna were seen and fished at on the Dogger Bank (MacKenzie & Myers 2007). No records were found in the IMARES database.									
Trends									
Disappeared after the 1960s (MacKenzie & Myers 2007)									
Current monitoring									
None									
Current measures									
None									
Additional measures needed									
<ul style="list-style-type: none"> <li>➤ Weakest link: fisheries in other areas</li> <li>➤ Proposed measure: a worldwide ban on blue tuna fisheries.</li> </ul>									
Additional monitoring needed									
None									

## 3.4 Reptiles

### 3.4.1 *Caretta caretta*

UK Loggerhead turtle, NL Onechte karetschildpad. Not present in the Dutch North Sea. Five strandings and sightings are known since 1954 ([www.ecomare.nl](http://www.ecomare.nl))

### 3.4.2 *Dermochelys coriacea*

UK Leatherback turtle, NL Lederschildpad. Not naturally present in the Dutch North Sea. A number of strandings and sightings are known (about 25 since the 1960s) ([www.ecomare.nl](http://www.ecomare.nl)).

### 3.5 Marine mammals

#### 3.5.1 *Balaena mysticetus*

UK Bowhead whale, NL Groenlandse walvis. Not present in the Dutch North Sea.

#### 3.5.2 *Balaenoptera musculus*

UK Blue whale, NL Blauwe vinvis. Not present in the Dutch North Sea.

#### 3.5.3 *Eubalaena glacialis*

UK Northern right whale, NL Noordkaper.

Names									
NL		Noordkaper							
UK		Northern right whale							
Scientific name		<i>Eubalaena glacialis</i>							
Status									
Absent (disappeared)	X	Vagrant		Reintroduced		Few records		Rel. small population	Large population
Introduction									
The right whale is not present in the Dutch North Sea, although in the Middle Ages it occurred in the southeastern North Sea and probably also in the Wadden Sea (Wolff 2000, Lotze 2005). The world population is only a few hundred individuals (refs in <a href="http://www.marinespecies.org/cetacea/aphia.php?p=taxdetails&amp;id=159023">http://www.marinespecies.org/cetacea/aphia.php?p=taxdetails&amp;id=159023</a> ).									
Trends									
Disappeared after the Middle Ages (Wolff 2000, Lotze 2005).									
Current monitoring									
None									
Current measures									
Not relevant for the Netherlands									
Additional measures needed									
<ul style="list-style-type: none"> <li>➤ Weakest link: ship strikes and entanglement with fishing gear in their current distribution</li> <li>➤ Proposed measure: none, the population should first recover in other areas.</li> </ul>									
Additional monitoring needed									
None									

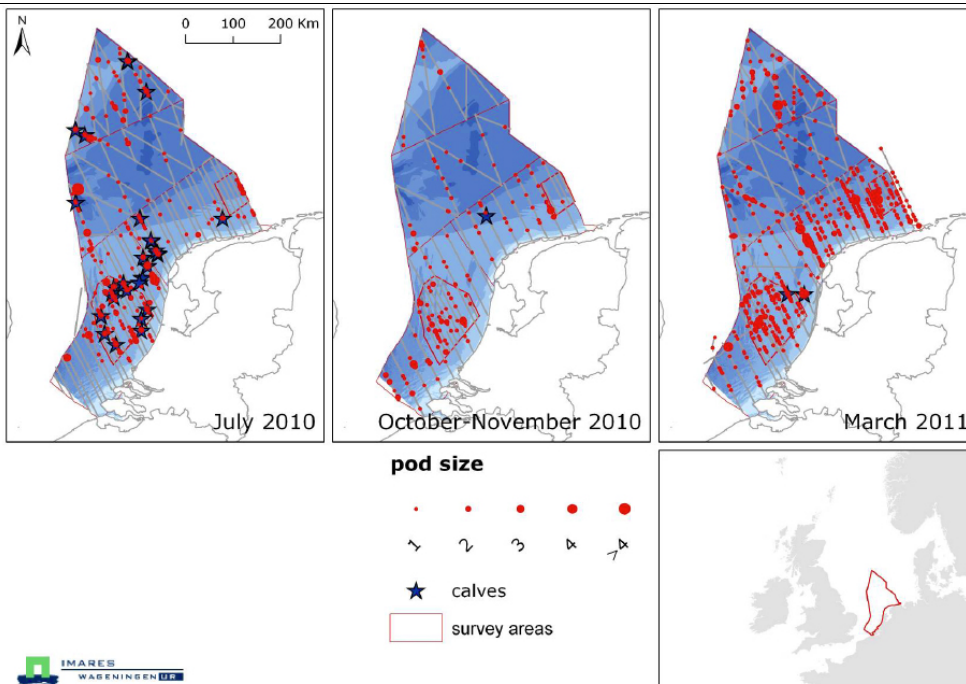


*Phocoena phocoena* - Harbour porpoise (photo: Wouter Jan Strietman)

#### 3.5.4 *Phocoena phocoena*

Names										
NL	Bruinvis									
UK	Harbour porpoise									
Scientific name	Phocoena phocoena									
Status										
Absent		Vagrant		Reintroduced		Few records		Rel. small population	Large population	X
Introduction										
<p>Following a decrease after the 1950s, and being locally extinct in the 1960-1980s, the harbour porpoise numbers have increased markedly in Dutch waters during the last decades. Current estimates in the Dutch Continental Shelf during the spring peak (March) are around 86,000 individuals (49,000-165,000: 95% Confidence Interval). For July, estimates are 26,000 (C.I. 14,000-54,000) and for October/November estimates are 30,000 (C.I. 16,000-59,000) (Geelhoed et al. 2011a). In the Eastern Scheldt, a small resident population of about 40-60 animals has been counted (<a href="http://www.rugvin.nl">www.rugvin.nl</a>). The species also occurs in the Wadden Sea and in the Western Scheldt area .</p>										
Distribution										
North Sea (MSFD area)	X	Western Scheldt	X	Eastern Scheldt	X	Wadden Sea	X			

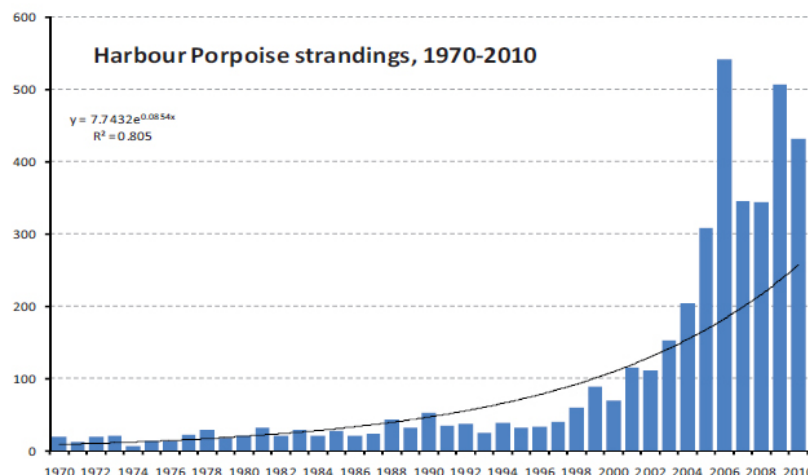
Figure 33. Harbour porpoise numbers as counted in 2010-2011 (Geelhoed et al. 2011a)



### Trends (long term)

The harbour porpoise population in the Dutch North Sea has increased since the 1990s, while the total population size in the international North Sea does not seem to have changed (Camphuysen 2004, SCANS II 2008, Camphuysen & Siemensma 2011).

Figure 34. Harbour porpoise strandings, reflecting the increased population size (Camphuysen & Siemensma 2011) (see also [www.walvisstrandingen.nl](http://www.walvisstrandingen.nl))



### Trends (last decade)

North Sea (MSFD area)	+	Western Scheldt	+	Eastern Scheldt	+	Wadden Sea	+
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### Current monitoring

There are several monitoring programs: MWTL (aerial seabird survey), monitoring of strandings, Land-based surveys by the Club van Zeetrekwaarnemers (seawatchers, Dutch Seabird Group), etc. (Camphuysen & Siemensma 2011). However, the most accurate monitoring is a dedicated aerial monitoring program, currently carried out on a project basis. In the future, the monitoring should become part of standard Natura 2000/MSFD monitoring program.

### Current measures

Within the framework of Natura 2000 and MSFD measures are being developed. In 2011 the Harbour Porpoise Conservation plan has been developed (Camphuysen & Siemensma 2011), which serves as a basis for conservation measures and for further research.

### Additional measures needed

For the harbour porpoise a national Conservation Plan has been finalised in 2011 (Camphuysen & Siemensma 2011). The proposed mitigation measures focus on bycatch and underwater noise.

- Weakest link: bycatch, underwater noise

- Proposed measure: see below

Table 5. Suggested mitigation measures for harbour porpoise (Camphuysen & Siemensma 2011).

<b>Bycatch</b>
Investigate alternative gear other than set-nets and/or investigate modification of set-nets.
Controlled use of pingers when bycatch is identified
Facilitate bycatch landing
Restrictions in recreational fisheries, control illegal fisheries
Amend EC 812/2004
Monitor and control compliance fisheries restrictions
<b>Underwater noise (detonation, seismic, piling)</b>
Develop a system of standards for loud explosive sounds
License and guidelines seismic surveys, pile-driving, underwater explosions
Establish porpoise observer schemes before during and after
Notification strandings network prior to acoustic impacts
Reduce noise using bubble curtains, solid barriers, other solutions if proven to be effective
Alert animals ramping up sounds, use acoustic deterrents
Avoid explosives and use an alternative method for wind farm demolition
<b>Additional monitoring needed</b>
The harbour porpoise is currently monitored with bimonthly aerial counts (MWTl) as part of a long term MWTl survey designed for birds and via a number of BO-projects, partly in relation to offshore wind energy. We expect the harbour porpoise monitoring to become part of the regular monitoring programme for the MSFD/N2000.

### 3.6 Habitats

#### 3.6.1 Intertidal *Mytilus edulis* beds on mixed and sandy sediments

Names										
NL		Littorale mosselbanken								
UK		Intertidal <i>Mytilus edulis</i> beds on mixed and sandy sediments								
Status										
Absent		Vagrant		Reintroduced		Few records		Rel. small area	Large area	X
Introduction										
<p>OSPAR definition:  <i>EUNIS Code: A2.7211 and A2.7212</i>  <i>National Marine Habitat Classification for UK &amp; Ireland code: LS.LMX.LMus.Myt.Mx and LS.LMX.LMus.Myt.Sa</i></p> <p><i>Definition for habitat mapping</i>  <i>Sediment shores characterised by beds of the mussel Mytilus edulis occur principally on mid and lower shore mixed substrata (mainly cobbles and pebbles on muddy sediments) but also on sands and muds. In high densities (at least 30% cover) the mussels bind the substratum and provide a habitat for many infaunal and epibiota species. This habitat is also found in lower shore tide-swept areas, such as in the tidal narrows of sealochs. A fauna of dense juvenile mussels may be found in sheltered firths, attached to algae on shores of pebbles, gravel, sand, mud and shell debris with a strandline of fucoïds. Mussel beds on intertidal sediments have been reported all along the coast of Europe, particularly in UK, France, Netherlands and Germany. (<a href="http://qsr2010.ospar.org/media/assessments/Species/p0010_supplements/CH10_03_Intertidal_mytilus_edulis.pdf">http://qsr2010.ospar.org/media/assessments/Species/p0010_supplements/CH10_03_Intertidal_mytilus_edulis.pdf</a>)</i></p> <p>Mussel beds are an important part of the ecosystem in the Dutch Wadden Sea. At the end of the 1970s about 4200 ha of mussel beds present in the Wadden Sea. Because of fisheries and severe winters, the area declined in the 1980s to 650 ha in 1987. Between 1991-1994 less than 200 ha were present. Since then mussel beds have gradually increased and were estimated to cover about 1400 ha in 2009 and 2010 (refs in Fey et al. 2010).</p>										
Distribution										
North Sea (MSFD area)			Western Scheldt			Eastern Scheldt		Wadden Sea		X
Mussel beds occur in the Dutch Wadden Sea. Biogenic structures like mussel beds are a characteristic feature for the (sub) HD habitat types H1110A , H1140A, H1130 and H1160										



Ligging van gekarteerde mosselbanken in het voorjaar van 2011  
Waddenzee

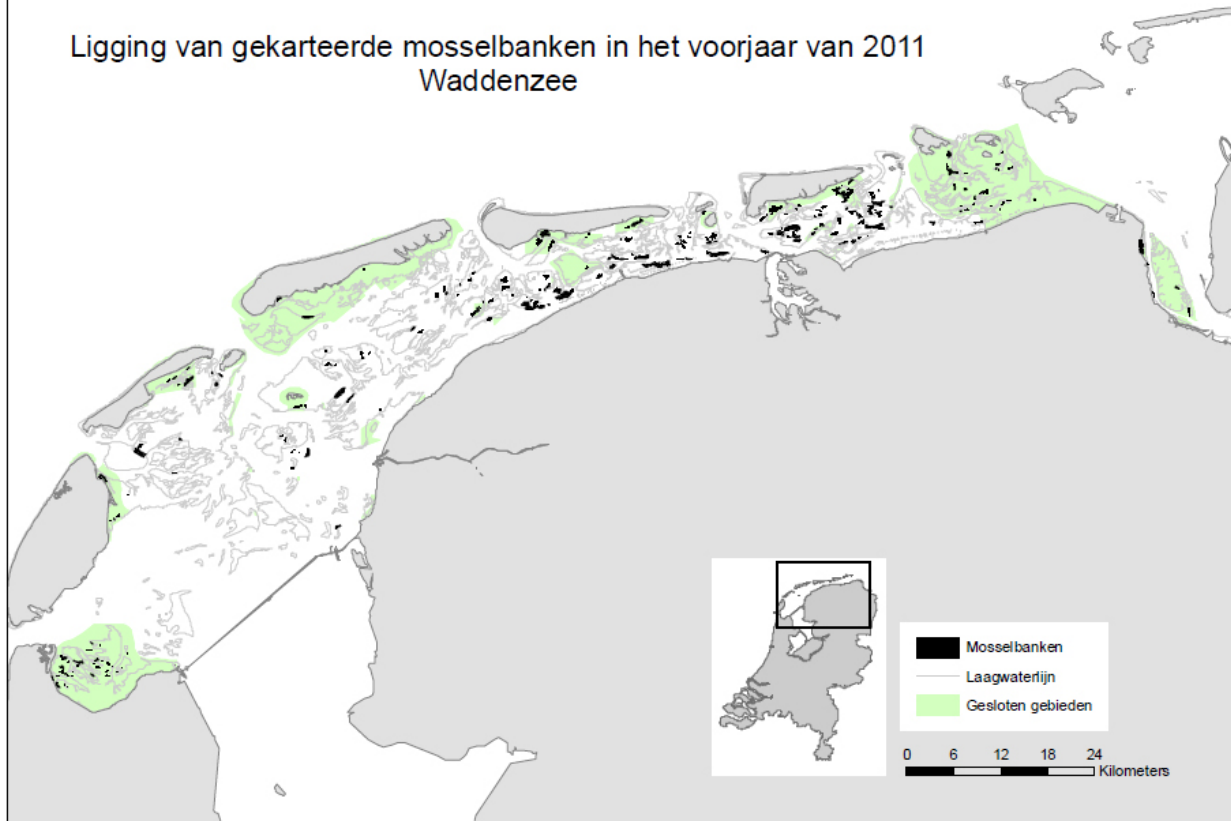


Figure 35. Distribution of intertidal musselbeds in the Dutch Wadden Sea in spring 2011 (Van Zweeden et al. 2012).

**Trends (long term)**

In the 1980's the area of mature intertidal mussel beds declined. In the period 1991-1993 nearly all littoral beds disappeared in the Dutch Wadden Sea. Since the late 1990's the area of mussel beds in the Dutch Wadden Sea is increasing (Nehls et al. 2009).

Figure 36. Trends of blue mussel biomass (t) in the Dutch Wadden Sea (Nehls et al. 2009)

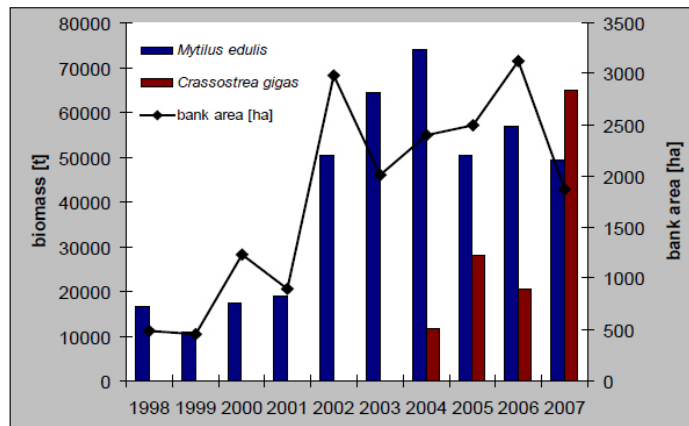
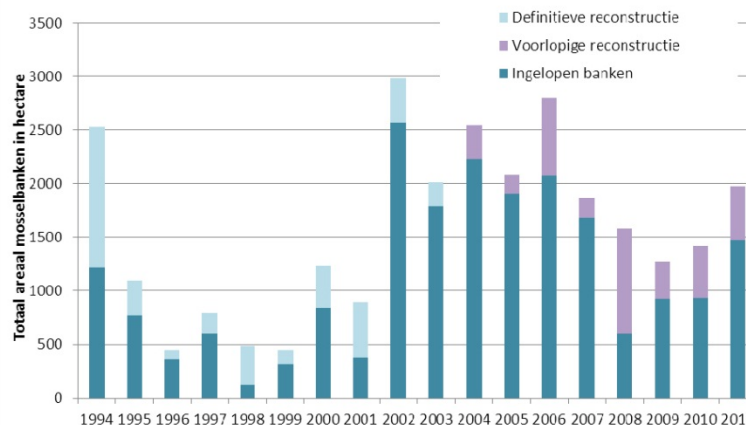


Figure 37. Trends of intertidal mussel beds area (ha) in the Dutch Wadden Sea. Dark: measured beds, lighter: reconstructed bed (Van Zweeden et al. 2012)



**Trends (last decade)**

North Sea (MSFD area)	Western Scheldt	Eastern Scheldt	Wadden Sea	0
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**Current monitoring**

In the WOT mussel survey all mature mussel beds in the Dutch Wadden Sea are being measured using GPS. The height, density and age structure of the bed are determined.

**Current measures**

- Mussel beds are part of HD habitatypes H1130, H1140, H1160.
- Policy decision shellfish fisheries 2005-2020 (Min LNV 2004): Fisheries on mussels is restricted and under conditions.
- Convention on mussel seed fisheries (2008) (In Dutch: Convenant transitie mosselsector en natuurherstel Waddenzee) (VIBEG 2011): Convention between the Dutch government, fishery and nature organizations. Areas in the Wadden Sea are being closed for mussel seed fishery (tidal and intertidal) and Mussel seed capture installations are promoted. The aim for 2020 is that the mussel seed collection is not affecting the sea bottom at all. The description of work is summarised in the program 'Towards a rich Wadden Sea / Naar een rijke Waddenzee' (Heessen 2010a).
- There are several research projects financed by the Wadden Fund (Waddenfonds) that investigate the causes of decline and possibilities for restoration ([www.mosselwad.nl](http://www.mosselwad.nl); [www.waddensleutels.nl](http://www.waddensleutels.nl))

**Additional measures needed**

No

**Additional monitoring needed**

Not

**3.6.2 Carbonate mounds**

Not present in the Dutch North Sea

**3.6.3 Coral Gardens**

Not present in the Dutch North Sea

**3.6.4 Cymodocea meadows**

Not present in the Dutch North Sea

**3.6.5 Deep-sea sponge aggregations**

Not present in the Dutch North Sea



Oscar Bos

*Mytilus edulis* - Mussel beds

3.6.6 Intertidal mudflats

Names										
UK		Intertidal mudflats								
Status										
Absent		Vagrant		Reintroduced		Few records		Rel. small area	Large area	X
Introduction										
<p>The OSPAR definition of this habitat type is :</p> <p><i>EUNIS Code: A2.3</i>  <i>National Marine Habitat Classification for UK &amp; Ireland code: LS.LMu</i>  <i>Two sub-types:</i>            9.1 Marine intertidal mudflats            9.2 Estuarine intertidal mudflats</p> <p><i>Intertidal mud typically forms extensive mudflats in calm coastal environments (particularly estuaries and other sheltered areas), although dry compacted mud can form steep and even vertical faces, particularly at the top of the shore adjacent to salt marshes. The upper limit of intertidal mudflats is often marked by saltmarsh, and the lower limit by Chart Datum. Sediments consist mainly of fine particles, mostly in the silt and clay fraction (particle size less than 0.063 mm in diameter), though sandy mud may contain up to 80% sand (mostly very fine and fine sand), often with a high organic content. Little oxygen penetrates these cohesive sediments, and an anoxic layer is often present within millimetres of the sediment surface. Intertidal mudflats support communities characterised by polychaetes, bivalves and oligochaetes. This priority habitat has been divided into two sub-types, based on the predominant salinity regime (OSPAR 2007).</i></p> <p>Intertidal mudflats in the Netherlands are common. After the flooding of 1953, the Delta work have been constructed in the southern part of the Netherlands, which have changed the hydrodynamics of the area. Some estuaries were completely closed off from the sea (Haringvliet, Grevelingen), so that the intertidal</p>										

mudflats disappeared. The Oosterschelde was partially closed so that the hydrodynamics changed (Oosterschelde). The Westerschelde remained open, and is used as an important shipping route and is regularly deepened for that purpose. The result was that many mudflats have disappeared, reducing the food availability to e.g. birds (Min LNV 2008).

In the Wadden Sea, the construction of the Afsluitdijk in 1932 and the closure of the Lauwersmeer in 1969 (also part of the Delta works) have resulted in a decrease of intertidal mudflat area.

A recent threats to intertidal mudflats includes the extraction of salt some 2000 meters below the Wadden Sea (close to Harlingen), which may lead to subsidence of the seafloor.

See also the profile document for habitattype H1140:

[http://www.synbiosys.alterra.nl/natura2000/documenten/profielen/habitattypen/profiel\\_habitattype\\_114\\_0.pdf](http://www.synbiosys.alterra.nl/natura2000/documenten/profielen/habitattypen/profiel_habitattype_114_0.pdf)

### Distribution

North Sea (MSFD area)	Western Scheldt	X	Eastern Scheldt	X	Wadden Sea	X
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Intertidal mudflats occur predominantly in estuaries and the adjacent sedimentary coastal areas, in sheltered bays and semi-enclosed areas such as behind barrier islands. This habitat occurs in the Netherlands in the Dutch Wadden Sea, the Eastern and Western Scheldt.

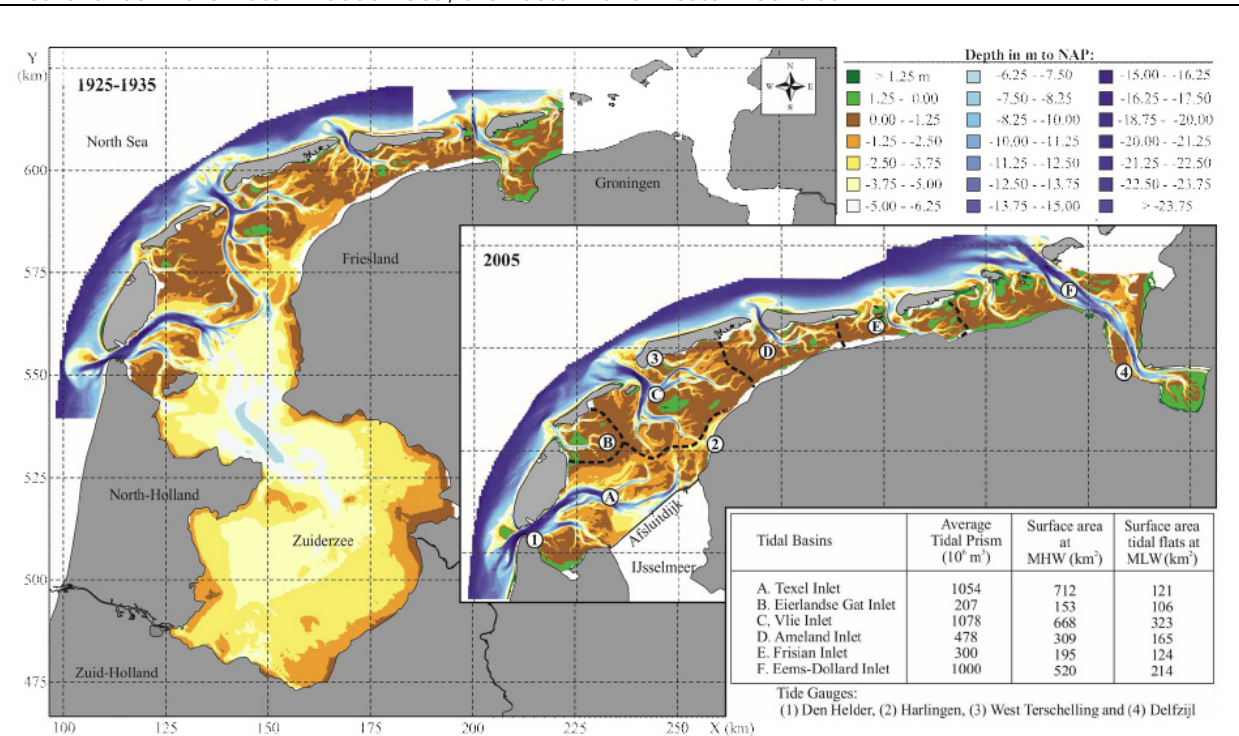


Figure 38. Morphology of the Wadden Sea in 1925-1935 and 2005 (Deltares 2012, Elias et al. in prep.)

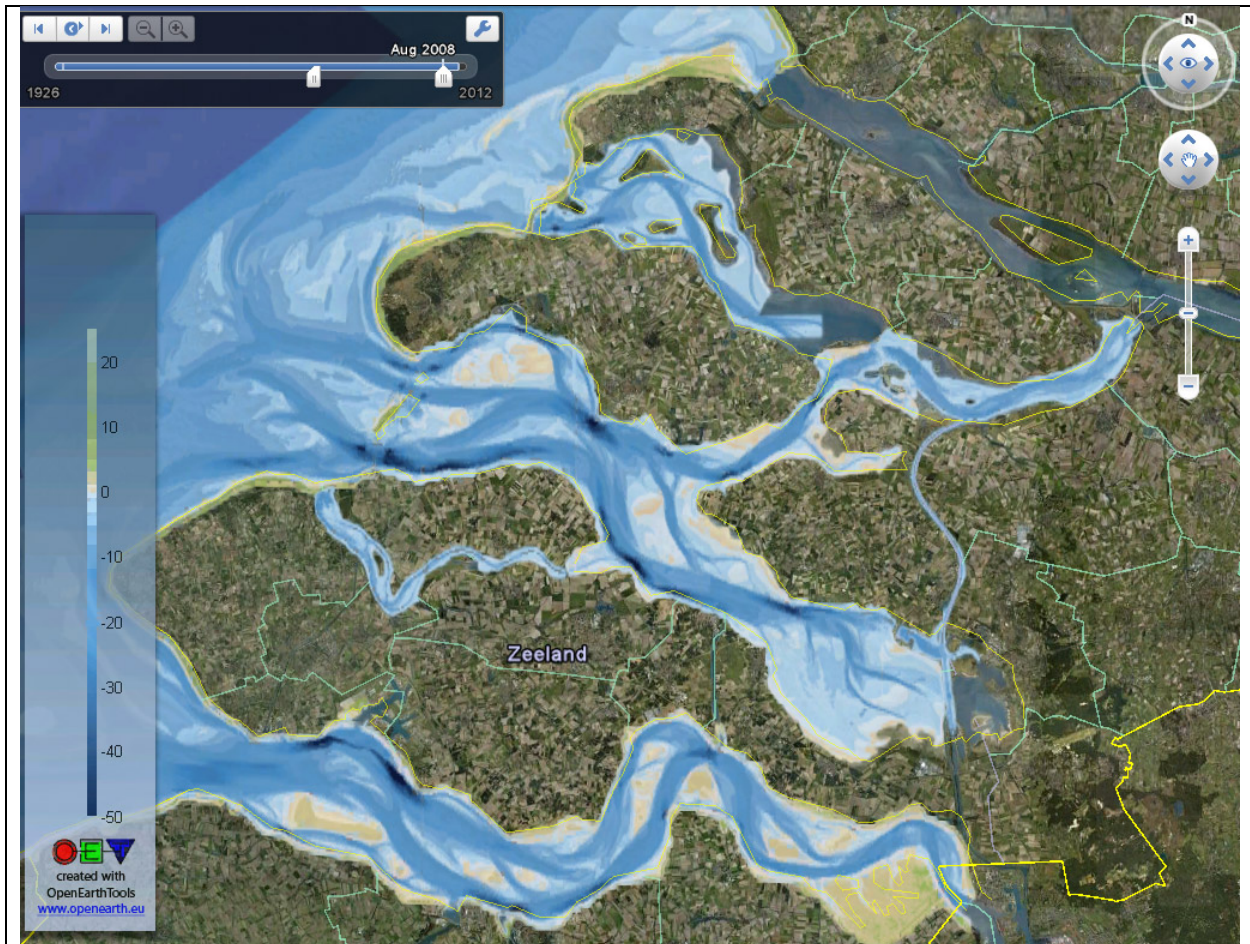


Figure 39. Morphology of the Delta area (source: RWS, <http://dtvirt5.deltares.nl/kml/rijkswaterstaat/vaklodingen.kml>)

#### Trends (long term)

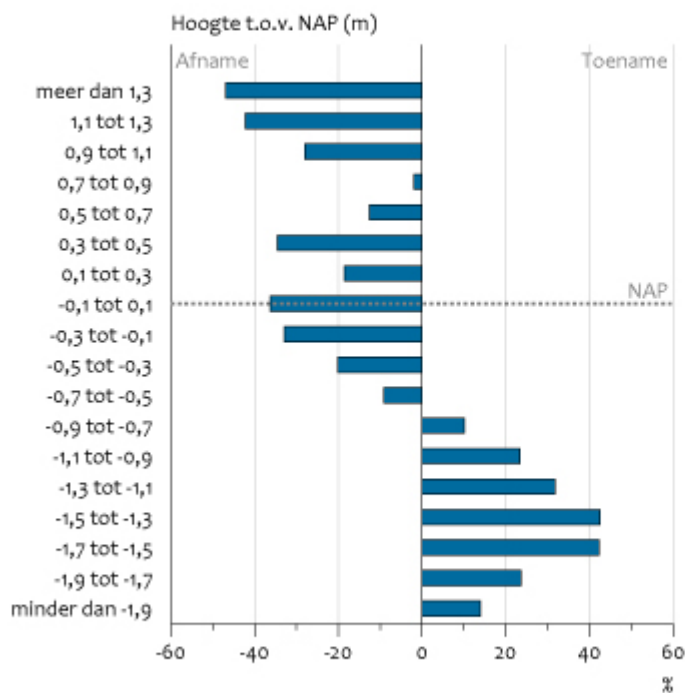
In the Eastern Scheldt (Oosterschelde) estuary/bay the area of intertidal mudflats is declining as a result of the infrastructural works of the Delta project. The compartmentalisation by dams and the storm surge barrier decreased the tidal water volume going in and out the Oosterschelde, as well as the tidal currents. As a result, the gullies are too wide for the reduced water volume. During storm events, the tidal flats are eroded, whereas tidal currents are too weak to bring back the sediments on the tidal flats. As a consequence the sediments are transported from the higher intertidal zone into the gullies, and the tidal flats are slowly eroding. Each year, an estimated total of 1 million m<sup>3</sup> of sand is disappearing into the gullies. More than 50% of the entire intertidal of the Eastern Scheldt (Oosterschelde) estuary is predicted to have disappeared by 2045 (Fey et al. 2010).

Also in the Western Scheldt estuary the mudflats are declining as a result of the deepening of the gullies for shipping (Min LNV 2008).

In the Wadden Sea, the construction of the Afsluitdijk in 1932 and the closure of the Lauwersmeer in 1969 (also part of the Delta works) have resulted in a decrease of intertidal mudflat area.

Figure 22. Downward trend of the area of intertidal mudflats in the Eastern Scheldt

Areaal slikken en platen Oosterschelde, 1983 - 2001



Bron: RIKZ.

www.compendiumv

#### Trends (last decade)

North Sea (MSFD area)	Western Scheldt	-	Eastern Scheldt	-	Wadden Sea	0
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#### Current monitoring

The depth profile of the Wadden Sea, Eastern and Western Scheldt is measured by Rijkswaterstaat using single and multibeam techniques ( ' Vaklodingen' ). These basins are covered in 6 years cycles and sometimes more frequent in case of important waterways. The changes in morphology of the tidal flats can be studied using the resulting elevation maps. In Google Earth, an animation of these measurements is available: <http://dtvirt5.deltares.nl/kml/rijkswaterstaat/vaklodingen.kml>

#### Current measures

- The Dutch Wadden Sea and Ems, Oosterschelde and Westerschelde estuaries are part of the Natura 2000 network under the European Birds and Habitats Directive.
- Currently, the Ministry of Infrastructure and Environment looking for the best approach for dealing with the erosion in the Eastern Scheldt area. The ANT study ("Autonomous Negative Trend") aims to deliver the scientific support needed to assess the feasibility and affordability of the different conservation goals of Natura 2000.
- For the Western Scheldt a management strategy has been developed together with Belgium. The proposed measures ( ' Ontwikkelingsschets 2010' )(proSes 2005) have been agreed upon by both governments in 2005, but are still under discussion in The Netherlands, despite the agreement ( <http://pro.vnsc.eu/werkgroepen/os2010/rapporten/opstellen-os2010/100/ontwikkelingsschets-2010-schelde-estuarium.html> ).
- Is habitatype H1140-A, and occurs as part of habitatype H1130 and H1160

#### Additional measures needed

The mud flats in the Oosterschelde are eroded. Within the Building with Nature programme, pilot projects are executed to test if reefs made of oyster shells can help to stop the erosion. If successful, these measures can be applied on a large scale ([http://documents.plant.wur.nl/imares/oesterriffen\\_flyer\\_uk.pdf](http://documents.plant.wur.nl/imares/oesterriffen_flyer_uk.pdf))

- Weakest link Oosterschelde: erosion
- Proposed measure Oosterschelde: installation of oyster reefs

**Additional monitoring needed**

None



*Intertidal mudflats (photo: Ingrid Tulp)*

*3.6.7 Littoral chalk communities*  
Not present in the Dutch North Sea

*3.6.8 Lophelia pertusa reefs*  
Not present in the Dutch North Sea

*3.6.9 Maerl beds*  
Not present in the Dutch North Sea

*3.6.10 Modiolus modiolus beds*  
Not present in the Dutch North Sea

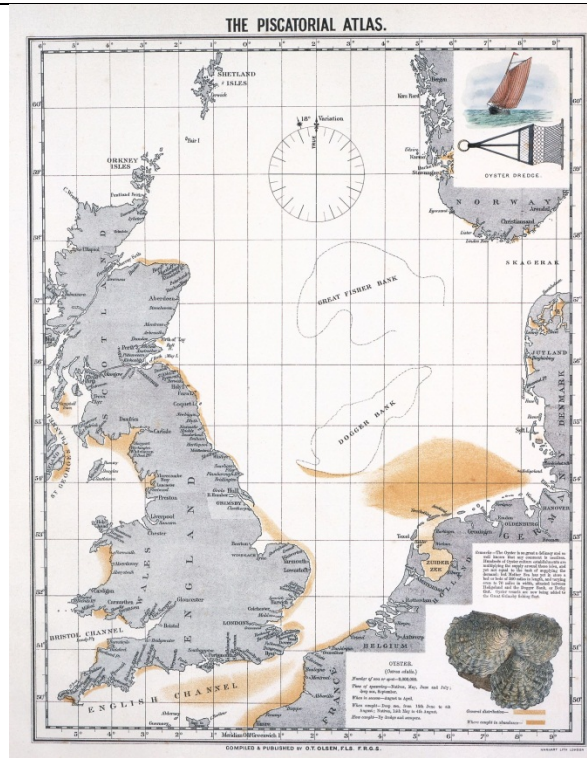
*3.6.11 Oceanic ridges with hydrothermal vents/fields*  
Not present in the Dutch North Sea

### 3.6.12 *Ostrea edulis* beds

Names									
NL				Gewone oester					
UK				Flat oyster					
Scientific name				<i>Ostrea edulis</i>					
Status									
Absent			Vagrant	Reintroduced		Few records	Rel. small area/population	X	Large population
Introduction									
<p><i>OSPAR definition of Ostrea edulis beds:</i>  <i>EUNIS Code: A5.435</i>  <i>National Marine Habitat Classification for UK &amp; Ireland code: SS.SMx.IMx.Ost</i>  <i>Beds of the oyster Ostrea edulis occurring at densities of 5 or more per m<sup>2</sup> on shallow mostly sheltered sediments (typically 0-10m depth, but occasionally down to 30m). There may be considerable quantities of dead oyster shell making up a substantial portion of the substratum. The clumps of dead shells and oysters can support large numbers of the ascidians Ascidiella aspersa and Ascidiella scabra. Several conspicuously large polychaetes, such as Chaetopterus variopedatus and terebellids, may be present as well as additional suspension-feeding polychaetes such as Myxicola infundibulum, Sabella pavonina and Lanice conchilega. A turf of seaweeds such as Plocamium cartilagineum, Nitophyllum punctatum and Spyridia filamentosa may also be present (Connor et al, 2004). (OSPAR 2007).</i></p> <p>In the Dutch seas the flat oyster is nearly extinct. In earlier days (19th century), large natural oyster beds occurred along the Dutch coast (Olsen 1883), in the Wadden Sea and the Delta area. In the Eastern Scheldt, the stock has decreased from 120 million oysters before the severe winter of 1962/1963 to 4 million oysters after the winter, to which soon 6 million oysters from Brittany (France) were added. In the following years, oysters were imported from various countries (England, Ireland, Italy, Greece). Due to breeding with other stocks, spat was not resistant to low temperatures and reproduction failed. In Lake Grevelingen, the original broodstock was not mixed with other strains and proved to be much more resistant. They are still present there. In the Wadden Sea, mixing with large quantities of French oysters also resulted in spat that was not resistant to low temperatures and the oyster disappeared from the Wadden Sea in 1962 (Drinkwaard 1999). Nowadays, small numbers occur locally (<a href="http://www.anemoon.org">www.anemoon.org</a>).</p> <p>In 1980 the <i>Bonamia ostreae</i> parasite was introduced through oyster imports, resulting in oysters that fail to grow into adulthood. This prevents the return of the flat oyster. <i>Bonamia</i> is found in the Oosterschelde and Westerschelde, but not in the Wadden Sea (refs in Troost 2010).</p>									
Distribution									
North Sea (MSFD area)				Western Scheldt		Eastern Scheldt	X	Wadden Sea	
<p>The oyster can occur on hard substrate from the littoral zone down to 80 m depth, including on biogenic substrate such as shells. In the Netherlands, the distribution is mainly limited to the bottom culture plots in the Delta.</p>									



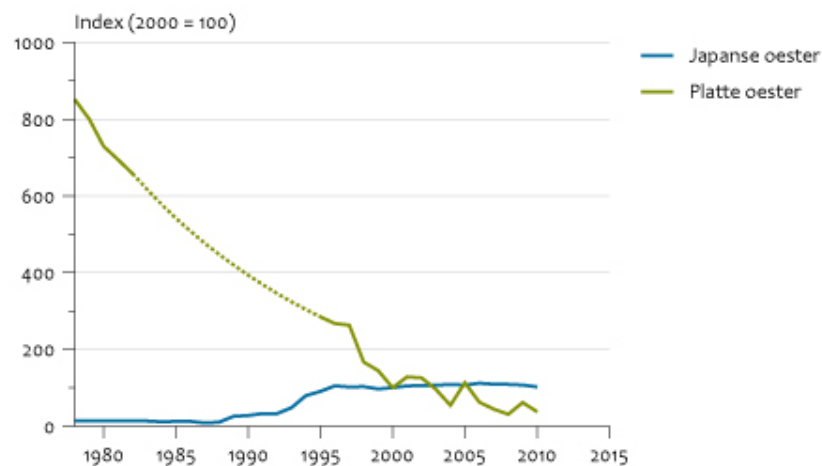
Figure 40. Historical distribution of *Ostrea edulis* (Olsen 1883).



**Trends (long term)**

Figure 22. Downward trend of the Flat oyster (*Platte oester*) in the Dutch delta (<http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl1242-Platte-en-Japanse-oester-in-de-Zeeuwse-delta.html?i=33-110>)

**Oesters in de Zeeuwse delta**



Bron: Stichting Anemoon.

CBS/nov11/1242  
www.compendiumvoordeleefomgeving.nl

**Trends (last decade)**

North Sea (MSFD area)	Western Scheldt	Eastern Scheldt	?	Wadden Sea
-----------------------	-----------------	-----------------	---	------------

**Current monitoring**

MWTL: The flat oyster can be found in the MWTL survey in lake Grevelingen, but MWTL does not monitor bottom culture plots.  
WOT: The WOT survey is mainly focused on commercial species, but other bivalves found, are also determined.

**Current measures**

Transport of shellfish from the Delta area to the Wadden Sea is not allowed, to prevent the introduction of (exotic) species diseases.

**Additional measures needed**

In the 19<sup>th</sup> century large oyster beds of *Ostrea edulis* were known in the Dutch and German part of the North Sea (Olsen 1883). These oyster beds have completely disappeared due to fisheries in the late 19<sup>th</sup> and early 20<sup>th</sup> century, diseases (*Bonamiosis*) and other factors (Lallias et al. 2010). Laing et al. reviewed the feasibility of oyster stock restoration in the UK (Laing et al. 2006). Their main conclusion is that prospects for restoration are more likely to be successful away from areas affected by diseases and pests. Breeding genetically diverse disease resistant *Ostrea edulis* in hatcheries could therefore be a solution (Lallias et al. 2010). We have to remark that disease resistance as a result of genetic modification of oysters will probably only be allowed in closed aquaculture systems, but not for restoration purposes. Laing et al. furthermore noted that the ban on TBT-based antifouling paints has been favourable for the population of oysters. Reintroduction appears to be possible, but requires considerable funding and commitment of all stakeholders. Techniques that can be used to obtain large quantities include breeding ponds in which oysters spawn and settlement substrate is provided on which oyster spat can settle, after which they can be redistributed to other locations (Laing et al. 2006). For a large scale restoration programme, sufficient brood stock is required, which may not be available. An option would be to use disease free Danish broodstock.

To restore the oysters beds in their original environment, first bottom trawling should be banned in a large part of the Dutch North Sea and disease resistant and genetically diverse oysters should be reintroduced on a large scale by using abundant settlement substrate, such as dead shells, accompanied by a large research programme to monitor the success of the introduction. Competition with the Pacific oyster *Crassostrea gigas* could inhibit restoration in shallower areas (more information: Troost 2010). First a pilot experiment will need to be done to check whether there is any chance of a successful reintroduction of the oyster.

- Weakest link: fisheries and diseases
- Proposed measure: Breed genetically diverse disease resistant *Ostrea edulis* in hatcheries (Lallias et al. 2010) in sufficient numbers, e.g. by using broodstock from *Bonamia* free areas such as Denmark, let them settle, spread them on abundant settlement substrate (mussel/oyster shells) and transfer young settled oysters to oyster restoration plots. Make sure that the areas are closed for bottom trawling.

#### **Additional monitoring needed**

There should be an annual monitoring of the flat oyster on the bottom culture plots, so that the monitoring will be in line with the other shellfish monitoring programs.





#### **3.6.13 Seamounts**

Not present in the Dutch North Sea

### 3.6.14 Sabellaria spinulosa reefs

Names										
UK		Sabellaria spinulosa reefs								
Status										
Absent		Vagrant		Reintroduced		Few records		Rel. small area	X	Large area
Introduction										
<p>EUNIS Code: A4.22 and A5.611;            National Marine Habitat Classification for UK &amp; Ireland code: SS.SBR.PoR.SspiMx and CR.MCR.CSab</p> <p>The tube-building polychaete <i>Sabellaria spinulosa</i> can form dense aggregations on mixed substrata and on rocky habitats. In mixed substrata habitats, comprised variously of sand, gravel, pebble and cobble, the <i>Sabellaria</i> covers 30% or more of the substrata and needs to be sufficiently thick and persistent to support an associated epibiota community which is distinct from surrounding habitats. On rocky habitats of bedrock, boulder and cobble, the <i>Sabellaria</i> covers 50% or more of the rock and may form a crust or be thicker in structure. In some areas, these two variations of reef type may grade into each other. <i>Sabellaria</i> reefs have been recorded in depths between 10-50m BCD or more. The reef infauna typically comprises polychaete species such as <i>Protodorvillea kefersteini</i>, <i>Scoloplos armiger</i>, <i>Harmothoe</i> spp., <i>Mediomastus fragilis</i>, <i>Lanice conchilega</i> and cirratulids together with the bivalves <i>Abra alba</i> and <i>Nucula</i> spp. and tube-building amphipods such as <i>Ampelisca</i> spp. Epifauna comprise calcareous tubeworms, pycnogonids, hermit crabs, amphipods, hydroids, bryozoans, sponges and ascidians. The characteristics of the reefs are linked to the density of aggregation and these are known to vary widely e.g. 120/m<sup>2</sup> in Belfast Lough, Northern Ireland and more than 4500/in the Wash on the east coast of England (in Hedrick &amp; Foster-Smith, 2006). <i>S.spinulosa</i> reefs are often found in areas with quite high levels of natural sediment disturbance; in some areas of reef, individual clumps of <i>Sabellaria</i> may periodically break down and rebuild following storm events. <i>S.spinulosa</i> reefs have been recorded from all European coasts except the Baltic Sea, Skagerrak and Kattegat. Areas of dead <i>Sabellaria</i> reef indicate the site supported reef habitat in the past and should be reported as this habitat type  <a href="http://qsr2010.ospar.org/media/assessments/Species/p0010_supplements/CH10_04_Sabellaria_spinulosa.pdf">http://qsr2010.ospar.org/media/assessments/Species/p0010_supplements/CH10_04_Sabellaria_spinulosa.pdf</a></p> <p>Individual specimens are common in the North Sea, but reefs are rare. Reefs formed by the Ross worm (<i>Sabellaria spinulosa</i>) occur in the Natura 2000 habitat type 1170, on the Cleaver Bank (Van Moorsel 2003).</p>										
Distribution										
North Sea (MSFD area)			Western Scheldt			Eastern Scheldt			Wadden Sea	
Trends										
<p><i>Sabellaria</i> reefs are not present in the Dutch Wadden Sea (Vorberg et al. 2009) and are in decline in the German Wadden Sea. The trend of the reefs on the Cleaver Bank is unknown, because of a lack of monitoring data.</p>										
Current monitoring										
<p>There is no regular benthos monitoring on the Cleaver Bank, at least not in the part where <i>Sabellaria</i> reefs occur. Within the framework of the MSFD and Habitats Directive, the Dutch government has intentions for complementary monitoring in this area.</p>										
Current measures										
<ul style="list-style-type: none"> <li>The Cleaver bank will become a Habitat Directive Site. <i>Sabellaria</i> is proposed as a typical species (Min EL&amp;I 2012)</li> <li>Within the framework of Natura 2000 the Cleaver bank is assigned as search area for fisheries measures. The measures are developed in the FIMPAS project. These should protect the <i>Sabellaria</i> reefs.</li> </ul>										
Additional measures needed										
No										
Additional monitoring needed										
<p>The reefs will probably be monitored in the future as part of the Natura 2000 monitoring in the Cleaver Bank area.</p>										

3.6.15 Sea-pen and burrowing megafauna communities

Names										
UK		Sea –pen and burrowing mega-fauna communities								
Status										
Absent		Vagrant		Reintroduced		Few records		Rel. small area	Large area	X
Introduction										
										
<i>Callianassa subterranea</i> (photo NIOZ)					<i>Seapen Pennulata phosphorea</i> (photo IMARES)					
										
<i>Upogebia deltaura</i> (photo IMARES)					<i>Nephrops norvegicus</i> (photo IMARES)					
<p>The OSPAR definition of this habitat type is:</p> <p><i>EUNIS Code: A5.361 and A5.362</i>  <i>National Marine Habitat Classification for UK &amp; Ireland code: SS.SMu.CFiMu.SpNMeg and SS.SMu.CFiMu.MegMax</i></p> <p><i>“Sea-pen and burrowing megafauna communities” means plains of fine mud, extending over an area of at least 25m<sup>2</sup> and at water depths ranging from 15-200m or more, which are heavily bioturbated by burrowing megafauna, with burrows and mounds typically forming a prominent feature of the sediment surface, and which may include conspicuous populations of sea-pens, typically Virgularia mirabilis and Pennatula phosphorea. This habitat is described further in the OSPAR other agreement on working definitions for OSPAR priority habitats (OSPAR 2007).</i></p> <p>In the Dutch part of the North Sea, the burrowing megafauna consists of burrowing crustaceans (<i>Nephrops norvegicus</i>, <i>Callianassa subterranea</i>, <i>Upogebia deltaura</i>). On the Frisian Front the ghost shrimp <i>Callianassa subterranea</i> is known to occur in densities of up to 300 ind/m<sup>2</sup> (Amaro et al. 2007). More information on <i>Nephrops norvegicus</i> is collected in Van der Hammen &amp; Steenbergen (Van der Hammen &amp; Steenbergen 2011). The seapens <i>Pennulata phosphorea</i> are less common.</p>										
Distribution										
North Sea (MSFD area)		x	Western Scheldt			Eastern Scheldt		Wadden Sea		
Deeper offshore waters: Frisian Front en Central Oyster Grounds.										

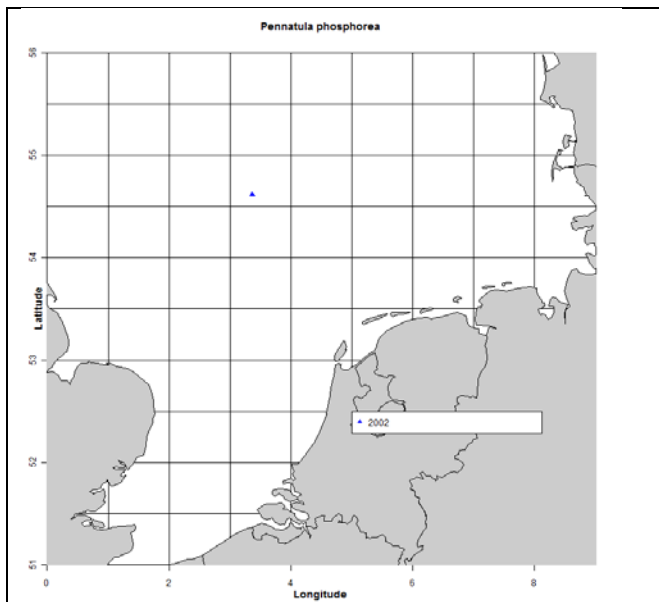


Figure 41. Distribution of *Pennulata phosphorea*, based on IMARES fishery survey data.

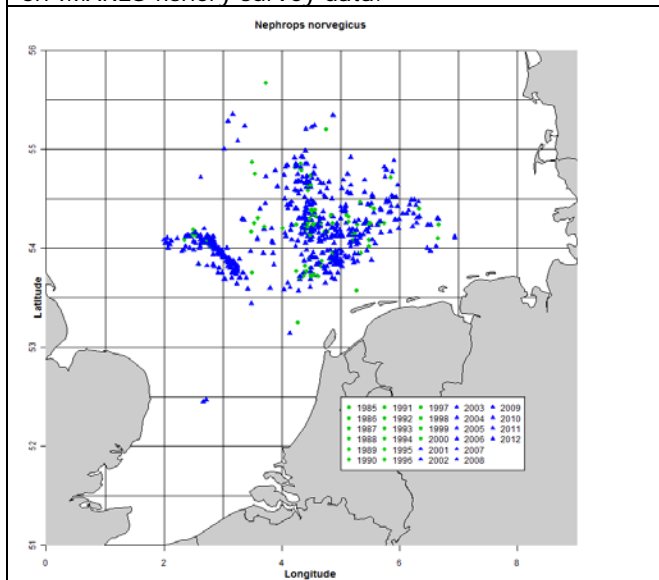
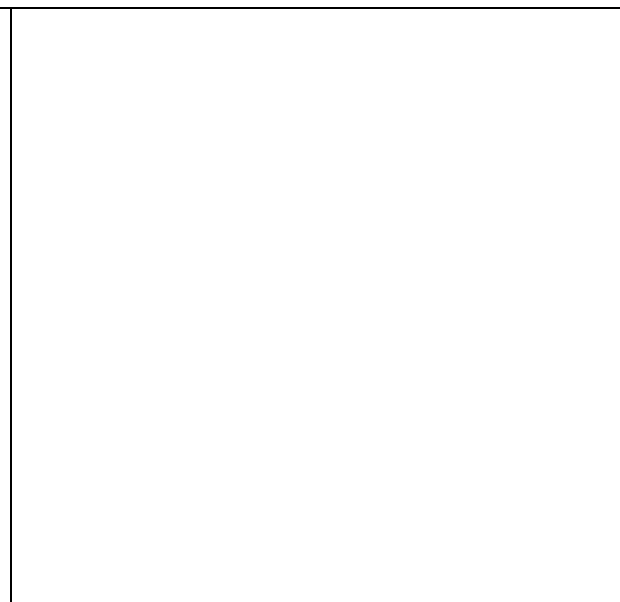


Figure 42. Distribution of *Nephrops norvegicus*, based on IMARES fish survey data.

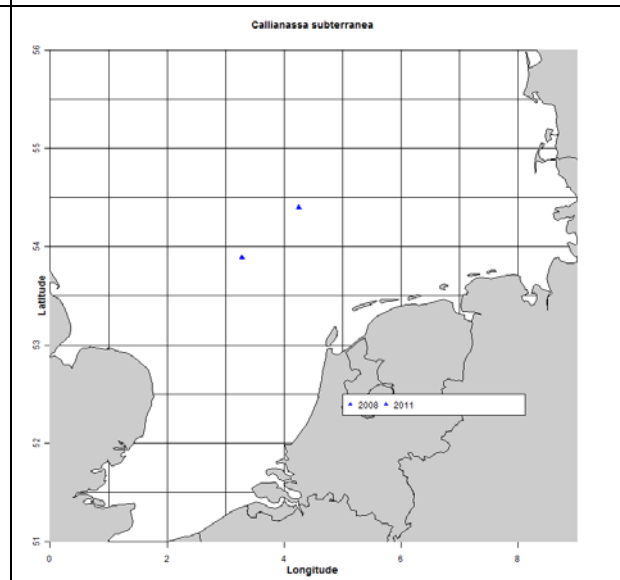


Figure 43. Distribution of *Callianassa subterranea*, based on IMARES fish survey data.

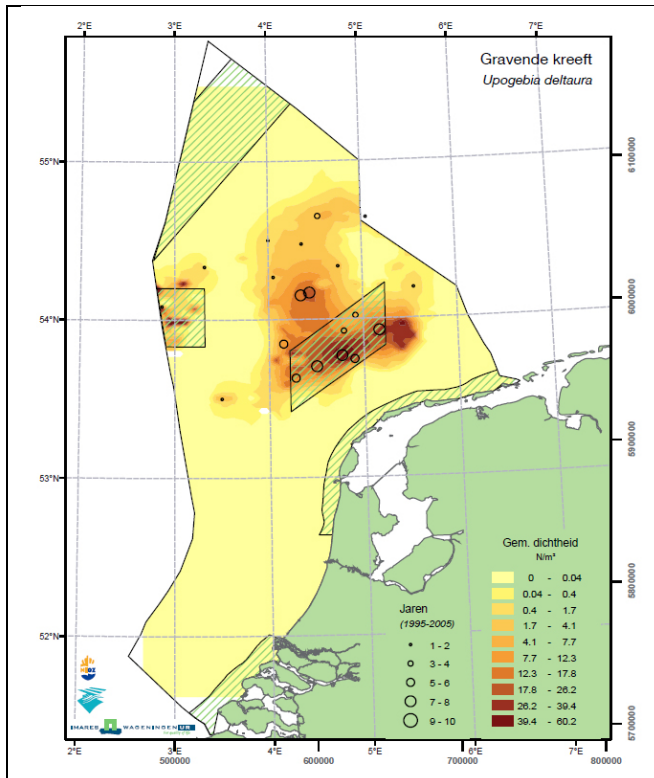


Figure 44. Distribution of *Upogebia deltaura* based on MWTL data (Lindeboom et al. 2008).

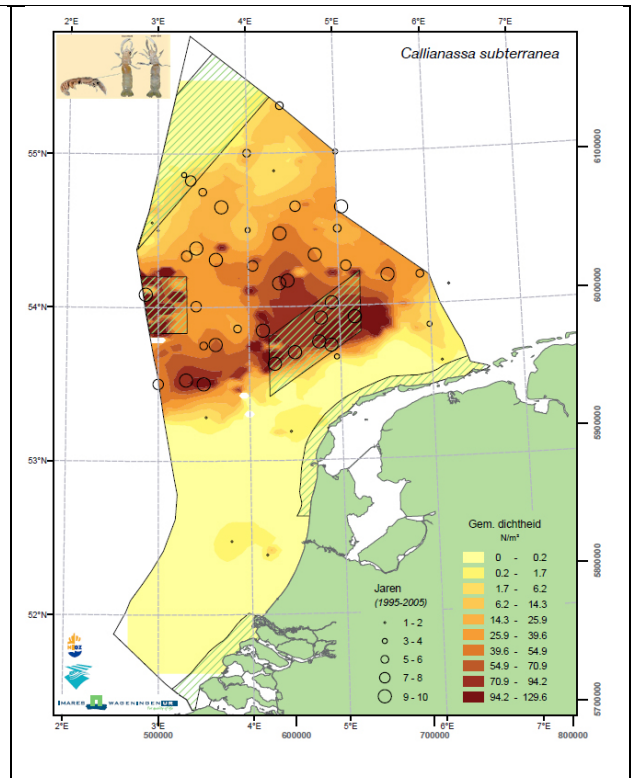


Figure 45. Distribution of adult *Callianassa subterranea*, based on MWTL data (Lindeboom et al. 2008).

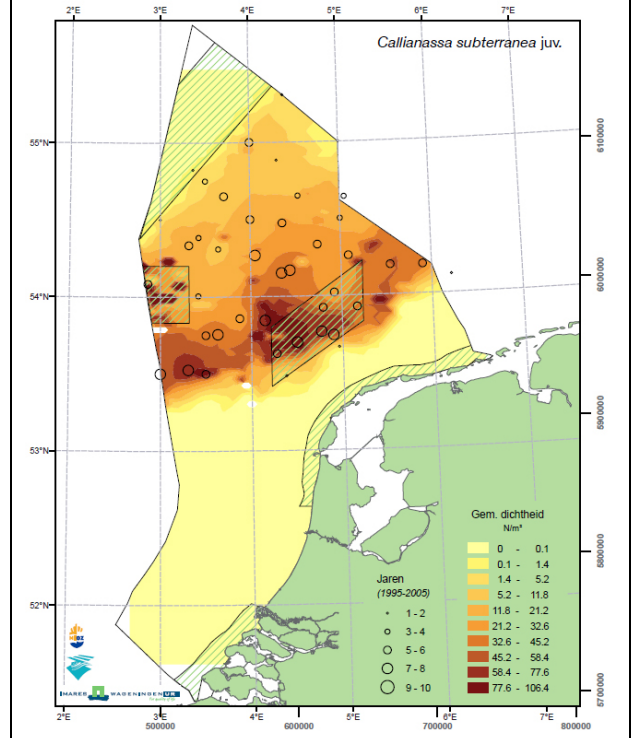


Figure 46. Distribution of juvenile *Callianassa subterranea*, based on MWTL data (Lindeboom et al. 2008).

**Trends (long term)**

Unknown

**Trends (last decade)**

North Sea (MSFD area)	?	Western Scheldt		Eastern Scheldt		Wadden Sea	
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**Current monitoring**

Boxcores are taken within the MWTL monitoring programme. However this monitoring has a very low coverage. The Dutch government has the intention to execute additional monitoring using a dredge in this area.

#### Current measures

Frisian Front en Central Oyster Grounds are assigned as Sea Bottom conservation area and search area for fisheries measures within the framework of the implementation of the MSFD (I&M & EL&I 2012).

#### Additional measures needed

For this community, roughly the same measures should apply as suggested for *Arctica islandica*, since the same pressures are present and their distributions are similar.

- Weakest link: beam trawling
- Proposed measure: A ban of traditional beam trawling in all areas where sea-pen and burrowing megafauna communities occur.

#### Additional monitoring needed

Although the MWTL (BIOMON) surveys cover the whole Dutch part of the North Sea, they are not well suited to provide good information on this community, since sampling is done with a boxcore. We suggest to use a combination of dredge, boxcore sampling and underwater video.

### 3.6.16 *Zostera beds*

Names										
NL	Zeegrass velden									
UK	Zostera beds									
Status										
Absent		Vagrant		Reintroduced		Few records		Rel. small area	X	Large area
Introduction										
<p><i>Zostera beds, Seagrass beds</i>  EUNIS Code: A2.611, A5.533 and A5.545  National Marine Habitat Classification for UK &amp; Ireland code: LS.LMP.LSgr and SS.SMP.SSgr</p> <p><i>Definition for habitat mapping</i>  There are two sub-types:  <i>Zostera marina</i>: <i>Zostera marina</i> forms dense beds, with trailing leaves up to 1m long (up to 2 m in Western Europe (Brittany France) (Hily et.al. 2003), in sheltered bays and lagoons from the lower shore to about 5 m depth, occasionally down to 10 m (in Sweden and Norway) if water is very clear, typically on sand and sandy mud (occasionally with an admixture of gravel). Where their geographical range overlaps, such as the Solent in the UK, <i>Z. marina</i> passes upshore to <i>Z. noltii</i>.  <i>Zostera noltii</i>: <i>Z. noltii</i> forms dense beds, with leaves up to 20 cm long, typically in the intertidal region (although it can occur in the very shallow subtidal), on mud/sand mixtures of varying consistency.  To qualify as a <i>Zostera</i> 'bed', plant densities should provide at least 5% cover (although when <i>Zostera</i> densities are this low, expert judgement should be sought to define the bed). More typically, however, <i>Zostera</i> plant densities provide greater than 30% cover.  <a href="http://www.ospar.org/documents/dbase/publications/p00426_zostera_beds.pdf">http://www.ospar.org/documents/dbase/publications/p00426_zostera_beds.pdf</a></p> <p><i>Zostera marina</i> used to occur in the Wadden Sea in large quantities between 0.5 and 2.4 m water depth. It was harvested and used to fill mattresses with and for the construction of dikes. In the 1930s the fields disappeared due to the 'wasting disease' and the construction of the Afsluitdijk. This dike prevented the return from the seagrass fields, due to changed hydrodynamics, increased turbidity and altered current patterns (Van der Heide et al. 2006). After 1938 this species only occurred in the intertidal areas (refs in Philippart &amp; Dijkema 1995). According to Van der Heide et al. (2006), the seagrass beds probably created a favourable condition for growth themselves by reducing the turbidity. In the absence of clear waters, it is questioned whether the return is possible (Van der Heide et al. 2006).</p>										

*Zostera noltii* was less affected by the wasting disease (refs in Philippart & Dijkema 1995). At the beginning of the 1970s the stands of *Z. noltii* also started to decline, but stands had increased at the end of the 1980s (Philippart & Dijkema 1995).

**Distribution**

North Sea (MSFD area)		Western Scheldt		Eastern Scheldt	X	Wadden Sea	X
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Figure 47. Sea grass locations in the Wadden Sea in 2005 (Min V&W 2005).



Fields of *Zostera* can be found in the Wadden Sea (Terschelling and coast of Groningen) and in the Dutch Delta (Eastern Scheldt).

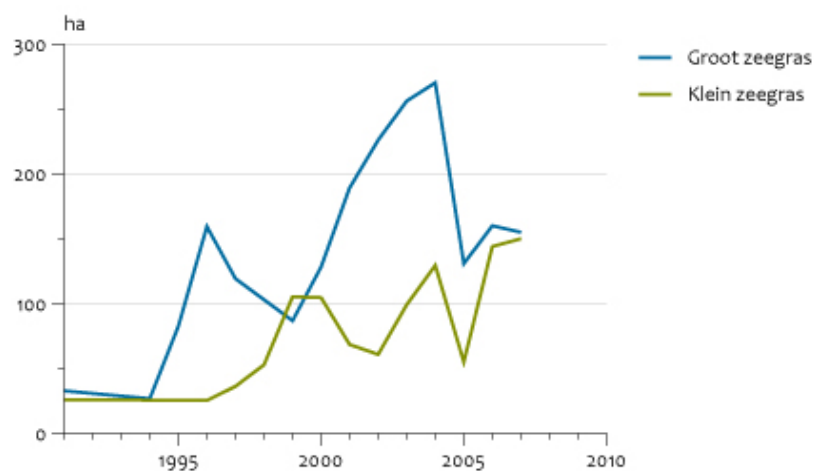
**Trends**

In the Wadden Sea until the 1930s, seagrass coverage was > 15,000 ha. Currently, only 2% is left. ([http://www.rijkswaterstaat.nl/water/natuur\\_en\\_milieu/zeegras/groot\\_zeegras/](http://www.rijkswaterstaat.nl/water/natuur_en_milieu/zeegras/groot_zeegras/))

In the 1970's and 1980's more than 4,000 ha of *Zostera* fields occurred in Lake Grevelingen, Lake Veerse and the Eastern Scheldt. These fields in the Delta did collapse in the 80's and 90's as a result of the infrastructural works of the Delta project. In the Wadden Sea the sea grass fields nearly disappeared in the early 20<sup>th</sup> century after an epidemic. Recently the area of sea grass has slightly increased (Brasseur & Reijnders 1994, Van der Graaf et al. 2009, Min EL&I 2012)

Figure 22. Trends in area of *Zostera* fields in the Dutch Wadden Sea.

**Zeegras Waddenzee**



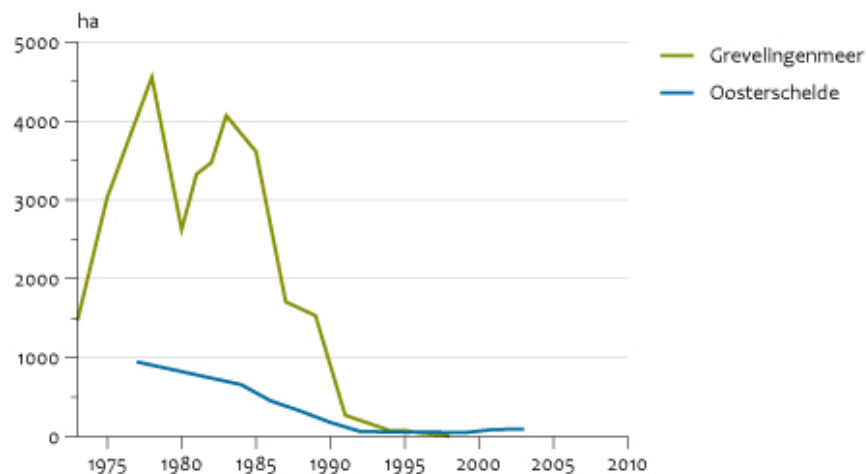
Bron: RWS, RIKZ.

CBS/sep08/1234  
www.compendiumvoordeleefomgeving.nl



Figure 23.  
Trends in area of  
*Zostera* fields in  
the Dutch Delta.

### Zeegras Zeeuwse delta



Bron: RWS, RIKZ.

CBS/sep08/1234  
www.compendiumvoordeleefomgeving.nl

#### Trends (last decade\_

North Sea (MSFD area)	Western Scheldt	Eastern Scheldt	-	Wadden Sea	+
-----------------------	-----------------	-----------------	---	------------	---

#### Current monitoring

- Within the MWTL monitoring programme, the area and density of *Zostera* fields in the Dutch Wadden Sea and Oosterschelde is mapped. In the Western Scheldt there is no regular monitoring for *Zostera*, due to low occurrence /absence, but there is mapping of the vegetation in the salt marshes when Sea grass is found, it is noted.
- Until 2015 the project office Zeeweringen (RWS en waterschap Zeeuwse Stromen) takes measurements of Sea grass fields at locations where the dikes are reinforced.
- In the Wadden Sea and Oosterschelde seagrass will be mapped every 3 years ([http://www.rijkswaterstaat.nl/water/natuur\\_en\\_milieu/zeegras/zeegraskartering/](http://www.rijkswaterstaat.nl/water/natuur_en_milieu/zeegras/zeegraskartering/)).

#### Current measures

- Both *Zostera noltii* as *Zostera marina* are on a red list for vascular plants (Floron, 2004)
- *Zostera marina* is a protected species under the Flora and Fauna Act (Nederlandse Staat 1998)
- Both species are typical species for HD habitat type H1140, H1130, H1160 (Min LNV 2008)
- For both *Zostera noltii* as *Zostera marina* reintroduction programmes were executed (2001-2005). Results of this programme are disappointing. Only in the western Wadden Sea some small fields of *Zostera noltii* did develop.
- Some new introduction programmes are currently executed (WFD)

#### Additional measures needed

For both *Zostera noltii* as *Zostera marina* reintroduction programmes were executed (2001-2005). Results of this programme are disappointing. Only in the western Wadden Sea some small fields of *Zostera noltii* did develop. A feasibility study for the reintroduction of *Zostera marina* was conducted by Van der Heide et al. (2006). They conclude that one of the main problems in the Wadden Sea is that the waters are too turbid to allow for sea grass growth.

- Weakest link: turbid waters
- Proposed measure: construction of artificial (biodegradable) seagrass fields or arrays of current-reducing screens to promote seagrass settlement (Van der Heide et al. 2006)

#### Additional monitoring needed

No

## 4 Status and distribution

In this chapter we provide a summary of the information on status (Table 6), distribution (Table 7) and trends (Table 8) that was provided in Chapter 2.7.

Table 6. Overview of occurrence of OSPAR species and habitats in The Netherlands. Names marked grey: Species and habitats that are absent, vagrant or only encountered few times. Dissappeared = species/habitats have occurred in the Netherlands in the past. For background information and references, see Chapter 2.7.

Group	OSPAR name	Status					
		Absent	Vagrant	Reintroduced	Few records	Rel. small population/area	Large population/area
Invertebrates	Arctica islandica						
Invertebrates	Megabalanus azoricus						
Invertebrates	Nucella lapillus						
Invertebrates	Ostrea edulis						
Invertebrates	Patella ulyssiponensis aspera						
Seabirds	Larus fuscus fuscus						
Seabirds	Pagophila eburnea						
Seabirds	Polysticta stelleri						
Seabirds	Puffinus assimilis baroli (auct.incert.)						
Seabirds	Puffinus mauretanicus						
Seabirds	Rissa tridactyla						
Seabirds	Sterna dougallii						
Seabirds	Uria aalge – Iberian population						
Seabirds	Uria lomvia						
Fish	Acipenser sturio	Dissappeared (and reintroduced)					
Fish	Alosa alosa						
Fish	Anguilla anguilla						
Fish	Centroscymnus coelolepis						
Fish	Centrophorus granulosus						
Fish	Centrophorus squamosus						
Fish	Cetorhinus maximus						
Fish	Coregonus lavaretus oxyrinchus						
Fish	Dipturus batis (synonym: Raja batis)	Dissappeared (sometimes caught by fishermen)					
Fish	Raja montagui (synonym: Dipturus montagui)						
Fish	Gadus morhua						
Fish	Hippocampus guttulatus						
Fish	Hippocampus hippocampus						
Fish	Hoplostethus atlanticus						
Fish	Lamna nasus						
Fish	Petromyzon marinus						
Fish	Raja clavata						

Fish	Rostroraja alba						
Fish	Salmo salar						
Fish	Squalus acanthias						
Fish	Squatina squatina	Dissappeared					
Fish	Thunnus thynnus	Dissappeared					
Reptiles	Caretta caretta	Some records					
Reptiles	Dermochelys coriacea	Some records					
Marine mammals	Balaena mysticetus						
Marine mammals	Balaenoptera musculus						
Marine mammals	Eubalaena glacialis	Dissappeared					
Marine mammals	Phocoena phocoena						
Habitats	Carbonate mounds						
Habitats	Coral Gardens						
Habitats	Cymodocea meadows						
Habitats	Deep-sea sponge aggregations						
Habitats	Intertidal Mytilus edulis beds						
Habitats	Intertidal mudflats						
Habitats	Littoral chalk communities						
Habitats	Lophelia pertusa reefs						
Habitats	Maerl beds						
Habitats	Modiolus modiolus beds						
Habitats	Oceanic ridges with hydrothermal vents/fields						
Habitats	Ostrea edulis beds						
Habitats	Sabellaria spinulosa reefs						
Habitats	Seamounts						
Habitats	Sea-pen and burrowing megafauna communities						
Habitats	Zostera beds						

Table 7. Overview of spatial distribution of OSPAR species and habitats. The MSFD covers the Dutch North Sea, but not the Delta area (Eastern and Western Scheldt), nor the Wadden Sea. In grey: species and habitats that are absent or do not regularly occur in the Dutch part of the OSPAR area (see Table 6). Green: species that are known to be present.

Group	OSPAR name	Presence			
		MSFD area (Dutch North Sea)	Western Scheldt	Eastern Scheldt	Wadden Sea
Invertebrates	Arctica islandica				
Invertebrates	Nucella lapillus				
Invertebrates	Ostrea edulis				
Seabirds	Rissa tridactyla				
Fish	Alosa alosa				
Fish	Anguilla anguilla				
Fish	Coregonus lavaretus oxyrinchus				
Fish	Raja montagui (synonym: Dipturus montagui)				
Fish	Gadus morhua				
Fish	Hippocampus guttulatus				
Fish	Hippocampus hippocampus				
Fish	Petromyzon marinus				
Fish	Raja clavata				
Fish	Salmo salar				
Fish	Squalus acanthias				
Marine mammals	Phocoena phocoena				
Habitats	Intertidal Mytilus edulis beds				
Habitats	Intertidal mudflats				
Habitats	Ostrea edulis beds				
Habitats	Sabellaria spinulosa reefs				
Habitats	Sea-pen and burrowing megafauna communities				
Habitats	Zostera beds				

Table 8. Overview of trends (last decade) of OSPAR species and habitat list that are regularly present in The Netherlands (Table 6). Trend information is based on the trend descriptions of species and habitats in Chapter 2.7. In grey (?): trend unknown, or very few observations, green (+): positive trend. Red (-): negative trend. Blue (0): variable or neutral trend. Blancs: not present.

	Trends (last decade) (+=pos, 0=variable or neutral, - = neg, ?=unknown)			
OSPAR name	MSFD area (Dutch North Sea)	Western Scheldt	Eastern Scheldt	Wadden Sea
Arctica islandica	?			
Nucella lapillus	-	?	+	?
Ostrea edulis			?	
Rissa tridactyla	0	?	?	?
Alosa alosa	?	?	?	?
Anguilla anguilla	-	-	-	-
Coregonus lavaretus oxyrinchus				+
Raja montagui (synonym: Dipturus montagui)	+			
Gadus morhua	0	0	0	0
Hippocampus guttulatus			?	
Hippocampus hippocampus	?		?	
Petromyzon marinus	0	0	0	0
Raja clavata	0			
Salmo salar	?	?		?
Squalus acanthias	-			
Phocoena phocoena	+	+	+	+
Intertidal Mytilus edulis beds		0		0
Intertidal mudflats		-	-	0
Ostrea edulis beds			?	
Sea-pen and burrowing megafauna communities	?			
Zostera beds			-	+

## 5 Monitoring

In this chapter we provide a summary of the information that was provided in Chapter 2.7 (see tables and description).

### 5.1 Invertebrates

Of the invertebrates, *Arctica islandica*, *Nucella lapillus* and *Ostrea edulis* occur in Dutch waters. *Arctica* is found within the MTWL macrofauna monitoring, which used to be carried out annually, but will probably be reduced to a 3-annually program. *Arctica* is also caught as bycatch in the annual fishery surveys that are carried out by IMARES. In addition, the Royal NIOZ has carried out a single survey with a dredge, but with high spatial coverage. This survey targeted the long-lived bivalves. Within the framework of the MSFD, IMARES has advised the Dutch government to carry out complementary monitoring with a dredge in protected North Sea sites. *Nucella* is monitored by volunteers (PIMP project of Stichting Anemoon) for Rijkswaterstaat to deliver information for OSPAR. The status of the monitoring programme is not clear to us. The third, the flat oyster, has largely disappeared since the 1940-1950s due to overfishing and habitat change, but is still cultured in small numbers. The main oyster species cultured nowadays is the Pacific oyster *Crassostrea gigas*, which has also established a large population in natural habitats (Troost 2010).

### 5.2 Seabirds

Most OSPAR seabirds are vagrants, of which only few records are available. The only species present in large number is the black-legged Kittiwake *Rissa tridactylus*. This species breeds on a number of oil platforms in the Dutch North Sea (Camphuysen & De Vreeze 2005, Geelhoed et al. 2011b) (see Table 6 and Table 7).

Seabirds are monitored bimonthly via the MTWL program (aerial surveys) (not suitable for vagrants), but a lot of data are also available from ship-based surveys, which are collected in the ESAS database. There is no monitoring program for breeding birds on production platforms.

### 5.3 Fish

Half of the fish species listed on the OSPAR list currently occur in Dutch waters (see Table 6 and Table 7). With the current fish monitoring programs (including freshwater programs) carried out by IMARES, most of fish species on the OSPAR list are monitored (e.g. *Raja clavata*), or would be detected if numbers would rise (e.g. *Alosa alosa*), although such programmes are usually specifically designed for commercial fish. A few species, including the seahorses, are not recorded by monitoring programmes, but are reported by scuba-divers.

### 5.4 Reptiles

Sea turtles are sometimes found dead or alive on the beach, or spotted alive in the North Sea, but do not usually occur in Dutch waters (see Table 6 and Table 7). There is no specific monitoring program for marine reptiles.

### 5.5 Marine mammals

Of the 4 listed OSPAR marine mammal species, only the harbour porpoise occurs in the Netherlands. A review of information on this species can be found in the Harbour porpoise Conservation Plan (Camphuysen & Siemensma 2011) (see Table 6 and Table 7). The harbour porpoise is monitored via the MTWL program that is designed for monitoring of seabirds, and in more detail by project-based monitoring for the government.

## 5.6 Habitats

In the Netherlands, 3 out of the 16 OSPAR habitat types are common: musselbeds, intertidal mudflats, burrowing megafauna, and two are probably present to some extent: oyster reefs (*Ostrea edulis*) and Sabellaria reefs (see Table 6 and Table 7).

Table 9. Overview of monitoring of OSPAR species and habitats occurring in the Netherlands. In green: species and habitats monitored regularly. Grey: possible future monitoring for the MSFD and Natura 2000.

Group	OSPAR name	IMARES fish/shellfish monitoring (WOT, and others)	MWTL	ESAS	PIMP	BO	MSFD	N2000
Invertebrates	Arctica islandica							
Invertebrates	Nucella lapillus							
Invertebrates	Ostrea edulis							
Seabirds	Rissa tridactyla							
Fish	Alosa alosa							
Fish	Anguilla anguilla							
Fish	Coregonus lavaretus oxyrinchus							
Fish	Raja montagui							
Fish	Gadus morhua							
Fish	Hippocampus guttulatus							
Fish	Hippocampus hippocampus							
Fish	Petromyzon marinus							
Fish	Raja clavata							
Fish	Squalus acanthias							
Marine mammals	Phocoena phocoena							
Habitats	Intertidal Mytilus edulis beds							
Habitats	Intertidal mudflats							
Habitats	Ostrea edulis beds							
Habitats	Sea-pen and burrowing megafauna communities							
Habitats	Zostera beds							

## 6 Recommendations for additional monitoring

In Table 8 we summarise the suggestions for additional monitoring.

Table 10. Overview of suggestions for additional monitoring of OSPAR species and habitat list that are regularly present in The Netherlands or have disappeared (Table 6). Shaded = extra monitoring required. Not shaded: no extra monitoring required. Shaded species/habitats: with OSPAR recommendation.

OSPAR name (shaded: with OSPAR recommendation)	Additional monitoring required
Arctica islandica	<p>We recommend to extend the monitoring for this species. In the Dutch marine strategy, two areas are proposed in which fishery measurements (closure to damaging bottom trawling) will be taken to protect vulnerable marine species such as the quahog (I&amp;M &amp; EL&amp;I 2012).</p> <p>To monitor the effect of such measures, IMARES has advised to monitor the biodiversity of benthos with a dredge, in addition to the MWTL BIOMON monitoring that uses a boxcore (Paijmans et al. in prep.). It was also advised to start with a TO measurement, to relate changes to proposed fisheries measures. The NIOZ has performed project-based monitoring with a dredge in recent years, but that is not part of a regular program. Whether or not additional monitoring for <i>Arctica</i> is needed will depend on the monitoring programme for Natura 2000 and the MSFD.</p> <p>Such monitoring should take place annually.</p>
Nucella lapillus	We recommend that monitoring of <i>Nucella</i> is continued, e.g. by the Anemoon Foundation
Ostrea edulis	The flat oyster should be annually monitored on the culture plots in the Delta area.
Rissa tridactyla	The current monitoring is sufficient to detect trends in population status.
Acipenser sturio	Not present, but current monitoring would detect the species if present in sufficient numbers.
Alosa alosa	The current monitoring is sufficient to detect trends in population status.
Anguilla anguilla	The current monitoring is sufficient to detect trends in population status.
Coregonus lavaretus oxyrinchus	The current monitoring is sufficient to detect trends in population status.
Dipturus batis	Not present, but current monitoring would detect the species if present in sufficient numbers. Potential improvements for monitoring this and other rare species are extensions to the observer programs on board commercial vessels, sampling the total catch for rare species. These observer programs have a much higher effort compared to the surveys and they occur year round.
Raja montagui	The current monitoring is sufficient to detect trends in population status. Potential improvements for monitoring this and other rare species are extensions to the observer programs on board commercial vessels, sampling the total catch for rare species. These observer programs have a much higher effort compared to the surveys and they occur year round.
Gadus morhua	The current monitoring is sufficient to detect trends in population status.
Hippocampus guttulatus	We recommend that monitoring is set-up, e.g. by the Anemoon Foundation.
Hippocampus hippocampus	We recommend that monitoring is set-up, e.g. by the Anemoon Foundation.
Petromyzon marinus	The current monitoring is sufficient to detect trends in population status.
Raja clavata	The current monitoring is sufficient to detect trends in population status. Potential improvements for monitoring this and other rare species are extensions to the observer programs on board commercial vessels, sampling the total catch for rare species. These observer programs have a much higher effort compared to the surveys and they occur year round.
Salmo salar	The current monitoring is sufficient to detect trends in population status.
Squalus acanthias	The current monitoring is sufficient to detect trends in population status. Potential improvements for monitoring this and other rare species are extensions to the observer programs on board commercial vessels, sampling the total catch for rare species. These observer programs have a much higher



	effort compared to the surveys and they occur year round.
<i>Squatina squatina</i>	Not present, but current monitoring would detect the species if present in sufficient numbers.
<i>Thunnus thynnus</i>	Not present, but current monitoring would detect the species if present in sufficient numbers.
<i>Eubalaena mysticus</i>	Not present, but current monitoring would detect the species if present in sufficient numbers.
<i>Phocoena phocoena</i>	The harbour porpoise is currently monitored with bimonthly aerial counts (MWTL) as part of a long term MWTL survey designed for birds, and via a number of BO-projects, partly in relation to offshore wind energy. We expect the harbour porpoise aerial monitoring to become part of the regular monitoring programme for the MSFD/N2000.
Intertidal <i>Mytilus edulis</i> beds	The current monitoring is sufficient.
Intertidal mudflats	The current monitoring is sufficient.
<i>Ostrea edulis</i> beds	The flat oyster should be annually monitored on the culture plots in the Delta area.
Sea-pen and burrowing megafauna communities	Although the MWTL (BIOMON) surveys cover the whole Dutch part of the North Sea, they are not well suited to provide good information on this community, since sampling is done with a boxcore. We suggest to use a dredge, perhaps in combination of boxcore sampling and underwater video.
<i>Zostera</i> beds	The current monitoring is sufficient.

## 7 Current measures

In Chapter 2.7 we have listed the current measures per species/habitat type. In this chapter we summarise these measures.

### 7.1 MSFD (see Annex A)

The Marine Strategy Framework Directive applies to the Dutch part of the North Sea (and not to the Wadden Sea, Oosterschelde and Westerschelde). In the Marine Strategy for Dutch waters (See Annex A) a number of environmental targets are announced that should lead to the good environmental status. These measures will be implemented in the coming years and are relevant to a number of the species and habitats listed by OSPAR.

#### 7.1.1.1 *Arctica islandica* and burrowing megafauna

The MSFD target for benthos stated in the Dutch Marine Strategy is: 'Improvement of the population size, condition and distribution of long-lived and/or vulnerable (to physical disturbance) benthic species' (see Annex A). Furthermore, it is stated that the Dutch government will focus on a reduction of the impact of beam trawl fisheries and bycatch of vulnerable species in the framework of the revision of the Common Fisheries Policy. Furthermore, in addition to the Natura 2000 network, the Frisian Front and Oyster Grounds are focus areas for spatial protection measures for benthic species of which *Arctica islandica* and the burrowing megafauna community will probably benefit (Table 14) (p14, I&M & EL&I 2012).

#### 7.1.1.2 *Sharks/rays/skates*

It is also stated the population size of sharks/rays/skates should increase: 'improvement of population size, condition and distribution for populations of vulnerable fish species...' (See Annex A). The responsible minister will discuss these measures in 2013 (<https://zoek.officielebekendmakingen.nl/kst-21501-32-637.html>).

### 7.2 WFD

The Water Framework Directive (WFD) in the Netherlands mainly targets fresh water systems, but also includes the following marine areas: Wadden Sea, Oosterschelde and Westerschelde. Measures in the marine part of the WFD area include restoration of *Zostera* beds and are performed by Rijkswaterstaat ([http://www.rijkswaterstaat.nl/water/natuur\\_en\\_milieu/zeegras/](http://www.rijkswaterstaat.nl/water/natuur_en_milieu/zeegras/)). Measures in the rivers include the restoration of suitable reproduction and nursery habitats for migratory fish and adaptation of river regulation works for migration.

### 7.3 Natura 2000 (Habitat Directive / Birds Directive / Natuurbeschermingswet)

#### 7.3.1 *Natuurbeschermingswet (NB wet, Nature Protection Act)*

The Dutch Nature Protection Act (Natuurbeschermingswet) is the instrument through which the Habitat Directive (HD) and Birds Directive (BD) are executed.

#### 7.3.2 *Protection of HD species and habitats*

Under the HD, special areas of conservation have to be designated for Annex I habitats and Annex II species. Annex IV lists animal and plant species in need of strict protection. Member States must establish protection systems for these species. Annex V lists species for which the use of non-selective methods of taking are prohibited. For each habitat type, typical species have been selected. These are species/habitat types that are an indicator for the quality of the habitat. Detailed descriptions of habitat types in the Netherlands are published in 'profile documents' (<http://www.synbiosys.alterra.nl/natura2000/gebiedendatabase.aspx?main=natura2000&subj=profielen>)

### 7.3.3 Protection of BD species

Under the Birds Directive, special protection areas have to be designated to protect certain species of birds.

## 7.4 Fisheries measures in Natura 2000 areas

Fisheries measures in coastal Natura 2000 areas are taken by the Dutch government in consultation with stakeholders. For the coastal zone, this has resulted in the VIGEB agreement, an agreement on the zonation of fisheries in the Natura 2000 areas Noordzeekustzone and Vlakte van de Raan (VIBEG 2011). In the VIBEG agreement it is stated that bottom trawling with tickler chains will be prohibited in all areas as per 1 January 2016. Until then, it is prohibited in zone I, II, and III (Table 11). More details can be found in the agreement. For OSPAR species/habitats these measures will be beneficial to a number of fish species.

Table 11. Division into areas with different VIBEG fisheries regimes (VIBEG 2011) of the Natura 2000 site Noordzeekustzone.

North Sea Coastal Zone	Zone I	II	III	IV	IV
Regime	Closed to all forms of fishery	Open for non-seabed fishery	Innovation areas	Area for other types of fishing	Research area
% site	10%	15%	28%	47%	To be determined

Fisheries measures in the off shore Natura 2000 areas will be developed in the FIMPAS project (Fisheries Measures in Marine Protected Areas) in consultation with stakeholders.

([http://www.noordzeenatura2000.nl/index.php?option=com\\_content&view=article&id=1:start-fimpas-project-&catid=1&Itemid=50&lang=en](http://www.noordzeenatura2000.nl/index.php?option=com_content&view=article&id=1:start-fimpas-project-&catid=1&Itemid=50&lang=en)). These measures need to be taken/approved by the EU.

## 7.5 EU TACs

Each year, total allowable catches (TACs) are determined at EU level for the most important commercial fish stocks and are set in line with multi-annual plans (see next paragraph). For rays/skates, TACs have been introduced in 1999. It was then set at 6060 tons for ICES areas IIa and IV and has been lowered since then down to 1397 t in 2010 (Heessen 2010a).

([http://ec.europa.eu/fisheries/cfp/fishing\\_rules/tacs/index\\_en.htm](http://ec.europa.eu/fisheries/cfp/fishing_rules/tacs/index_en.htm)).

For certain shark species including *Squalus acanthias*, TACs are set at zero for 2012 (EU 2012).

## 7.6 EU and national action plans for sharks, rays and skates:

The EU has developed an Action plan for the Conservation and Management of Sharks. The Netherlands will implement the measures mentioned in the action plan. An update of the status was given by the responsible minister in September 2012 (<https://zoek.officielebekendmakingen.nl/kst-21501-32-637.html>). The measures proposed in the plans are executed through e.g. the EU Common Fisheries Policy, the Marine Strategy Framework Directive, etc..

EU Action Plan for the Conservation and Management of Sharks (Votier et al. 2008)

*The Action Plan pursues the following three specific objectives:*

*(a) To broaden the knowledge both on shark fisheries and on shark species and their role in the ecosystem;*

*(b) To ensure that directed fisheries for shark are sustainable and that by-catches of shark resulting from other fisheries are properly regulated;*

*(c) To encourage a coherent approach between the internal and external*

The Action Plan foresees the following actions

([http://europa.eu/legislation\\_summaries/maritime\\_affairs\\_and\\_fisheries/fisheries\\_resources\\_and\\_environment/ev0014\\_en.htm](http://europa.eu/legislation_summaries/maritime_affairs_and_fisheries/fisheries_resources_and_environment/ev0014_en.htm)):

- *'increasing investments in shark data collection;*
- *establishing systems to provide verification of catch information by species and by fishery;*
- *improving the monitoring and reporting of catch, bycatch and discards, as well as market and international trade data;*
- *preparing and implementing measures to assist in species identification and monitoring, as called for in the IPAO-SHARKS;*
- *facilitating stakeholder awareness-raising and consultation regarding shark management and best practices to reduce by-catches;*
- *launching educational programmes aimed specifically at educating the public about chondrichthyan conservation programmes;*
- *adapting catches and fishing effort to available resources;*
- *limitation or prohibition of fishing activities in areas that are considered sensitive for endangered stocks;*
- *prohibiting all shark discards in the medium to long term and requiring that all catches be landed;*
- *increasing selectivity in order to reduce by-catches;*
- *confirmation of the shark finning ban.'*

The EU Action Plan should be implemented in the national policies.

For the Dutch implementation of the EU Action Plan the following actions have been performed:

(<https://zoek.officielebekendmakingen.nl/kst-21501-32-637.html>):

- A state of the art report (Heessen 2010a)
- Evaluation of knowledge gaps
- Regular contact between NGOs and IMARES on dissemination of knowledge on sharks
- Development of identification and educational material (IMARES, Nederlandse Elasmobranchen Vereniging and Sportvisserij Nederland)

In 2013 the minister will discuss measures that are needed within the MSFD to restore shark/ray/skate populations (<https://zoek.officielebekendmakingen.nl/kst-21501-32-637.html>).

## 7.7 Cod recovery plan

In relation to OSPAR, the EU and national recovery plans for cod (*Gadus morhua*) (EU 2008a) and eel (*Anguilla Anguilla*) (EC 1100/2007) are relevant.

- EU Regulation for the Recovery of the Eel Stock (EC 1100/2007)
- Dutch Eel Management Plan (Aal beheerplan) (Min EL&I 2011)
- EU Regulation establishing a long-term plan for cod stocks and the fisheries exploiting those stocks (EU 2008a).

## 7.8 Eel management plans

- EU Regulation for the Recovery of the Eel Stock (EC 1100/2007)
- Dutch eel management plan (Min EL&I 2011)

For eel, a number of measures are currently in place (Table 4), based on the eel management plan (Min EL&I 2011) that has been set-up according to the EU Regulation for the Recovery of the Eel Stock (EC 1100/2007). Of the 1800 most important migration barriers, 900 should have been solved before 2015 and the other 900 before 2027. Because of the financial crisis, this operation will be delayed.

- Weakest link: river regulation works, Delta works (barriers to migration)

- Proposed measure: prevent delay in the execution of the eel management plan (see above).

Table 12. Overview of measures for management of the Dutch eel (Min EL&I 2011, Bierman et al. 2012).

Nr	Measure	Period
1	Pumping stations/barriers Present: of the 1800 migration barriers, 900 will be solved before 2015 and the other 900 before 2027	present-2027
2	Hydroelectric plants: 35% reduction of mortality (for technical reasons, only 24% is possible)	2009
3	Fishery-free zones: realise a number of fishery free zones that are important for eel migration	2010
4	Sea angling: release eel alive	2009
5	Recreational fishery: ban on fishery with profession equipment in coastal waters	2011
6	Closure of eel fishery Sept-Dec	sept-dec 2009
7	Closed area to eel fisheries	2011
8	snigging	2009
9	restocking (glass eel and small eel)	2009
10	Angling inland waters: release eel alive	2009
11	Research artificial propagation	on-going

### 7.9 Harbour porpoise conservation plan

For the harbour porpoise a national Conservation Plan has been finalised in 2011 (Camphuysen & Siemensma 2011). The proposed mitigation measures (Table 13) focus on bycatch and underwater noise.

- Weakest link: bycatch, underwater noise
- Proposed measure: see below

Table 13. Suggested mitigation measures for harbour porpoise (Camphuysen & Siemensma 2011).

<b>Bycatch</b>
Investigate alternative gear other than set-nets and/or investigate modification of set-nets.
Controlled use of pingers when bycatch is identified
Facilitate bycatch landing
Restrictions in recreational fisheries, control illegal fisheries
Amend EC 812/2004
Monitor and control compliance fisheries restrictions
<b>Underwater noise (detonation, seismic, piling)</b>
Develop a system of standards for loud explosive sounds
License and guidelines seismic surveys, pile-driving, underwater explosions
Establish porpoise observer schemes before during and after
Notification strandings network prior to acoustic impacts
Reduce noise using bubble curtains, solid barriers, other solutions if proven to be effective
Alert animals ramping up sounds, use acoustic deterrents
Avoid explosives and use an alternative method for wind farm demolition

### 7.10 Mussel fisheries transition

Conventant on mussel seed fisheries (2008) (In Dutch: Convenant transitie mosselsector en natuurherstel Waddenzee) (VIBEG 2011): Convention between the Dutch government, fishery and nature organizations. Areas in the Wadden Sea are closed for mussel seed fishery and Mussel seed capture installations are promoted. The aim for 2020 is that the mussel seed collection is not affecting

the sea bottom at all. This is part of the programme plan for nature recovery in the Wadden Sea 'Naar een rijke Waddenzee' ([http://www.rijkwaddenzee.nl/assets/pdf/dossiers/natuur-en-landschap/Rzee\\_eng\\_Samenvatting\\_programma.pdf](http://www.rijkwaddenzee.nl/assets/pdf/dossiers/natuur-en-landschap/Rzee_eng_Samenvatting_programma.pdf)) (Heessen 2010a).

Table 14. Summary of measures to protect OSPAR species and habitats. For abbreviations, see glossary.

OSPAR name	EU regulations, conventions, national legislation, red lists						Measures, action plans, conservation plans	
	HR/BD (NB Act)	CITES	Treaties	Red lists	FF act / Fisheries act	IMO	EU level	National level
Arctica islandica	proposed typical species of H1110-C							MSFD Spatial protection measures (Dutch marine strategy)
Nucella lapillus						TBT ban (IMO)		
Ostrea edulis					Fish art 1.2			
Rissa tridactyla	BD species		Bern conv		FF			
Alosa alosa	Annex II, V (NB act)		Bern conv		Fish art 1.2			
Anguilla anguilla					Fish art 1.2		EU eel plan	national eel plan
Coregonus lavaretus oxyrinchus	Annex II, IV (NB act)		Bern conv		FF			
Gadus morhua				IUCN 2004 list	Fish art 1.2		EU cod recovery plan	
Raja montagui (synonym: Dipturus montagui)					Fish art 1.2		EU shark plan	national shark plan
Hippocampus guttulatus		x			FF			
Hippocampus hippocampus		x		Dutch red list	FF			
Petromyzon marinus	Annex II (NB act)		Bern conv	Dutch red list	Fish art 1.2			
Raja clavata	proposed typical species of H1110-C			IUCN 2004 list	Fish art 1.2		EU shark plan	national shark plan
Salmo salar	Annex II, V (NB act)		Bern conv		Fish art 1.2 (no catch allowed)			
Squalus acanthias				IUCN 2004 list	Fish art 1.2		EU shark plan; EU TAC 2012= no catch	shark plan, MSFD measures
Phocoena phocoena	Annex II, IV (NB act)	x	Bern conv, Bonn conv, Ascobans	IUCN 2004 list, Dutch red list	FF			Harbour porpoise conservation plan
Intertidal Mytilus edulis beds on mixed and sandy sediments	Typical species of H1130, H1140, H1160				Fish art 1.2			Mussel transition

Intertidal mudflats	is habitattype H1140-A, and occurs as part of habitattype H1130 and H1160							
Ostrea edulis beds					Fish art 1.2			
Sea-pen and burrowing megafauna communities								MSFD Spatial protection measures (Dutch marine strategy)
Zostera beds	Typical species of H1130, H1140, H1160			Dutch red list	FF (Z. marina)			Reintroduction (Measures for Water Framework Directive)

### 7.11 International treaties/conventions

- Bern Convention: Convention on the conservation of European wildlife and natural habitats ([http://www.coe.int/t/dg4/cultureheritage/nature/bern/default\\_en.asp](http://www.coe.int/t/dg4/cultureheritage/nature/bern/default_en.asp)).
- Bonn Convention: convention on migratory species: acts as a framework for international protection, conservation of places where they live, mitigating migration obstacles etc. ([http://en.wikipedia.org/wiki/Bonn\\_Convention#Implementation](http://en.wikipedia.org/wiki/Bonn_Convention#Implementation))
- ASCOBANS: regional agreement on the protection of small cetaceans under de auspices of the Bonn Convention (<http://en.wikipedia.org/wiki/ASCOBANS>)
- CITES: regulates trade (<http://en.wikipedia.org/wiki/CITES>)
- IMO: ban on TBT ([http://www.imo.org/about/conventions/listofconventions/pages/international-convention-on-the-control-of-harmful-anti-fouling-systems-on-ships-\(afs\).aspx](http://www.imo.org/about/conventions/listofconventions/pages/international-convention-on-the-control-of-harmful-anti-fouling-systems-on-ships-(afs).aspx).)

### 7.12 Dutch Flora and Fauna Act

The Dutch Flora and Fauna Act (2002) regulates the protection of plant and animal species. A number of plant species are protected. Invertebrate marine species are not protected. All bird species are protected. All fish are protected, unless they are listed in the Fisheries Act. All reptile species are protected and all mammals are protected, including marine mammals (see Table 14). Activities that are harmful to these species are not allowed, including killing, disturbance, damaging nesting sites, selling animals, etc, unless permissions are obtained from the Ministry (e.g. for hunting or research).

### 7.13 Dutch Fisheries Act

Fish are protected under the Flora and Fauna Act, unless they are listed in the Fisheries Act (Nederlandse Staat 1963), which is the case for a number of them (Table 14). Within the Fisheries Act, it can be stated that the species is not to be fished (e.g. salmon).



## 8 Recommendations for additional measures

For every species and habitat that currently occur or have disappeared in the Dutch part of the OSPAR area we have suggested additional measures (see species/habitat factsheets in Chapter 2.7). A summary of these measures is provided in this chapter (Table 15). In general, the migratory fish are hindered by the river regulation works. For those species, the number of barriers should drastically be reduced to increase the possibilities for migration by construction of fish passages and restoration of habitats. For the rays/skates and sturgeon, the main threat is fisheries. Therefore, (species specific) marine protected areas are suggested as additional measures, so that fishing mortality is reduced. For *Arctica islandica* and for the deep burrowing megafauna communities, the main problem is traditional beam trawling. We therefore propose to close the areas where these species occur for traditional beam trawling. Other measures are species specific, e.g. the reintroduction of flat oysters and reduction of underwater noise for harbour porpoises.

Table 15. Summary of additional measures to protect OSPAR species and habitats that are present in the Netherlands.

Species/habitat	Weakest link	Proposed measure
<i>Arctica islandica</i>	beam trawling	A ban of beam trawling in all areas where <i>Arctica islandica</i> occurs, notably in the deeper parts of the Dutch North Sea (Frisian Front, Oyster Grounds).
<i>Nucella lapillus</i>	sand nourishment, dike repair/enforcement	displace and safeguard specimens before starting sand nourishment and dike construction works.
<i>Ostrea edulis</i>	See <i>Ostrea edulis</i> beds.	See <i>Ostrea edulis</i> beds
<i>Rissa tridactyla</i>		No additional measures needed
<i>Acipenser sturio</i>	No population present, river regulation works, fishery mortality	Reduce fishery mortality before implementing other measures.
<i>Alosa alosa</i>	river regulation works, Delta works (barriers to migration)	Improve conditions for migration
<i>Anguilla anguilla</i>	river regulation works, Delta works (barriers to migration)	prevent delay in the execution of the eel management plan.
<i>Coregonus lavaretus oxyrinchus</i>	river regulation works, Delta works (barriers to migration)	improve conditions for migration through construction of fish passages
<i>Dipturus batis</i>	fisheries	create sufficiently large protected areas without fisheries/reduce fisheries mortality
<i>Raja montagui</i> (synonym: <i>Dipturus montagui</i> )	fisheries	create sufficiently large protected areas without fisheries/reduce fisheries mortality
<i>Gadus morhua</i>	fisheries	None
<i>Hippocampus guttulatus</i>	unknown	Probably measures taken for the restoration of seagrass beds will be beneficial for seahorses (see 3.6.16)
<i>Hippocampus hippocampus</i>	unknown	Probably measures taken for the restoration of seagrass beds will be beneficial for seahorses (see 3.6.16)
<i>Salmo salar</i>	river regulation works, Delta works (barriers to migration)	improve conditions for migration.
<i>Squalus acanthias</i>	fisheries	create sufficiently large protected areas without fisheries/reduce fisheries mortality

Petromyzon marinus	river regulation works, Delta works (barriers to migration)	improve conditions for migration.
Phocoena phocoena	bycatch, underwater noise	See Table 5
Intertidal Mytilus edulis beds on mixed and sandy sediments	Not well known, perhaps mussel seed fisheries	Remove mussel seed fisheries
Intertidal mudflats	erosion	installation of oyster reefs
Ostrea edulis beds	fisheries and diseases	Breed genetically diverse disease resistant <i>Ostrea edulis</i> in hatcheries (Lallias et al. 2010) in sufficient numbers, e.g. by using broodstock from <i>Bonamia</i> free areas such as Denmark, let them settle, spread them on abundant settlement substrate (mussel/oyster shells) and transfer young settled oysters to oyster restoration plots. Make sure that the areas are closed for bottom trawling.
Sea-pen and burrowing megafauna communities	beam trawling	A ban of traditional beam trawling in all areas where sea-pen and burrowing megafauna communities occur.
Zostera beds	turbid waters	construction of artificial (biodegradable) seagrass fields or arrays of current-reducing screens to promote seagrass settlement (Van der Heide et al. 2006)

## **9 Specific measures for species with an OSPAR recommendation**

### **9.1 Relevant species/habitats with an OSPAR recommendation**

The species with an OSPAR recommendation are listed in Table 17. Of these species, only a few are relevant to the Netherlands in the sense that they are present. *Rissa tridactyla* is already monitored and protected. The seahorses *Hippocampus* are only encountered locally, almost no information is available and any measures would be hard to take. Only for the 'Sea-pen and burrowing megafauna communities' (OSPAR 2011a) and 'Zostera beds' (OSPAR 2012) the Netherlands probably has to take additional measures.

### **9.2 Sea-pen and burrowing megafauna community**

The 'Sea-pen and burrowing megafauna communities' is the habitat type for which until now no measures have been taken and which are most in need of protection.

In the OSPAR recommendation (Table 16) it is stated that protection measures should be taken and monitoring should inform on the distribution of this habitat. Protection in the Netherlands will probably take place through the measures that are announced in the Dutch Marine Strategy (I&M & EL&I 2012) (see Chapter 7). We therefore recommend OSPAR to be closely involved in the processes of (1) development of the MSFD programme of measures and (2) the MSFD/Natura 2000 monitoring program.

Furthermore it is stated that fishery data from fisheries should become available; that fishermen should be encouraged to report catches of part of this burrowing community, and that impact assessments should be made. In general, the availability of Dutch VMS data (positions of ships) is not a problem. VMS data from other countries are not easily obtained, however, not even by national research institutes within these countries. Also, there is data available from IMARES fishery surveys, and there are some bycatch monitoring programmes. However, we doubt whether these provide the right information on this habitat type. As has been suggested for the MSFD monitoring, we recommend to execute dedicated research surveys, that target the (deep burrowing) crustaceans. Impact assessments specifically targeted at this community are also not available yet. We recommend to discuss the possibilities for such assessments with e.g. IMARES fisheries scientists.

In the OSPAR recommendation there is a lot of emphasis on the establishment/enlargement of the knowledge base. In 2013, within the EL&I North Sea biodiversity research (EL&I program BO11) for the MSFD there will be attention for this part of the ecosystem. It would be beneficial to stay into contact with the responsible of the ministry of EL&I.

### **9.3 Zostera beds**

The programme and measures of the OSPAR recommendation are listed in Table 16. In general, different reintroduction programmes exist under the Water Framework Directive. Also the protection, monitoring and information base seems to be all right.

Table 16. Programme and measures for burrowing megafauna and for *Zostera* beds.

		<b>Burrowing megafauna</b>	
<b>3</b>		<b>Programme and measures</b>	<b>Dutch measures</b>
3.1		Each Contracting Party should:	
	a	consider the introduction of national legislation to protect sea-pen and burrowing megafauna communities;	part of MSFD (see Annex A)
	b	assess whether existing management measures for the protection of sea-pen and burrowing megafauna communities are effective and determine what further measures are needed to address the key threats;	not effective. See text on additional measures
	c	investigate systematically the distribution, quality and extent of sea-pen and burrowing megafauna communities by means of seabed habitat surveys and monitoring in order to complete the knowledge base and provide indicators for the state and recovery of the habitat;	This is possibly done through the future MSFD monitoring.
	d	seek ways and means to broaden the information base on the occurrence of sea-pen and burrowing megafauna communities by involving commercial fishermen, and integrating environmental and fisheries research;	This is possibly done through the future MSFD monitoring.
	e	improve access to fishing distribution, frequency and intensity data at the appropriate spatial resolution for nature conservation purposes;	VMS data are usually available
	f	report any existing and new data on the distribution, quality and extent of sea-pen and burrowing megafauna communities to the OSPAR habitat mapping database;	Research is needed to do this
	g	consider whether any sites within its jurisdiction justify selection as marine protected areas for the conservation and recovery of sea-pen and burrowing megafauna communities, and;	This is part of the MSFD protection measures (see Annex A)
	h	in accordance with OSPAR Recommendation 2003/3 as amended by OSPAR Recommendation 2010/2, report to the OSPAR Commission on sites selected for inclusion as components of the OSPAR Network of Marine Protected Areas and develop appropriate management plans and measures;	will be done when MSFD measures are taken
	i	address any significant adverse impacts on sea-pen and burrowing megafauna communities arising from human activities in waters under its jurisdiction, where necessary, by working with appropriate international competent authorities.	This will be done for the MSFD/CFP
3.2		Acting collectively within the framework of the OSPAR Commission, Contracting Parties should:	

	a	improve the OSPAR habitat mapping database, and publish regularly updated quality assessments and distribution records;	this report provides basic information. Additional research is needed. Currently, the ministry of EZ and RWS are developing monitoring programs for the MSFD/Natura 2000. The data collected in these programs could be used to improve the knowledge base on OSPAR habitats/species. We further recommend to issue a report such as this one e.g. every 6 years.
	b	communicate the current knowledge base on this habitat to OSPAR Contracting Parties, stakeholders and other international competent authorities;	this report provides basic information. Additional research is needed (see also previous point)
	c	in accordance with Annex V of the OSPAR Convention, draw relevant issues to the attention of authorities competent for fisheries management, including issues such as:	
	ci	requests for closing to fishing further areas where there may be a significant adverse impact on sea-pen and burrowing megafauna communities from fishing, where this is necessary and scientifically relevant for their preservation and conservation;	will be done through MSFD (see Annex A)
	cii	encouraging commercial fishermen to report incidental by-catches of relevant sea-pen and burrowing megafauna species, including information about location and date, to competent authorities in order to reveal areas where the habitat occurs;	IMARES fishery surveys provide data. There is information on bycatches, sampled either by fishermen or observers, available as well. Monitoring for MSFD/N2000 will focus on this as well.
	ciii	suggesting new strategies that significantly address the by-catch associated with Nephrops fisheries.	This is a task for the fishery department of the Ministry of Economic Affairs
	d	evaluate the extent to which ecological data from commercial Nephrops stock assessment and commercial video footage and photographic evidence can be used to assess the status of sea-pen and burrowing megafauna communities, and as appropriate develop protocols for assessment purposes.	no stock assessment takes place in the Dutch part of the North Sea.
		<b>Zostera beds</b>	
		<b>3. Programmes and measures</b>	
3.1		Each Contracting Party should:	
	a	consider the introduction of national legislation to protect Zostera beds;	is present (see factsheet)
	b	assess whether existing management measures for the protection of Zostera beds are effective and determine what further measures are needed to address the key threats;	See factsheet
	c	investigate systematically the distribution, quality and extent of Zostera beds, by means of seabed habitat surveys and monitoring, in order to complete the knowledge base and provide indicators for the state and recovery of the habitat;	is done (see factsheet)

	d	whenever applicable seek ways and means to broaden the knowledge base on the occurrence of <i>Zostera</i> beds by gathering additional knowledge from sources such as commercial and recreational fishers, fisheries research and the general public;	not applicable
	e	report any existing and new data on the distribution, quality and extent of <i>Zostera</i> beds habitat to the OSPAR habitat mapping database;	is a task for RWS
	f	consider whether any site within its jurisdiction justifies selection as a marine protected area for the conservation and recovery of <i>Zostera</i> beds; and	<i>Zostera</i> beds are exclusively present in Natura 2000 areas
	g	implement paragraph f with regards to the particular link established between <i>Zostera</i> beds and any species noted in the OSPAR List of Threatened and/or Declining Species and Habitats <sup>1</sup> ;	
	h	address any significant adverse impacts on <i>Zostera</i> beds arising from human activities in waters under its jurisdiction;	should be part of Natura 2000
	i	regulate land reclamation, coastal constructions, including marinas and ports, and downscaling of water exchange between open sea and inshore shallow waters, e.g. lagoons;	should be part of Natura 2000
	j	adapt coastal protection measures in such a way that undesired negative effects on <i>Zostera</i> beds are minimised;	should be part of Natura 2000
	k	raise awareness of the importance of <i>Zostera</i> beds among relevant management authorities, the fishery sector and the general public;	The website <a href="http://www.zeegras.nl">www.zeegras.nl</a> has disappeared, which means that there is no central website for the protection of seagrass. We recommend to improve the communication on seagrass to stakeholders and other parties.
3.2		Acting collectively within the framework of the OSPAR Commission, Contracting Parties should:	
	a	improve the OSPAR habitat mapping database, and publish regularly updated quality assessments and distribution records;	
	b	communicate the current knowledge base on <i>Zostera</i> beds to OSPAR Contracting Parties, stakeholders and other international competent authorities;	The website <a href="http://www.zeegras.nl">www.zeegras.nl</a> has disappeared, which means that there is no central website for the protection of seagrass. We recommend to improve the communication on seagrass to stakeholders and other parties.
	c	intensify efforts for nutrient reduction;	Nutrients have been successfully reduced.
	d	formulate a common monitoring and assessment strategy addressing the distribution, extent and condition of <i>Zostera</i> beds e.g. :	The currently known <i>Zostera</i> beds are monitored
	i	quality indicators suggested: presence/absence and area distribution of <i>Zostera</i> beds, colonisation depth of <i>Zostera</i> , cover, biomass of <i>Zostera</i> , shoot density, presence and amount of filamentous algae, abundance of epiphytes, key fauna, water quality and climatic variables, sedimentation, mapping of <i>Zostera</i> presence and abundance at the annual biomass maximum and preferably at	The currently known <i>Zostera</i> beds are monitored

		the same time of the year;	
	i	use of existing monitoring notably those developed within the context of the Marine Strategy Framework Directive and the Water Framework Directive and corresponding legislation of Contracting Parties;	The currently known Zostera beds are monitored
	ii	synergy with monitoring of other species and habitats with focus on the OSPAR listed ones (OSPAR Agreement 2008-6), and those selected as indicators within the relevant EU directives and corresponding legislation of Contracting Parties;	The currently known Zostera beds are monitored
	iii	establishment of assessment criteria and methods;	
	iv	data recording including date, time, site or transect description, quadrat size, number of replicates, GPS location, tide condition and water depth.	The currently known Zostera beds are monitored

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## **11 Quality Assurance**

*Decimal characters: Data is in derogation Dutch SI reported a decimal point (.) Instead of a comma (,).*

IMARES utilises an ISO 9001:2008 certified quality management system (certificate number: 57846-2009-AQ-NLD-RvA). This certificate is valid until 15 December 2012. The organisation has been certified since 27 February 2001. The certification was issued by DNV Certification B.V.



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## Justification

Rapport C134/12

Project Number: 4306120701

The scientific quality of this report has been peer reviewed by the a colleague scientist and the head of the department of IMARES.

Approved: Dr Robbert Jak  
Senior researcher

Signature:



Date: 15 November 2012

Approved: Drs Jakob Asjes  
Head Ecology department

Signature:



Date: 15 November 2012

## Annex A. Relevant texts of the Dutch Marine Strategy

In October 2012 the 'Draft Marine Strategy for the Dutch part of the North Sea 2012-2020, Part I' (I&M & EL&I 2012) was adopted by the Dutch government. Below an overview is given of the relevant texts in the context of this report. Per descriptor the relevant texts on good environmental status, environmental targets and policy assignments are provided. Keyword are printed bold. Numbers in the text refer to the EU Marine Strategy Framework Directive (EU 2008b) and the Commission Decision (EU 2010). The English translation of the Dutch Marine Strategy can be found on: <http://ec.europa.eu/environment/marine/pdf/Marine%20Strategy%20Dutch%2020120609.pdf>.

**3.4 Marine Ecosystem** (MSFD Annex I, comprises the descriptors (1) biodiversity, (3) commercially exploited fish and shellfish, (4) food webs, and (6) sea-floor integrity)

### 3.4.1 Good environmental status of the Dutch North Sea ecosystem 2020 (MSFD, Art. 9)

- Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions. (MSFD, Annex 1, descriptor 1).
- Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock. (MSFD, Annex 1, descriptor 3).
- All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and at levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity. (MSFD, Annex 1, descriptor 4).
- Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and that benthic ecosystems, in particular, are not adversely affected. (MSFD, Annex 1, descriptor 6).

### 3.4.2 Environmental targets 2020 (MSFD Art. 10)

#### Main target: structure of the ecosystem

The interim target for 2020 is to reverse the trend of degradation of the marine ecosystem due to damage to seabed habitat and biodiversity to one of recovery. (Commission Decision Criterion 1.7). This constitutes a first step towards a situation in which the marine ecosystem in the Dutch part of the North Sea can (in part) recover in the long term. This implies a structure in which the relative proportions of the ecosystem components (habitats and species) are in line with prevailing physiographic, geographic and climatic conditions.

#### Subtargets:

##### **1) Species:**

##### Benthos:

a) Improvement of the size, quality and distribution of populations of long-living and/or vulnerable (i.e. sensitive to physical disturbance) benthic species. (Commission Decision, criteria 1.1, 1.2, 1.3, 1.6, and 6.2).

##### Fish:

b) Improvement of the size, quality and distribution of populations of **vulnerable fish species**, in so far as deterioration has been caused by human activity. (Commission Decision, criteria 1.1, 1.2, 1.3, 4.1 and 4.3). This includes fish species with a long-term negative trend in population size and fish species with a low reproductive capacity (e.g. **skates, rays and sharks**). As regards improving the status of the Habitats Directive species, the targets are in line with the national targets of the Habitats Directive. Items c and d below apply to commercially exploited fish and shellfish covered by this description.

c) The fishing mortality rate (F) for all commercially exploited fish and shellfish stocks remains at the same level as or below the value of a *Maximum Sustainable Yield*, (MSY):  $F \leq F_{msy}$ . (Commission

Decision, criterion 3.1).204 The target for depleted stocks of sharks, skates and rays exploited by the EU fleet is rebuilding in line with the European Community Action Plan for the Conservation and Management of Sharks, Commission Decision 2009/40. This is a process target. Moreover, achieving the target not only depends on the Netherlands, but on many other countries as well.

d) The *Spawning Stock Biomass* (SSB) of commercially exploited fish and shellfish is above the precautionary level Bpa. (Commission Decision, criterion 3.2).

e) Minimisation and, eventually, elimination of *discards* from fishing. (Commission Decision, criteria 1.1, 1.2 and 1.3).

#### Birds:

f) The targets for Birds Directive species are in line with the national targets of the Birds Directive. (Commission Decision, criteria 1.1, 1.2, 1.3, 4.1 and 4.3).

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#### Marine mammals:

g) The targets for marine mammals covered by the Habitats Directive (common seal, grey seal and harbour porpoise) are the same as the national targets pursuant to the Habitats Directive. (Commission Decision, criteria 1.1, 1.2, 1.3, 4.1 and 4.3).

#### Demographic characteristics:

h) The demographic characteristics of fish, bird and marine mammal populations are indicative of resilient populations in terms of, for instance, natural size and age groups, male/female ratio, reproduction and mortality. (Commission Decision, criteria 1.3 and 3.3) Sub-targets c and d contribute to this subtarget for commercially exploited fish species. (see: c).

### 2. Food webs:

i) The effect of human interventions on interactions between the different trophic levels in the food is reduced. (Commission Decision, criteria 1.7, 4.1, 4.2 and 4.3).

### 3. Habitats:

j) The distribution and area of predominant habitat types distinguished at EUNIS level 3 remain more or less the same (i.e. within the limits of natural variation at EUNIS level 3). (Commission Decision, criteria 1.4 and 1.5).

k) For the special habitat types protected under the Habitats Directive the national targets of the Habitats Directive apply. (Commission Decision, criteria 1.4, 1.5 and 1.6).

l) Supplementary **improvement of the quality of the deeper, silty parts and deeper, non-dynamic sand beds** in the Dutch part of the North Sea. (Commission Decision, criterion 1.6). The quality of the habitats applies to the physical structure, ecological function and diversity and structure of the associated species communities.

m) **10-15% of the seabed** of the Dutch part of the North Sea is not appreciably disrupted by human activities. (Commission Decision, criteria 1.6 and 6.1).

#### 3.4.3 Policy assignment supplementary to existing and initiated policy

- Revision of Common Fisheries Policy. The Cabinet is committed to capitalising in Europe on the road taken in the Netherlands to make fisheries more sustainable by way of the revision of Common Fisheries Policy (Ministry of Economic Affairs, Agriculture and Innovation, *Revision of Common Fisheries Policy, Letter to the Dutch House of Representatives, reference 224792* (The Hague, 30 September 2011)). In Europe, the Cabinet is committed to sustainably managed fish stocks, reducing seabed disruption and countering by-catches. Policy should primarily aim at the sustainable use and maintenance of natural marine resources and ecosystems, and maintaining

opportunities for a socially accepted fishing industry that operates in a sustainable manner and meets a considerable demand for food. Policy in that respect should be simple, effective, practical and enforceable.

- Supplementary seabed protection. To supplement the implementation of the BHD and the generic commitment to making fisheries more sustainable, **protection is offered for the seabed ecosystem in the *Frisian Front* and the *Central Oyster Grounds*. These are considered search areas for spatial protective measures.** In 2015, decisions will be taken on limiting the areas within these search areas in which spatial protective measures will be taken. Such decisions will also cover the nature of the measures to be taken. The following prerequisites will apply:
  - the ambition to safeguard 10-15% of the Dutch part of the North Sea against seabed disruption (including parts of the designated Habitats Directive areas, Dogger Bank, Klaver Bank, North Sea coastal zone and Vlakte van de Raan) and
  - minimising inconvenience for fisheries.

Moreover, this will take into account the differences in nature value of the areas as well as considerations on efficiency and enforcement (such as the spatial concentration of the BHD and MSFD tasks). For this a process will be set up, to which the fishing industry and nature organisations will also be invited. The measures will be implemented as part of CFP, but also uses other than fisheries will be explored as necessary.

### **3.8.1 Good environmental status - Contaminants 2020**

(MSFD, Art. 9)

**Concentrations of contaminants are at levels not giving rise to pollution effects. (MSFD, Annex I, descriptor 8).**

Overview of current and initiated policy

- Ocean shipping: Stringent IMO regulations for dumping. The North Sea is, among others, a special area for oil pollution, litter and SOx emissions. IMO prohibits organotin compounds on ship's hulls. The ban on TBT has been embedded in a EU Regulation.
- Oil and gas recovery: OSPAR decisions on reducing emissions have been implemented in the Mining Act.
- Land-based point sources: a general policy framework, as laid down in the Environmental Management Act, the Water Act and general substances policy.
- Diffuse sources: diffuse sources action programme.
- River basin areas: within the WFD context, the approach to sources upstream is subject to agreements with neighbouring countries in the basin areas of the major rivers.
- Approach to incidents and disasters: pursuant to the Bonn Agreement and the Seveso II Directive. This collaboration agreement includes agreements on performing risk analyses to prevent accidents, limiting the effects of accidents, a notification duty and reporting on incidents.

### **3.8.2 Environmental targets 2020**

(MSFD, Art. 10)

- Counter the concentrations of contaminants where these do not meet the targets of the Water Framework Directive, pursuant to its timeline. (Commission Decision, criterion 8.1).
- Ensure that concentrations of other known substances, where these meet the Water Framework Directive standards, do not exceed current concentrations and, where possible, reduce them. (Commission Decision, criterion 8.1).
- Specific target for TBT and oil is to prevent the pollution effects that are currently observed. (Commission Decision, criterion 8.2).



## Annex B. OSPAR recommendations

Table 17 Species with an OSPAR recommendation ([www.ospar.org](http://www.ospar.org))

Group	Species name	English name	Regularly present in the Netherlands?
Seabirds	Larus fuscus fuscus	Lesser black-backed gull / Balthic gull	No
Seabirds	Pagophila eburnea	Ivory gull	No
Seabirds	Polysticta stelleri	Steller's eider	No
Seabirds	Puffinus assimilis baroli (auct.incert.)	Little shearwater / Barolo shearwater	No
Seabirds	Puffinus mauretanicus	Balearic shearwater	No
Seabirds	Rissa tridactyla	Black-legged kittiwake	Yes
Seabirds	Sterna dougallii	Roseate tern	No
Seabirds	Uria lomvia	Thick-billed murre	No
Fish	Cetorhinus maximus	Basking shark	No
Fish	Dipturus batis (synonym: Raja batis)	Common Skate species complex	Yes
Fish	Hippocampus guttulatus (synonym: Hippocampus ramulosus)	Long-snouted seahorse	Yes, very locally
	Hippocampus hippocampus	Short-snouted seahorse	Yes very locally
Fish	Hoplostethus atlanticus	Orange roughy	No
Fish	Rostroraja alba	White skate	No
Fish	Squatina squatina	Angel shark	No
Habitats	Coral Gardens		No
Habitats	Deep-sea sponge aggregations		No
Habitats	Lophelia pertusa reefs		No
Habitats	Sea-pen and burrowing megafauna communities		Yes
Habitats	Zostera beds		Yes (few locations)