

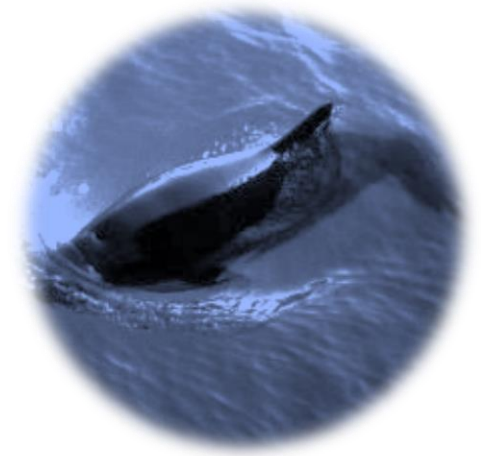
Muddied Waters – The current status of harbour porpoise conservation in the Wadden Sea



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Trilateral Symposium on Harbour porpoises in the Wadden Sea,
Thursday 11 April 2019, WHV UNESCO World Heritage Visitor Center

**What is the
conservation status of harbour porpoise in
the Wadden Sea?**

What is the conservation status of harbour porpoise in the Wadden Sea?

Conservation status ... indicates how likely it is that a **group of organisms** is going to **become extinct* in the future.**

How does one **measure the likelihood of extinction** in the future?

**extirpation*

Extirpation (also known as 'local extinction') describes the situation in which a species or population no longer exists within a certain geographical location. Unlike extinction, whereby a species no longer exists anywhere, extirpation means that at least one other population of the species still persists in other areas.

How to measure **extinction/extirpation risk**:

Those are for example:

- increase/decrease of number of individuals of the group
- Increase/decrease of the population over time
- Breeding success
- Known threats
- Emerging threats

What is the conservation status of harbour porpoise in the Wadden Sea?

Conservation status ... indicates how likely it is that a **group of organisms** is going to **become extinct* in the future.**

How does one **measure the likelihood of extinction** in the future?

What do we mean by **group of harbor porpoises**?

What do we mean by **Wadden Sea**?

How to define what unit to conserve.

Species: a specifically named taxonomic group of living organisms of the same kind which are capable of producing fertile offspring.

Population: a collection of individuals (same species) generally in the same area. Genetic variation within the population itself & with other populations. Can exist in isolation, or co-exist at times with conspecific populations in the same area.

Ecological Unit: the overall area frequented by a 'population' to reflect differences in spatial preferences of individuals with no consideration of management (Evans & Teilmann 2009; Evans 2012).

Management Unit (MU): a geographical area in which the animals of a species are found and to which management of human activities is applied. An MU may be smaller than a 'population' or an 'ecological unit'.

Assessment Unit (AU): OSPAR term under the Marine Strategy Framework Directive. They reflect a geographical area occupied by a population and so are divisions based on biology/ecology rather than management. These areas vary by species, i.e. they are not the same within a regional sea for different species.

Stock: [viable stock used as term] Needs a clear definition

Management Units can also be defined as a smaller unit such as:

Management Units Harbour Porpoise European Atlantic Waters

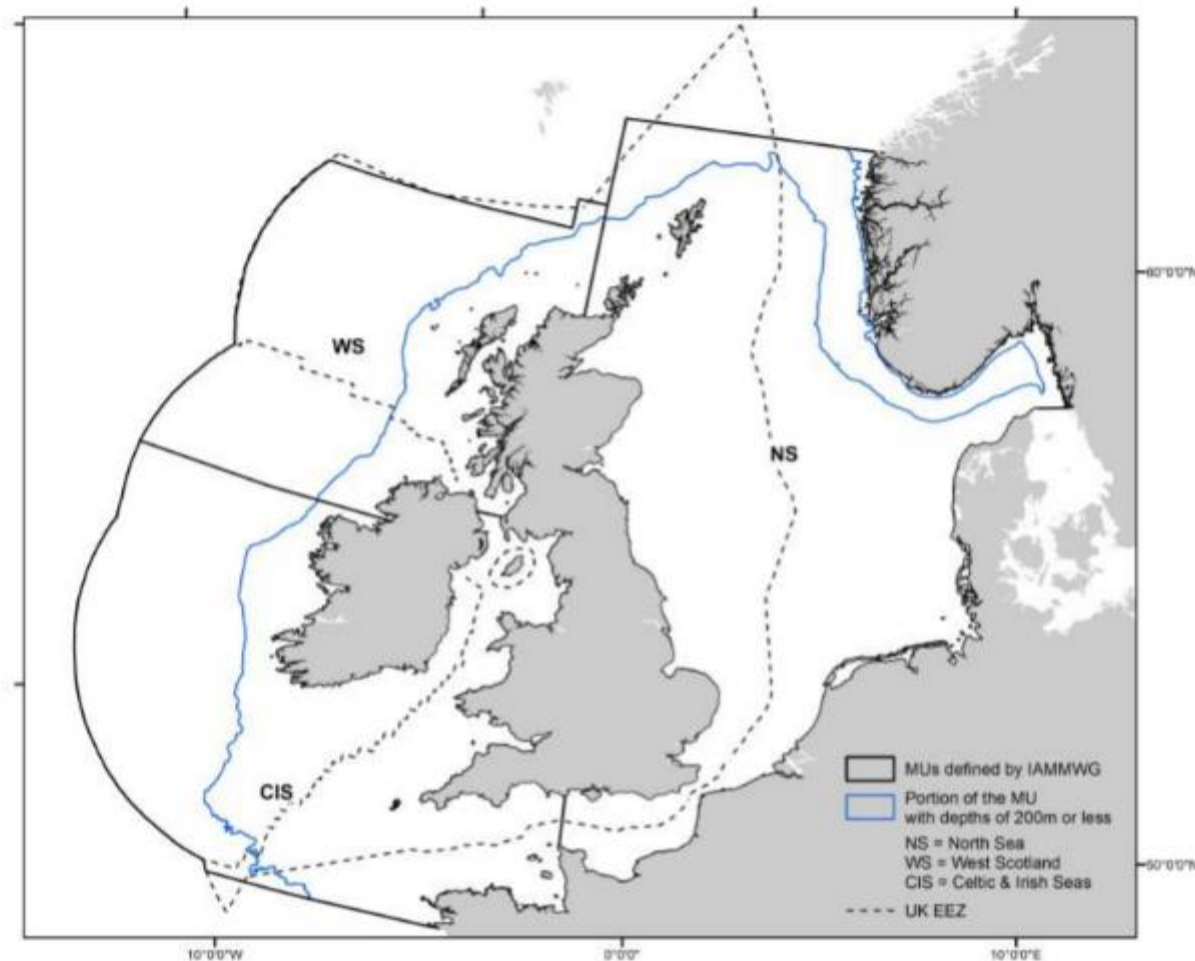
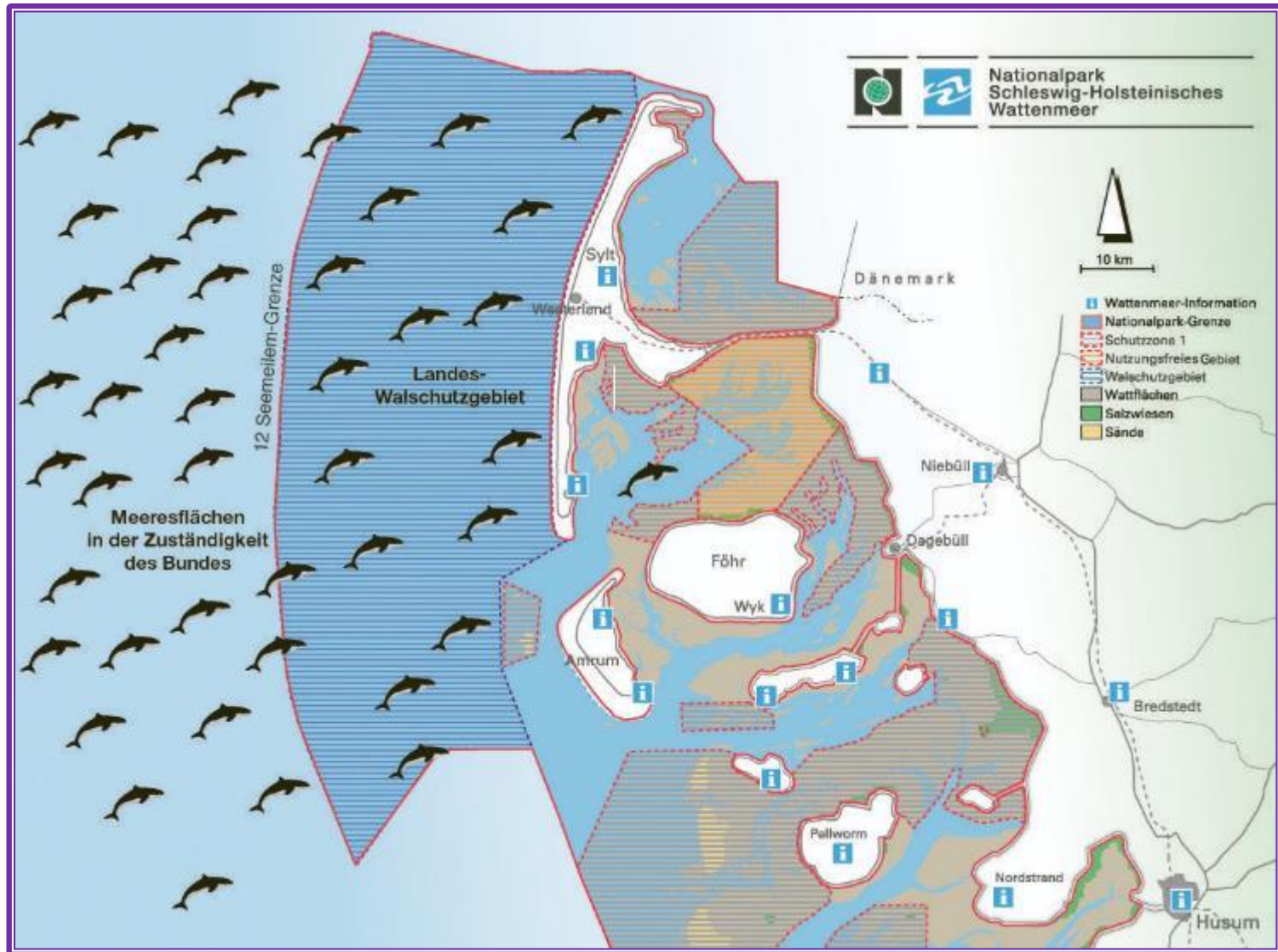


Figure 1.3. Management units (MUs) for the Harbour porpoise (*Phocoena phocoena*) in European Atlantic waters (top) and UK waters (bottom) (from ICES, 2014a and IAMMWG, 2015a, respectively).

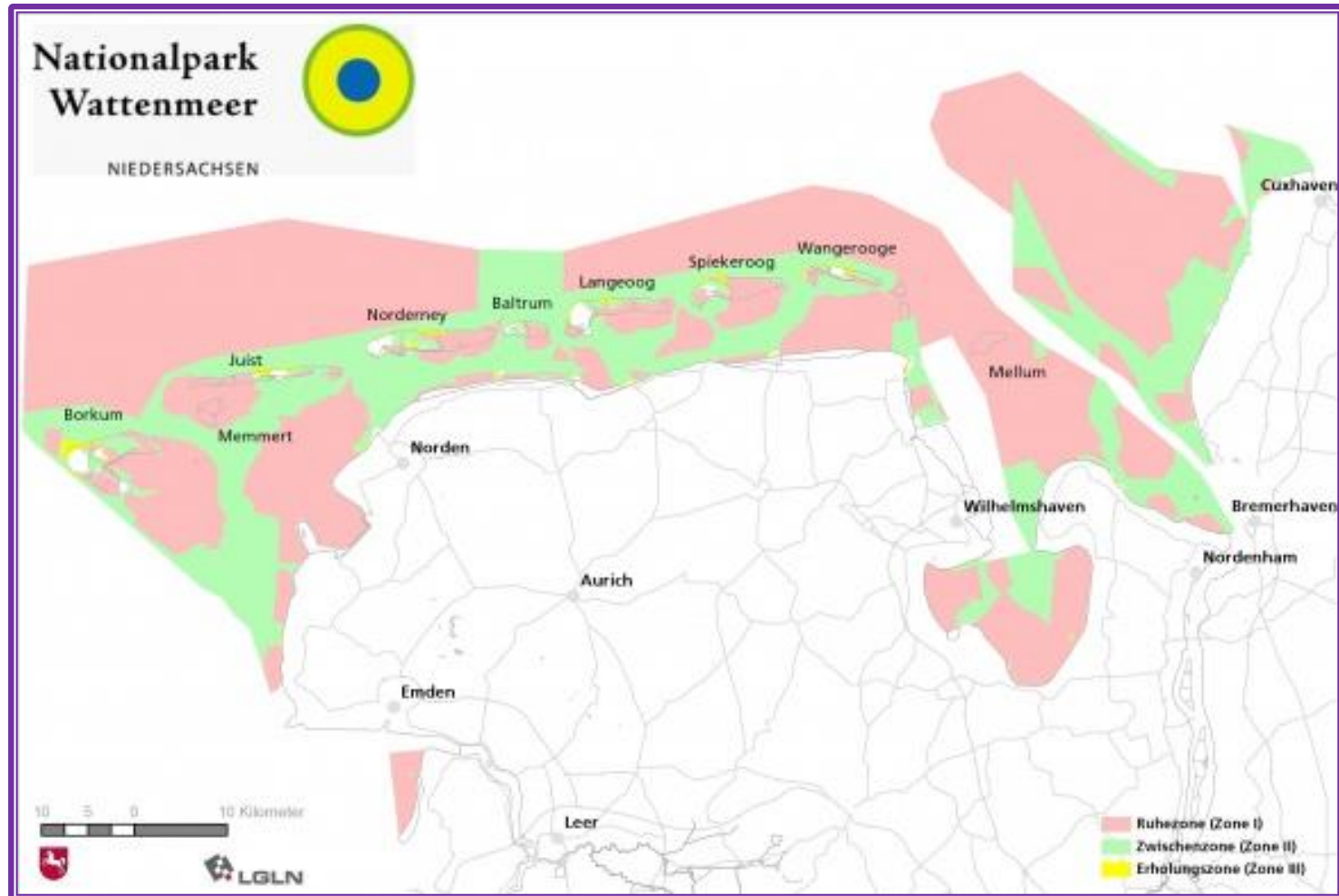
Walschutzgebiet Sylt – Whale Sanctuary Sylt



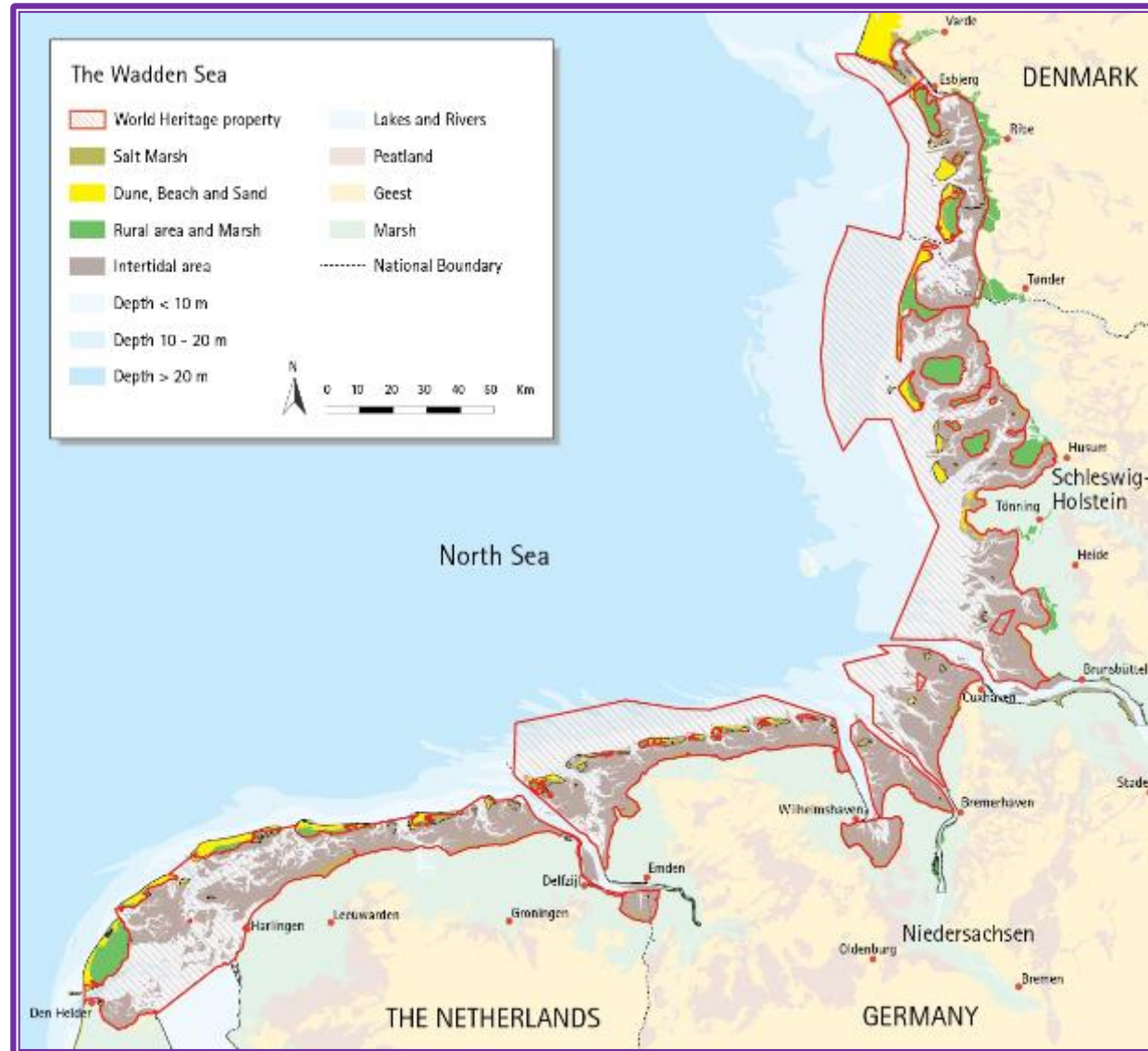
North Sea Coastal Zone Natura2000 area



National Park Wadden Sea Lower Saxony



UN World Heritage Site Wadden Sea



What is World Heritage?

- World Heritage properties belong to all the people of the world.
- To be included on the World Heritage List, a site has to be of Outstanding Universal Value.
- ‘Outstanding Universal Value’ is defined as the “cultural and/or natural significance, which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity”.



United Nations
Educational, Scientific and
Cultural Organization



World
Heritage
Convention

 Denmark

 Germany

 Netherlands

N53 31 43 E8 33 22

Date of Inscription: 2009

Extension: 2014

Minor boundary modification inscribed year: 2011,
2011

Criteria: (viii)(ix)(x)

Ref: 1314ter

EMARNATA

SECRETARÍA DE

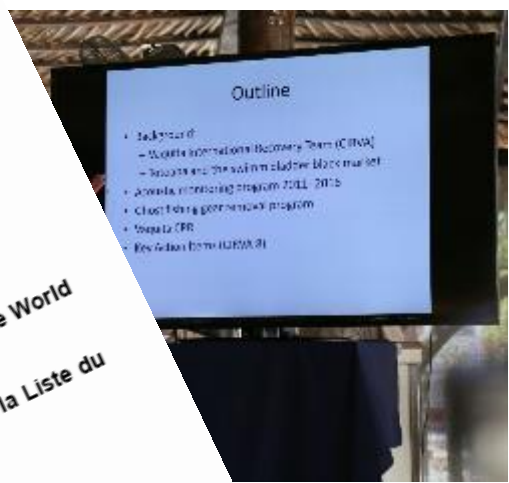


World Heritage Patrimoine mondial

41 COM
Paris, June 2017
Original: English

UNITED NATIONS EDUCATIONAL,
SCIENTIFIC AND CULTURAL ORGANIZATION
ORGANISATION DES NATIONS UNIES
POUR L'ÉDUCATION, LA SCIENCE ET LA CULTURE
CONVENTION CONCERNING THE PROTECTION OF THE WORLD
CULTURAL AND NATURAL HERITAGE
CONVENTION CONCERNANT LA PROTECTION DU PATRIMOINE
MONDIAL, CULTUREL ET NATUREL
WORLD HERITAGE COMMITTEE / COMITE DU PATRIMOINE MONDIAL
Forty-first session / Quarante-et-unième session
Krakow, Poland / Cracovie, Pologne
2-12 July 2017 / 2-12 juillet 2017

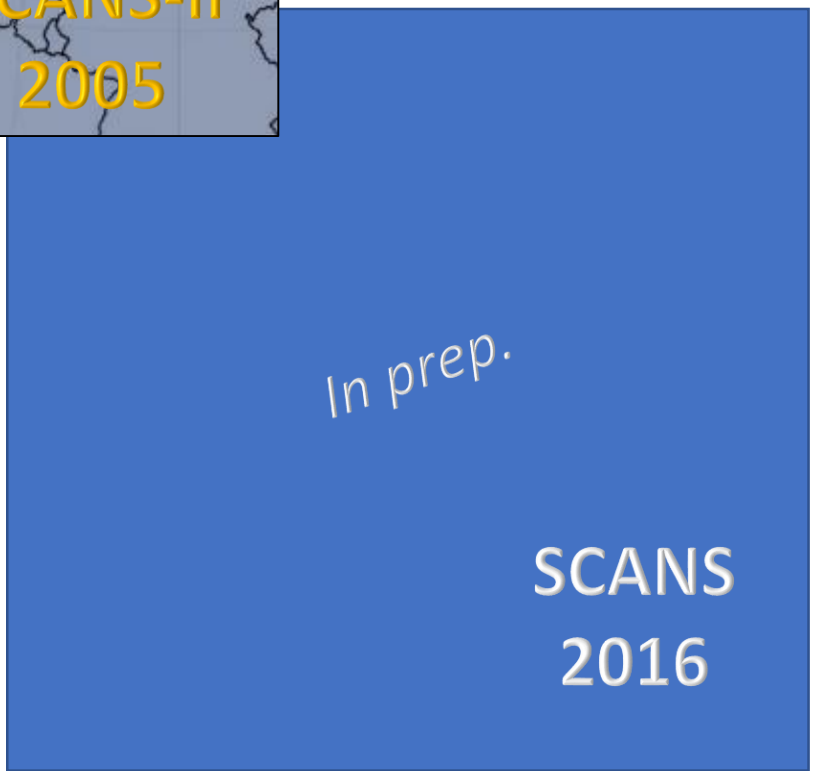
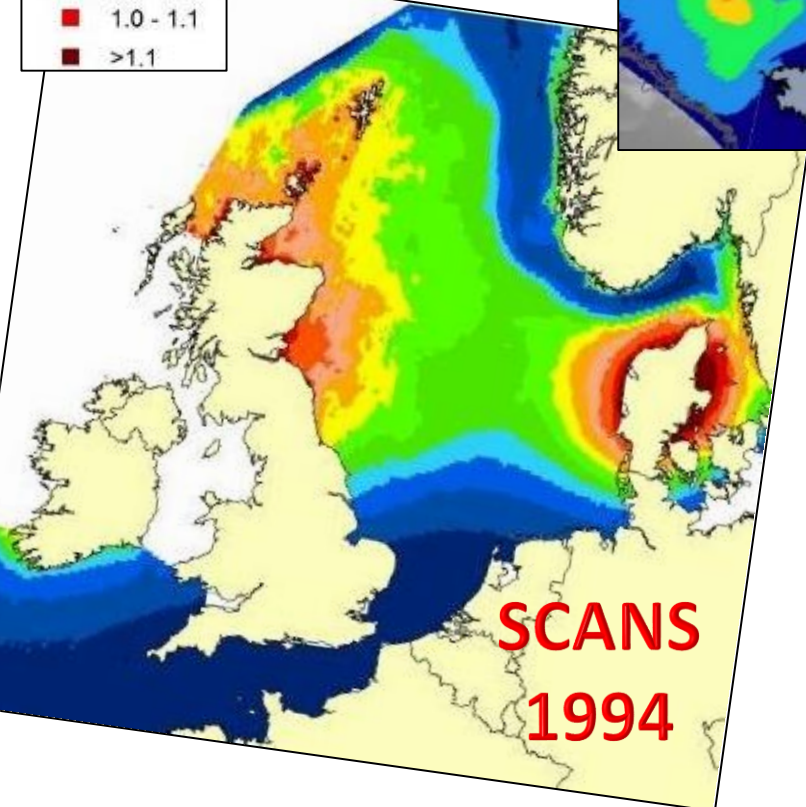
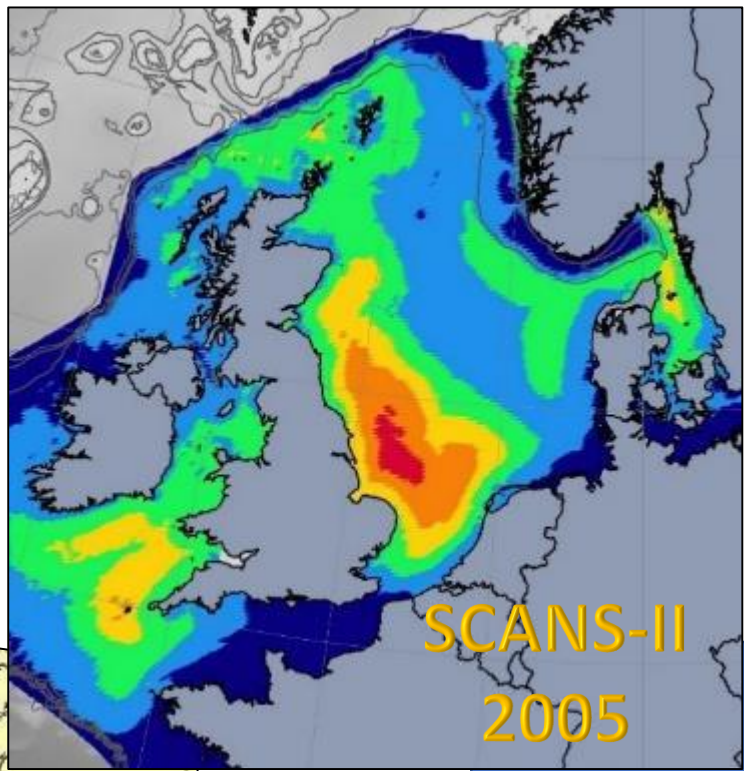
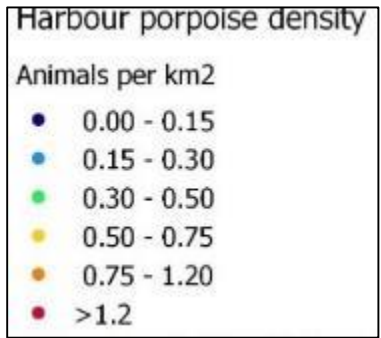
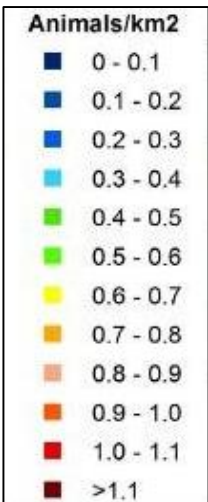
Item 7 of the Provisional Agenda: State of conservation of properties inscribed on the World Heritage List and/or on the List of World Heritage in Danger
Point 7 de l'Ordre du jour provisoire: Etat de conservation de biens inscrits sur la Liste du patrimoine mondial et/ou sur la Liste du patrimoine mondial en péril
MISSION REPORT / RAPPORT DE MISSION
Islands and Protected Areas of the Gulf of California (Mexico) (1182ter)
îles et aires protégées du Golfe de Californie (Mexique) (1182ter)
9 - 15 April 2017



So, what's up with
porpoises in the
Wadden Sea?

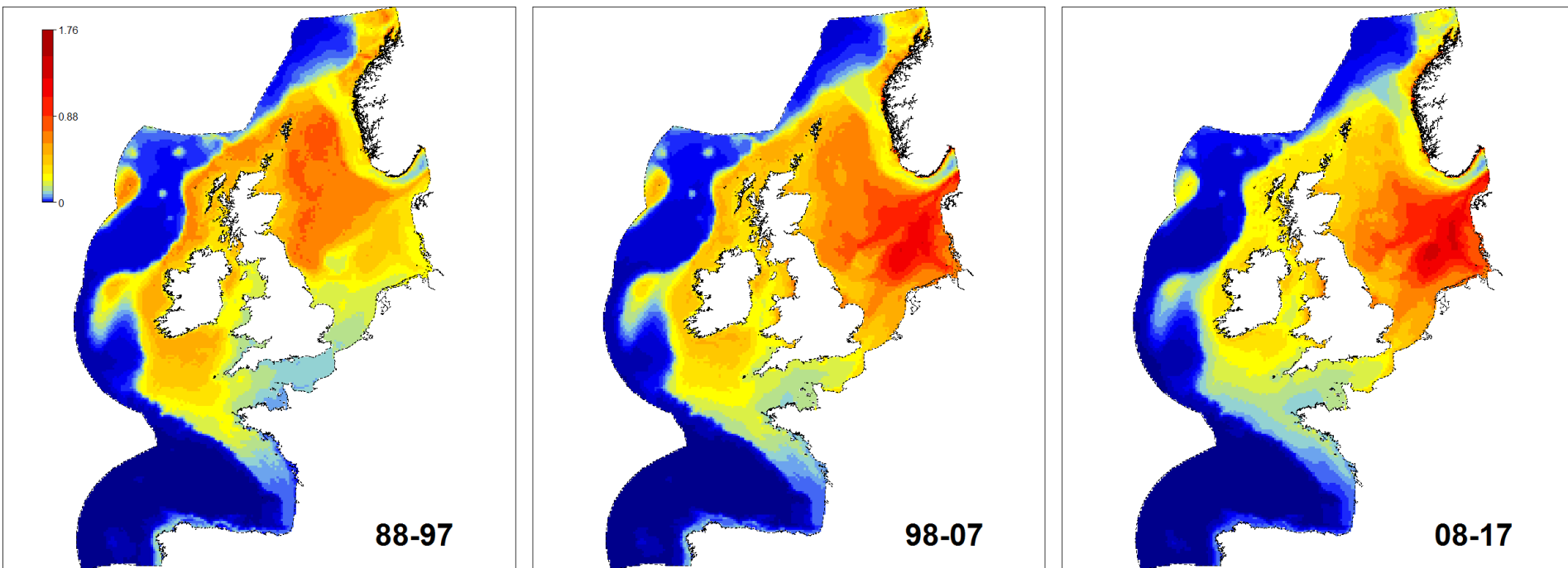
Aerial surveys



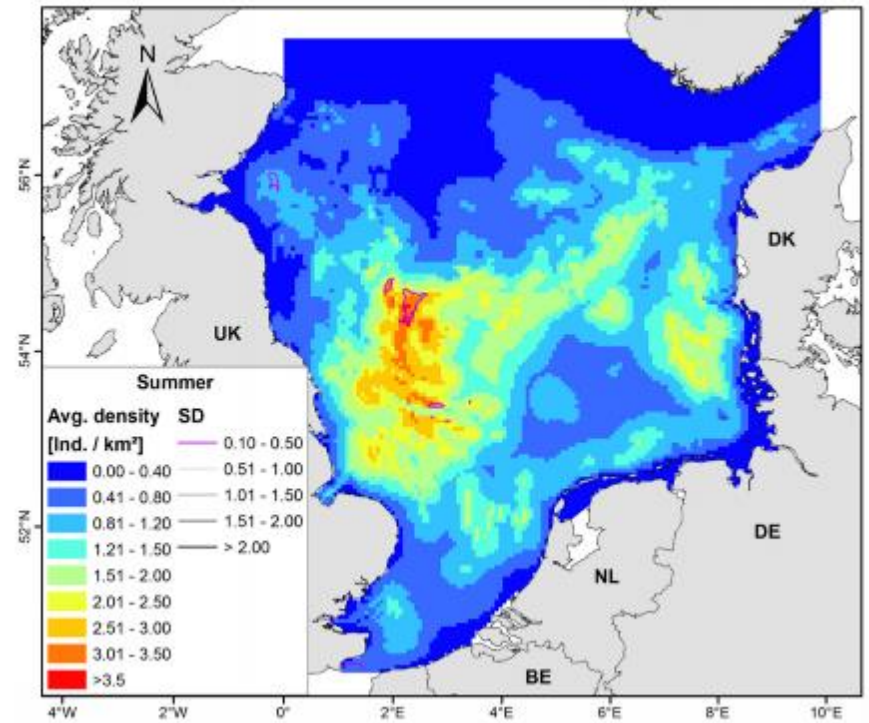
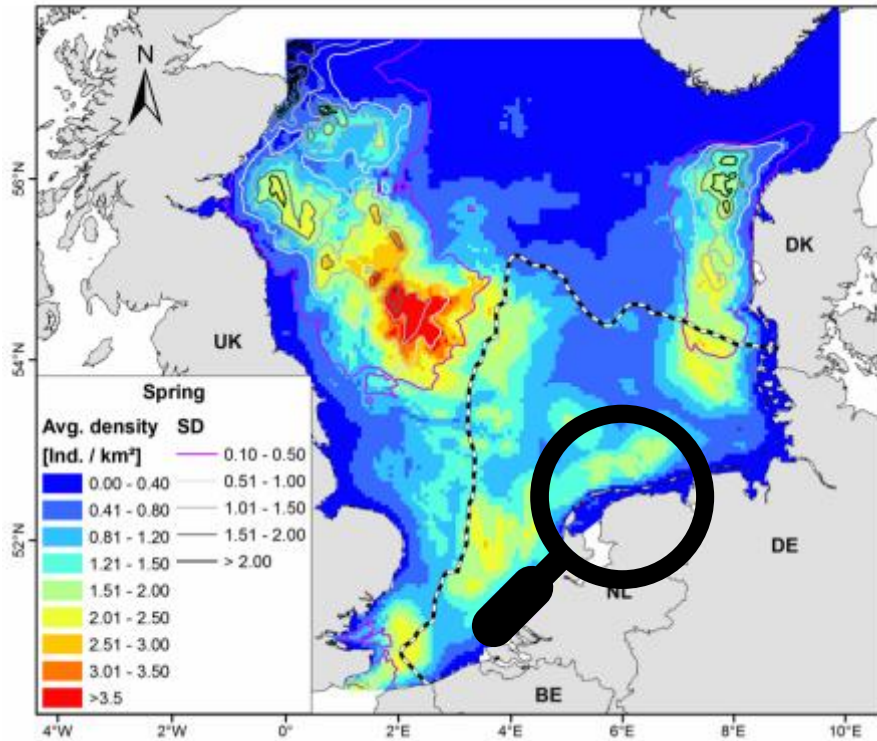


Long-term Trends in Harbour Porpoise Distribution

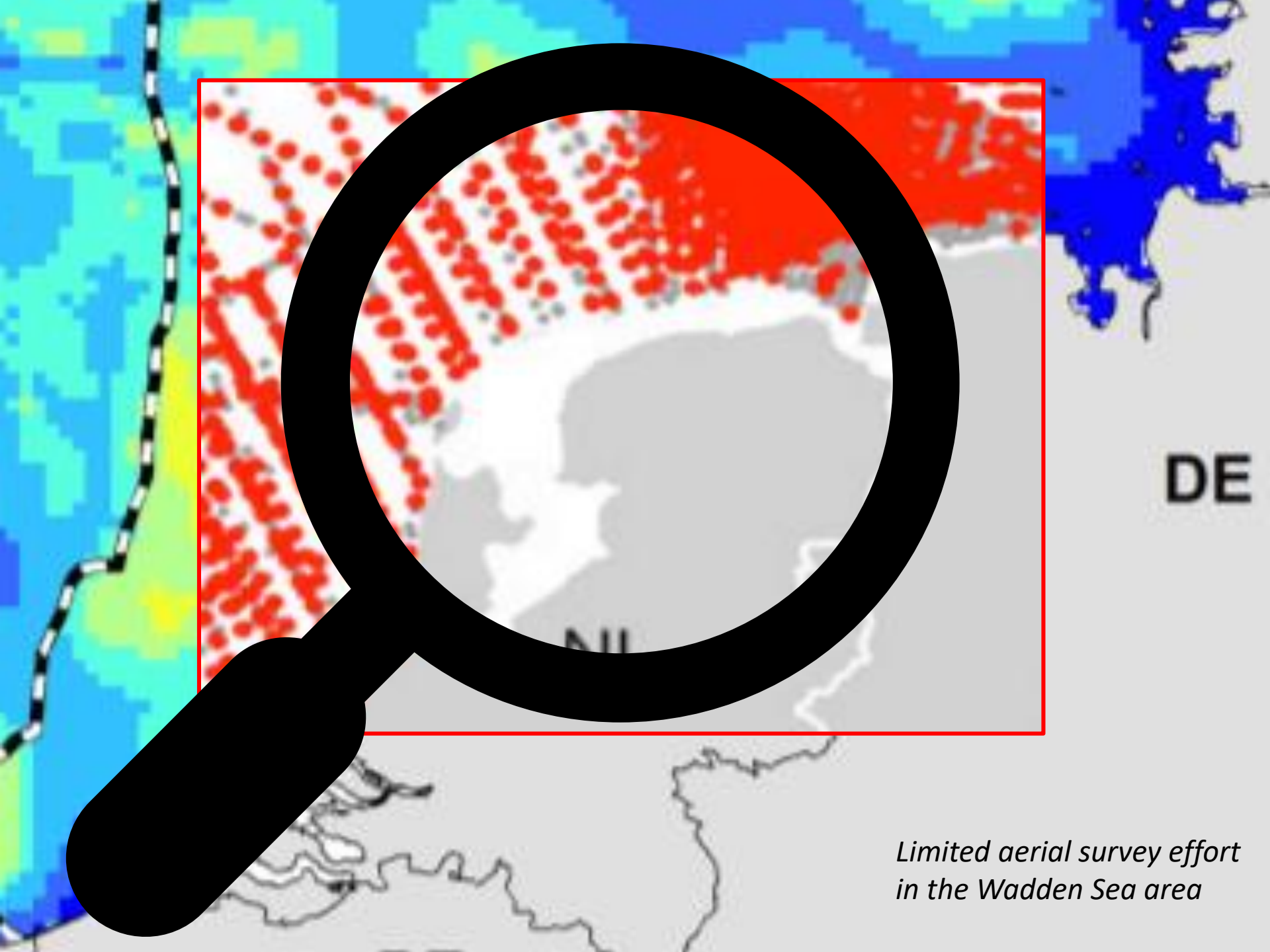
Phocoena phocoena



Courtesy Peter Evans,
MERP project



Gilles, A., et al. 016. Seasonal habitat-based density models for a marine top predator, the harbor porpoise, in a dynamic environment. *Ecosphere* 7(6):e01367. [10.1002/ecs2.1367](https://doi.org/10.1002/ecs2.1367)

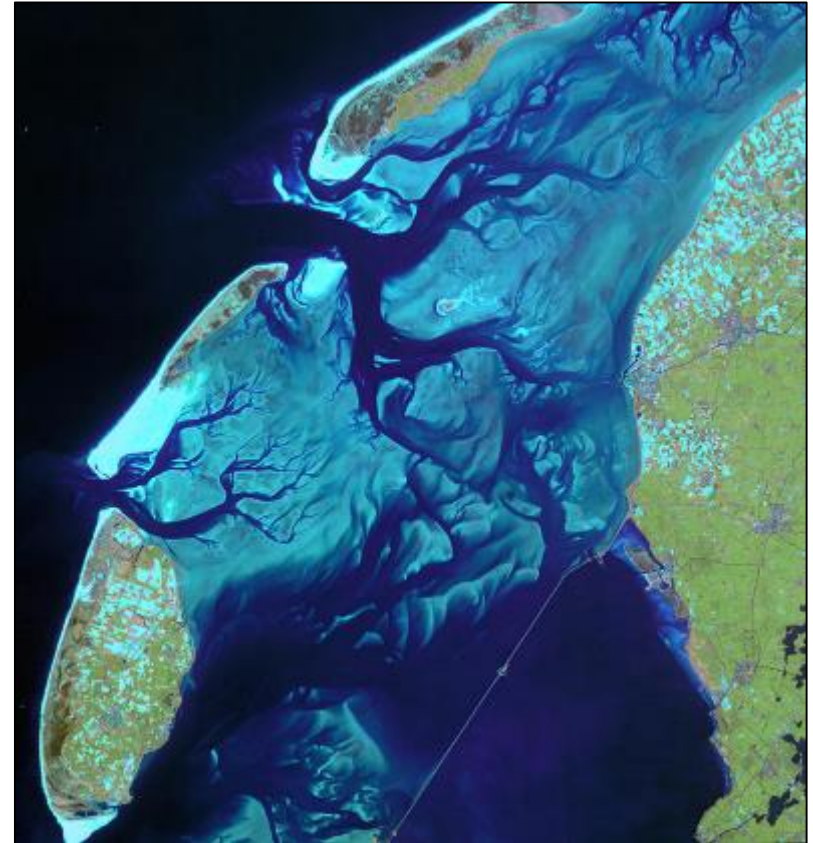
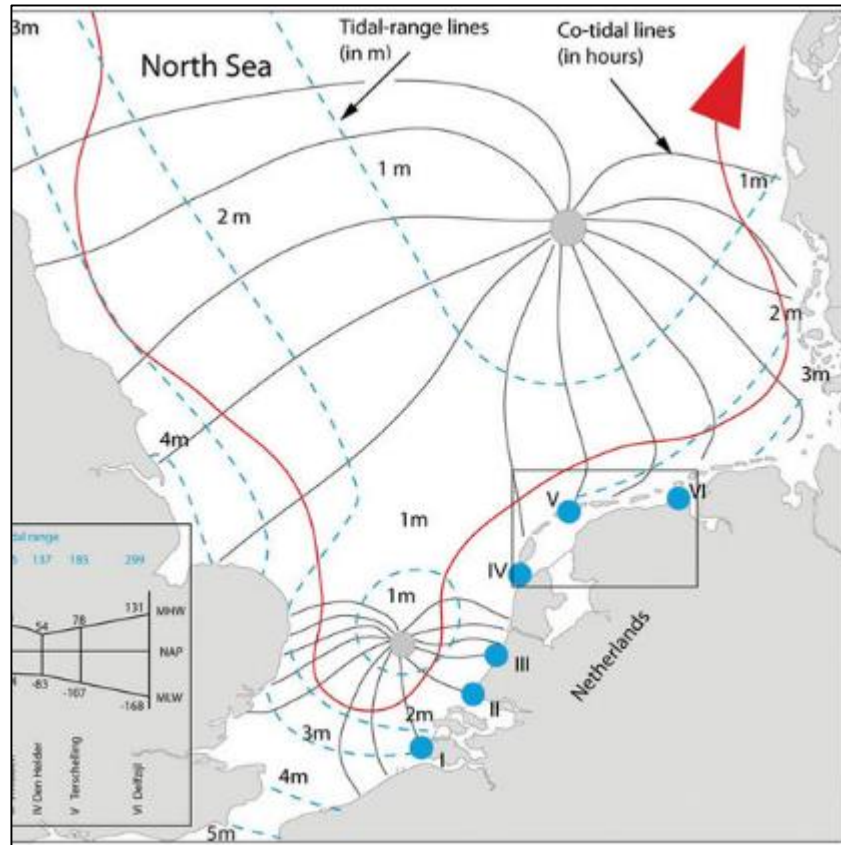


DE

NL

*Limited aerial survey effort
in the Wadden Sea area*

Why are aerial surveys not an adequate method to assess porpoise abundance and distribution for (inner) Wadden Sea waters?

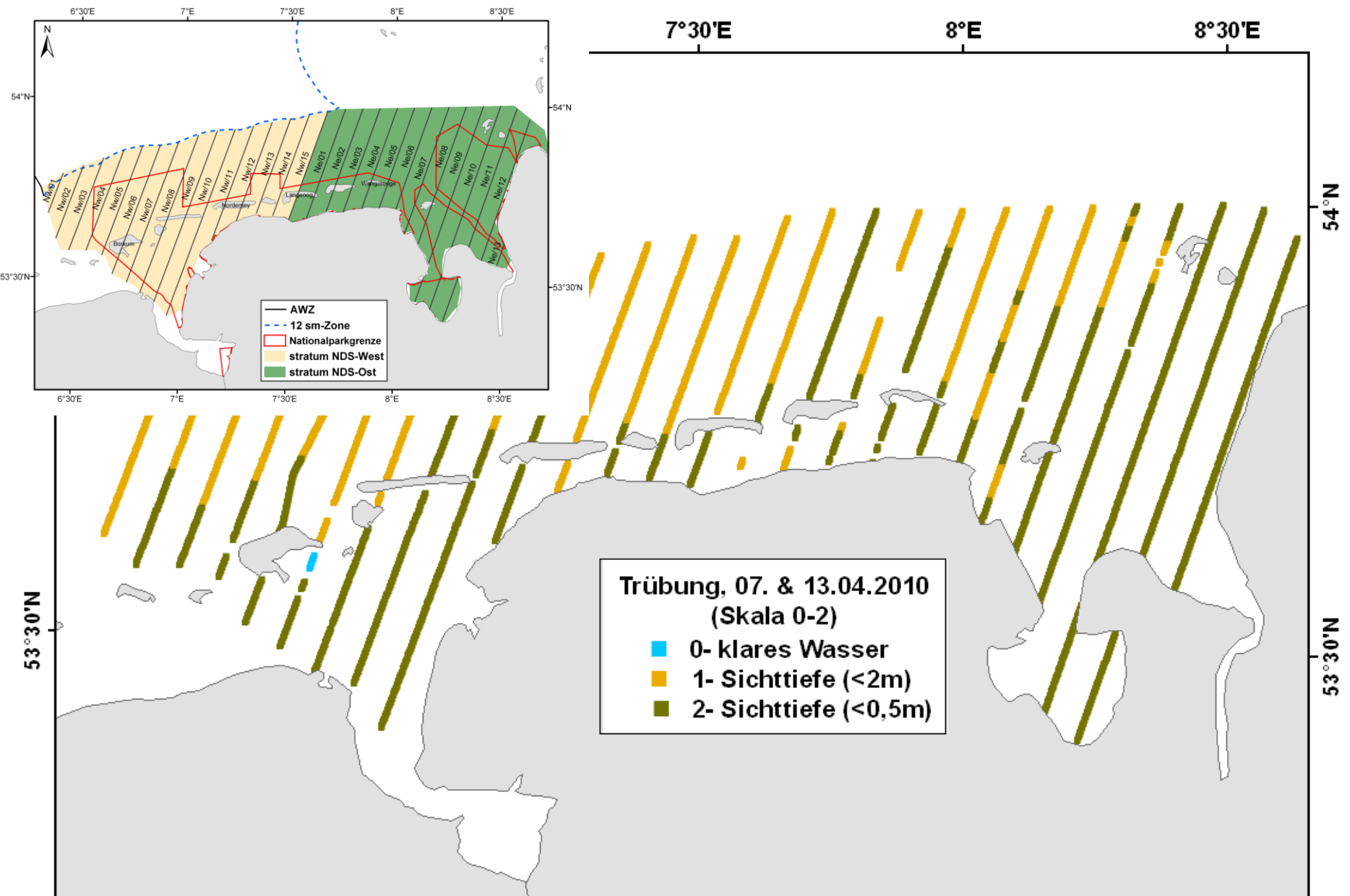


I. Tides

Why are aerial surveys not an adequate method to assess porpoise abundance and distribution for (inner) Wadden Sea waters?



I. Turbidity



Gilles et al. 2010. Schweinswalerfassung im Bereich des niedersächsischen Wattenmeeres im Rahmen eines Monitorings. Forschungs- und Technologiezentrum Westküste der Christian-Albrechts-Universität zu Kiel. Büsum.

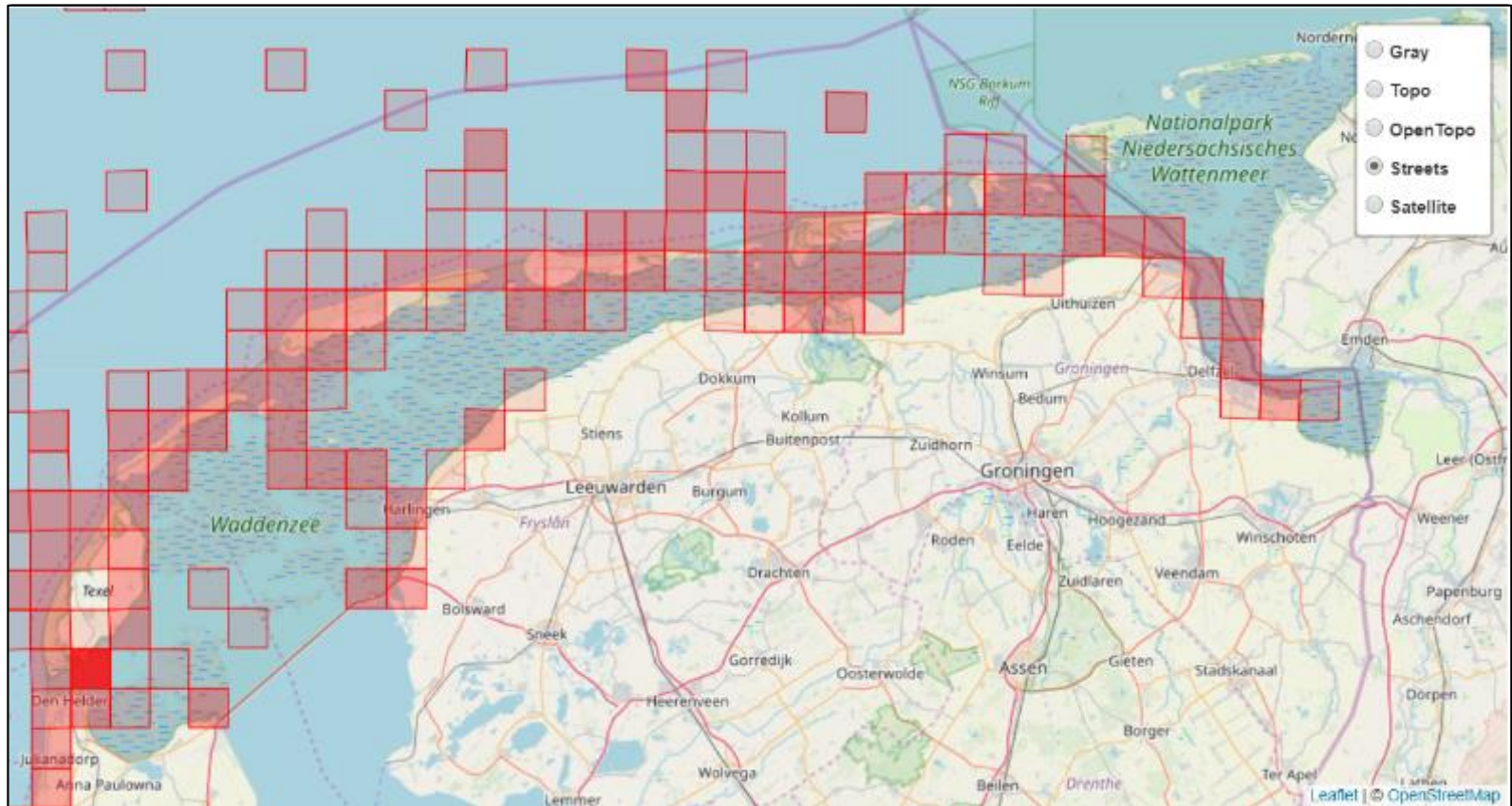
Why are aerial surveys not an adequate method to assess porpoise abundance and distribution for (inner) Wadden Sea waters?



I. Multi-Use

Shore-based
&
opportunistic
counts





2015 to 2018

The Eems – following fatty fish

Feeding behaviour of harbour porpoises (*Phocoena phocoena*) in the Ems estuary

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e-mail: meike.scheidat@wur.nl

Abstract: Passive acoustic monitoring (PAM) was used to study the occurrence and distribution of feeding behaviour of harbour porpoises (*Phocoena phocoena*) in the Ems estuary, on the border between the Netherlands and Germany. Occurrence was expressed as detection positive hours (DPH) per month or station, and feeding behaviour was described as feeding buzz ratio (FBR). Three types of analyses were undertaken: 1. A year-round analysis of FBR and DPH for one PAM station close to the Ems harbour; 2. An analysis of FBR and DPH for 10 PAM stations in the Ems estuary in March and September 2010; and 3. A comparison of porpoise clicks and fish density in the area for September/October of 2010. The year-round analysis results showed a variable seasonal pattern of porpoise occurrence, with in general lower values in April-July, and higher values in August-December. FBR and DPH per station differed between March and September 2010. The March data shows an increase of DPH when moving from the Wadden Sea into the estuary, with at the same time an increase in FBR. In September 2010, DPH decreased from outside to inside the Ems estuary, coinciding with an increase in feeding behaviour. Fish density was analysed for 5 potential prey taxa (smelt, whiting, goby, flounder and herring) at sampling stations in 4 areas along the estuary. Flounder and smelt increased in occurrence towards the inner estuarine waters. Smelt is an anadromous fish that is a known prey species for porpoise. The results of this study suggest that while feeding activity and occurrence of porpoises is observed all along the estuary and throughout the whole year, the presence of a preferred prey might be the reason for porpoises to move far into the Ems estuary at specific times. The Ems is highly used by humans and some activities, such as construction work and intense shipping, could have potential harmful consequences to the locally occurring porpoises. As this study has only covered a short time frame, the results should be considered preliminary. Future studies on the investigation of fish and porpoise occurrence in this area would allow a more in-depth understanding of this relationship and would be of high relevance for conservation and management actions.

Keywords: harbour porpoise, *Phocoena phocoena*, C-POD, feeding buzzes, behaviour, Ems estuary, smelt, anadromous fish.

Introduction

Ranking amongst the smallest of cetaceans in the world, harbour porpoises (*Phocoena phocoena*) are usually found in coastal seas and estuaries in temperate northern climes (Perin et al. 2002). With a short nursing period

(usually less than a year) and reaching sexually maturity at three years, the resting period between pregnancies is brief (Santos & Pierce 2003). The consequence of this feature, plus their small size, is that they cannot store much energy, which makes them highly dependent on year-round food availability (Brodie 2001).

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* Corresponding author

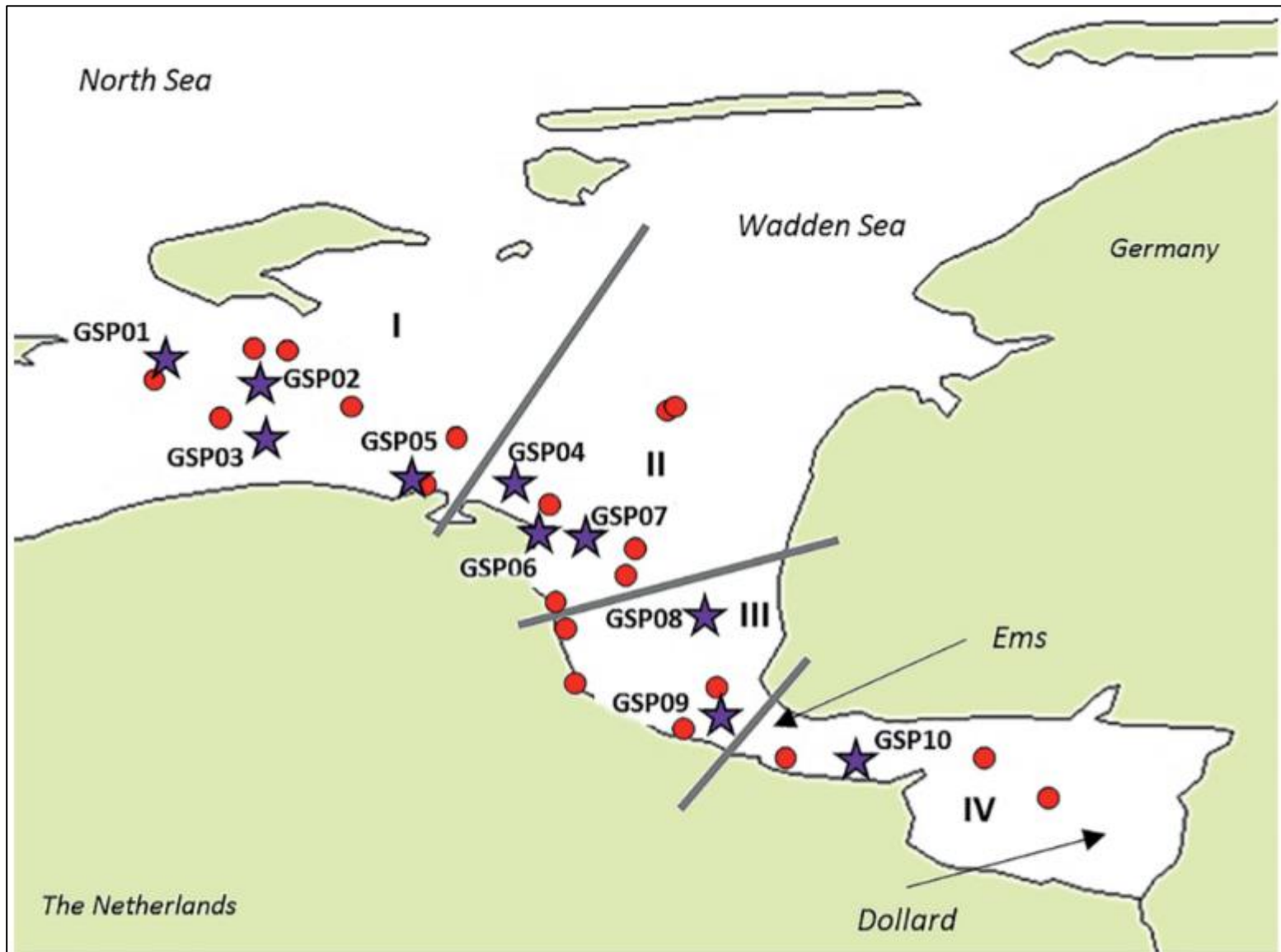


Figure 1. Location of C-PODs (stars; GSP01 to GSP10) in the study area in the Ems-Dollard estuary. The fish sampling stations are represented as dots. The roman numbers (I-IV), indicate the areas used for comparing acoustic and fish sampling data.

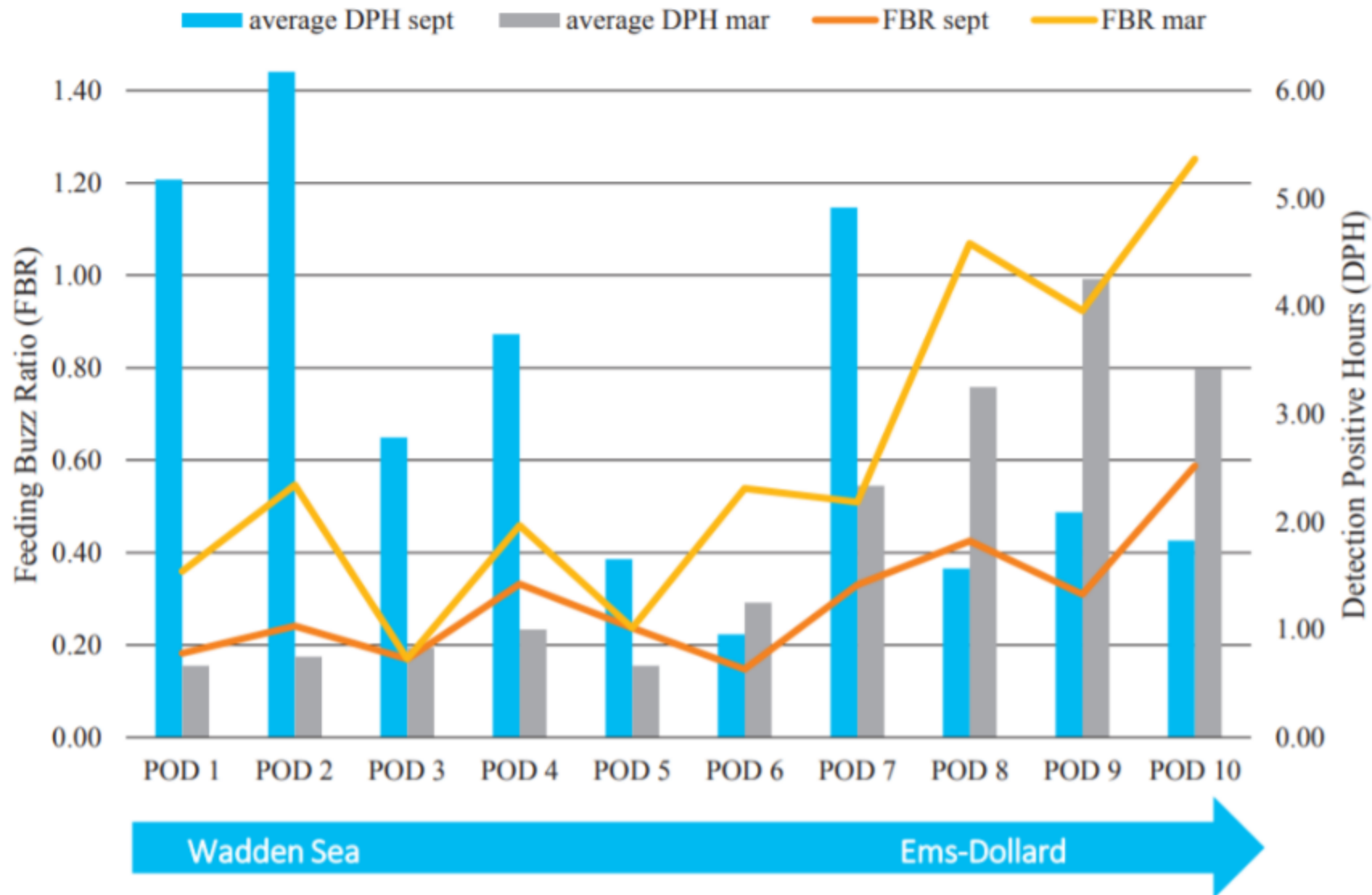


Figure 3. Feeding buzz ratio (FBR) determined for all C-PODs during 1-21 September (orange line) and 17-28 March (yellow line) in 2010 and detection positive hours (DPH) determined for all C-PODs during 1-21 September (blue bar) and 17-28 March 2010 (grey bar).

Why is this attractive???



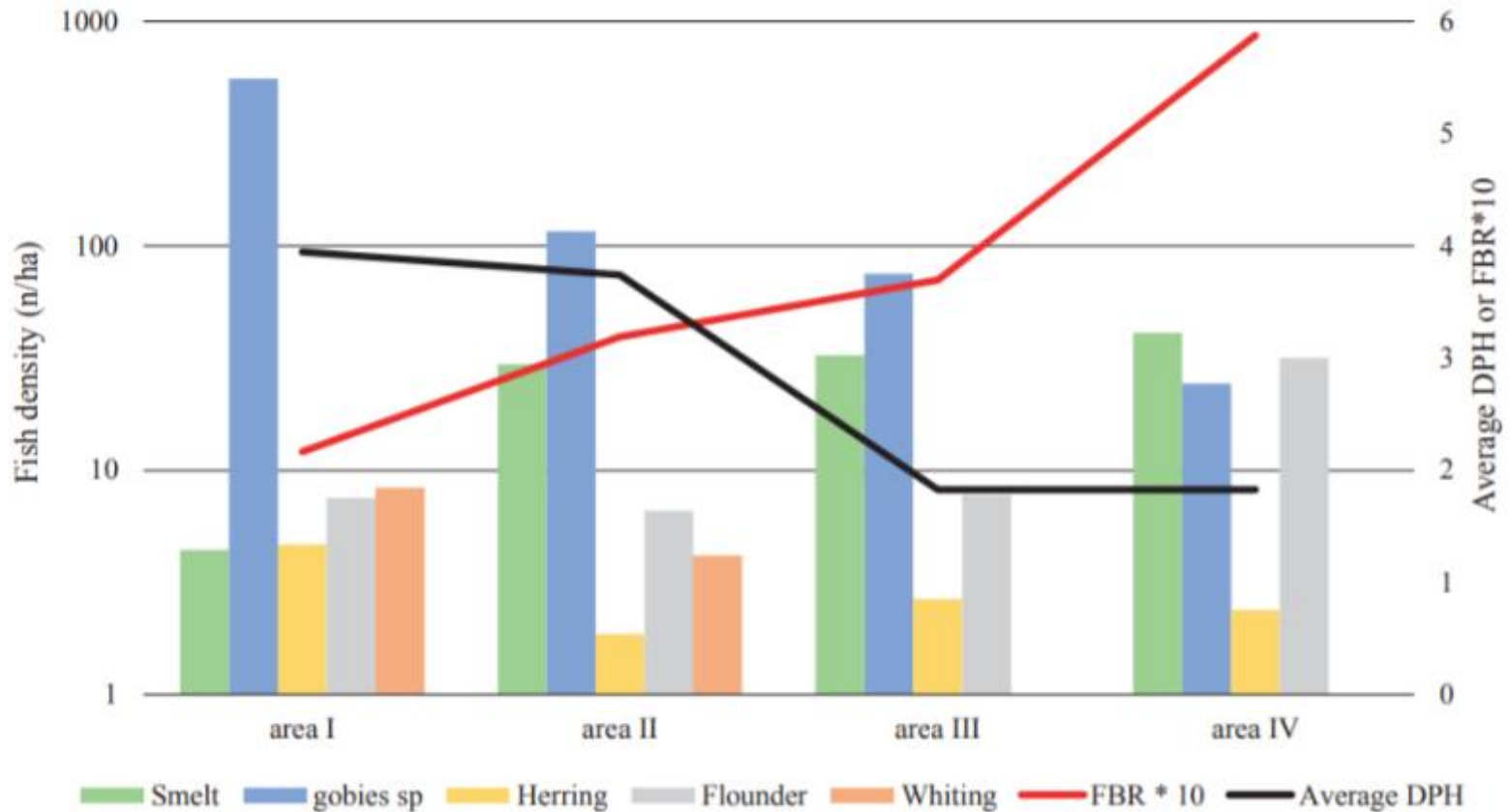


Figure 5. Average fish density for five taxa for all stations per area (expressed as n/ha on a logarithmic scale) and average DPH per area (black line) and FBR (red line, shown as FBR*10) for the period 1-23 September 2010.

PAM shows porpoise patterns

Jahresbericht zum Projekt
**Akustisches Monitoring von Schweinswalen im
Wattenmeer für den Landesbetrieb für
Küstenschutz, Nationalpark und Meeresschutz
Schleswig-Holstein und die Nationalparkverwaltung
Niedersächsisches Wattenmeer 2018**



Johannes Baltzer
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Im Auftrag des Landesbetriebes für Küstenschutz, Nationalpark und Meeresschutz
Schleswig-Holstein

Busum, Dezember 2018



RESEARCH ARTICLE

Time and tide: Seasonal, diel and tidal rhythms in Wadden Sea Harbour porpoises (*Phocoena phocaena*)

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1 Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover, Foundation, Bischoferring, 30625 Hannover, Germany, **2** School of Geography & Oceanography, University of St Andrews, St Andrews, Fife, Scotland, United Kingdom, **3** German Oceanographic Museum, Stralsund, Mecklenburg-Vorpommern, Germany, **4** German Navy, Messinghafen, Gevelandter Deichstr., 25103 Cuxhaven, North Sea, Germany, **5** The Danish Coastal Authority, Ministry of Environment and Food of Denmark, Lyngby, Denmark

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Abstract

Ochthoceans have evolved a rich diversity of prey- and habitat-specific foraging strategies, which allow them to feed opportunistically on locally and temporally abundant prey. While habitat-specific foraging strategies have been documented for some odontocete species, this is less known for the harbour porpoise (*Phocoena phocaena*). We collected multiple years of acoustic data using echolocation click loggers to analyse porpoise occurrence and buzzing behaviour, including hearing, in the German Wadden Sea (North Sea). Seasonal, diel and tidal effects were studied using Generalised Estimating Equations (GEE-GAMM). Locally seasonal, time of day and tidal time significantly influenced the probability of porpoise detections and detection of foraging sequences (buzzes). Hunting strategies, and therefore frequency of buzzes, were likely affected by prey distribution and large differences between POD locations indicated that porpoises used highly specific behaviour adapted to time and time of day to efficiently feed on the available prey. Strong seasonal and spatial variation in diel and tidal effects underline the importance of long-term observations. Studies on porpoise behaviour are often based on short-term observations and might rather reflect a seasonal than a general pattern. The results of this study show clearly that significant changes in porpoise behaviour can be found in short and long-term observations. Here some features are based on short-term observations and others are stable over years and days. We should be aware about drawing general conclusions based on local patterns. Highly variable spatio-temporal patterns indicate a high flexibility of porpoises in a highly variable environment and address a challenge for complex conservation management plans.

OPEN ACCESS

Citation: Wöfling B, Wöfling B, Dähne M, Schaffeld T, Luchwig S, Rye JH, et al. (2019) Time and Tide: Seasonal, diel and tidal rhythms in Wadden Sea Harbour porpoises (*Phocoena phocaena*). PLoS ONE 14(2): e0210342. <https://doi.org/10.1371/journal.pone.0210342>

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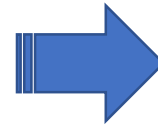
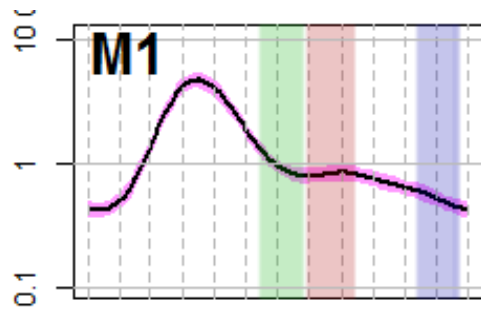
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Data Availability Statement: The data that support the findings of this study are available from the agency for Coastal Conservation, National Park and Marine Conservation Schleswig-Holstein (LWS) but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the agency for Coastal Conservation, National Park and Marine Conservation Schleswig-Holstein (LWS).

Station M1

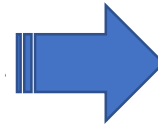
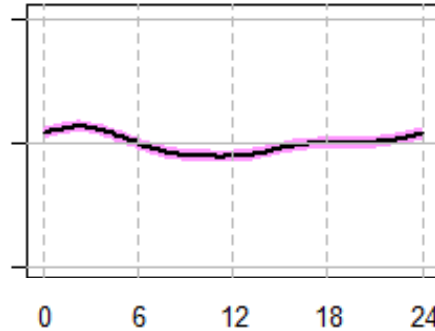


Month



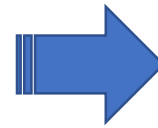
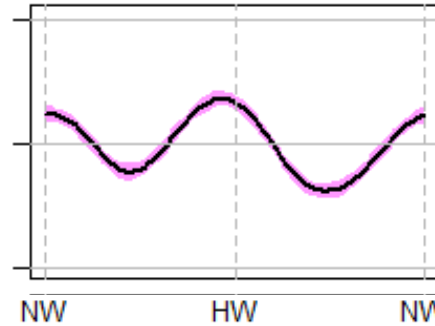
Increase late winter
early spring

Time of day



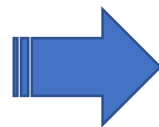
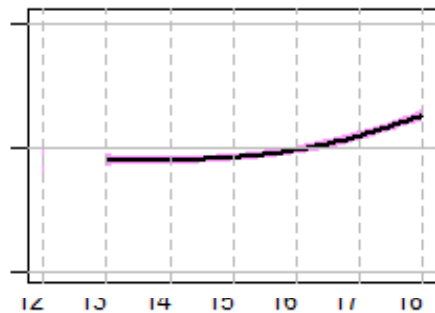
Slight increase at
night

Tidal phase

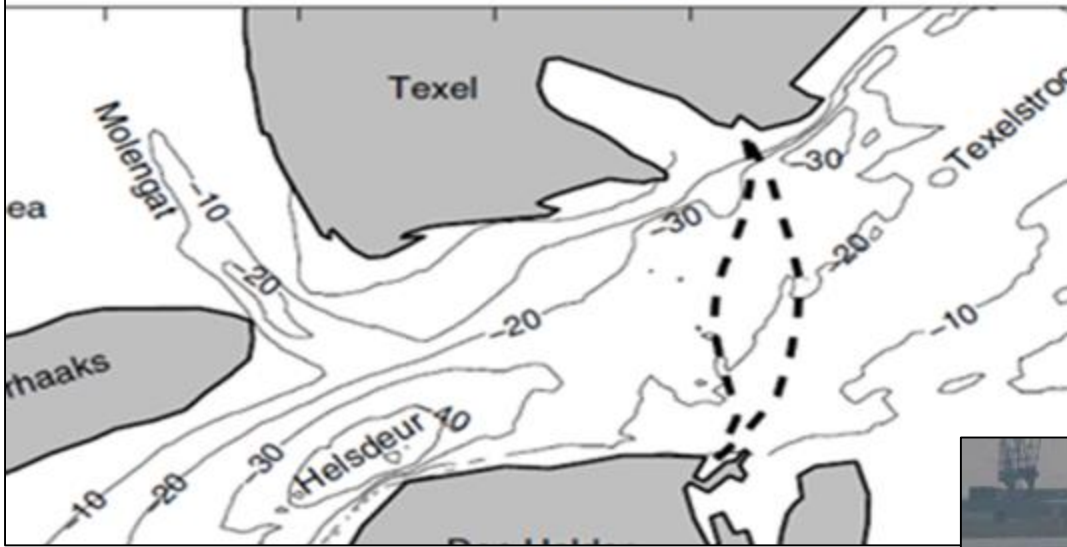


Maximum at high
and low tides

Year



Upward trend after
2016



IJsseldijk, L.L.; Camphuysen, K.C.J.; Nauw, J.J.; Aarts, G. (2015). Going with the flow: Tidal influence on the occurrence of the harbour porpoise (*Phocoena phocoena*) in the Marsdiep area, The Netherlands. *J. Sea Res.* 103: 129-137. [dx.doi.org/10.1016/j.seares.2015.07.010](https://doi.org/10.1016/j.seares.2015.07.010)

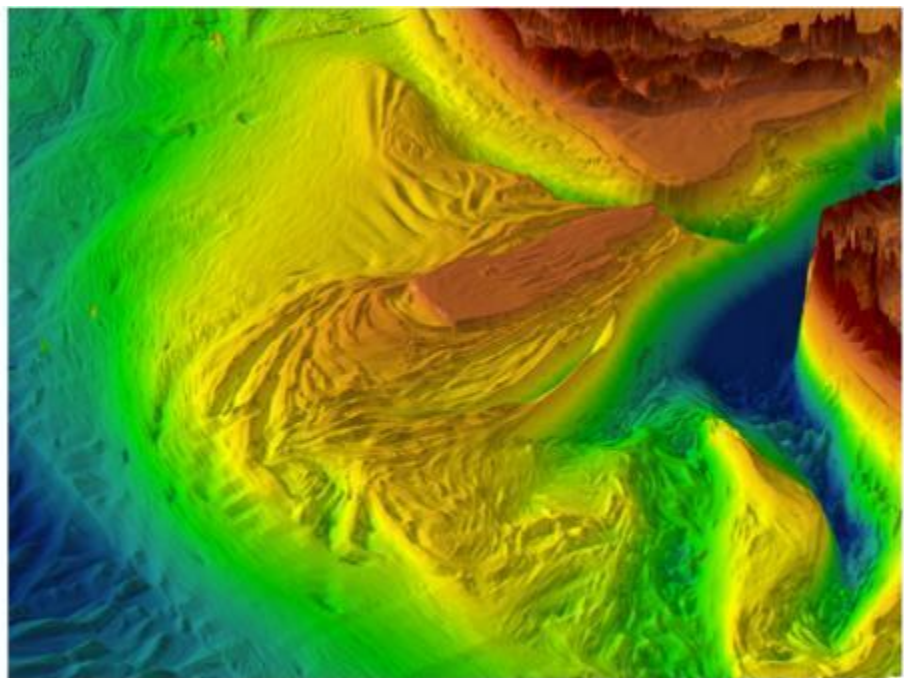
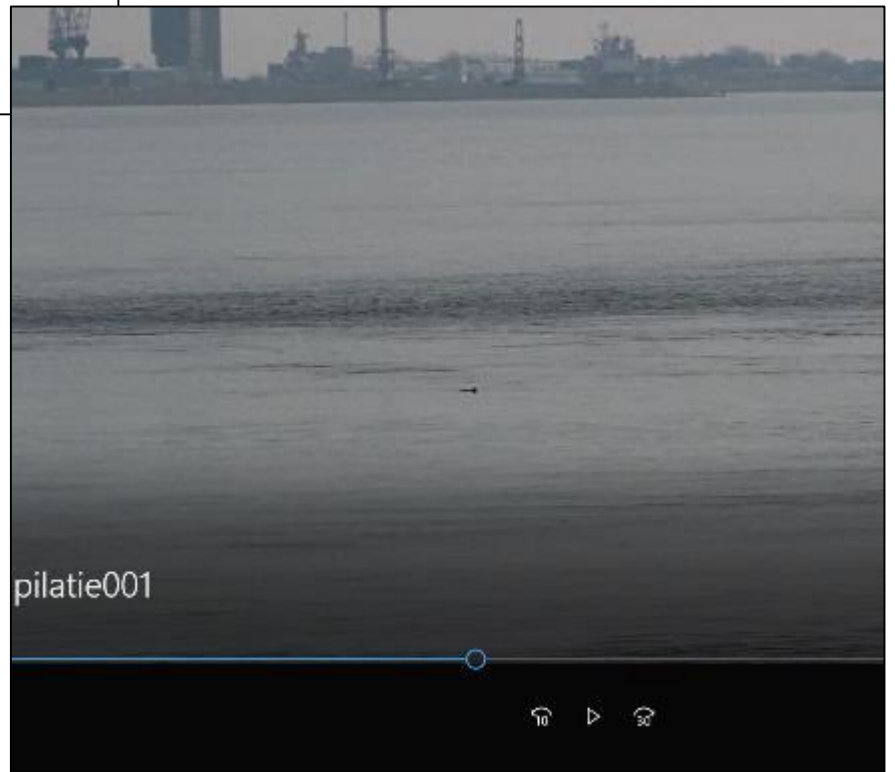


Figure 4. Oblique view of the ebb-tidal delta of Texel Inlet (Marsdiep), red scale in the inlet is 2 km, based on 2004 depth soundings; colours indicate depths (blue deepest) (source: RWS).



Video compilation harbor porpoise in the Marsdiep: courtesy Jeroen Hoekendijk

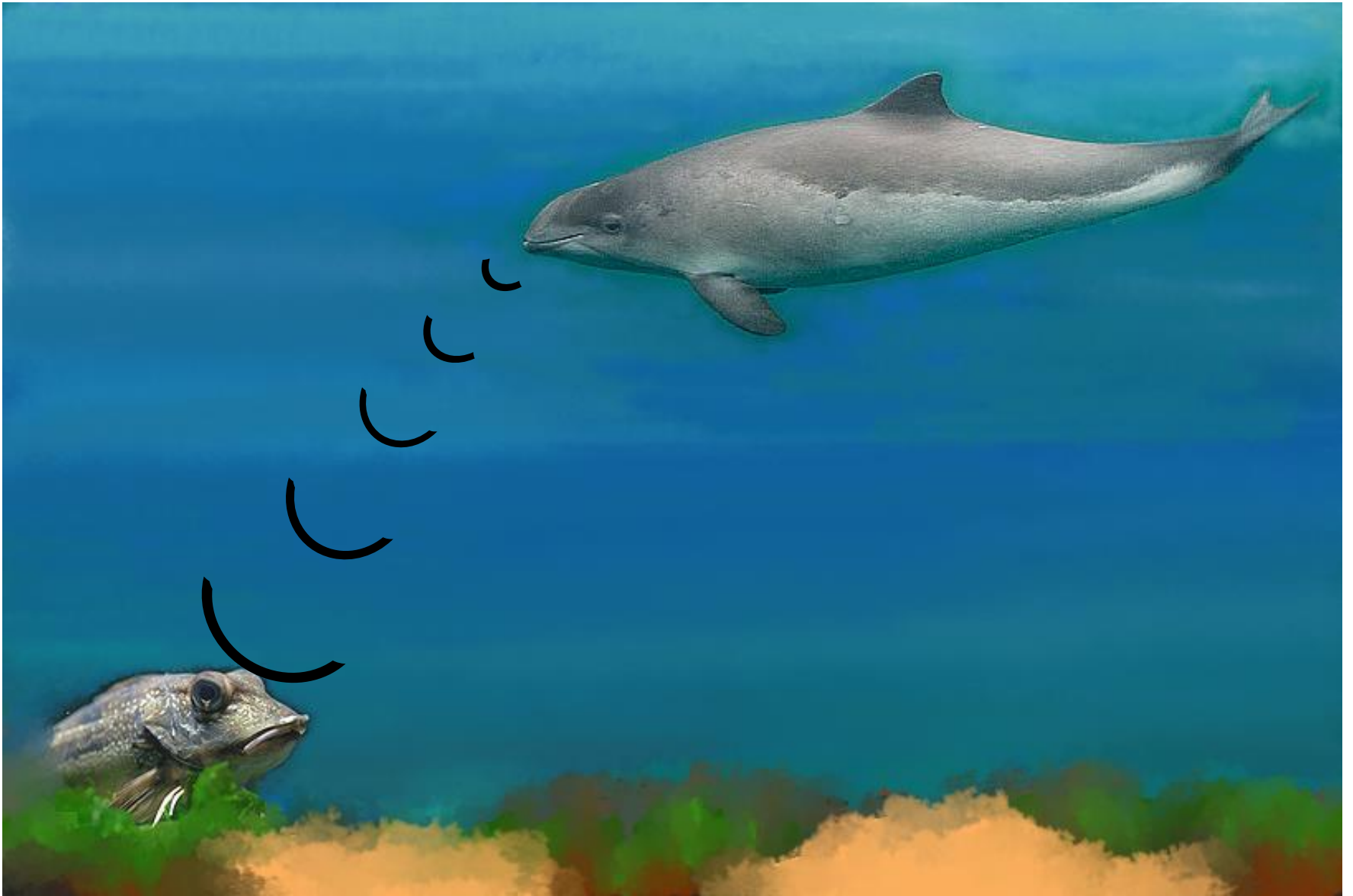
What drives the behaviour of porpoises?

- High metabolic rate
- High need for energy
- Constant need for....

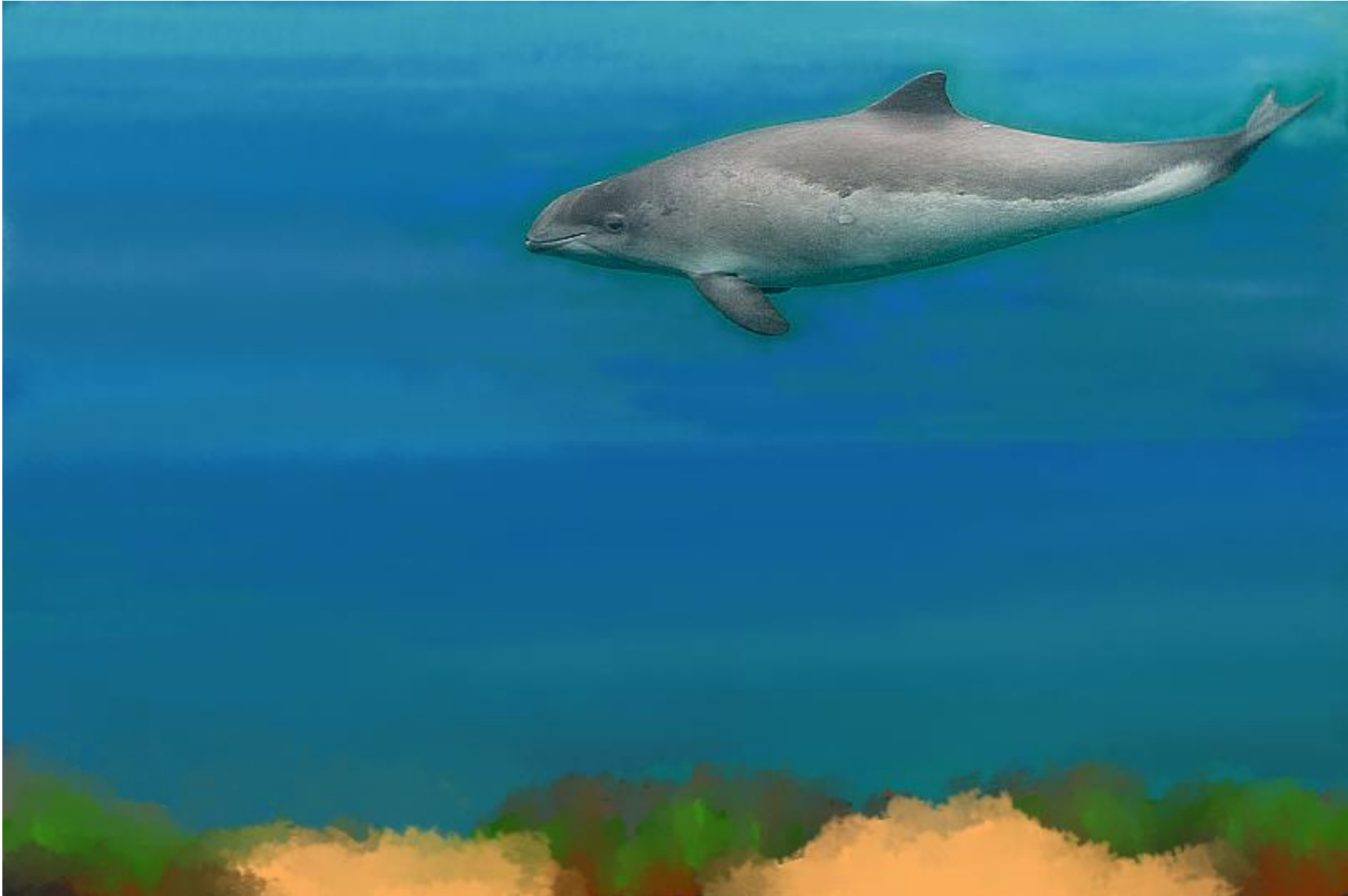
FOOD

Why might the Wadden Sea be a good place to hunt for prey?

- Other top predators go here too
- Tides aggregate prey
- High productivity in the area
- Fish nursery
- Migratory “fat” fish
- Advantage of hunting in turbid waters (lower chance of predator avoidance)



Fish can avoid predators visually

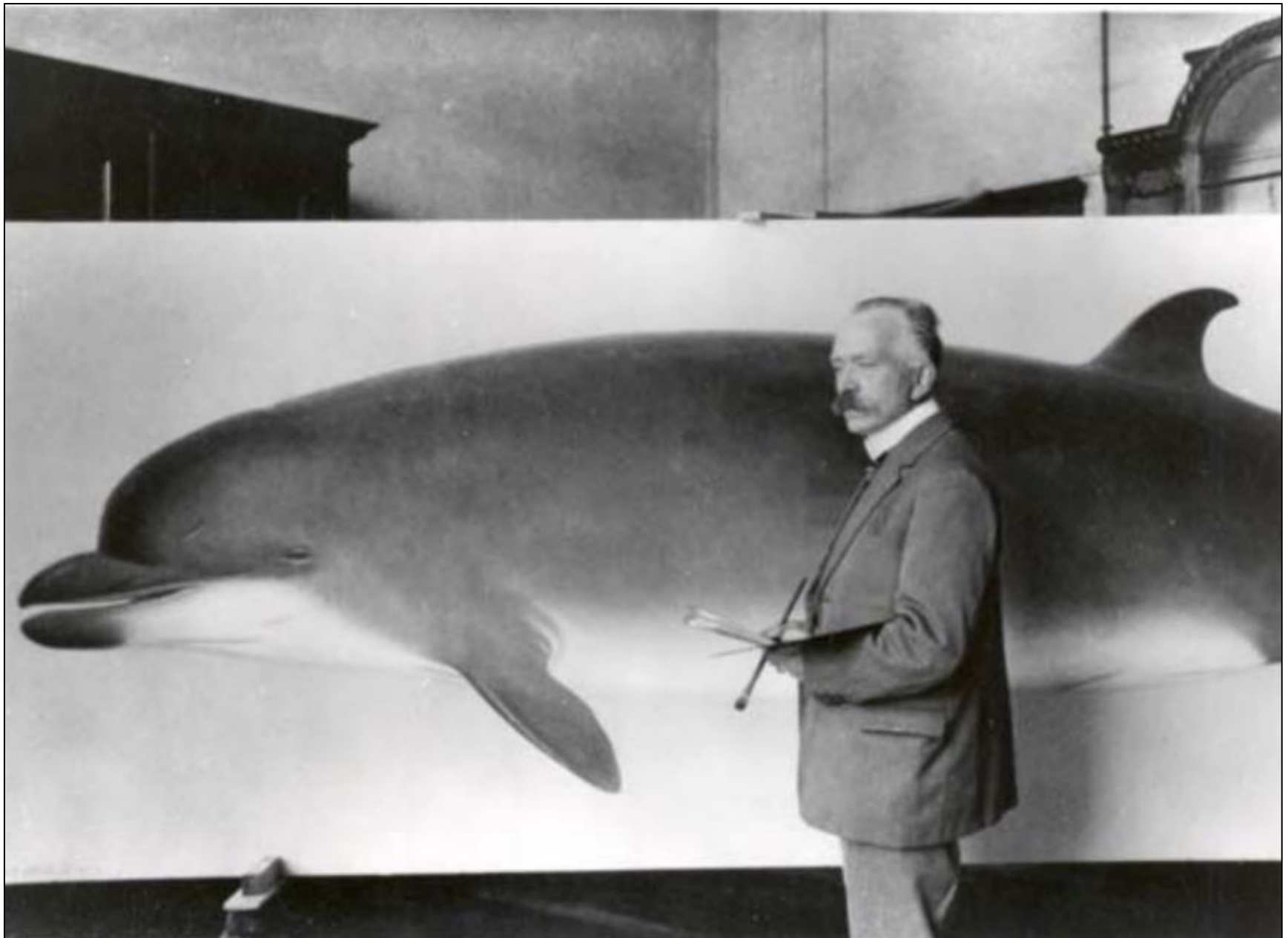




Fish can avoid predators visually, in the Wadden Sea porpoises might have an advantage using their sonar to detect them while being “invisible” themselves.

What is the conservation status of harbour porpoise in the Wadden Sea?

- We are lacking information on abundance, distribution, habitat use and impact of threats.
- However, we do know:
 - Increase in the last decade(s) of porpoises
 - Potential link to prey occurrence
 - That the Wadden Sea has the potential to be an important habitat for harbor porpoises occurring here.



Marinus Adrianus Koekkoek II (1873 – 1944) (fotocollectie Naturalis Biodiversity Center)



Marinus Adrianus Koekkoek
Rond 1910

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the 'Big Five'



of the



Wadden Sea



10
YEARS

WADDEN SEA

WORLD HERITAGE