The Danish Environmental Monitoring Programme

Environmental effect studies

– status more than 2 years after the erection of Horns Rev and Nysted offshore wind farms

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Energi E2
Copenhagen Offshore Wind 26-28 October 2005

Agenda

- Administrative setup
- Brief description of the full programme
- Preliminary results

Administrative setup

- PSO-funded programme
- All data publicly available
- The environmental group: The Danish Energy Authority, The Danish Forest and Nature Agency, Energi E2 & Elsam
- IAPEME evaluates the outcome of the studies

The environmental monitoring programmes

- **Hydrograhpy**
- **Coastal morphology**
- **Infauna**
- **Introduction of hard substrate habitat**
- **Fish**
- **Electromagnetic fields**
- **Sandeels**
- **Birds**
- **Seals**
- **Harbour porpoises**
- **Socio- and environmental economic effects**

***Temporal variation**: EIA/Baseline, Construction, Operation*

***Spatial variation**: Impact area (Wind farm) and reference areas*

Bottom flora & fauna

Results

No dramatic change has been observed on the soft seabed in either of the wind farms.

Changes in sediment and species composition have occurred both in the wind farm and reference areas

The density of the most common species have increased slightly on the soft seabed between the turbines

Introduction of hard substrate habitat

New species have been introduced (others re-introduced)

Surprisingly dense vegetation: Biomass on the foundation/scour-protection has multiplied several times compared with the surrounding seabed.

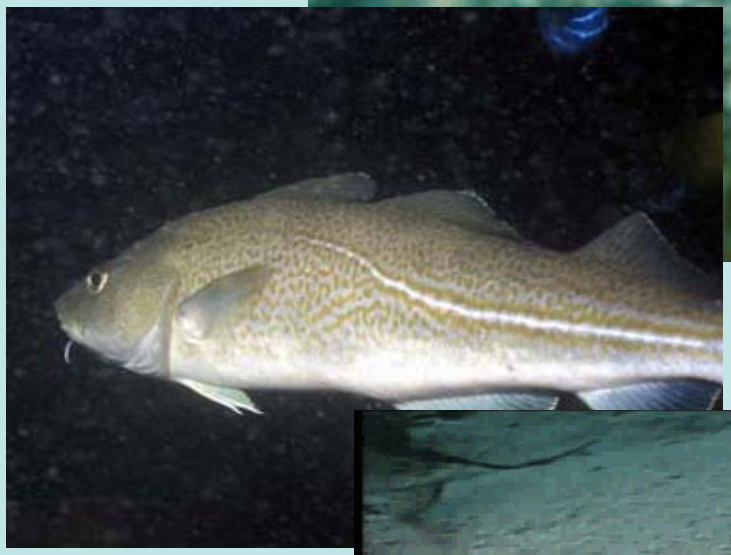
It is expected that the community structure will evolve successively towards a stabile composition within 5-6 years

Fish - Results

Large diurnal variation

The preliminary results indicate that fish are attracted to the wind farm at distances above 500m

Final results about attraction to the individual foundations awaits the final analysis of data compiled in fall 2005



Sandeels

Results

No indication of an increase in the content of fine particles (clay/silt)

The number of sandeels increased by 300% from 2002 to 2004 in the wind farm area and decreased by 20 % in the reference area.

Potential effects of the wind farm on birds

Habitat loss

Do loss or shift in foraging area have an effect?

Risk of collision

Highly dependent on a number of factors

Focus on long-lived species such as waterbirds

Birds of special interest at Horns Rev and Nysted Offshore Wind Farm

Horns Rev Offshore Wind Farm

Diver

Common Scoter

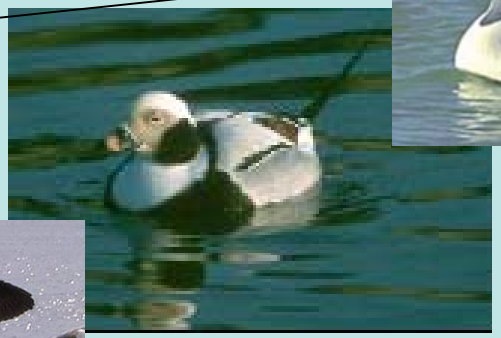
Gannet

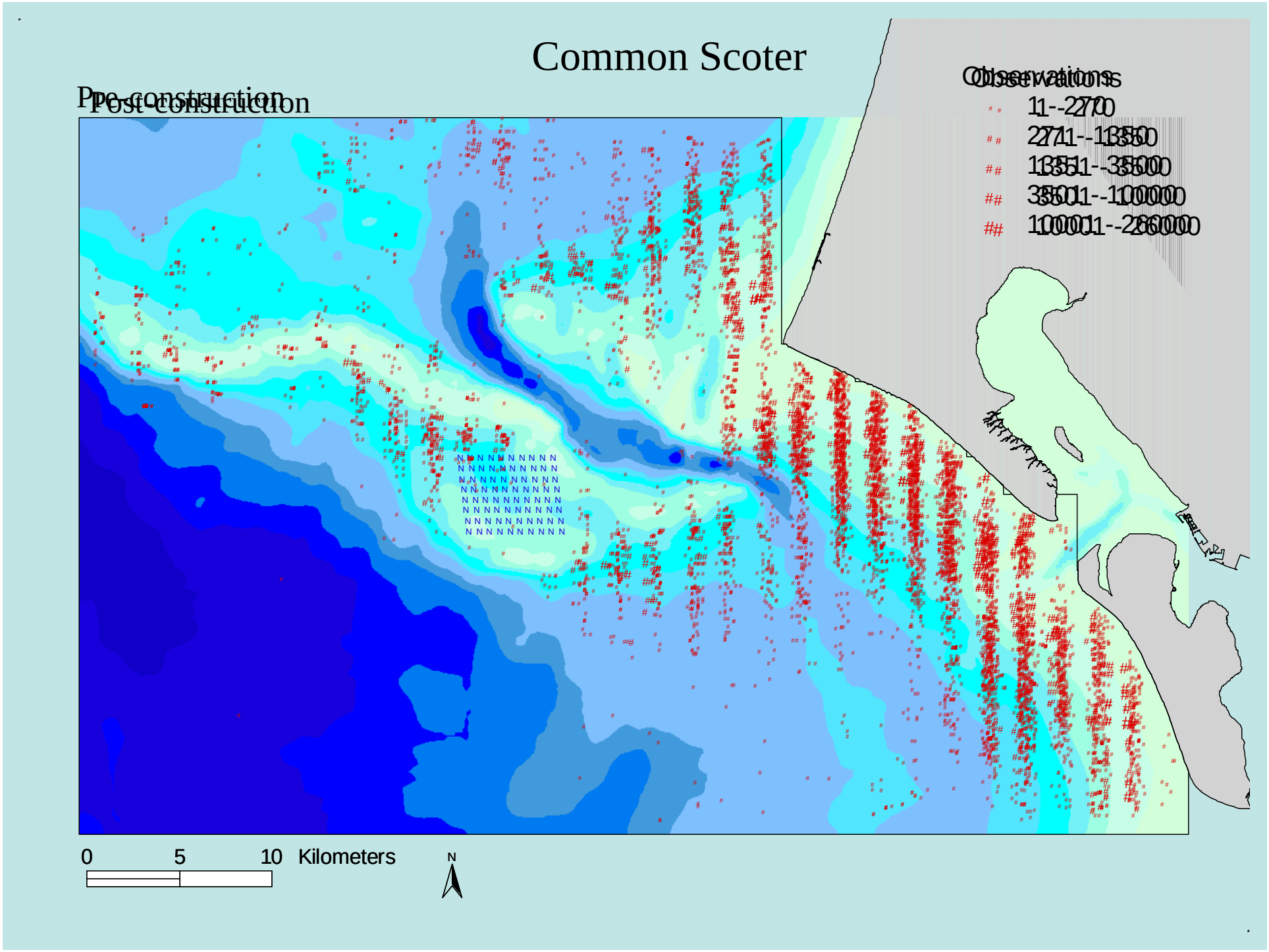
Nysted Offshore Wind Farm

Eider and Geese

Long-tailed duck

Cormorants




Common Scoter
Pre-construction
Post-construction
Observations
1 -- 270
271 -- 1350
1351 -- 3500
3501 -- 10000
10001 -- 28600
0
5
10
Kilometers
N

Results – Habitat loss

Preliminary conclusions

Both Nysted and Horns Rev were characterised by low local feeding densities of birds, so major effects on bird distributions were never expected

Displacement (Diving ducks - e.g. Common Scoter at Horns Rev and Long-tailed Duck at Nysted)

Attraction (gulls – e.g. Herring Gull and Little Gull especially at Horns Rev. Cormorants are resting on the superstructures at Nysted).

It is still difficult to draw firm conclusions because of large inter-annual variability in bird abundance and distribution

It is too soon after construction to conclude whether displaced species will habituate to the presence of wind turbines

Migrating birds – assessing the collision risk

Focus on waterfowl migration, and their avoidance response to offshore wind turbines

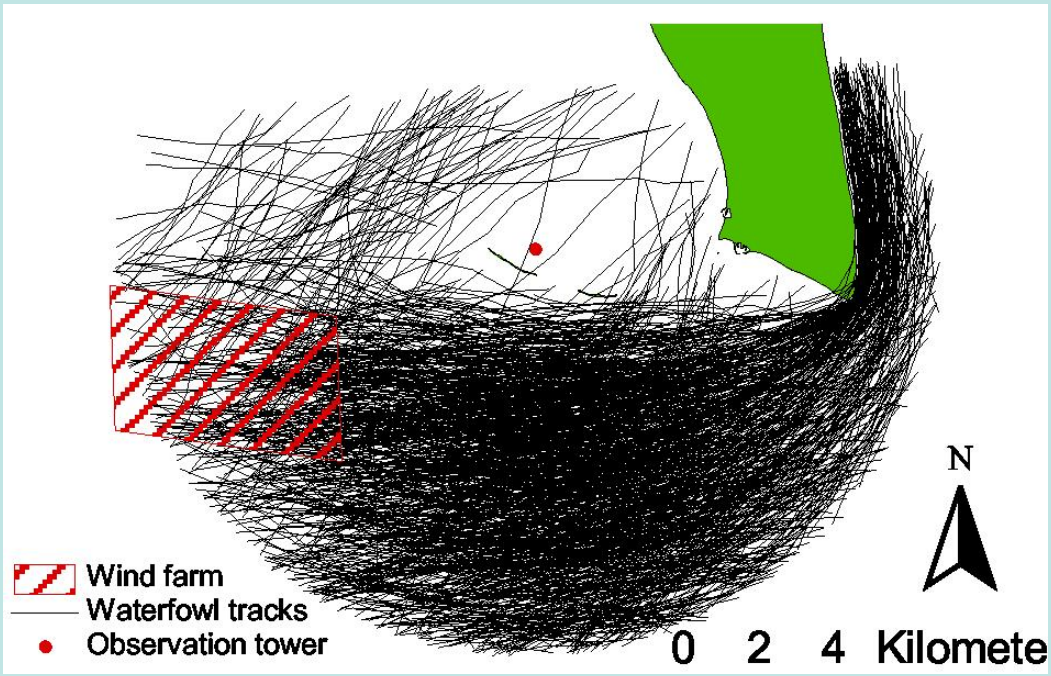
Results – Collision Risk

In general only very few birds fly through or over the wind farms

Change in waterfowl tracks at a distance of 3,000 m from the wind farm during daytime and 1,000 m during night time.

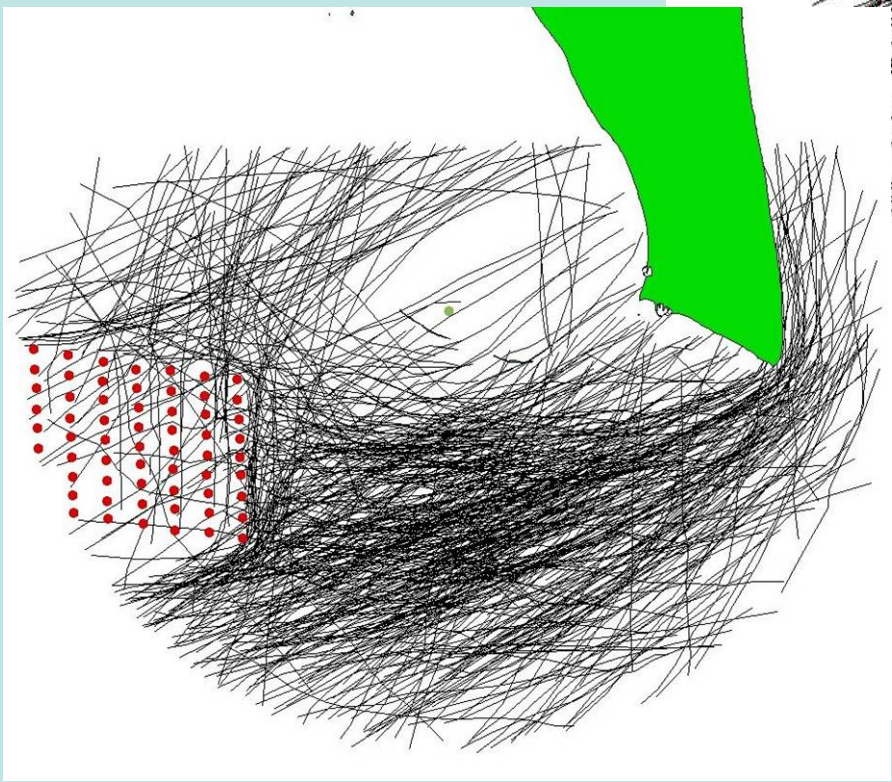
During baseline studies approx. 35% of the flocks of waterfowl flew into the wind farm area compared to 9% in the operation phase.

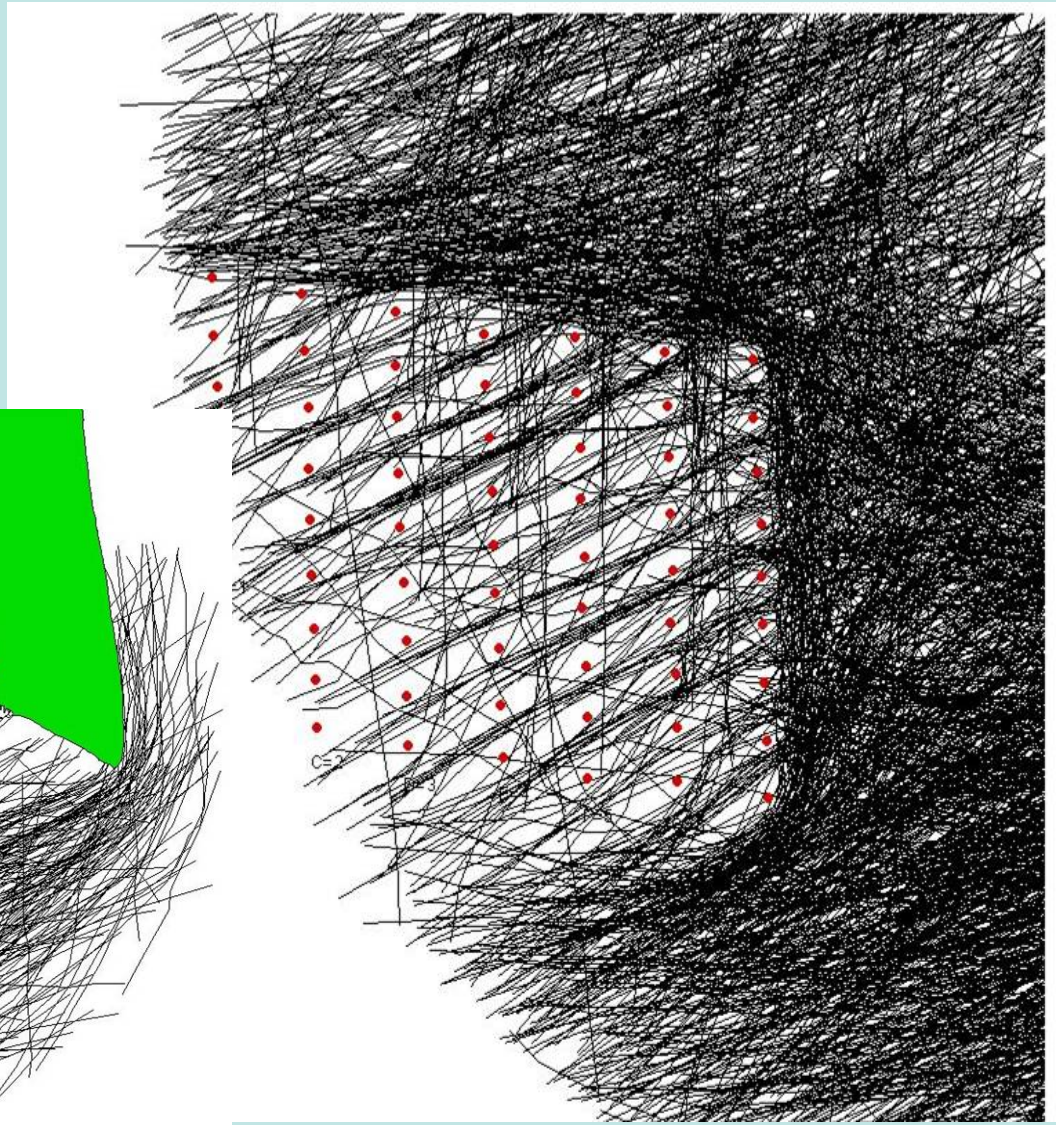
Reverse migration has not occurred as a result of the operation of the wind farm.



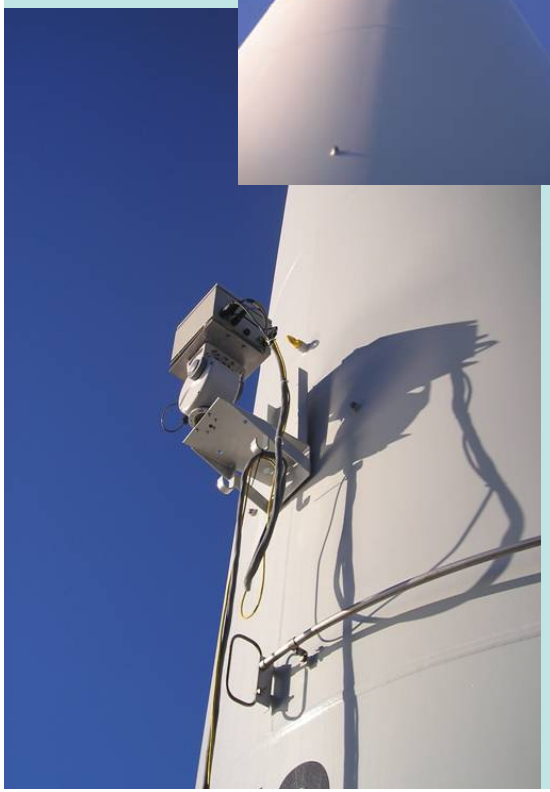
Results – Collision Risk

Radar observations of flocks of waterbirds at Nysted, autumn 2004





Use of an infrared camera



No long-term negative effects on seals from the construction or operation of the two wind farms have been observed

Harbour porpoise activity at both wind farms has been investigated.

Clear conclusions await the results of 2005.

Final Results

The Danish
Monitoring Programme

27-29 November 2006

Info | Preliminary programme | Registration | Venue

Conference

Offshore Wind Farms and the Environment

Horns Rev and Nysted

Main themes

- Bird habitat loss and collision risk
- Effects on marine mammals
- Introduction of hard bottom substrate
- Fish attraction
- and much more…

www.hornsrev.dk
www.nystedhavmoellepark.dk
www.ens.dk
www.sns.dk