Ministry of Infrastructure and the Environment

Offshore Wind ecological programme: Wozep

Kees Borst; Inger van den Bosch; Aylin Erkman; Martine Graafland; Maarten de Jong; Suzanne Lubbe; Maarten Platteeuw; Ingeborg van Splunder; Marijke Warnas

Presenter:

Ingeborg van Splunder (RWS)

WOZEP

DUTCH GOVERNMENTAL OFFSHORE WIND ECOLOGICAL PROGRAMME

Introduction and history

Why research on the effects of offshore Wind farms?

How are research results used?

What is Wozep? (Offshore wind ecological programme)

some examples

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Why research

- In EIA and AA analysis of expected impact of wind farms
- Cumulative effect assessment

  Assumptions, uncertainty

  precautionary principle research on knowledge gaps

  are mitigating measures effective?

- Ecology as “show stopper”

Offshore Wind Ecological Programme (Wozep)

- Ministry EKZ has given assignment to RWS 2016
- Government coordinates research programme Wozep
- Earlier, monitoring and evaluation part of permit by wind sector

Goals of Wozep research programme:

- Reduce uncertainties in knowledge gaps and assumptions in EIA/AA, KEC
- Reduce uncertainties in upscaling offshore wind energy after 2023
- Effectiveness and necessity of mitigation measures

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Wozep research programme

Priority species and pressures:

- Marine mammals, under water noise
- Birds, collision and displacement
- Bats, migrating subpopulation, collision
- Benthos ‘long’ term development soft and hard substrate
- Focus on cause-effect relationships

Bird research

How can offshore wind farms impact populations of seabirds and coastal birds?

- A modelling approach
- Effect on level of populations
- Large gulls meet boundary

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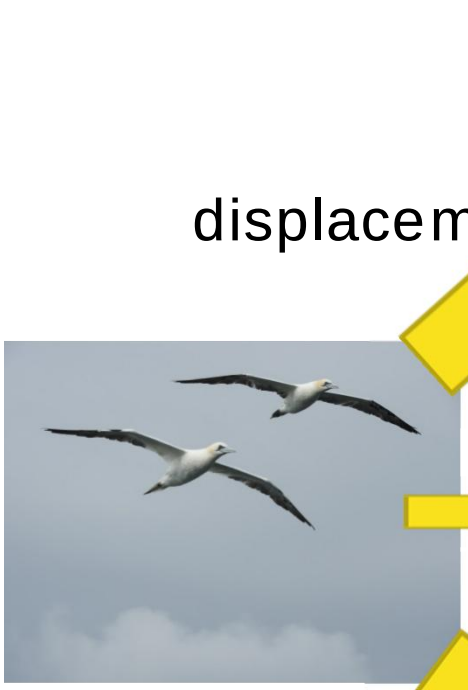
Potential effects on individual level of birds



displacement

habitat loss

- increased competition
- reduced fitness

collision risk

- enhanced mortality

avoidance

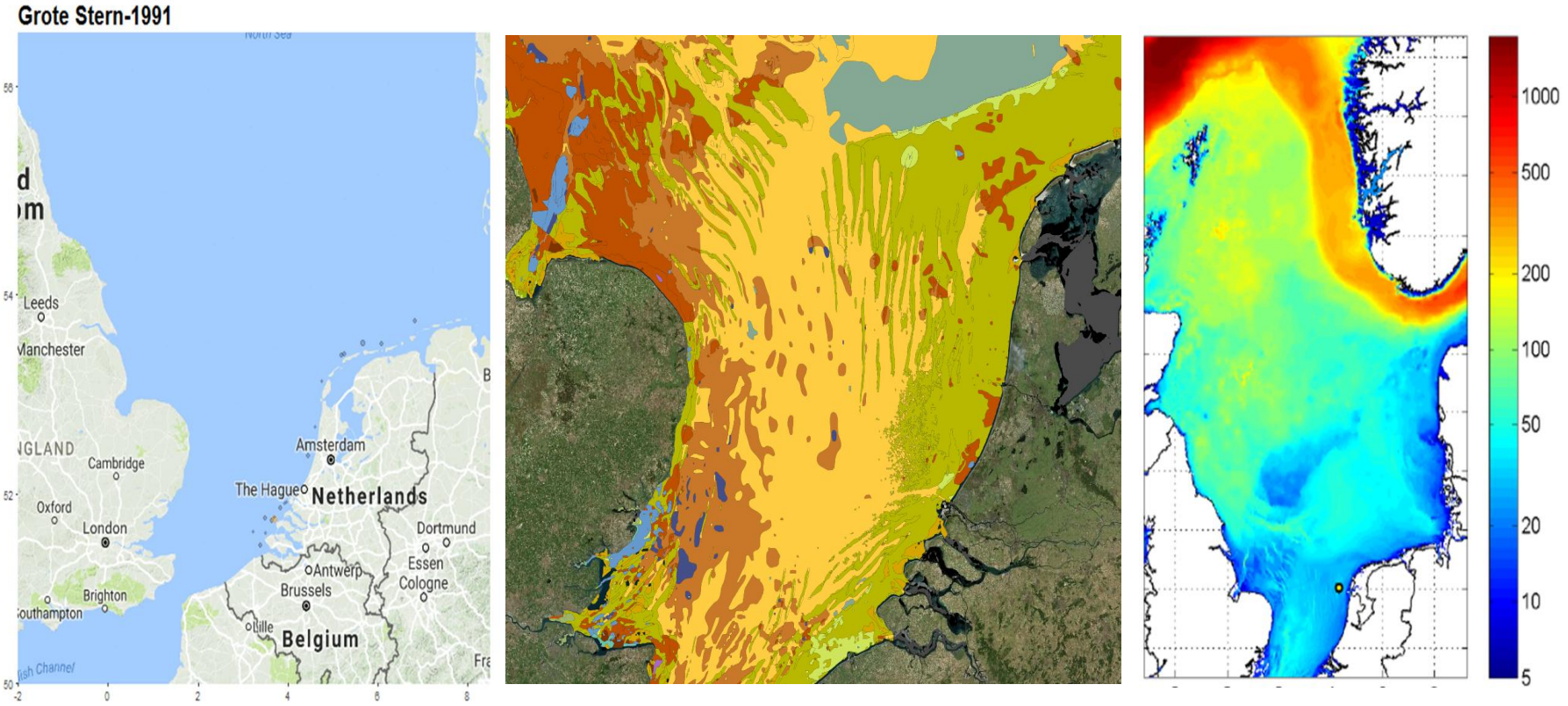
barrier effect

- enhanced energy expenditure

Population modelling for species prone to habitat loss and/or collision risk

- 15 sensitive species:
  - Habitat loss: Northern Gannet, Common Guillemot, Razorbill, Red-throated Diver, Sandwich Tern
  - Collision risk: Lesser Black-backed, Herring & Great Black-backed Gull, Great Skua, Kittiwake, Brent Goose, Shelduck, Curlew, Black Tern, Bewick's Swan
  - Align with populations models for marine mammals, whenever possible

Habitat model – 1st focus on Sandwich Tern



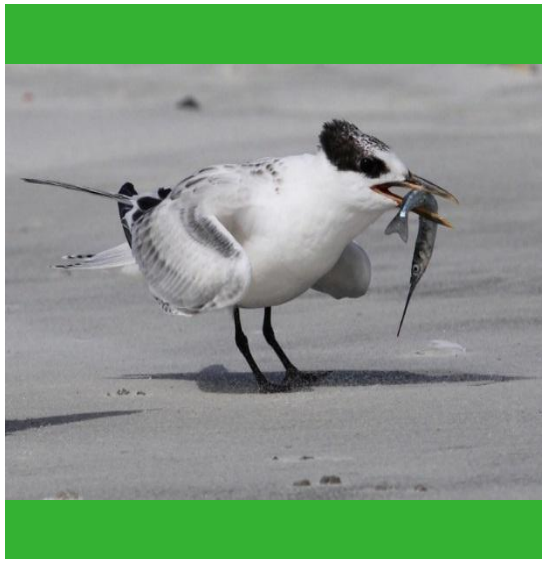
Habitat model is a statistical relationship between birds and other, known, factors

Can be used to generate maps of predicted bird occurrence in space if other factors are known

Model parameterization

Reproductive Success – how many offspring does an adult produce?

Age at maturation – at what age do individuals start reproduction?



Survival – what is the probability of survival in each age/stage class?

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100years
1918 — 2018

Collisions – improve input and validate output of collision risk models

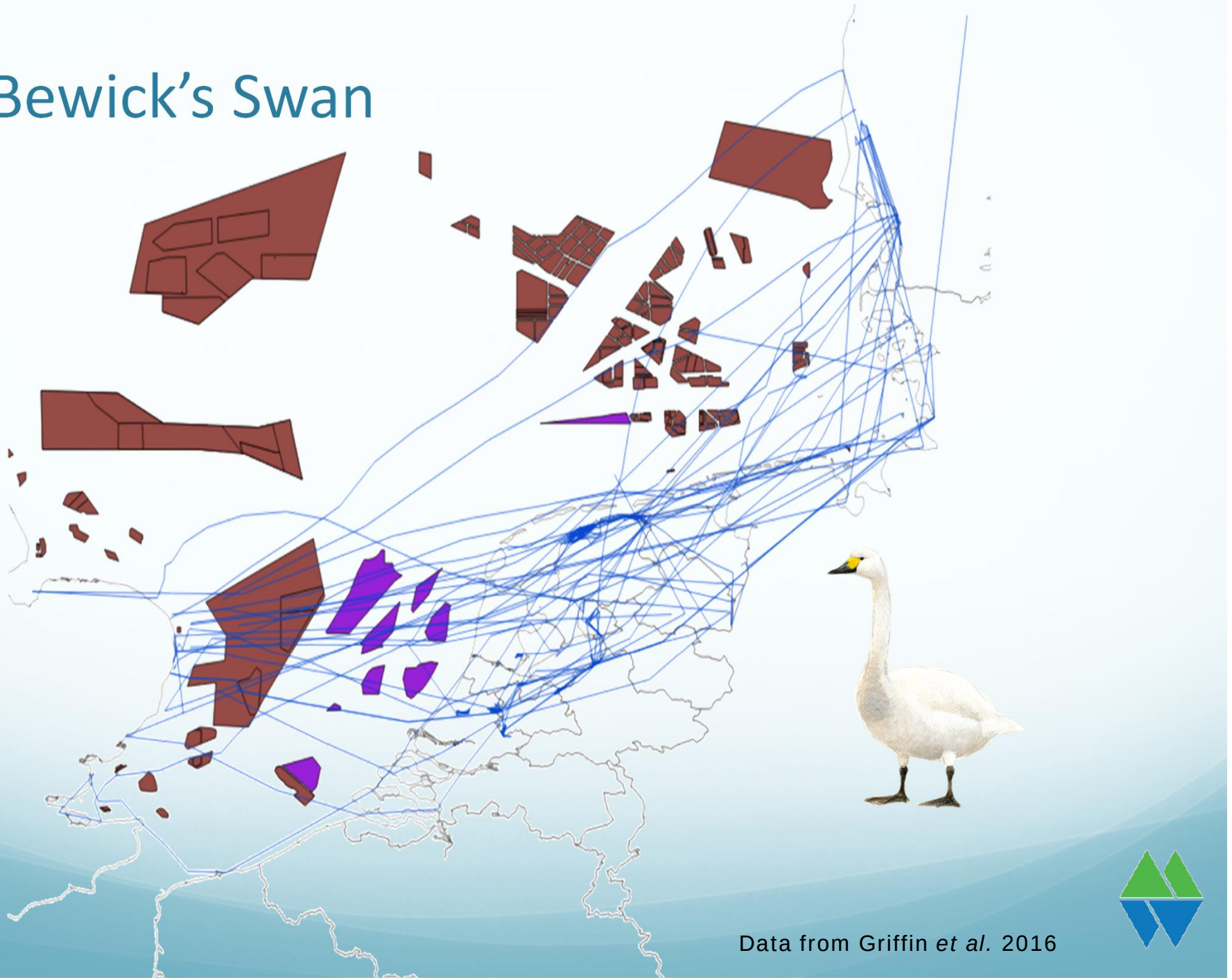
2016

- Overview methods detection collisions, measurements fluxes
- Review and analysis of available tracking data – improve input for collision risk modelling

2017

- Field study collision monitoring & bird avoidance
- Pilot study catching large gulls at sea (GPS-tagging); behavioural study
  - Which populations involved, where do the birds come from?
- Population modelling for 10 vulnerable bird species

Bewick's Swan



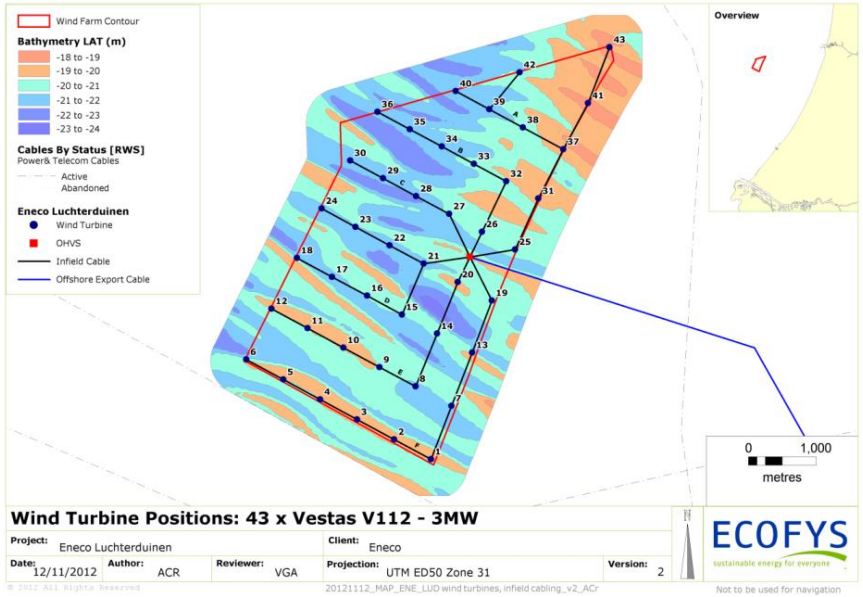
Data from Griffin *et al.* 2016

Field study collision monitoring & bird avoidance

- Experimental setup in OWF Eneco Luchterduinen - collaboration

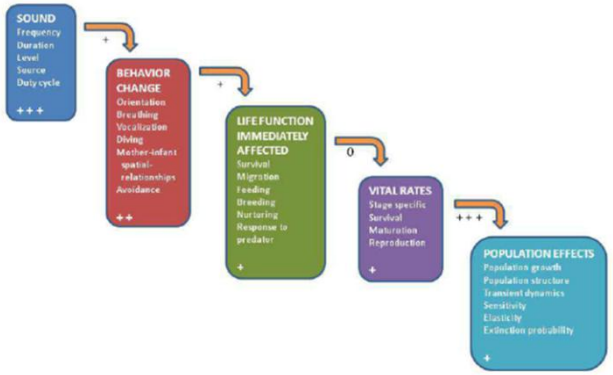
- Horizontal radars
- Vertical radar
- Camera's

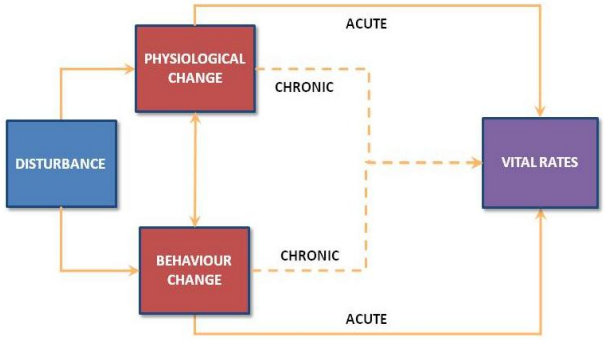
- Planning
  - Q2/3 2018: installation sensors
  - 2 years of measurements



Effects of underwater sound

- Anthropogenic sound can interfere with behaviour and ecologically important functions of marine mammals like communication, prey and predator detection, navigation …
- Anthropogenic sound can induce physiological effects like hearing threshold shifts, stress …
- Translation of effects on individuals to populations (PCAD, iPCOD, DEPONS)





Uncertainties and assumptions

- Predictions of area of effect don't match with observed area of effect.
- Uncertainties in sound propagation modelling
  research on effect frequency weighting on sound propagation
- Effect of disturbance duration on energetics and therefore the condition of the individual is based on expert judgement
  effect of starvation on body weight and blubber thickness

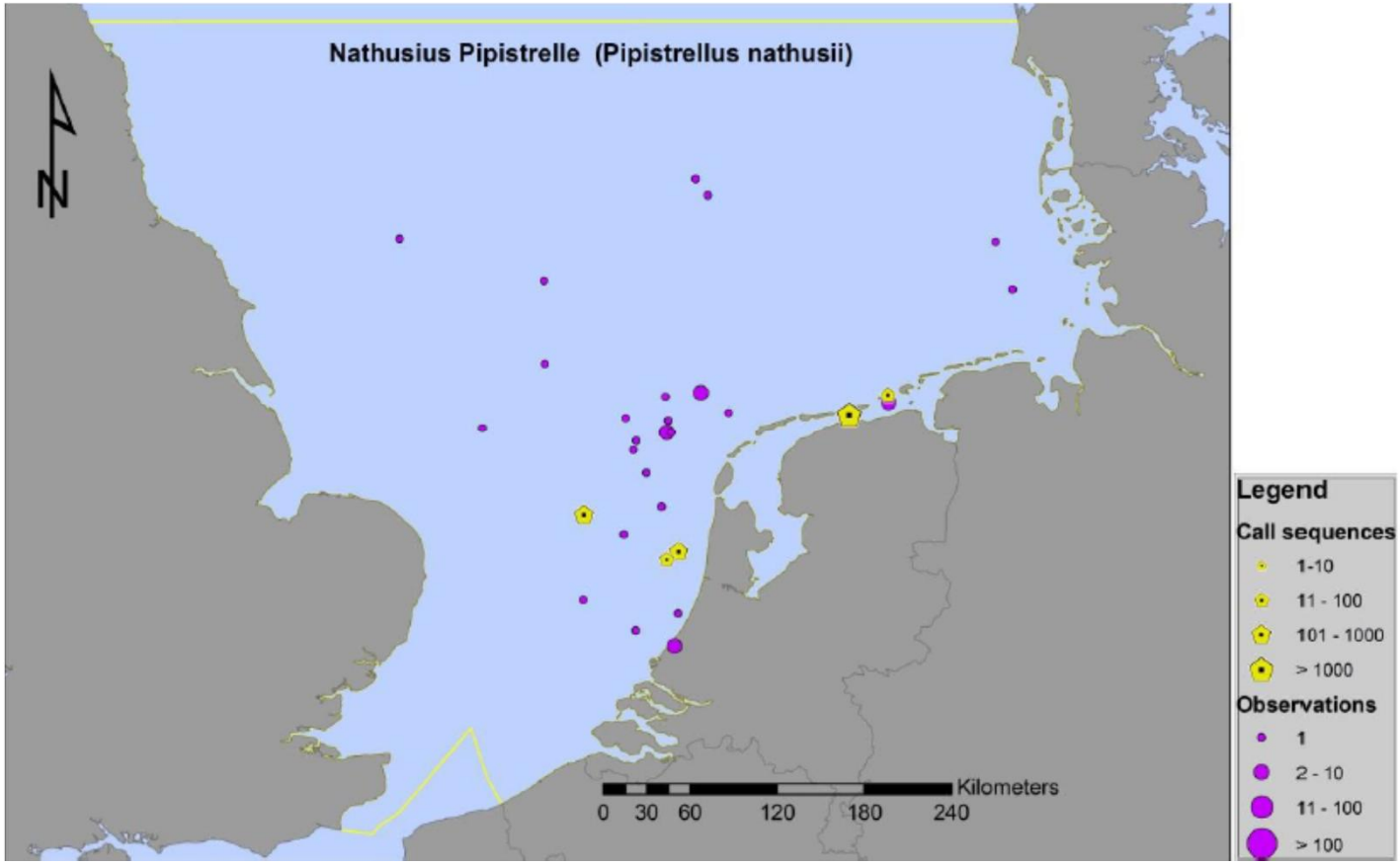
Bat research

How can offshore wind farms impact populations of bats?

At the beginning of knowledge development migrating bats and population Effects.

All bat species strictly protected by EU Habitat Directive

Records of Nathusius' Pipistrelle, autumn 2012: an example



Bats and (offshore) wind farms

- Bats well-known to be prone to collision risk in onshore wind farms
- Knowledge gaps:
  - Are bats attracted to (offshore) wind farms
  - Details on flight behaviour within wind farms
  - What numbers of bats actually cross the North Sea
  - Predicting migration peaks at sea by analysis of weather influences
  - Which proportion of populations (and at which scale) are at risk
  - Determining migration routes by telemetry

bat detector network

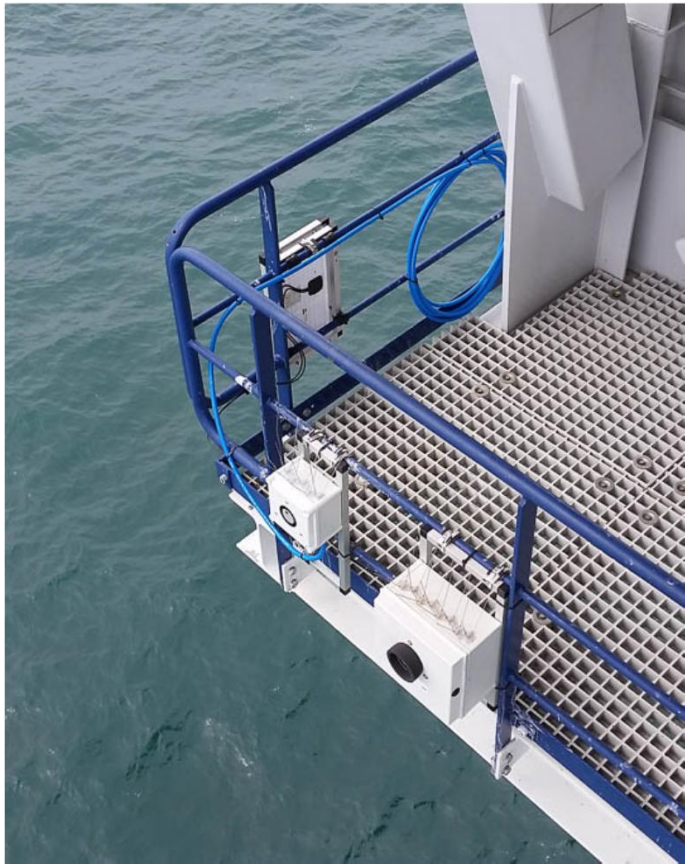
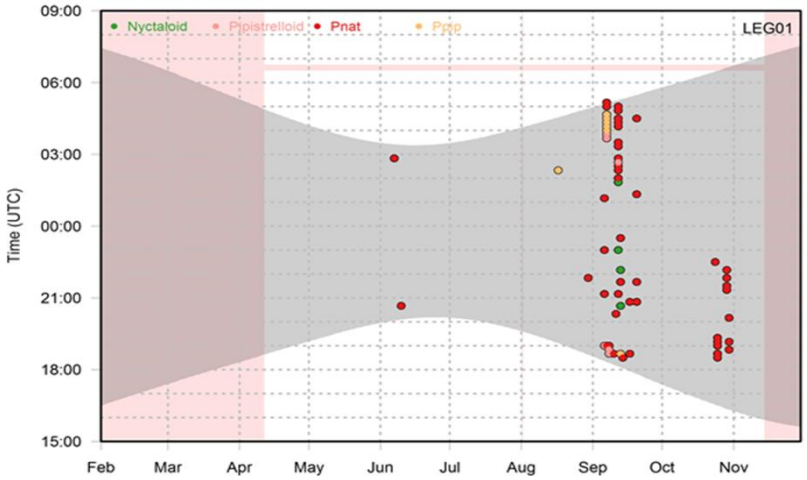
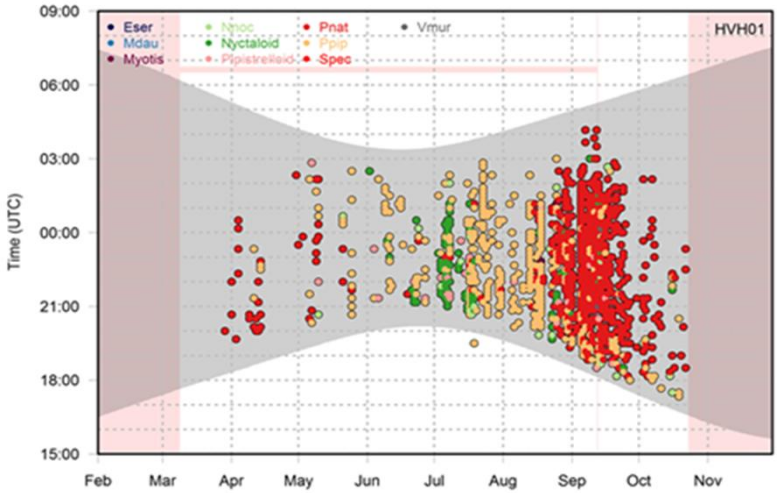


Photo: Hans Verdaat

Bat detector results (offshore & coastal)



Lichteiland Goeree 2016



Hoek van Holland 2016

- Higher densities at the coast in comparison to sea
- Differences in temporal occurrence and species composition
- Sea: migrants
- Coast: migrants + local populations

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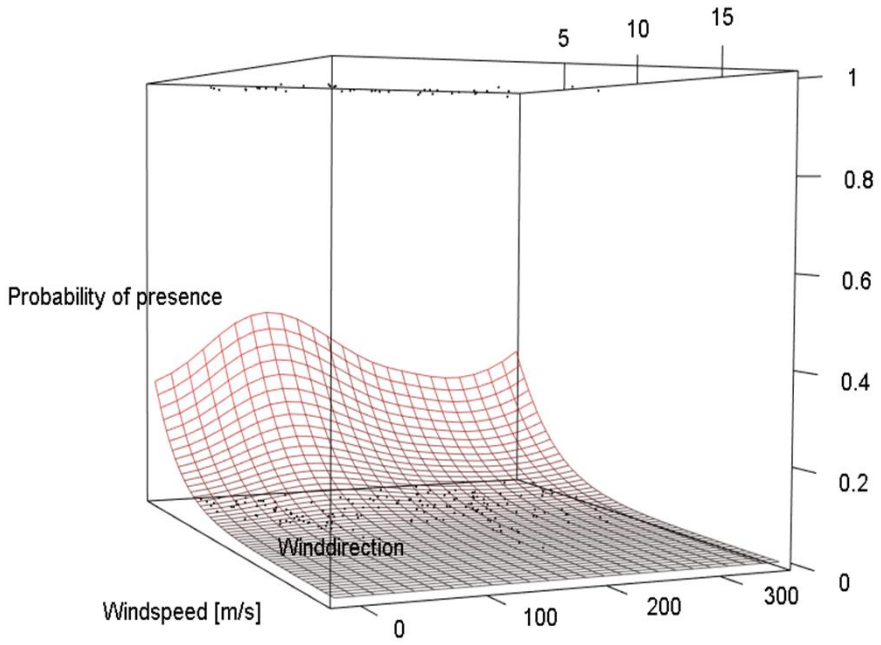
Occurrence depends on environmental conditions

- Important predictors:
  - Windspeed
  - Wind-direction
  - Temperature
  - Cloud cover
  - Moon illumination



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Mitigation possibilities

- Spatial planning of (offshore) wind farms

- Operation of windfarms
  - Standstill procedures
  - Deterrents?

Telemetry - aims

- Determine the proportion of bats that follows the coast and the proportion that heads out to sea
- Attraction to wind farms?
- Staging times in offshore wind farms?
- Access environmental conditions when migration occurs

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Study setup

- Planned receiver network
- 500 bats (2018 – 2020)

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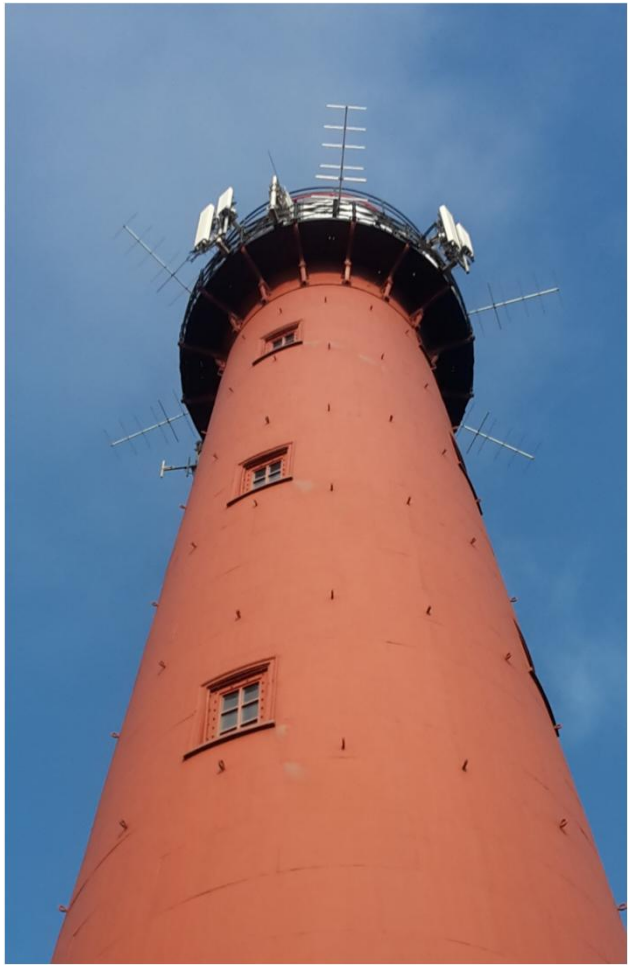
Receivers



Photos Sander Lagerveld

Tagging bats – 5 Oct 2017

- 5 Nathusius' pipistrelles
- 8 Noctules

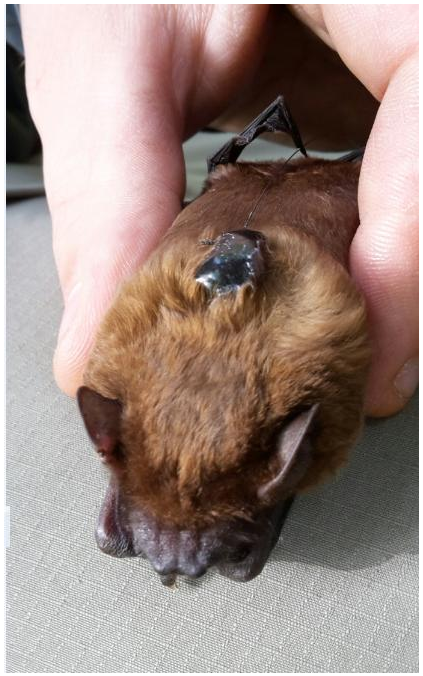


Photo: Sander Lagerveld

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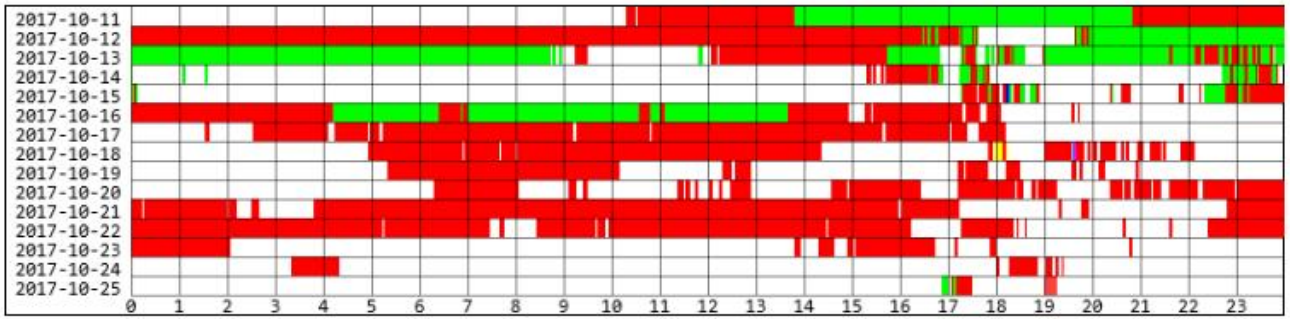
Nathusius' pipistrelle

- 391: ad female: no detections
- 484: ad female: no detections
- 486: ad female: departed 6 Oct: Petten > Camperduin
- 396: juv female: departed 30 Oct: ECN > Petten > Camperduin
- 393: juv male – departed 25 Oct: Schagerbrug > ECN > IJmuiden



Receiver deployments

- ECN-003-2017 (ID# 4310) (show only this receiver deployment)
- Schagerbrug - 004-2017 (ID# 4455) (show only this receiver deployment)
- Pett-007-2017 (ID# 4313) (show only this receiver deployment)
- Camp-009-2017 (ID# 4317) (show only this receiver deployment)
- Zwan-001.2017 (ID# 4309) (show only this receiver deployment)
- Pett-006-2017 (ID# 4312) (show only this receiver deployment)
- IJmuiden - WURSG011 (ID# 4454) (show only this receiver deployment)

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Wozep research 2016 - 2021 ...

- Knowledge available for KEC update
- Knowledge available for EIA and AA

- Research takes time
- What are the unkown unknown?

Developments around Wozep

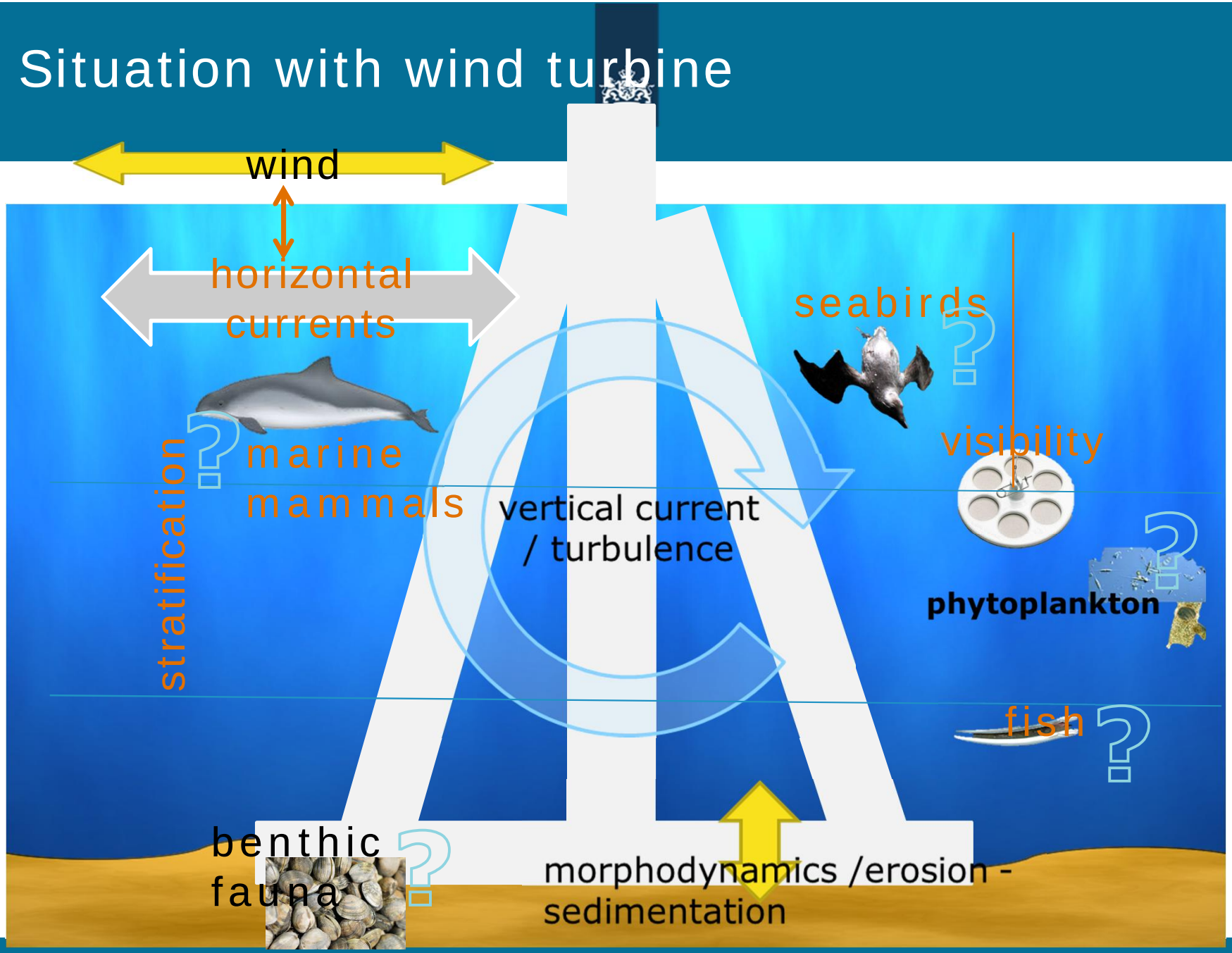
- Routekaart 2030
- Multi use of Wind farms (and free passage)
- Building WF's Natuurinclusief; improving wind farm habitat?
- Technical innovation – changes in stressors (i.e. under water noise)?

- Increasing area offshore windfarms: ecosystem effects?

  How may effects of individual offshore wind turbines add up

  Pilot : large-scale spatial modelling approach

Situation with wind turbine



What may have changed locally?

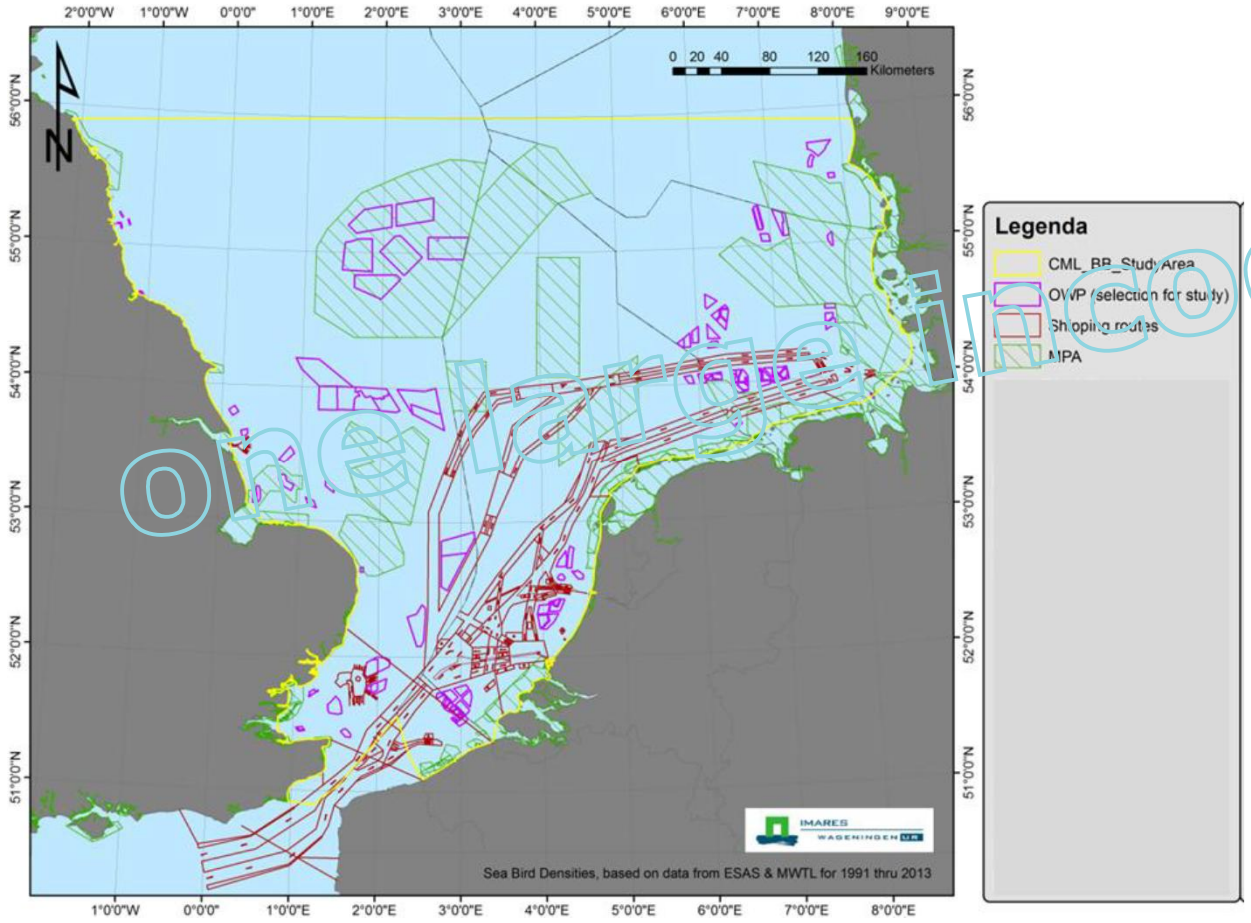
Abiotic changes

- Decreased wind intensity
- Change in wind – water interface
- Increased turbulence → change in state of stratification
- Increased turbulence → higher light extinction
- Change in morpho dynamics → shifts in local erosion-sedimentation patterns
- Change in substratum composition → more hard, less soft
- Etc.

Ecological consequences

- Increase or decrease in spatio-temporal occurrence of stratification?
- Increase or decrease of nutrient availability and primary production due to increased turbulence?
- Increase in filtering capacity of increased hard substrate benthic communities; influence on pelagic system?
- Less bottom disturbance beneficial for benthic (and thus marine) communities?
- Etc.

And… how do all these local changes add up in future at ecosystem level?



one large unknown…

A large-scale spatial modelling approach seems to be inevitable

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Questions?