

The harbour porpoise (*Phocoena phocoena*) in the Eastern Scheldt: a resident stock?

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Marine Mammals & Global change

- Large scale changes – drastic influences on distribution
 - Thermoregulation
 - Primary production
 - Feeding/breeding habitat
 - Reproduction
- Pelagic toothed whales, dolphins and porpoises
 - Less tied to particular locality
 - Shifts in distribution
 - New niches?
- Despite many pressures, **remarkably resilient...**

Harbour porpoise (*Phocoena phocoena*)

- Small marine mammal/cetacean

Adult \pm 145-160 cm / 50-60 kg

Food intake: \pm 10% body weight/day

Prey species: whiting, sandeel, herring,

- Abundance and distribution

Inshore species from shallow coastal waters

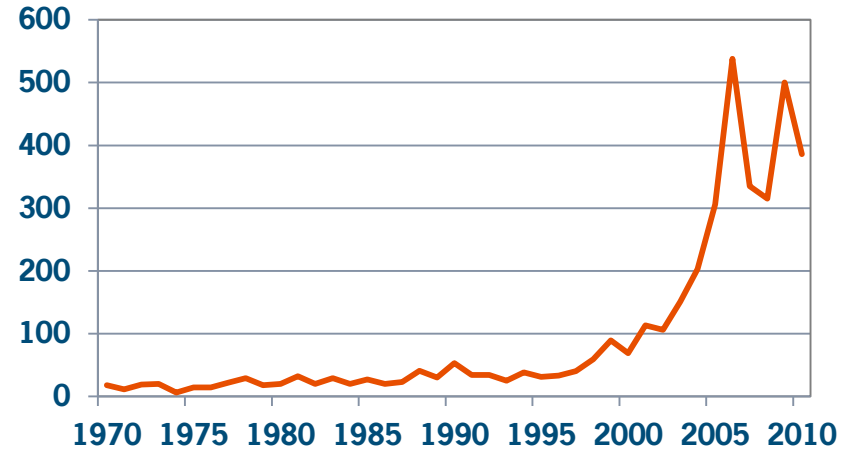
Temperate to cold waters of Northern hemisphere

Most common small cetacean in North Sea & Dutch coastal waters

North Sea population \pm 350 000 individuals

Southern shift

- prey abundance
- climate change
- human influences (e.g. fisheries)



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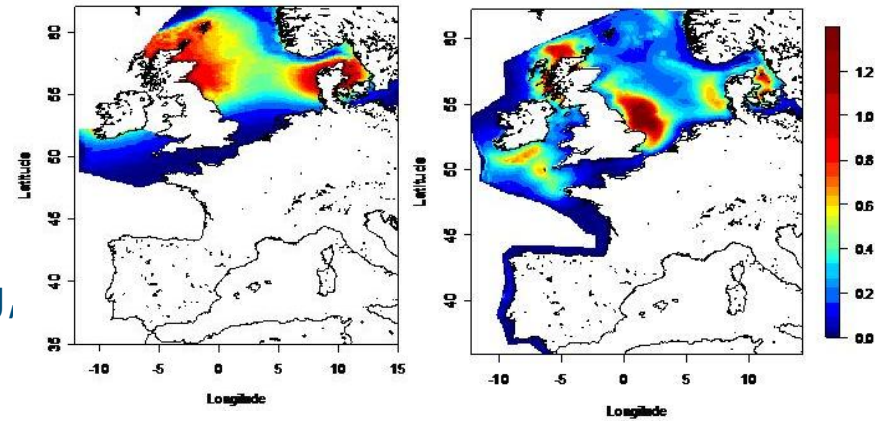
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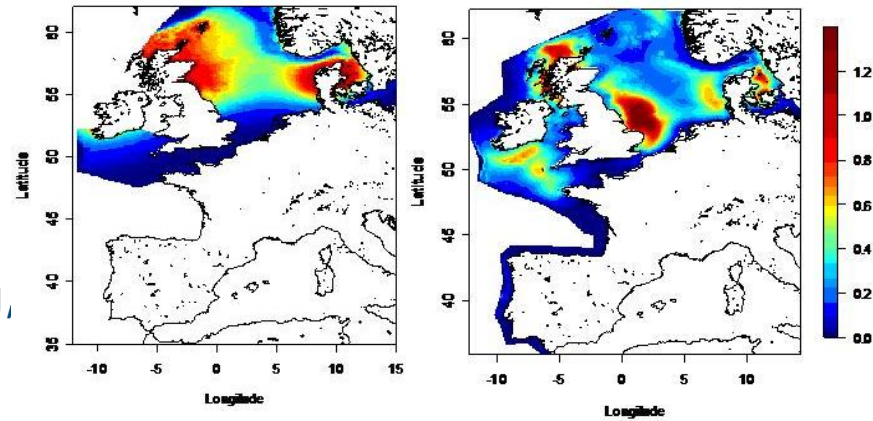
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Globally occurring phenomenon!



Stable isotope analysis

- Stable isotopes

Isotope Ratio Mass Spectrometer + NCS-EA

$$\delta X = (R_{sample} - R_{standard}) / R_{standard} \times 1000$$

Feeding ecology study

Nitrogen ($^{15}\text{N}/^{14}\text{N}$ or $\delta^{15}\text{N}$): trophic level

Carbon ($^{13}\text{C}/^{12}\text{C}$ or $\delta^{13}\text{C}$): foraging location

- Samples

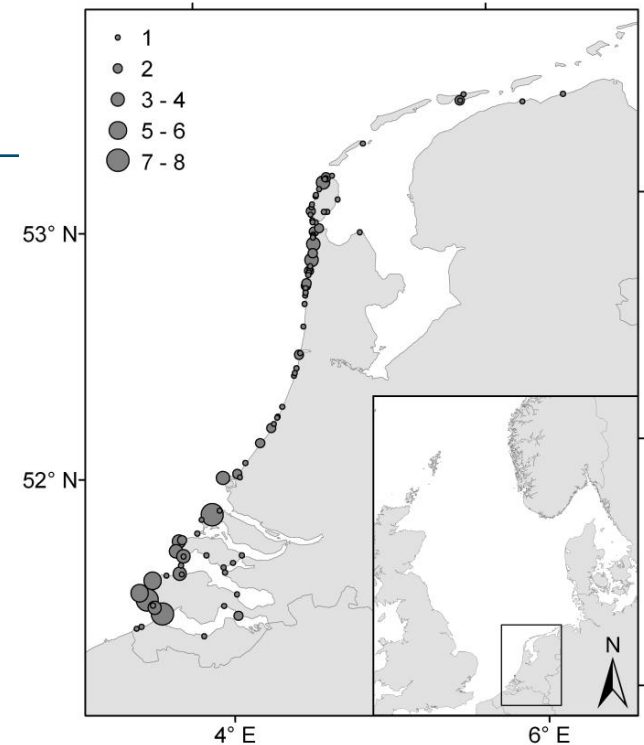
160 porpoises (2003-2008)

Muscle (n = 105): weeks - months

Bone (n = 118): years - lifetime

Age-related, seasonal, interannual & geographic differences

Muscle & Bone (n = 63): changes in diet over time



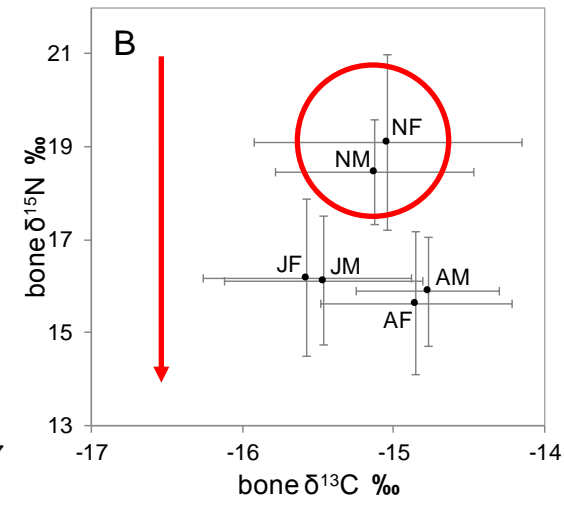
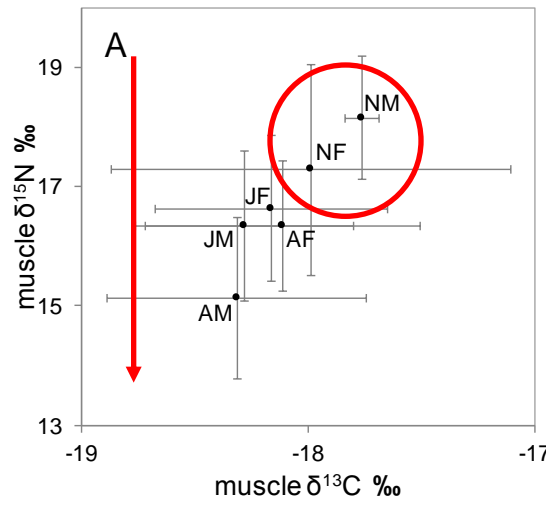
Results

Multiple linear regression

Muscle & Bone:

Suckling in neonates

Larger porpoises feed on lower trophic level prey



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Multiple linear regression

Muscle & Bone:

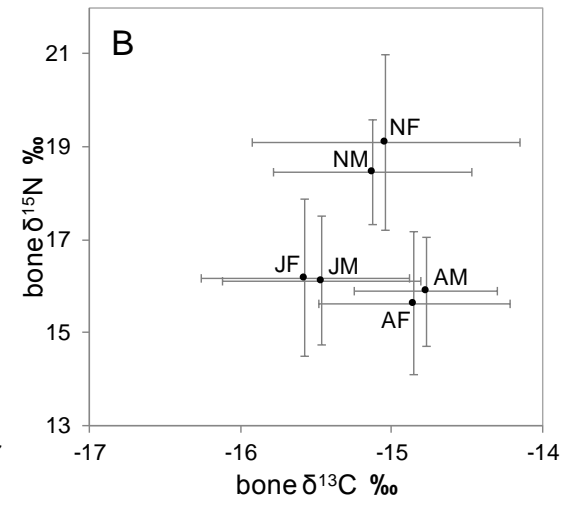
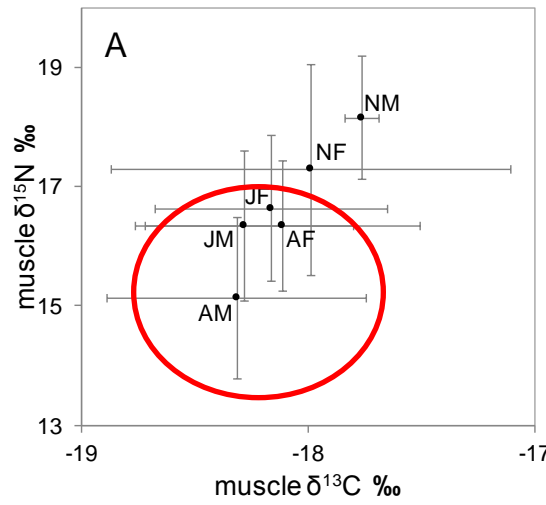
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Muscle:

Sexual segregation at maturity

Females closer to shore and more benthic



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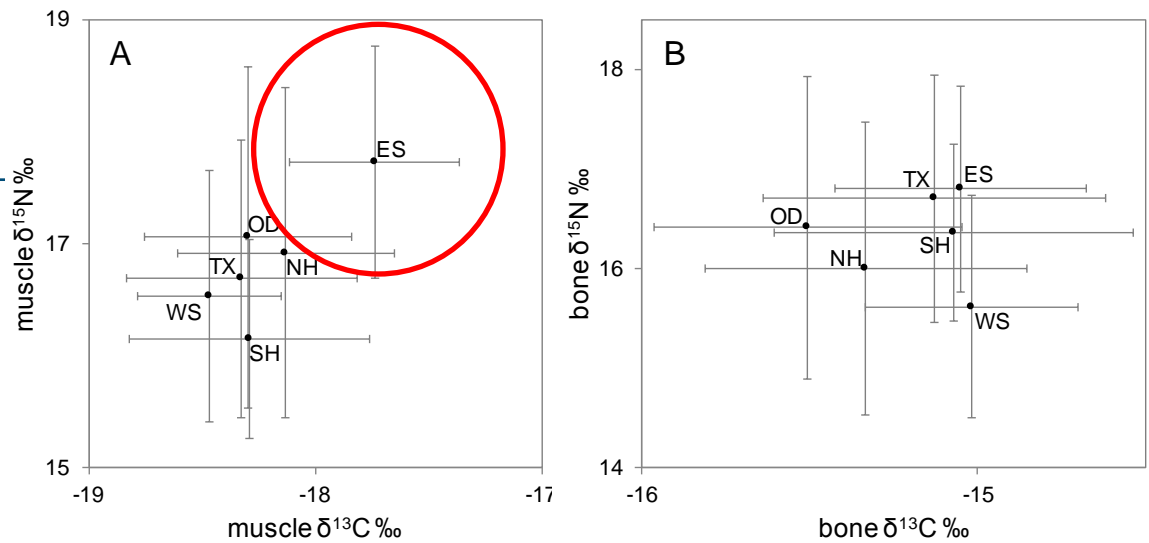
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Eastern Scheldt different from other locations

Bone: Winter animals feed on higher trophic level, benthic prey

Recent shift in habitat use!



The Eastern Scheldt

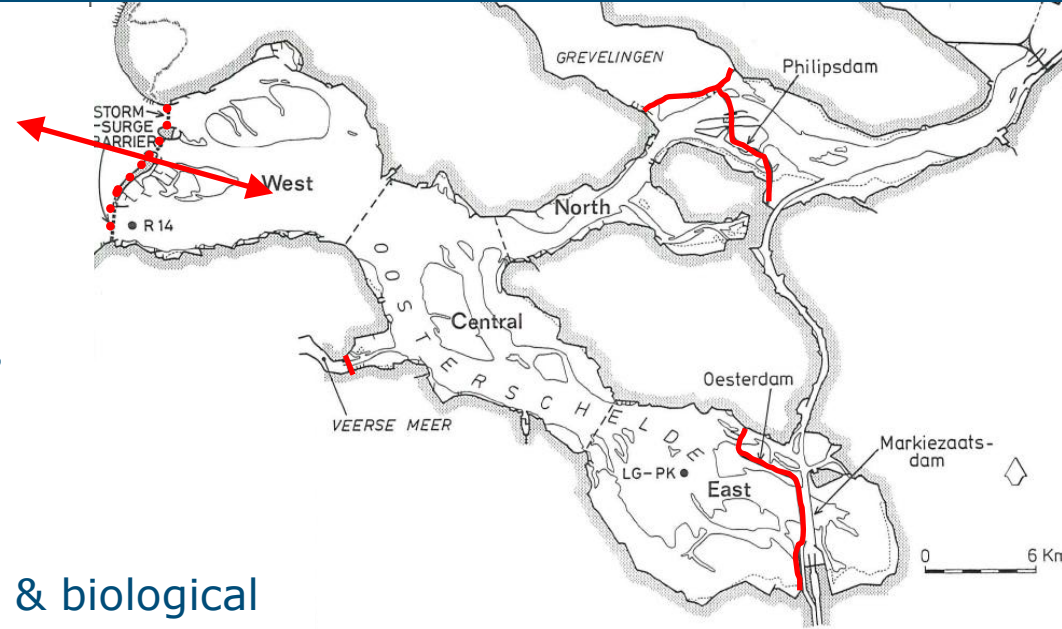
Human influence on the environment...

- Storm-surge barrier & dams
- Turbid estuary → Tidal bay
- Changes in the system:

Physical, chemical, geological & biological

Freshwater input	70 → 25 m ³ s ⁻¹
Tidal volume	1230 → 880 m ³ x 10 ⁶
Flow velocity	1.5 → 1.0 m s ⁻¹
Residency time	5-50 → 10-150 d
Freshwater load	70 → 25 m ³ s ⁻¹

Marine Mammal movements? Porpoises & Seals



Porpoises in the E.S.



Abundance

Used to be common

~ 1980's absent (building of the SSB)

Only recently (~ 10 years) seen again in small numbers

All year through

Mothers-calf pairs

Movement in and out of the area

Restricted or limited?

Free in movement?

Stable isotope data

Porpoises stayed and foraged in the area for a longer period of time

Some animals entered or left area recently

Animals not born in the area (at least until 2008)

A resident stock?



Why are they in the area

Chance

Prey availability

Less disturbance

Movement

Free movement

Incidental/active movement

Isolation/Entrapment

Site fidelity

Re-sightings

Long-term/year round residency

Future

Sea level rise

Storm floods



Thank you for listening...

