Studying effects of sand nourishments on fish and birds

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Wadden Sea Day 2018, Wilhelmshaven

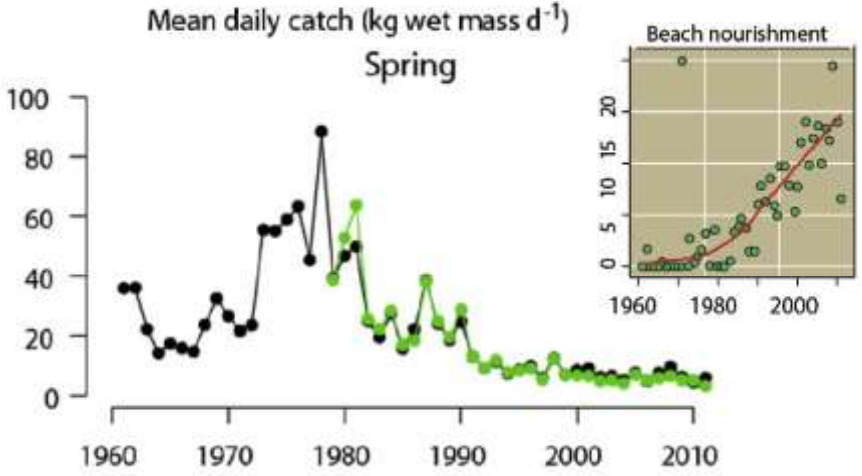
Fish biomass western Wadden Sea

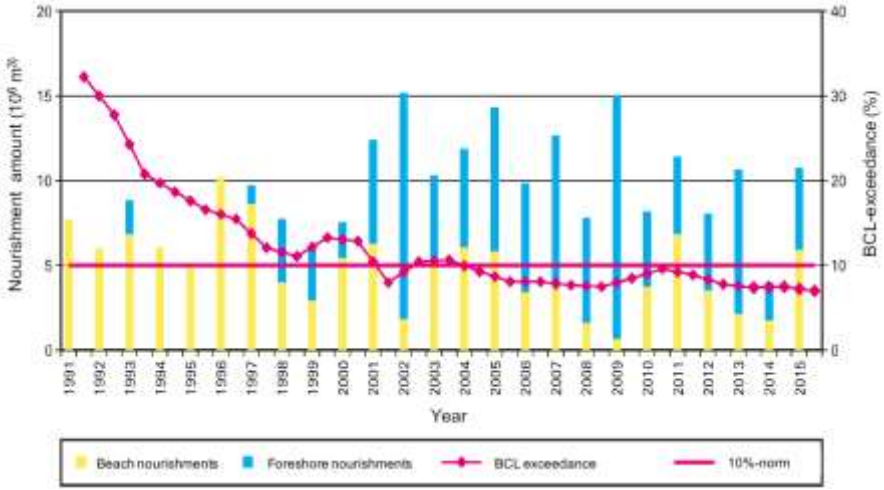
Estuarine, Coastal and Shelf Science 155 (2015) 156–166

Changes over 50 years in fish fauna of a temperate coastal sea: Degradation of trophic structure and nursery function

Henk W. van der Veer [a, *], Rob Dapper [a], Peter A. Henderson [b], A. Sarina Jung [a], Catharina J.M. Philippart [a], Johannes IJ. Witte [a], Alain F. Zuur [c]

"The strong correlations of fish biomass with habitat destruction and top predators are more likely to reflect causality [...] then nutrient loadings."





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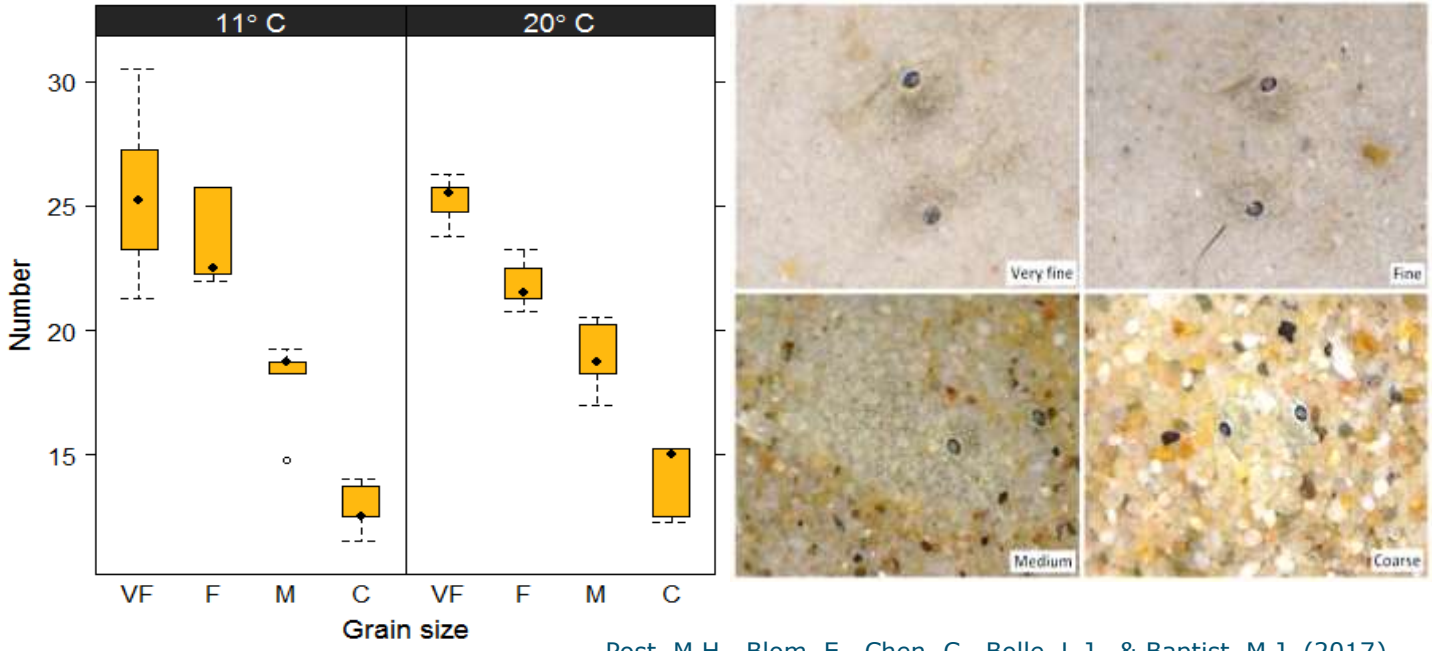
Effect pathways on fish

Sediment preference of juvenile sole



Post, M.H., Blom, E., Chen, C., Bolle, L.J., & Baptist, M.J. (2017). Habitat selection of juvenile sole (*Solea solea* L.): Consequences for shoreface nourishment. Journal of Sea Research, 122, 19-24.

Field study into effects of nourishments on fish

Research question: What are the medium-term (10-20 years) effects of sand nourishments on juvenile fish habitat?

Methods:

- Multiple surveys into the distribution and density of juvenile fish along spatial gradients in the shallow coastal zone.
- Statistical analysis to construct habitat models.
- Predicting the effects of nourishments on morphology and juvenile fish habitat quality.

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Deltares

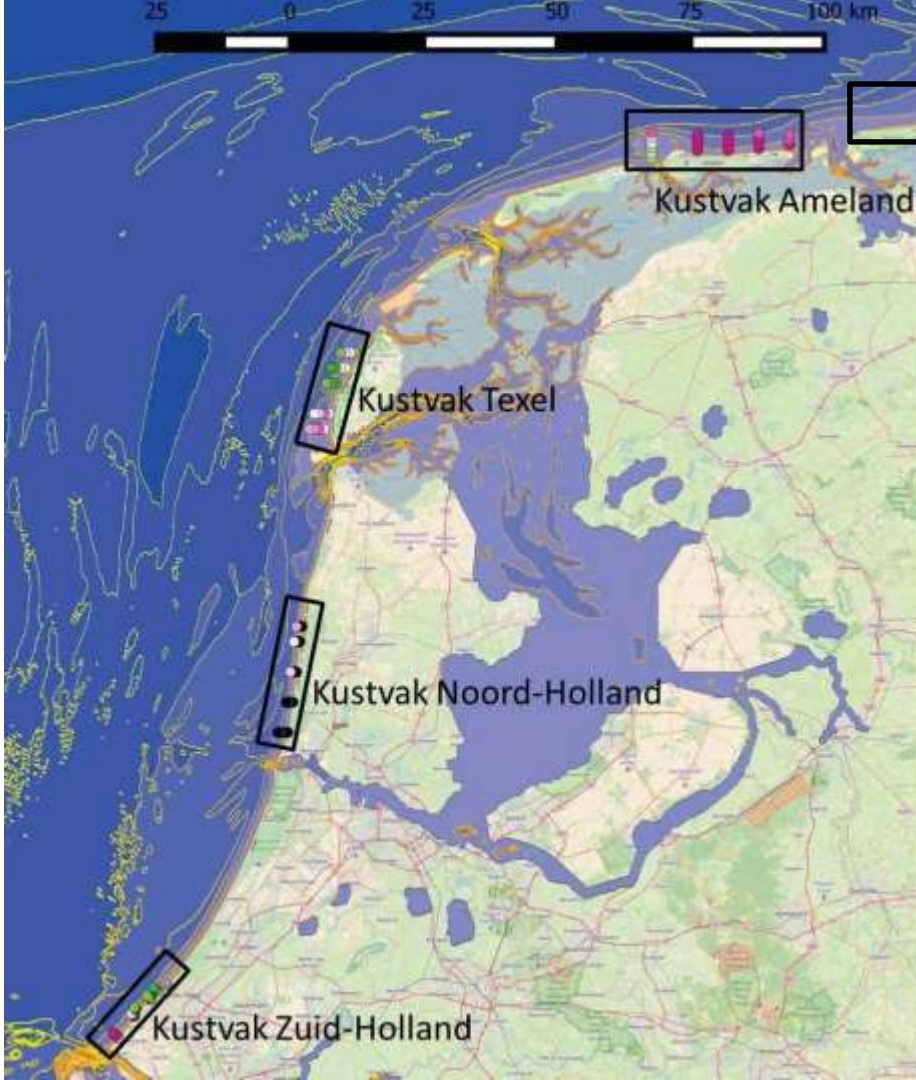
Rijkswaterstaat
Ministerie van Infrastructuur en Waterstaat

Survey locations

- Location 1: Zuid-Holland
- Location 2: Noord-Holland
- Location 3: Texel
- Location 4: Ameland

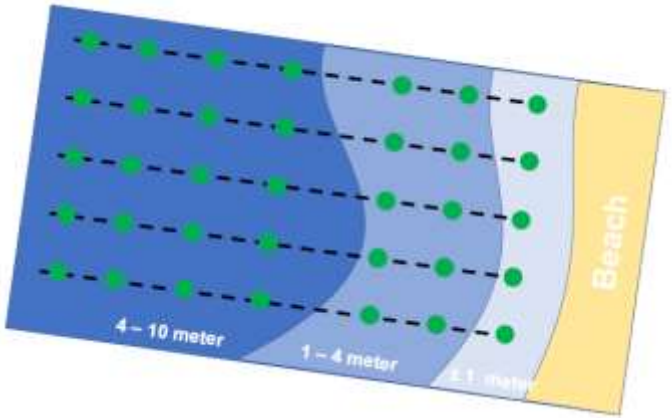
=>4 consecutive weeks from South to North

- Location 5: Schiermonnikoog in 2018

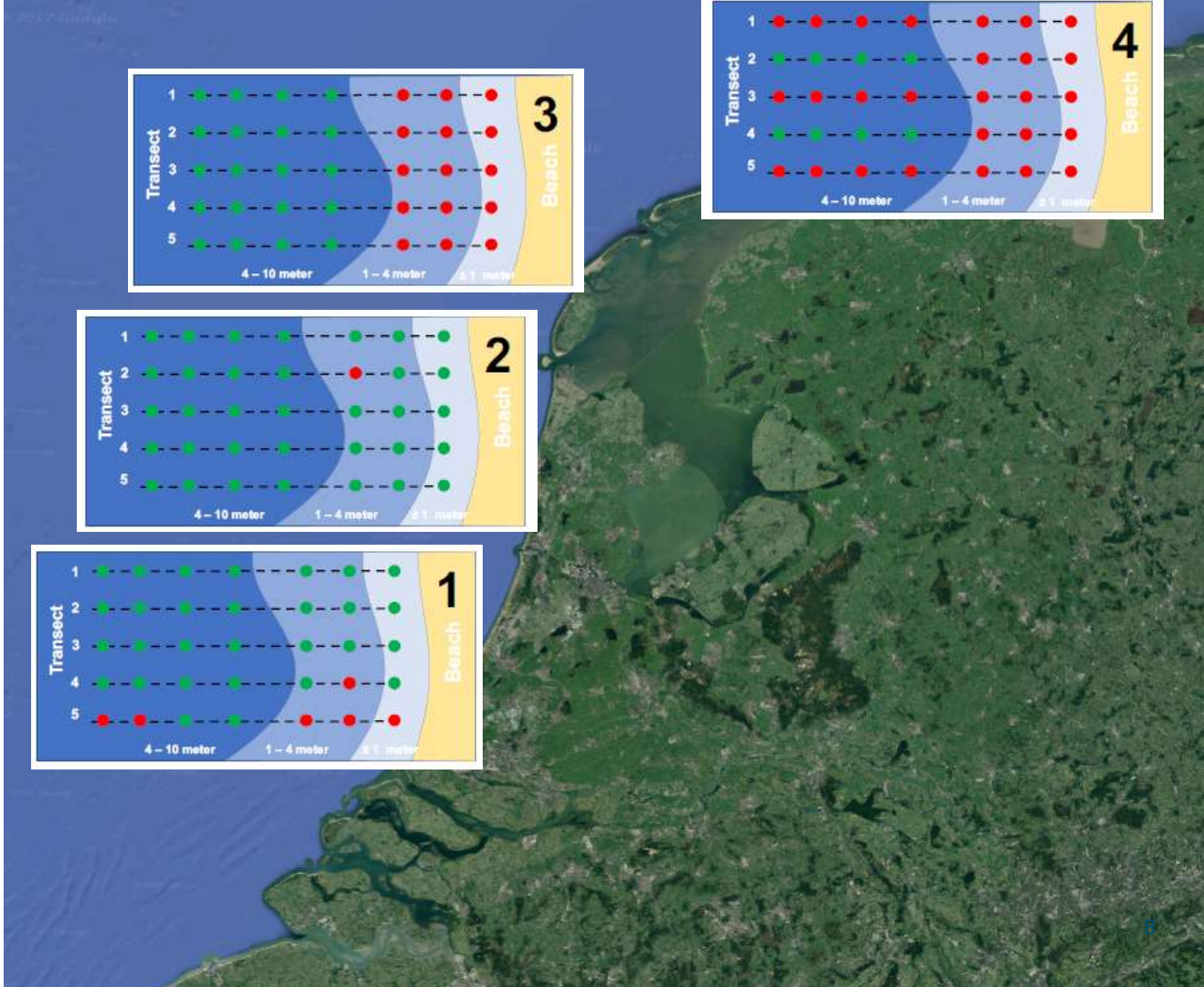


Transects: sampling

- Transects based on sediment
- Stratification based on depth
- Fish sampling:
    - 0-1 m: walking, seine net
    - 1-4 m: dinghy, 2 m beamtrawl
    - 4-10 m: vessel, 3 m beamtrawl + acoustics
- Benthos sampling each location
- Zooplankton, one sample per transect
- Continuous recording temp., salinity.



Missing hauls

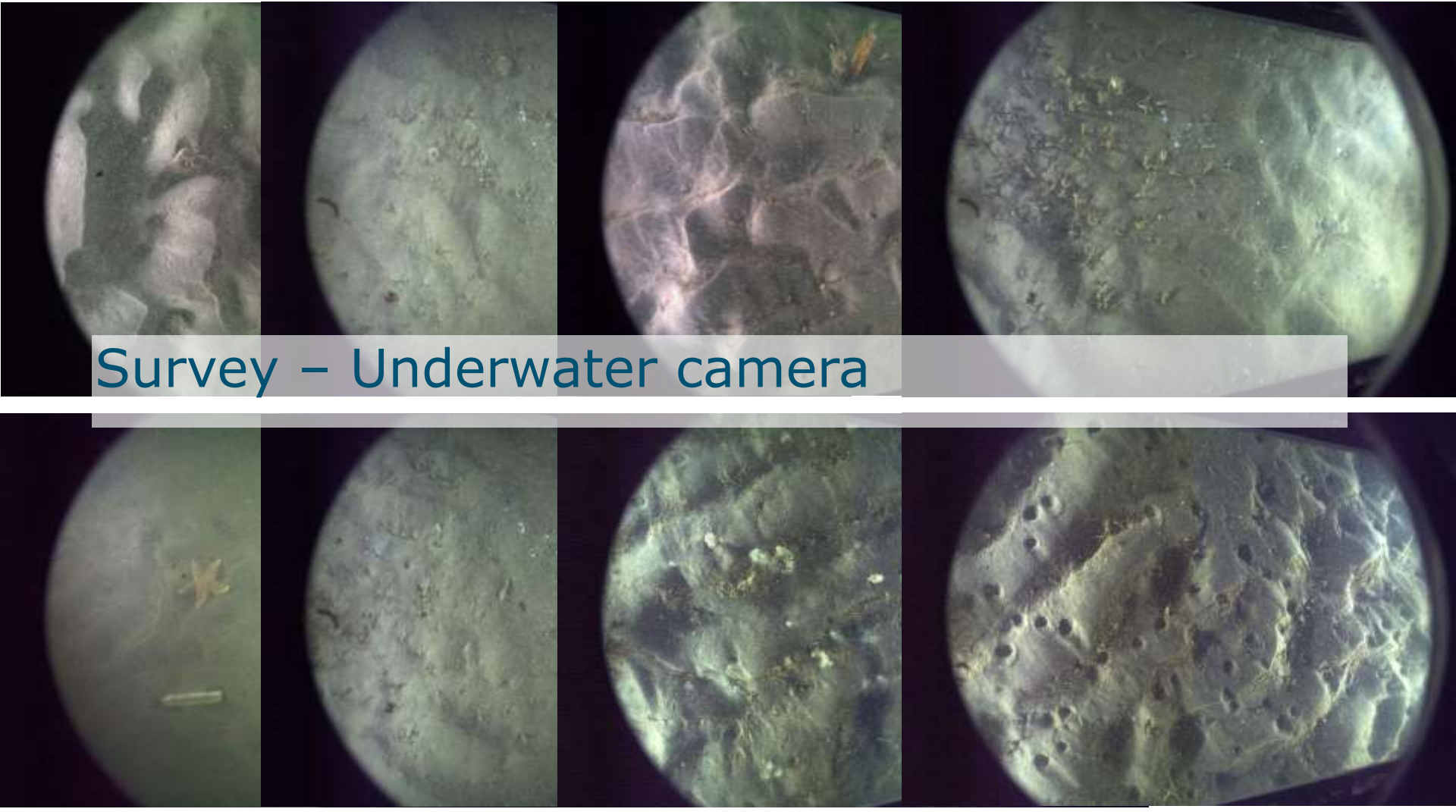


Survey - Fish

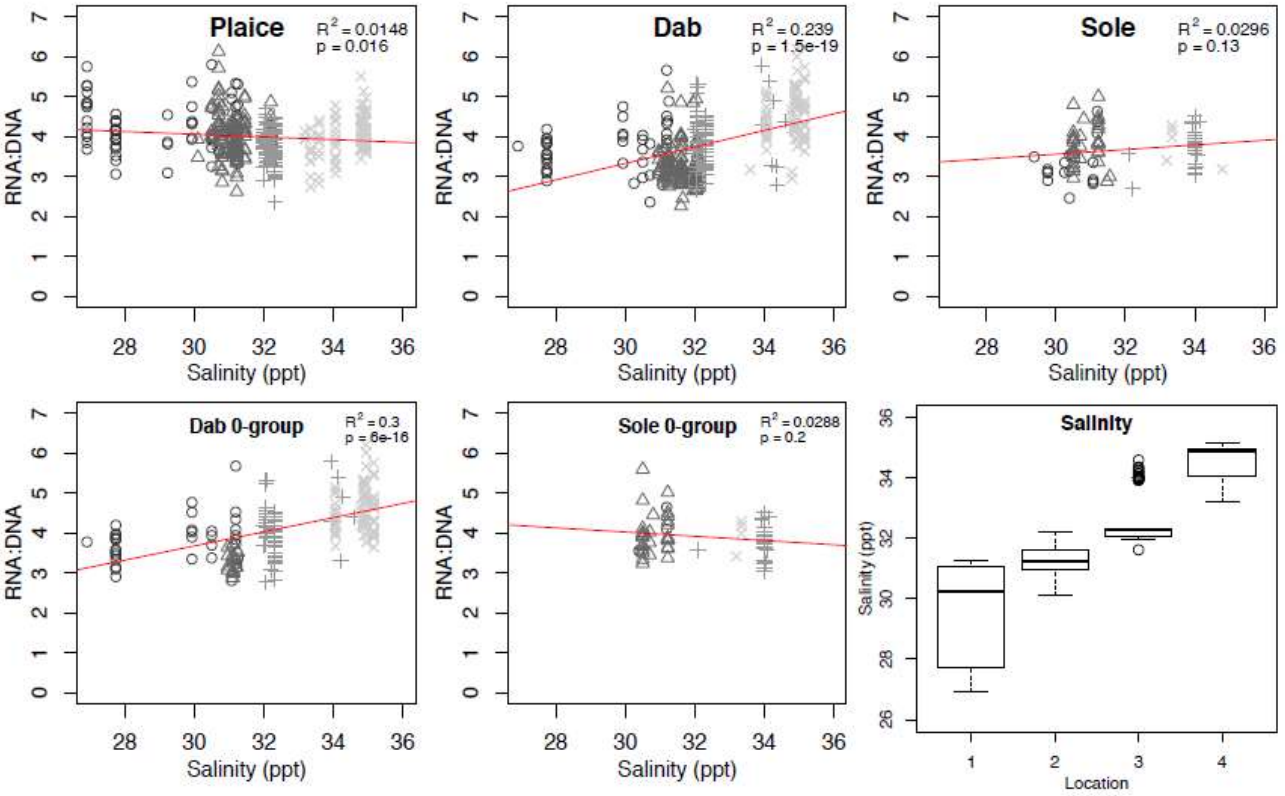
Survey - Benthos

Survey - Sediment

Survey – Underwater camera



One example result. On RNA:DNA ratios in fish



Ebb-tidal deltas: fish-eaters' paradises

Sand eel in the Ameland ebb-tidal delta

- Sand eel are staple food for birds and sea mammals and dependent on sediment characteristics.
- As part of the pilot project on nourishment of the Ameland ebb-tidal delta, we sampled for sand eel using a special dredge, at night.

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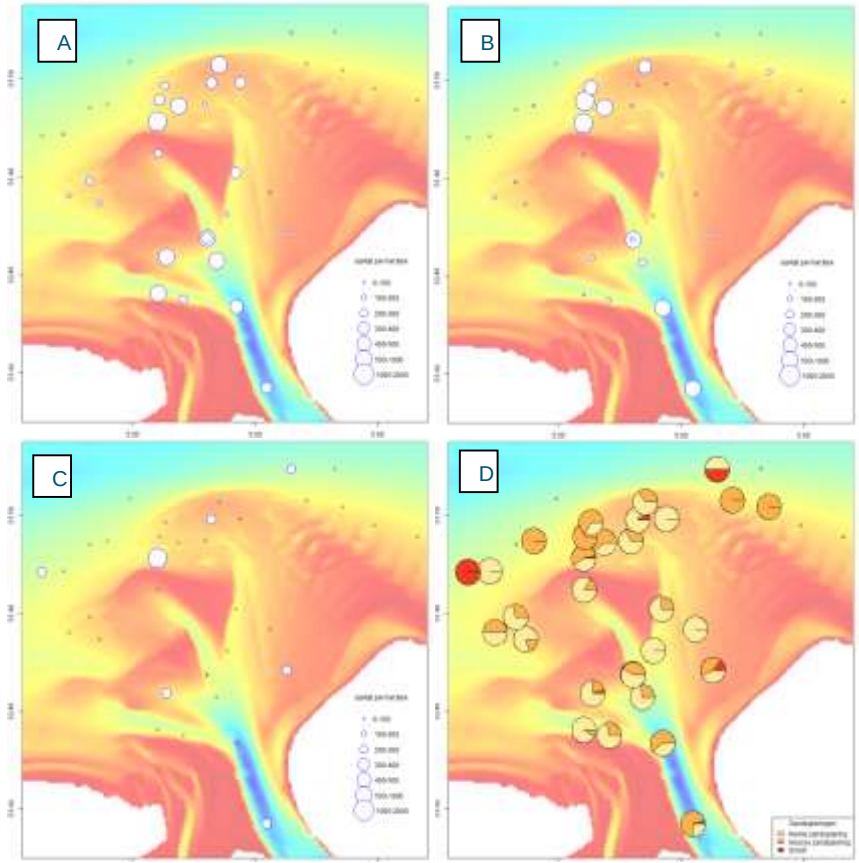
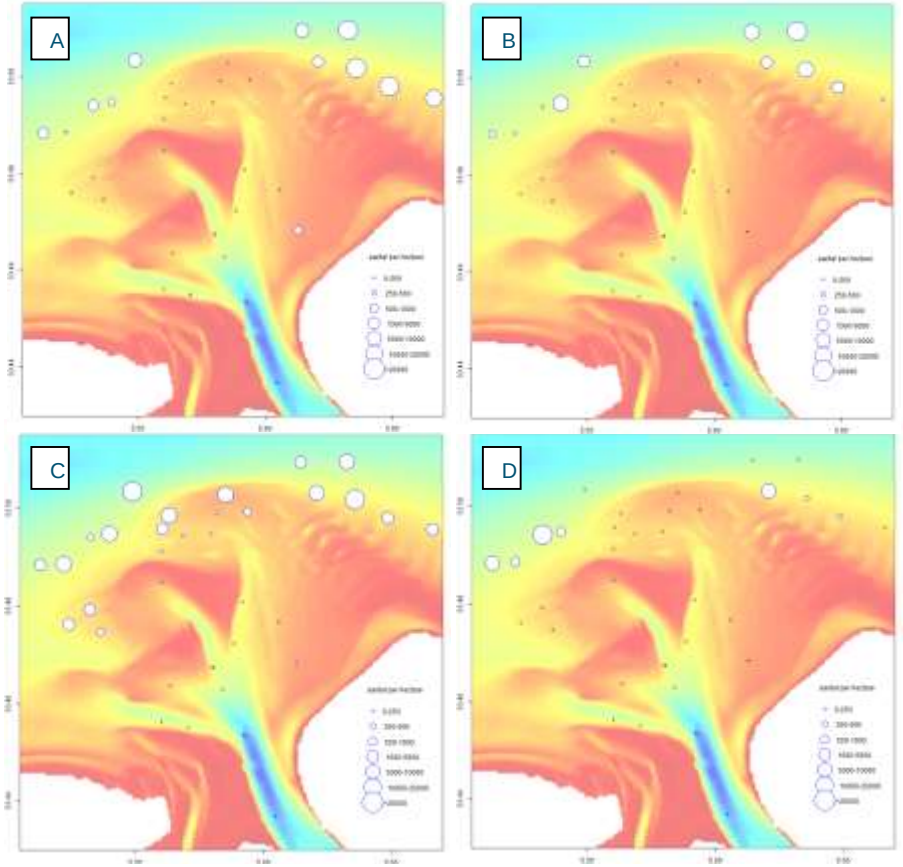


Number of sand eels/ha: A) Lesser; B) Raitt's; C) Great; D) ratio.



Number of shellfish/ha: A) *Spisula*; B) *Limecola*; C) *Donax*; D) *Ensis*.

Sandwich terns

- Outer deltas are used extensively by Sandwich tern foraging on sand eels and herring/sprot during the breeding season.
- Research question: can sand nourishments affect the foraging possibilities of Sandwich tern?
- Research method: telemetry study to pinpoint the foraging locations in an ebb-tidal delta as precise as possible.
- 2018: pilot study on five birds.

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2018 05.23 08:05


14


Tx-1 Utopia


09-06-2018 Sat 11:44:33
Tx-1 Utopia

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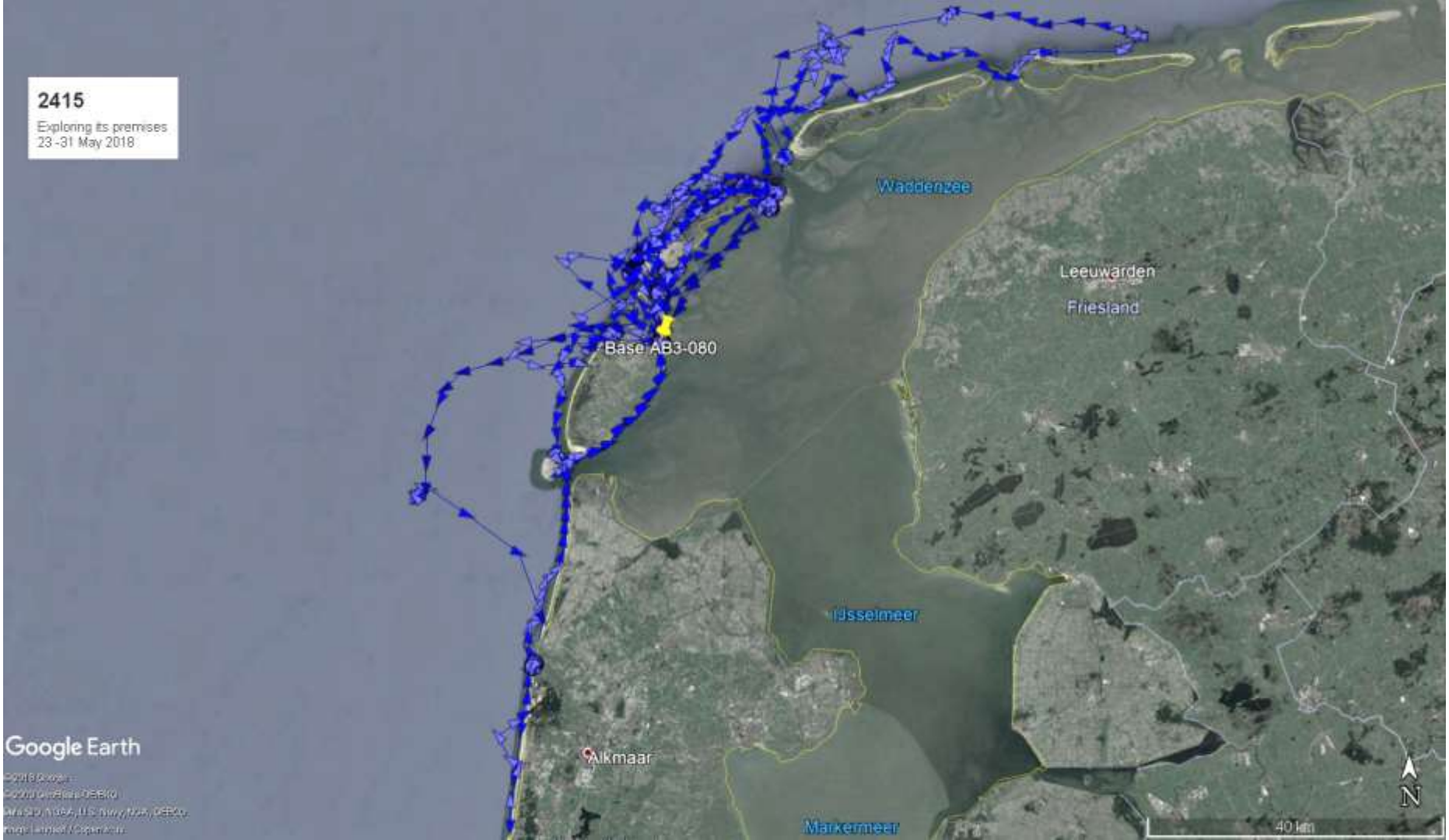
29-05-2018 Tue 12:23:14
Texel Utopia


2415
Exploring its premises
23 -31 May 2018
Waddenzee
Leeuwarden
Friesland
Base AB3-080
IJsselmeer
Alkmaar
Markermeer
Google Earth
40 km
N

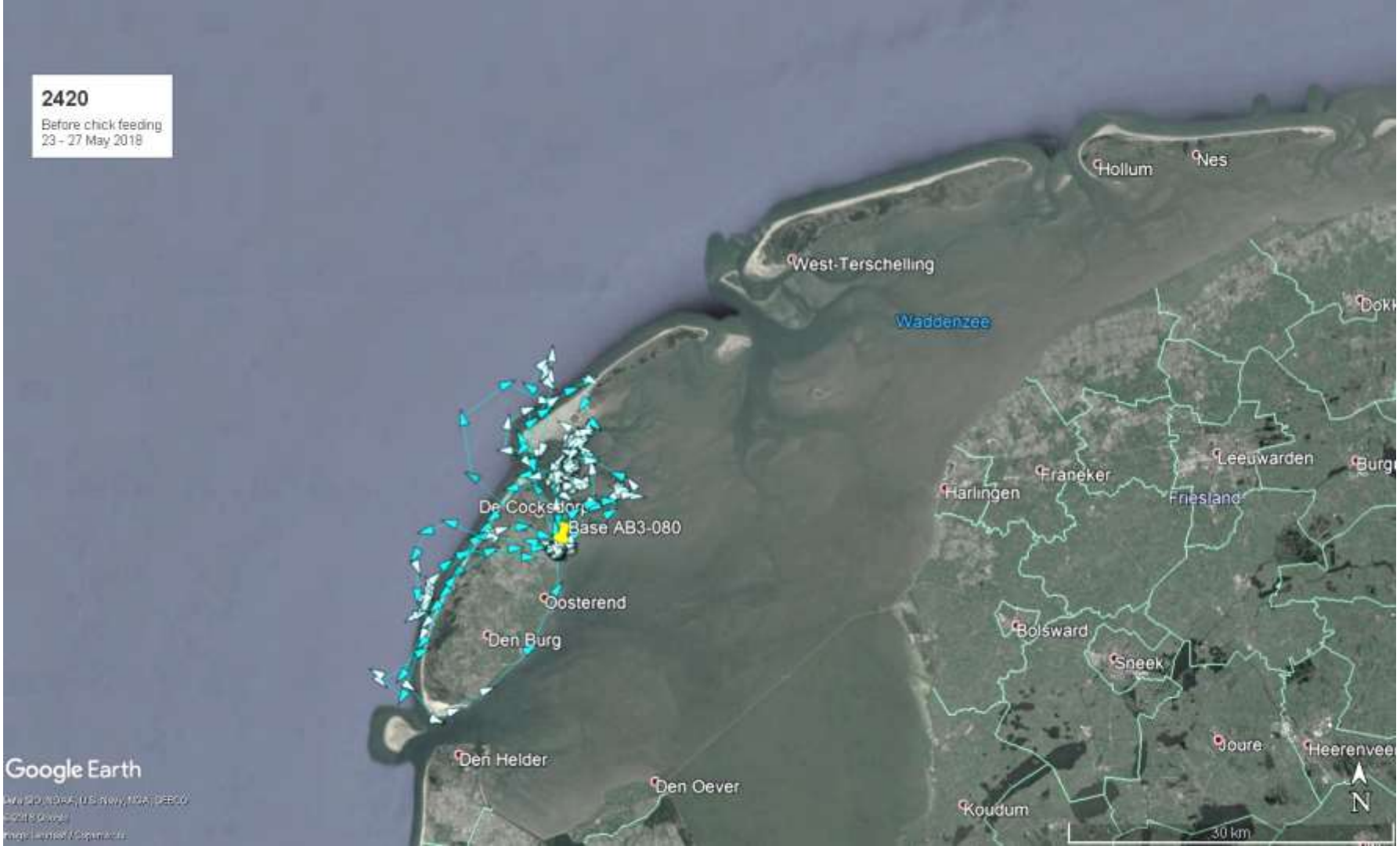

2414
Journey to the Delta region
25-28 May 2018
Base AB3-080
Alkmaar
geofence LR
North Holland
Haarlem
Amsterdam
Almere
Flevoland
Leiden
Utrecht
Amersfoort
Netherlands
The Hague
South Holland
Rotterdam
Breda
Tilburg
Zeeland
N
Google Earth

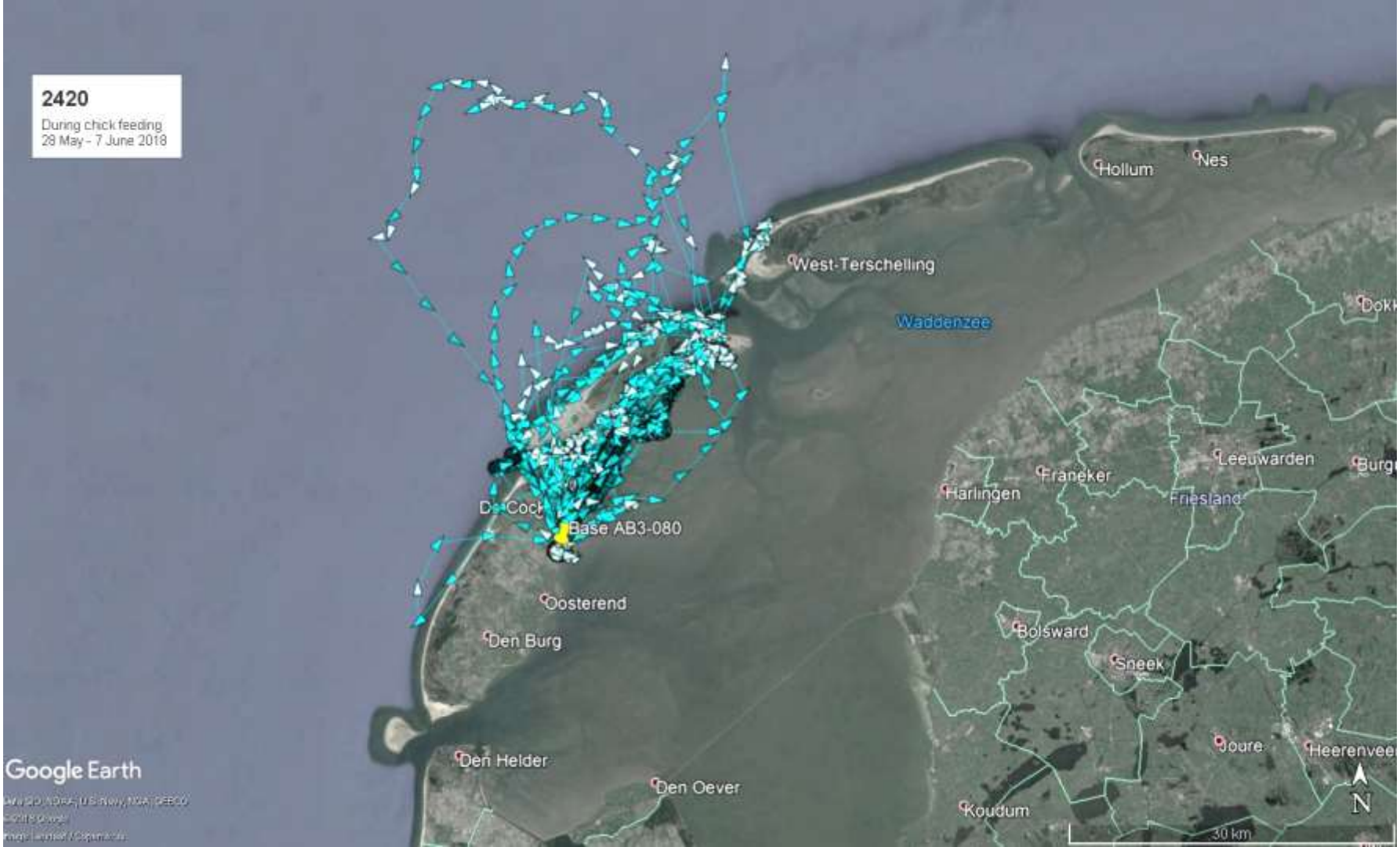

2414
Lingering around Texel
30 May - 6 June 2018
Waddenzee
Leeuwarden
Friesland
Base AB3-080
IJsselmeer
Alkmaar
Google Earth
40 km
N


2414
Exploring Wadden Sea islands
7 - 15 June 2018
Juist
Memmert
Borkum
Borkum
Waddenzee
Groningen
Leeuwarden
Fryslân
Groningen
Base AB3-080
Drenthe
N
40 km
Google Earth


2414
Trip to Minsener Oog
16 - 22 June 2018
Juist
Norderney
Borkum
Dornum
Norden
Wittmund
Wangerland
Wilhelmshaven
Krummhorn
Aurich
Emden
Waddenzee
Groningen
Leeuwarden
Friesland
Base AB3-080
Oldenburg
Drenthe
Google Earth
N
50 km


2414
Offshore Texel
23 - 28 June 2018
Waddenzee
Base AB3-080
Google Earth
30 km
N


2420
Before chick feeding
23 - 27 May 2018
Hollum
Nes
West-Terschelling
Waddenzee
Leeuwarden
Franeker
Harlingen
Friesland
De Cocksdorp
Base AB3-080
Oosterend
Den Burg
Bolsward
Sneek
Joure
Heerenveen
Den Helder
Den Oever
Koudum
30 km
N
Google Earth

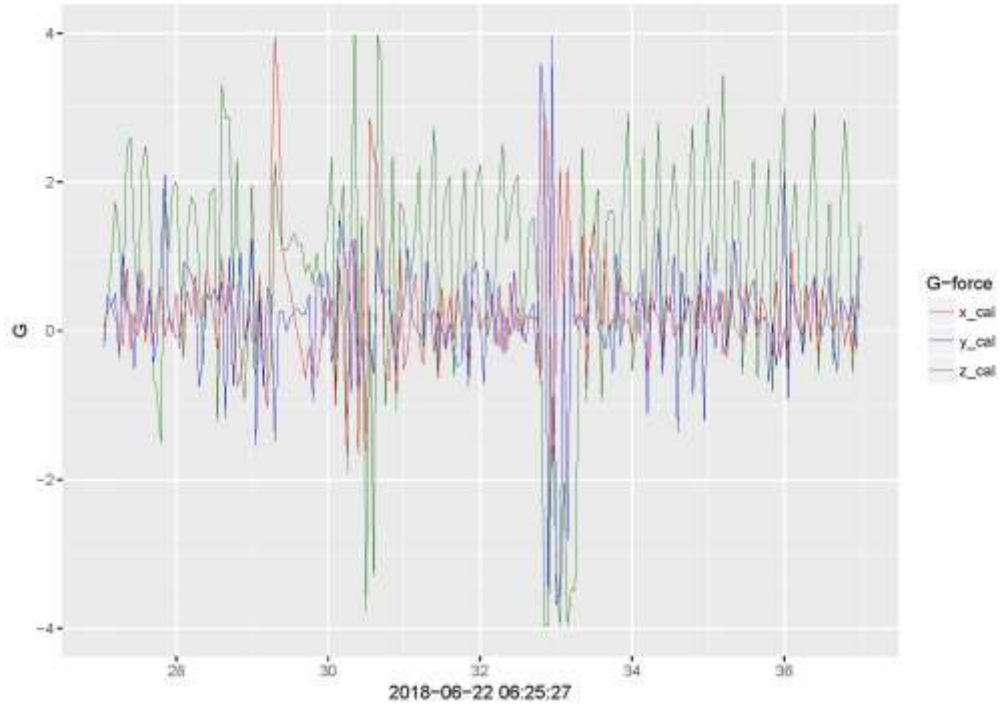

2420
During chick feeding
28 May - 7 June 2018
Hollum
Nes
West-Terschelling
Waddenzee
Leeuwarden
Franeker
Harlingen
Friesland
Base AB3-080
Oosterend
Den Burg
Bolsward
Sneek
Joure
Den Helder
Den Oever
Koudum
N
30 km
Google Earth


2420
After chick feeding
8 - 27 June 2018
West-Terschelling
Waddenzee
Base AB3-080
Harlingen
Franeker
Leeuwarden
Friesland
Google Earth
30 km
N


2420
Delta journey
28 -30 June 2018
Base AB3-080
Friesland
Groningen
Drenthe
IJsselmeer
Alkmaar
North Holland
Markermeer
Flevoland
Haarlem
Amsterdam
Almere
Leiden
The Hague
South Holland
Rotterdam
Utrecht
Utrecht
Amersfoort
Netherlands
Apeldoorn
Ede
Gelderland
Arnhem
's-Hertogenbosch
Google Earth
N
40 km

Further work on terns

- Next year (hopefully) fifteen Sandwich terns can be followed.
- This year's pilot showed that the combination of temperature and accelerometer data can pinpoint the location of foraging dives.



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Conclusions

- Various effect pathways of sand nourishments on fish and birds exist, but unravelling these from other effects is not an easy task.
- Fish and bird species are mobile and show large resource flexibility. Effects of sand nourishments may appear rather through medium to long-term cumulative burden than through short-term direct effects.