

Expected and unexpected effects of managed realignment in an urbanised estuarine environment

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UK



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Industrialised
estuaries of the
North Sea Region

Concentrations of
carbon-heavy
industries





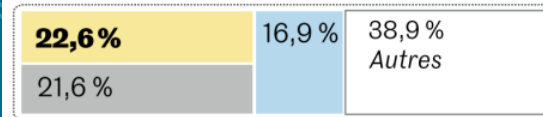
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Industrialised estuaries of the North Sea Region

Concentrations of carbon-heavy industries

Trois secteurs concentrent deux tiers des émissions de l'industrie européenne

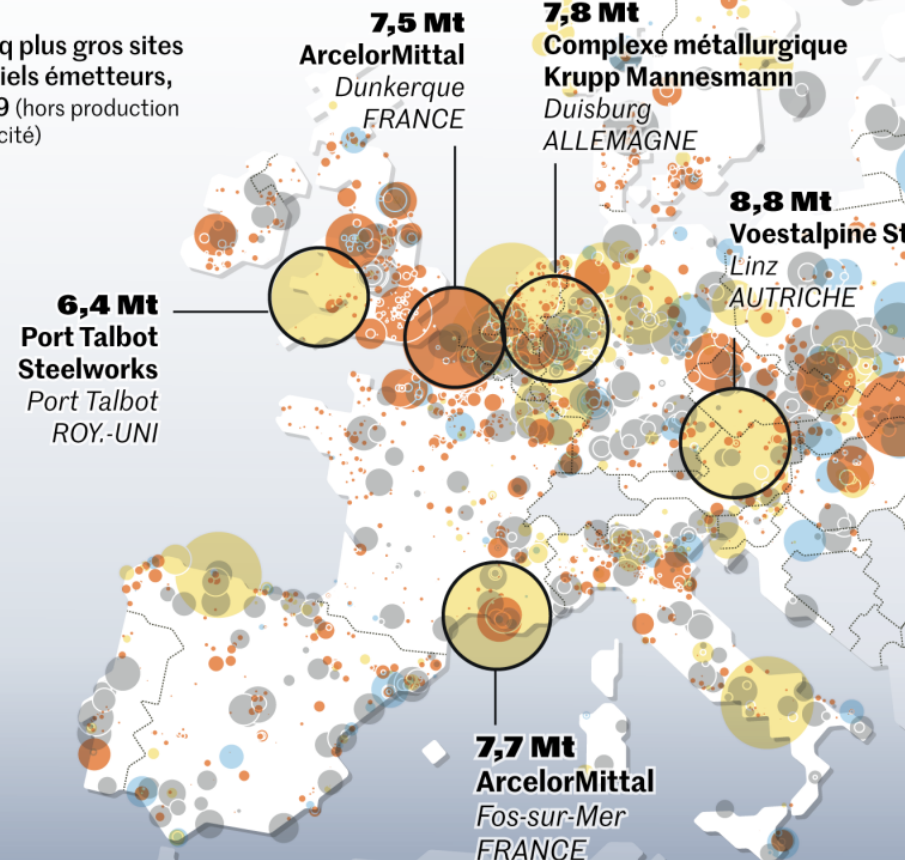
● Métallurgie ● Ciment ● Chimie ● Combustion



Emissions de gaz à effet de serre, par sites industriels en Europe, en mégatonnes (Mt), en 2019



X,x Mt Les cinq plus gros sites industriels émetteurs, en 2019 (hors production d'électricité)



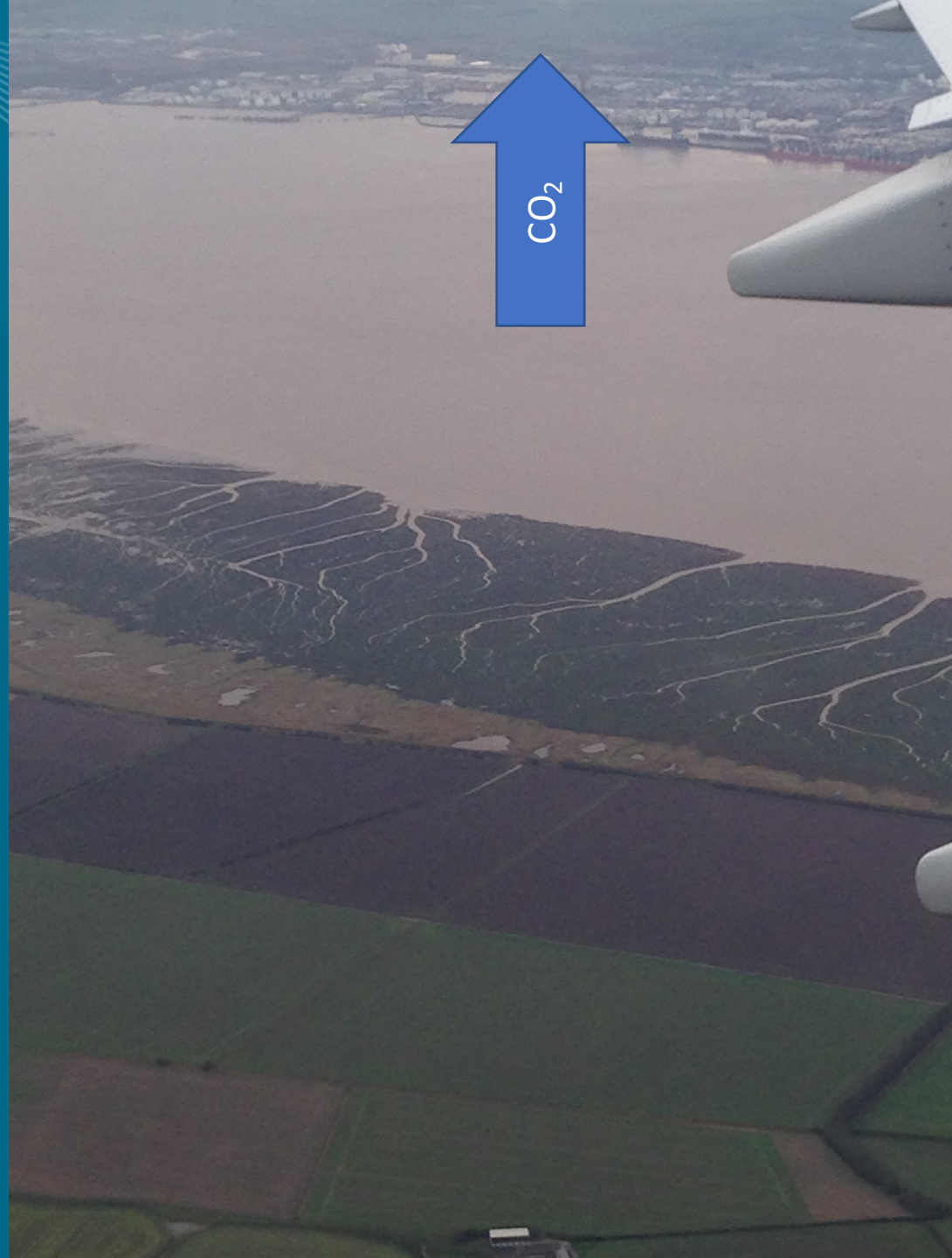
Infographie : *Le Monde*, Benjamin Martinez,
Marianne Pasquier, Floriane Picard

Sources : Agence européenne pour
2021, Haut Conseil pour le climat ; Sys



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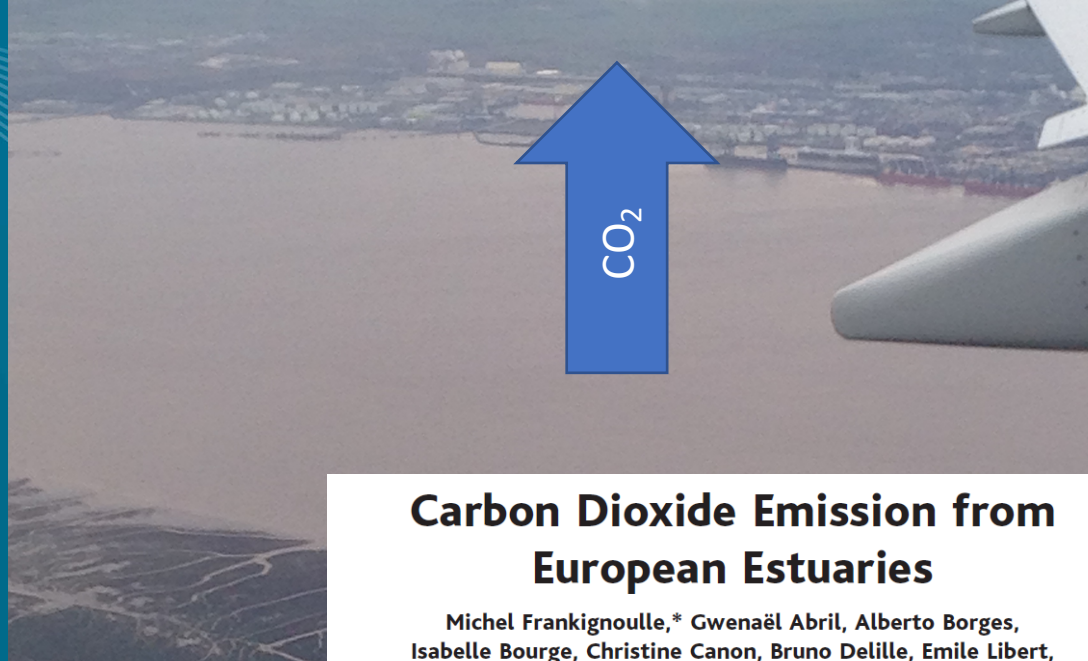
The water of the
estuary itself is
also a source of
 CO_2 and CH_4
emissions





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The water of the
estuary itself is
also a source of
 CO_2 and CH_4
emissions



Carbon Dioxide Emission from European Estuaries

Michel Frankignoulle,* Gwenaél Abril, Alberto Borges,
Isabelle Bourge, Christine Canon, Bruno Delille, Emile Libert,
Jean-Marie Théate

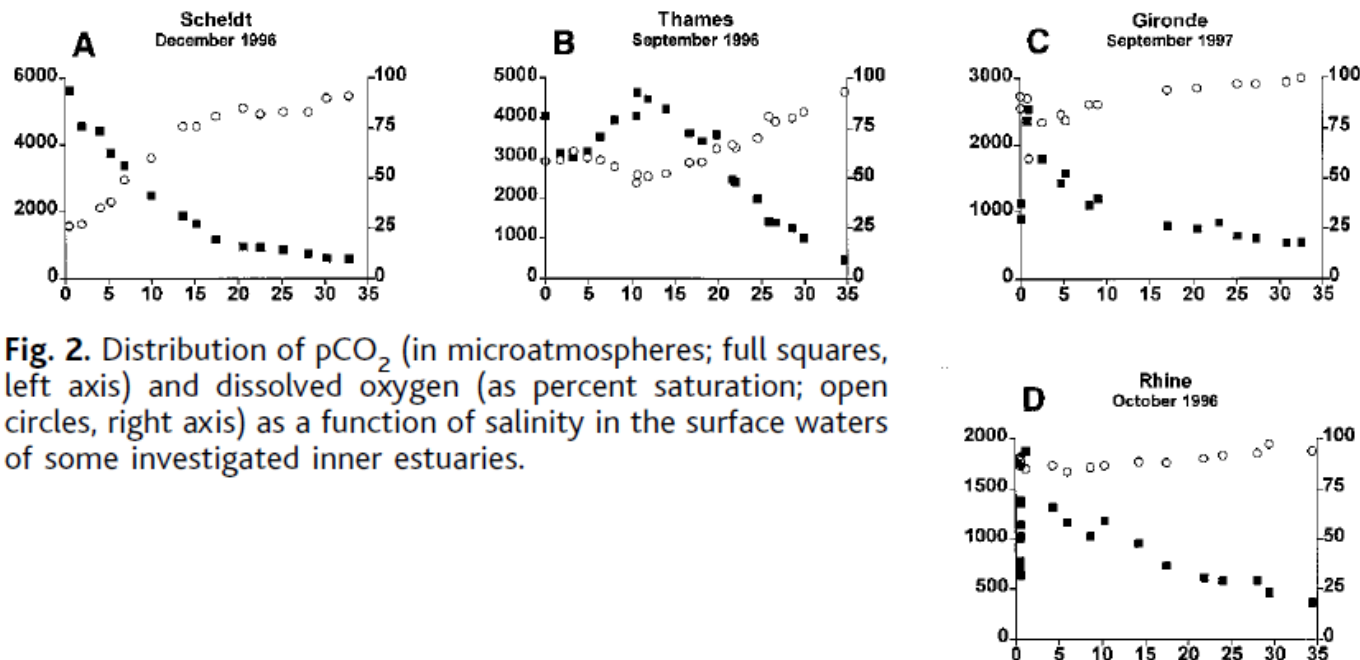


Fig. 2. Distribution of pCO_2 (in microatmospheres; full squares, left axis) and dissolved oxygen (as percent saturation; open circles, right axis) as a function of salinity in the surface waters of some investigated inner estuaries.



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Managed realignment

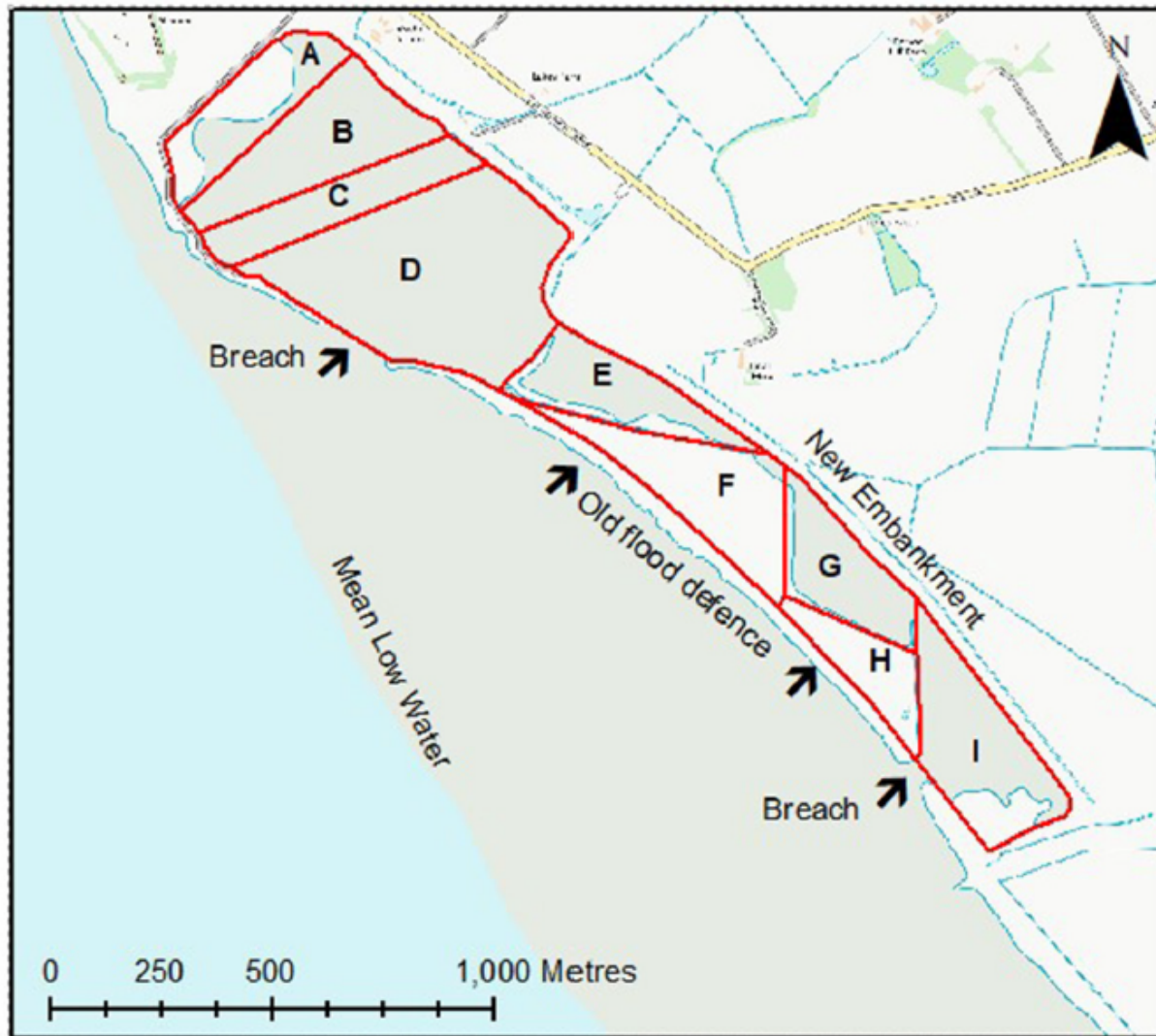
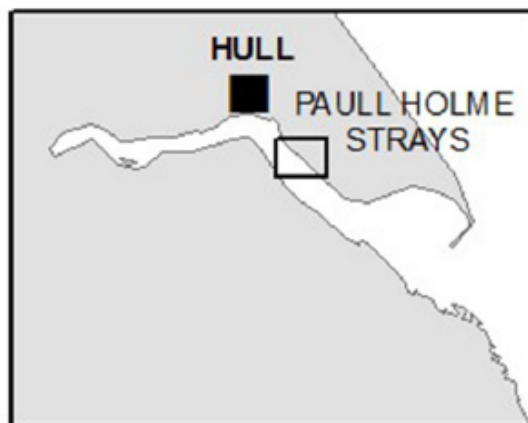
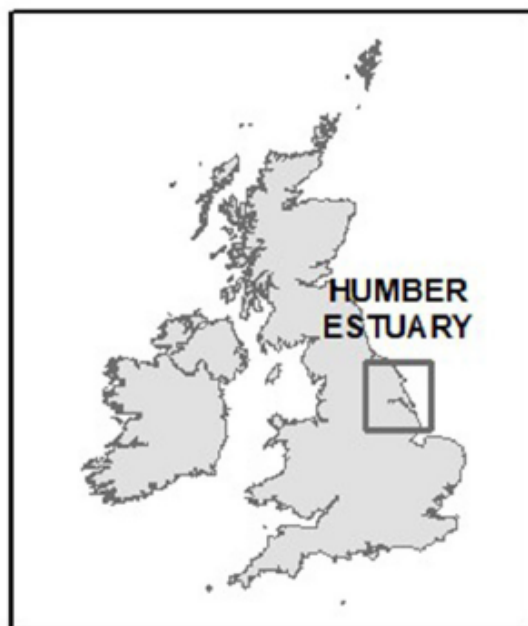
flood defence
habitat creation

carbon storage?



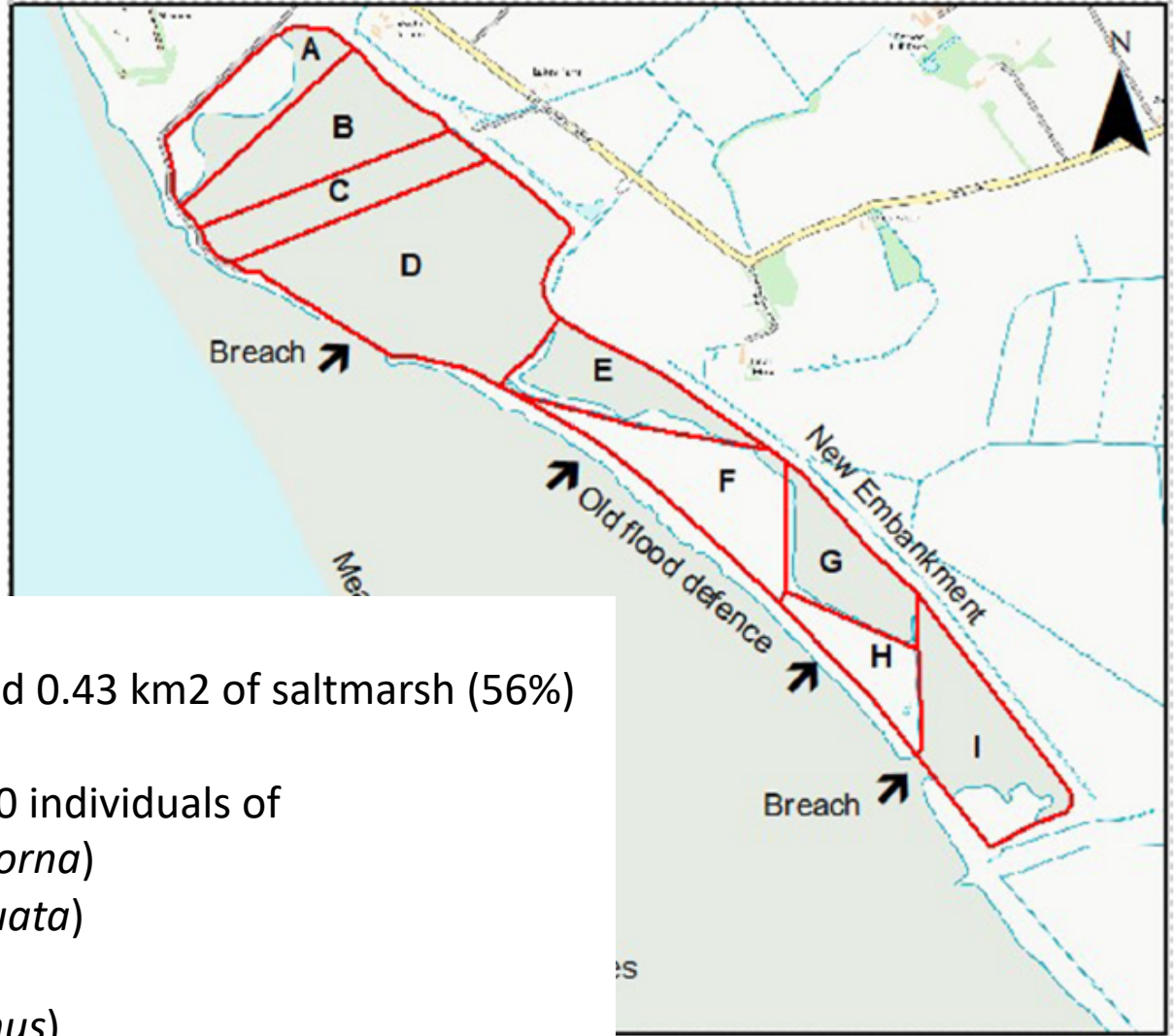
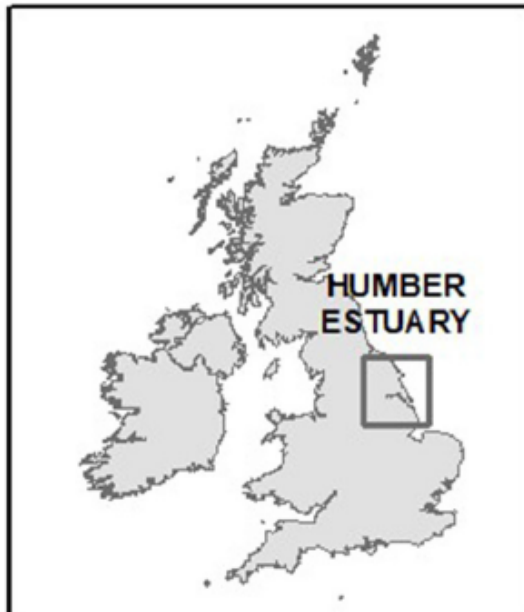
Paull Holme Strays

Managed realignment site 2003, 75 hectares



Paull Holme Strays

Managed realignment site 2003, 75 hectares



Aim - habitat creation

~ 0.32 km² of mudflat (42%) and 0.43 km² of saltmarsh (56%)

minimum population targets: 30 individuals of
common shelduck (*Tadorna tadorna*)

Eurasian curlew (*Numenius arquata*)

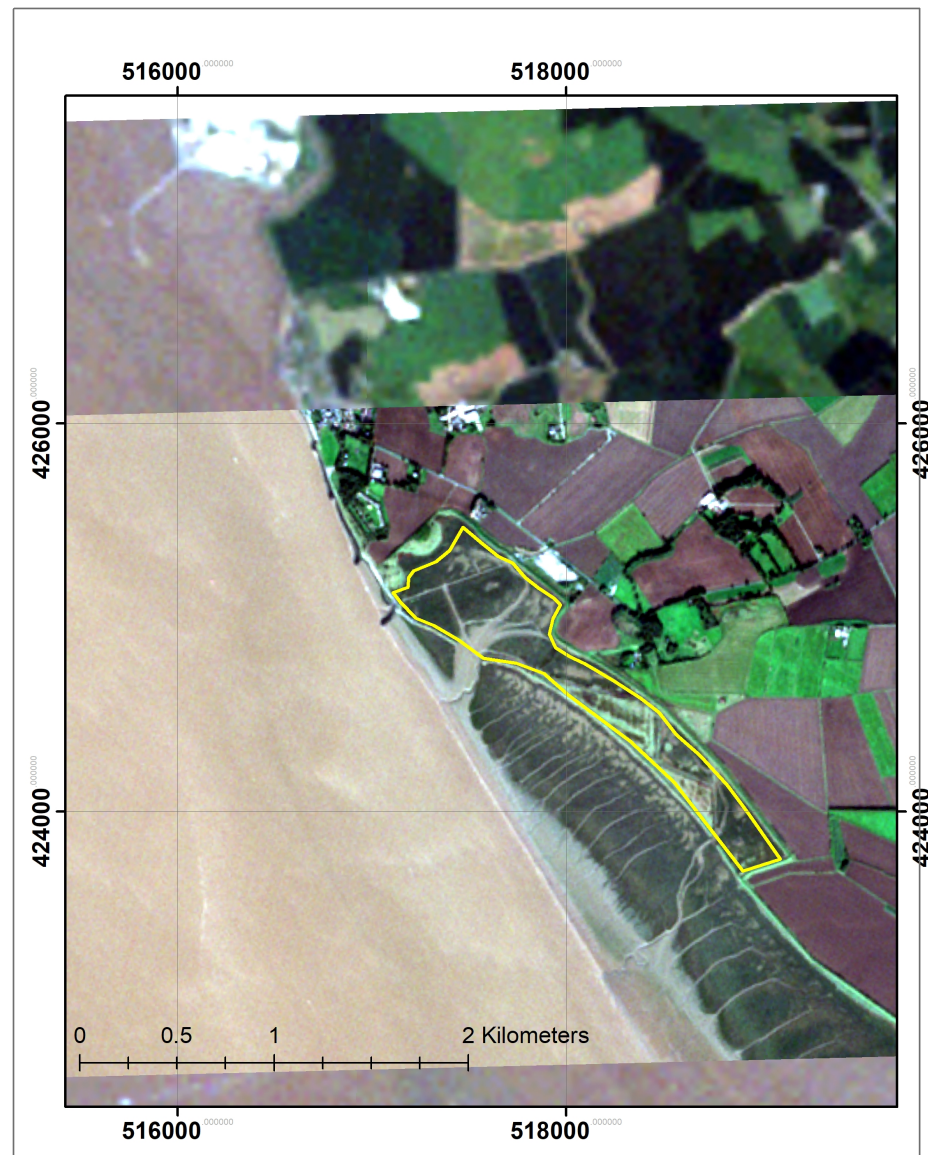
dunlin (*Calidris alpina*)

common redshank (*Tringa totanus*)



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Paul Holme Strays timeline

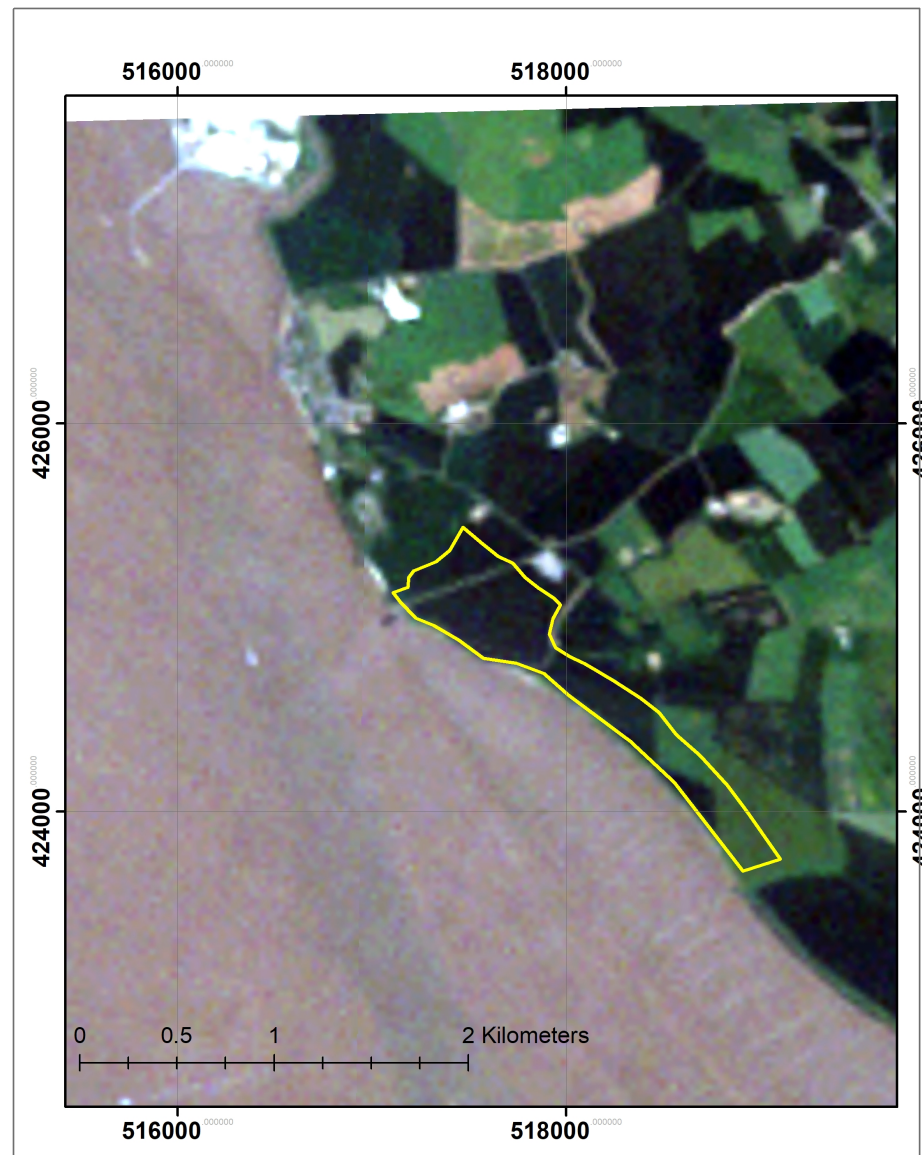




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Paul Holme Strays timeline

1999 Landsat 5

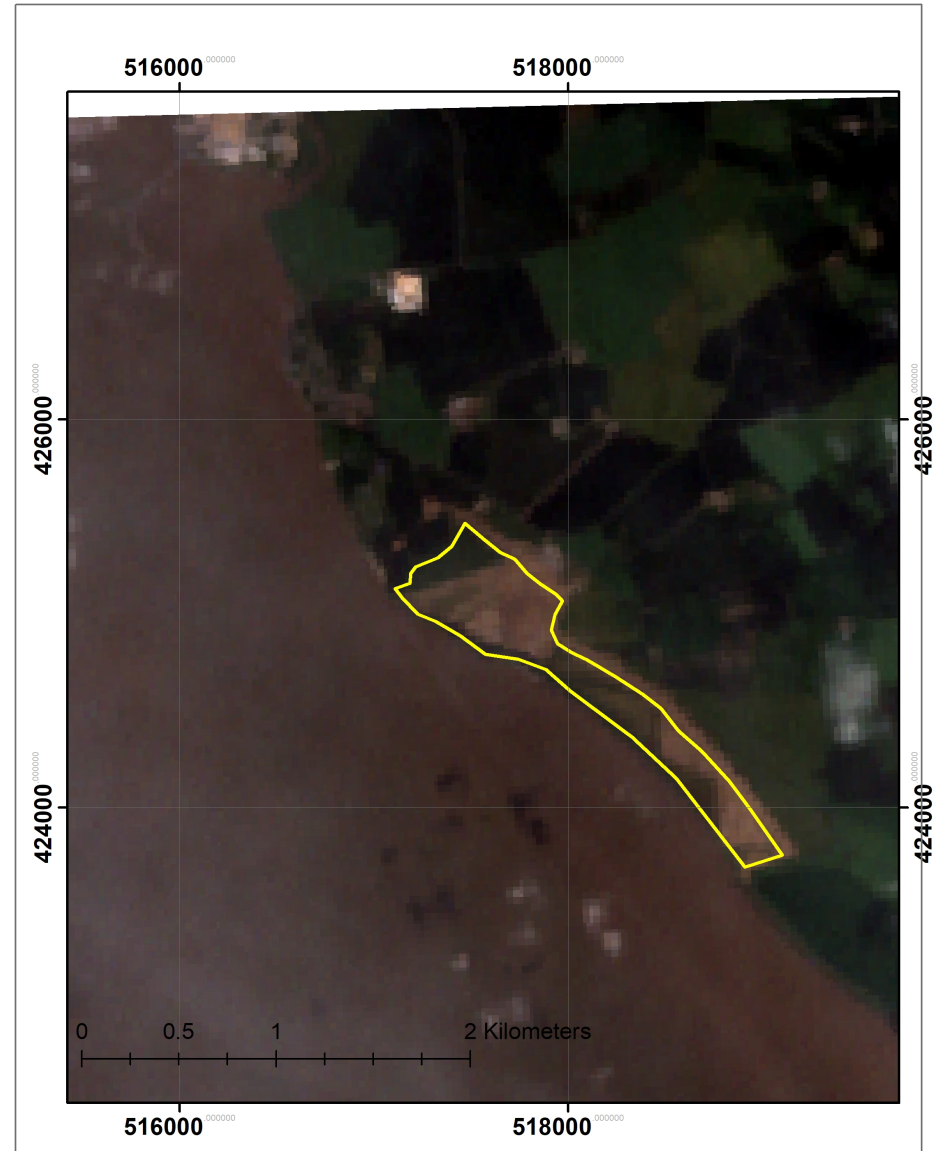




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Paul Holme Strays timeline

2002 Landsat 7

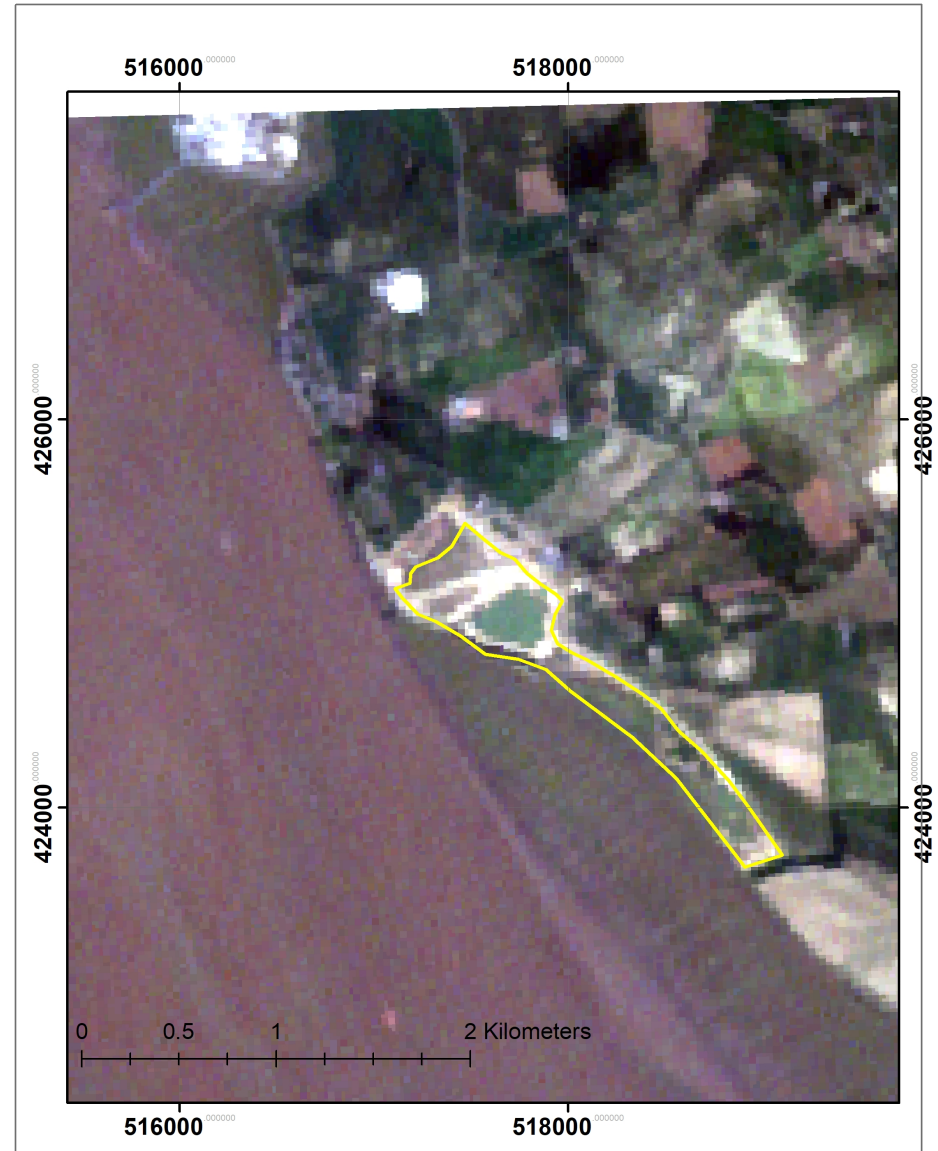




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Paul Holme Strays timeline

April 2003 Landsat 7





Long-Term Changes in the Abundance of Benthic Foraging Birds in a Restored Wetland

Lucas Mander^{1*}, Luca Scapin², Chris B. Thaxter³, Rodney M. Forster¹ and Niall H. K. Burton³

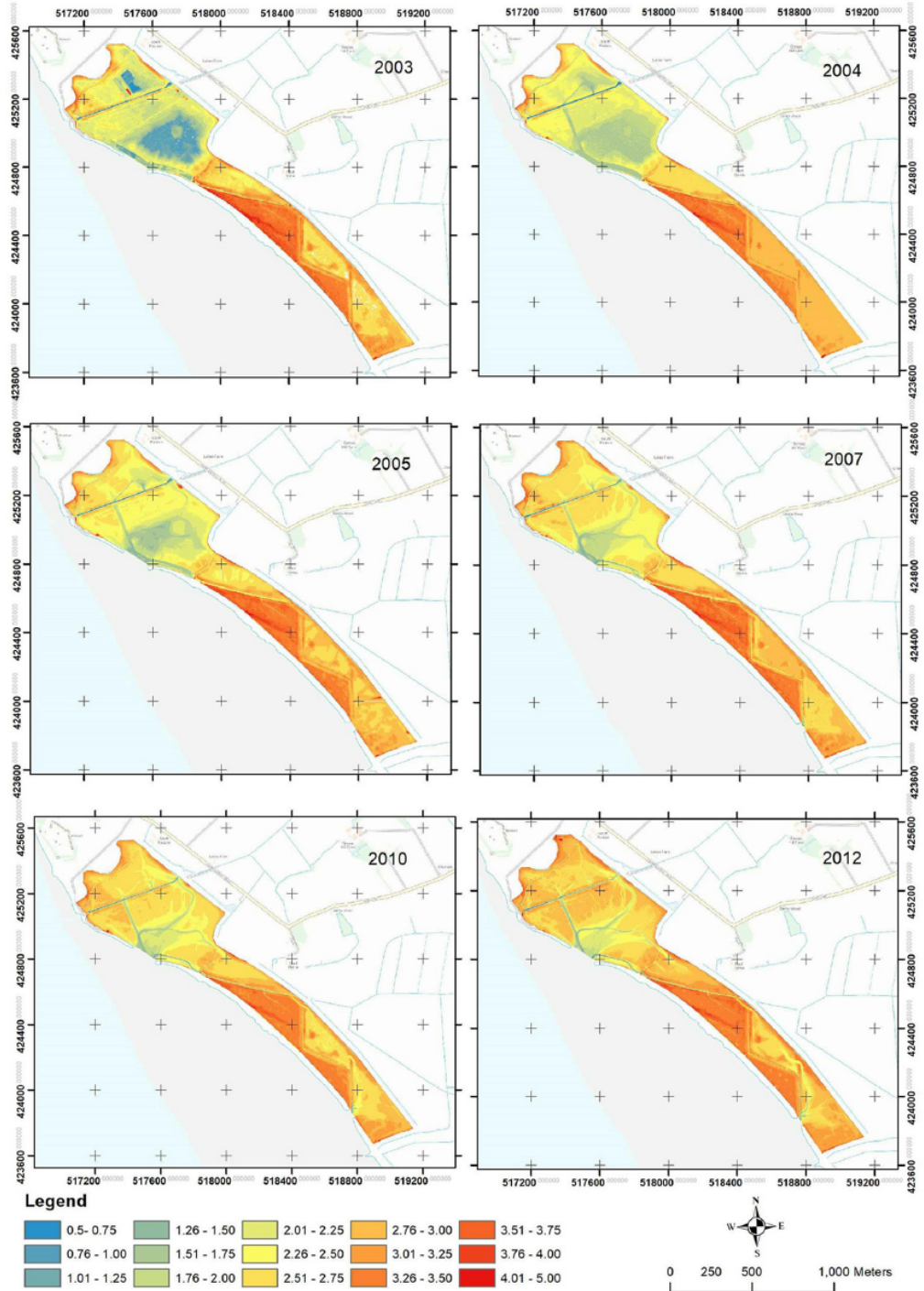
¹ Department of Biological and Marine Sciences, University of Hull, Hull, United Kingdom, ² Dipartimento di Scienze Ambientali, Informatica e Statistica—DAIS, Università Ca' Foscari Venezia, Venice, Italy, ³ British Trust for Ornithology, The Nunnery, Thetford, United Kingdom

(Bi)-annual LIDAR

 flights show

 accretion of

 sediment



Highest accretion at lowest parts of the MR site

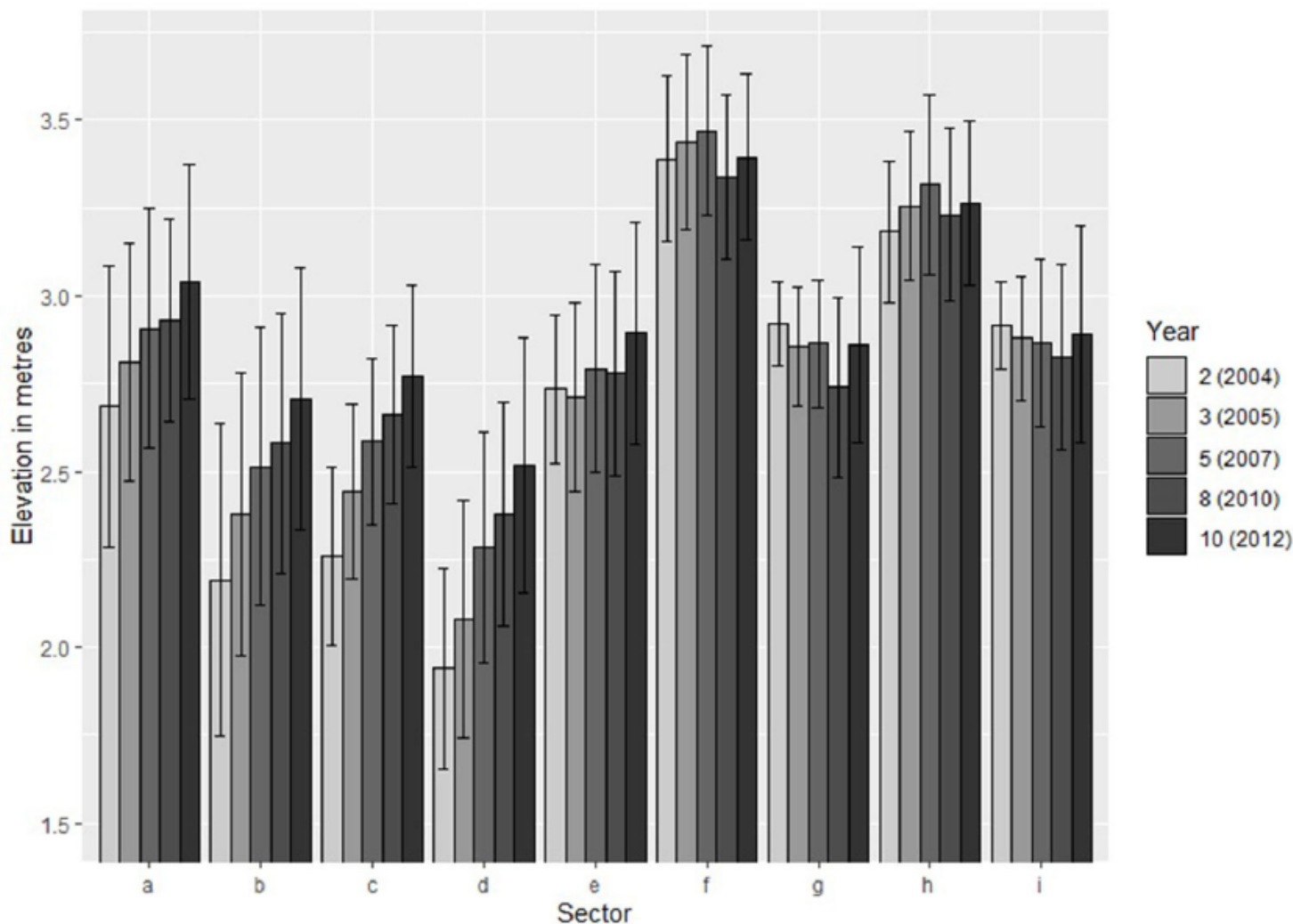


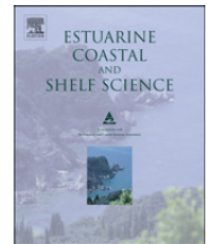
FIGURE 3 | Changes in the mean elevation of each sector of the Paull Holme Strays MR site over the study period.



Contents lists available at ScienceDirect

Estuarine, Coastal and Shelf Science

journal homepage: www.elsevier.com/locate/ecss



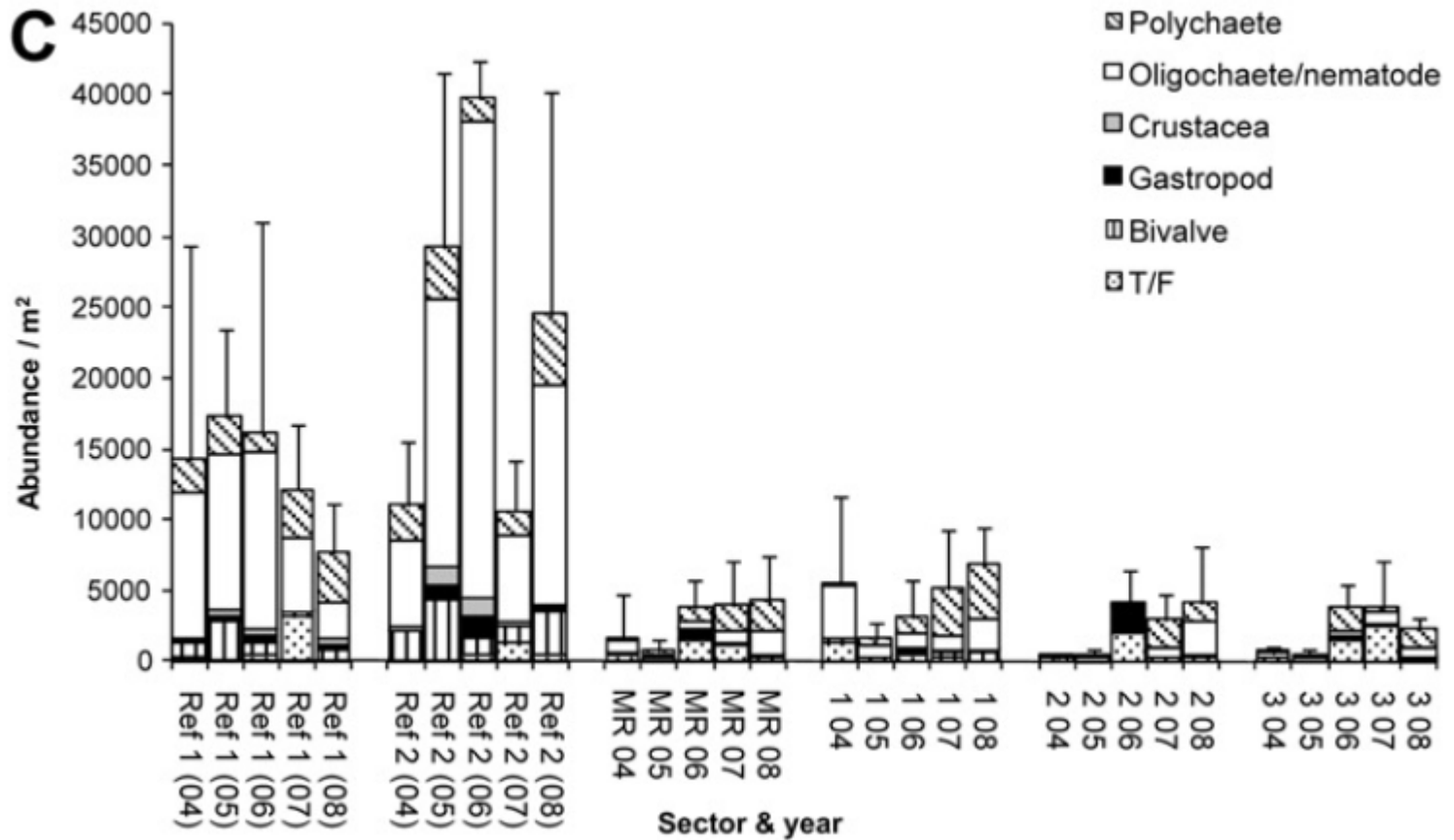
Managed realignment as compensation for the loss of intertidal mudflat: A short term solution to a long term problem?

Kryisia Mazik^{a,*}, Will Musk^a, Oliver Dawes^a, Katya Solyanko^a, Sue Brown^b, Lucas Mander^a, Mike Elliott^a

^a Institute of Estuarine & Coastal Studies, University of Hull, Cottingham Road, Hull, HU67RX, UK

^b CoastLife, Lynden, Marshall Row, Swanage, UK

Colonisation of the new habitat by invertebrates



Control

MR

Colonisation of the new habitat by invertebrates

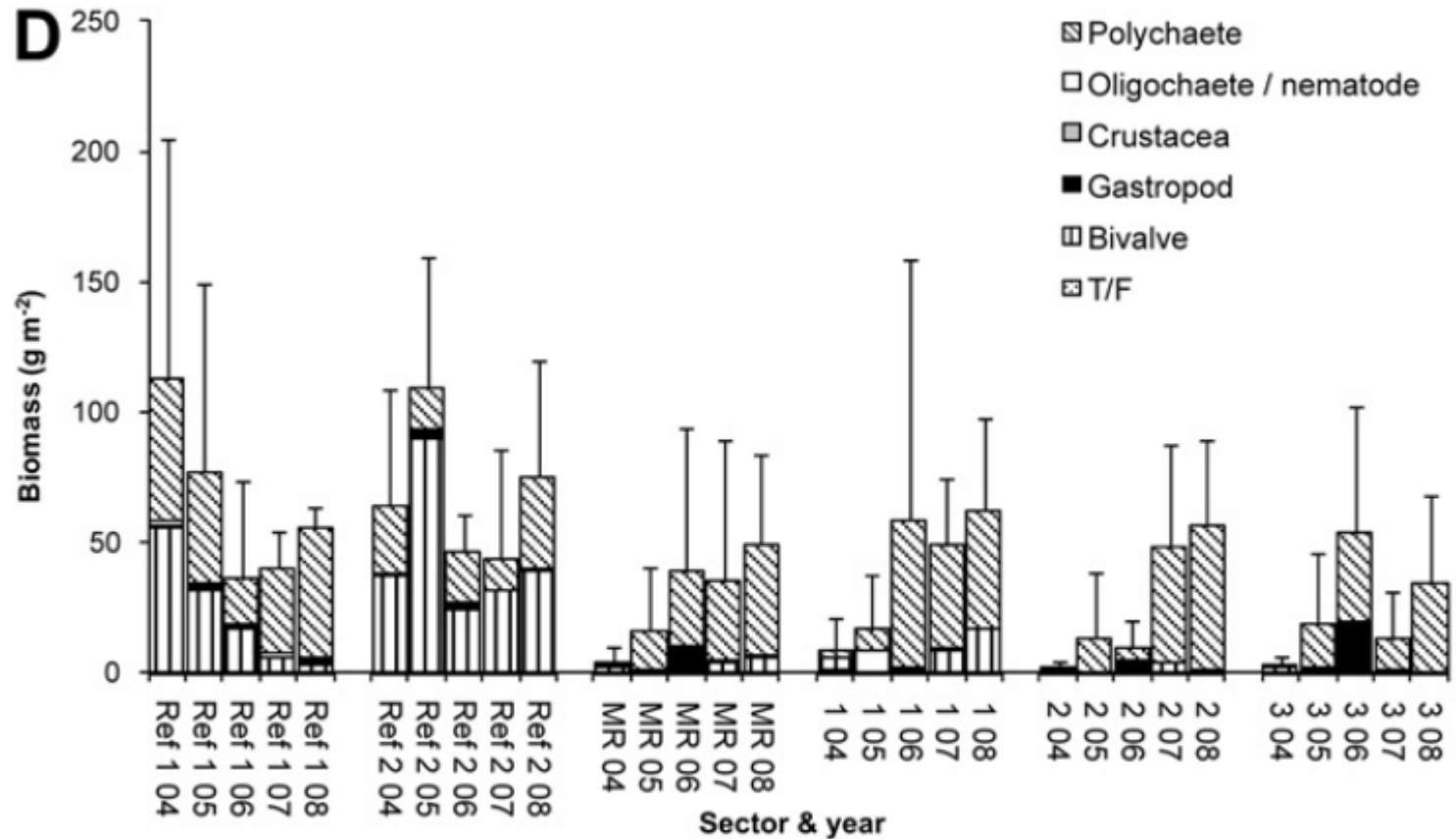


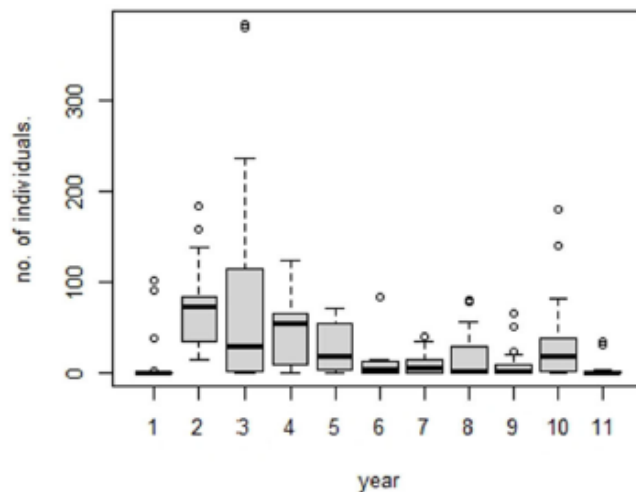
Fig. 2. Variation in the mean (\pm SD) species richness (A), diversity (B) total abundance (C) and biomass (D) with proportional representation of the taxa.

Control

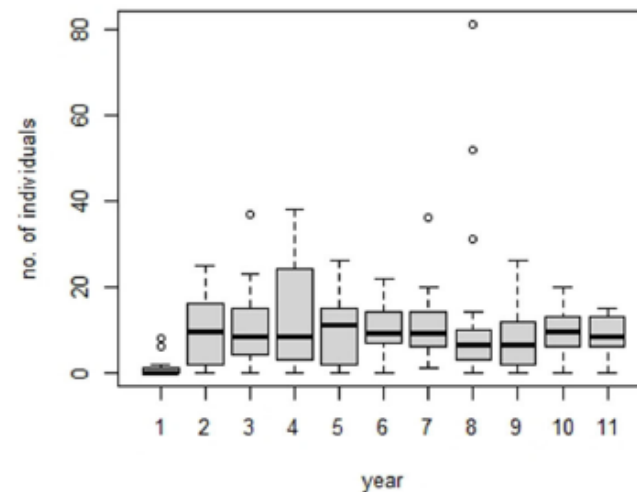
MR

Wading bird monitoring

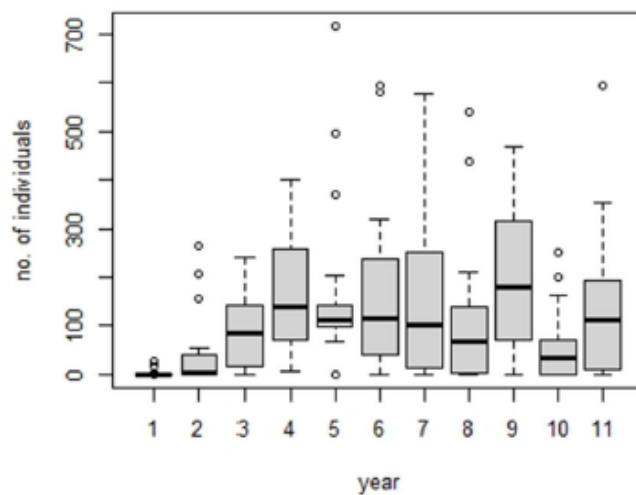
Common Shelduck



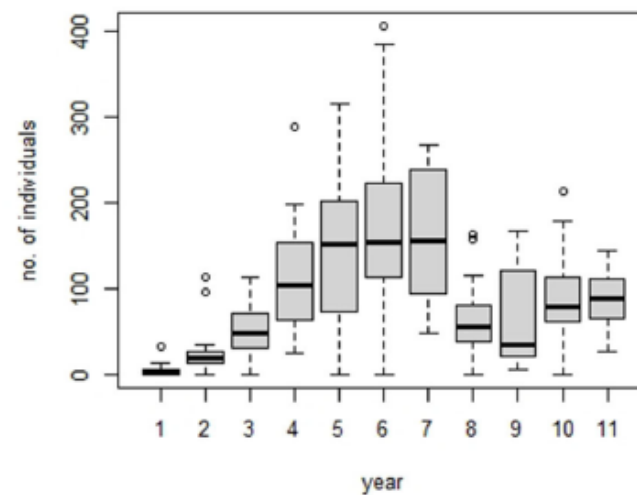
Eurasian Curlew



Dunlin



Common Redshank



No stable state in the ten years of monitoring

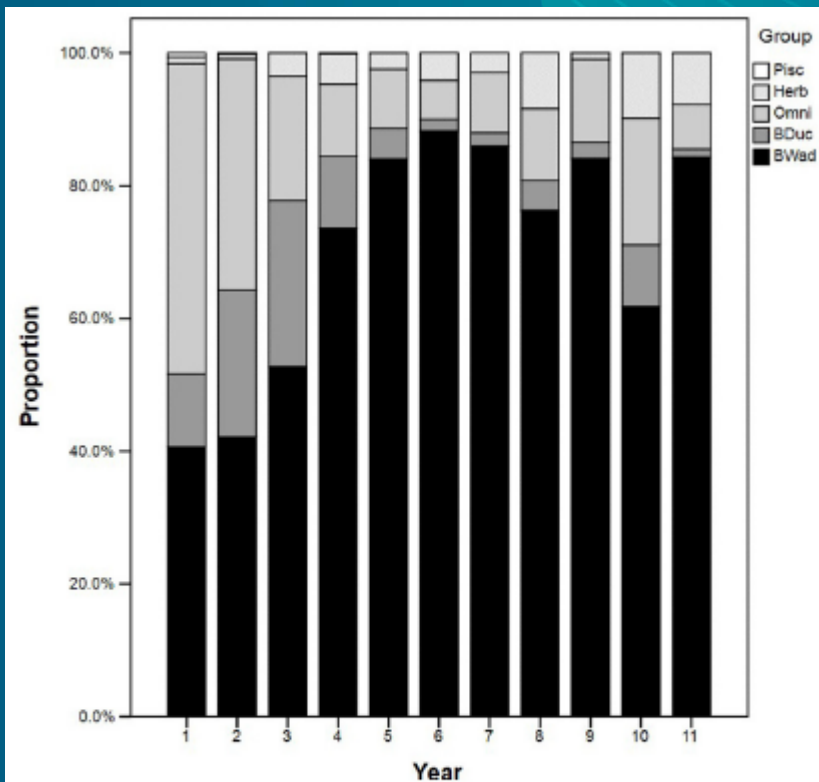
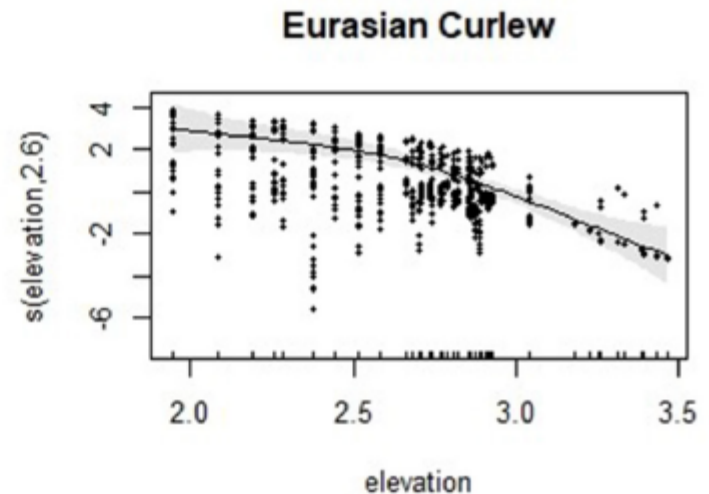
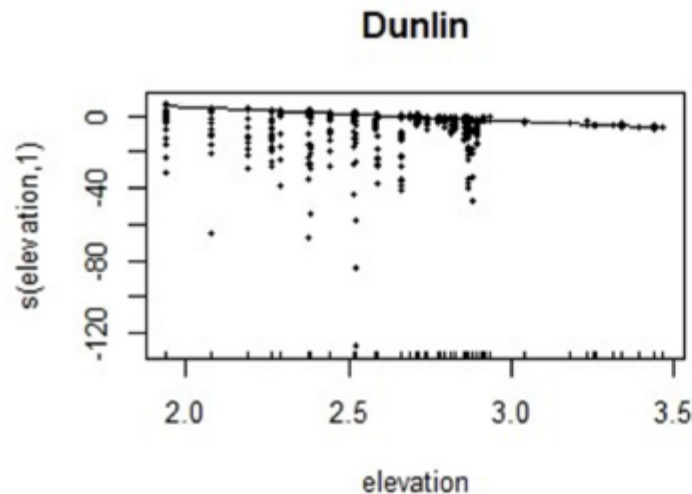
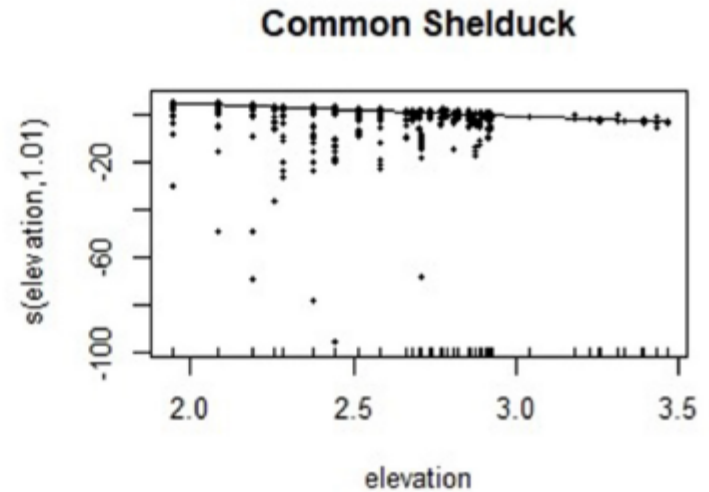
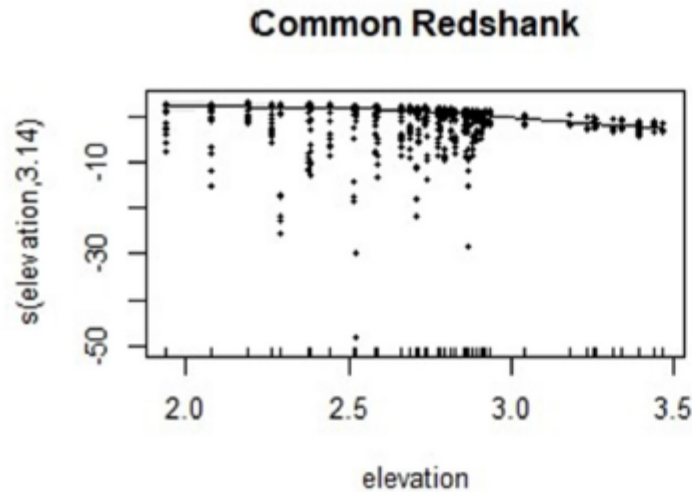


FIGURE 4 | Temporal guild composition (% abundance) of the foraging assemblage at the MR site. Guilds are abbreviated as follows: BWad, benthivorous waders; BDuc, benthivorous ducks; Herb, herbivorous ducks, geese, and swans; Omni, omnivorous ducks and rails; Pisc, piscivorous grebes, cormorant, and herons.

Decreased foraging opportunity with increasing elevation





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End of monitoring 2012 Targets met

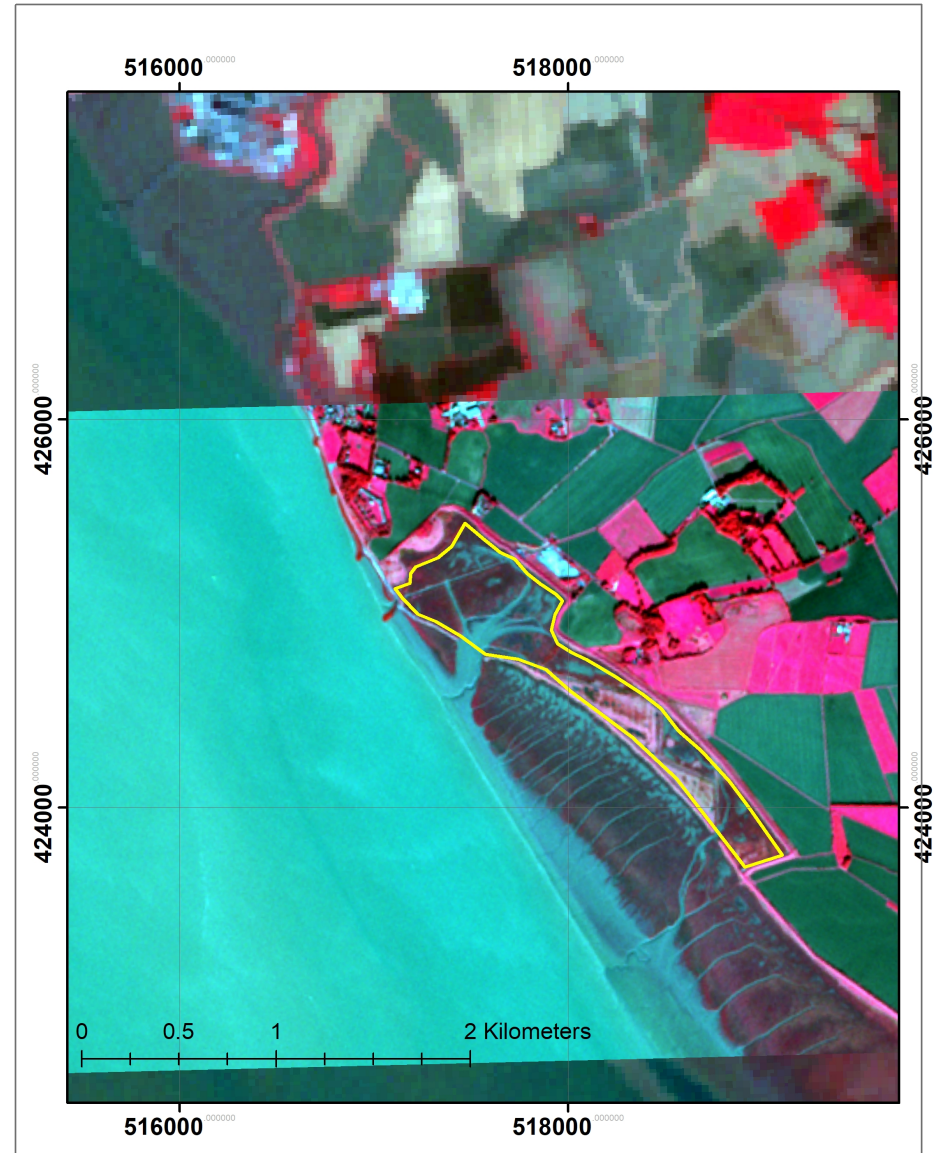




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End of monitoring 2012
Targets met

Satellite+LIDAR time
series 1999-2021 work
in progress



Lucas Mander PhD deployment of GPS tags



Home Range Size



Curlew are site-faithful with small home range



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Future Humber

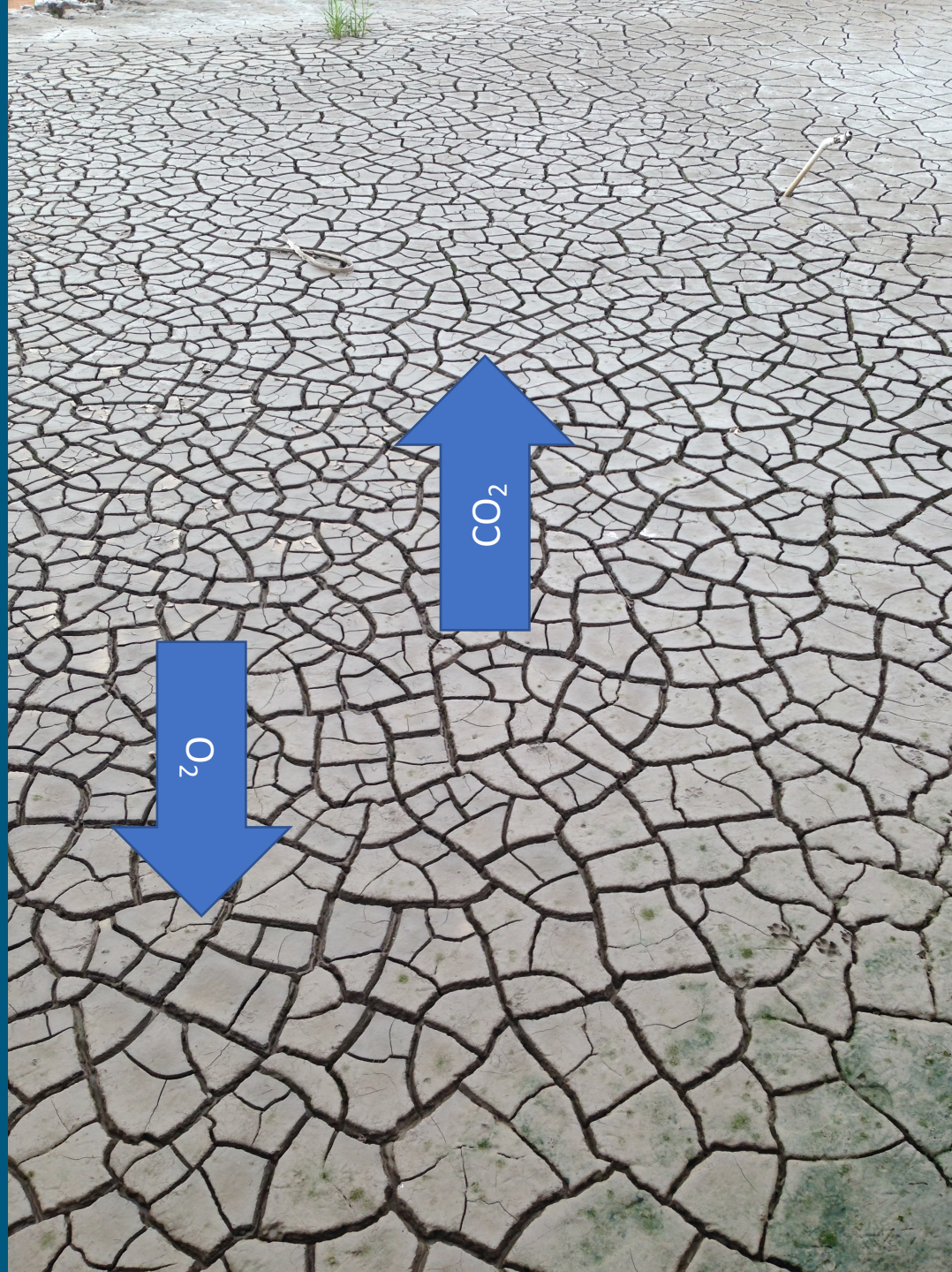




Record breaking heat-wave July 2019

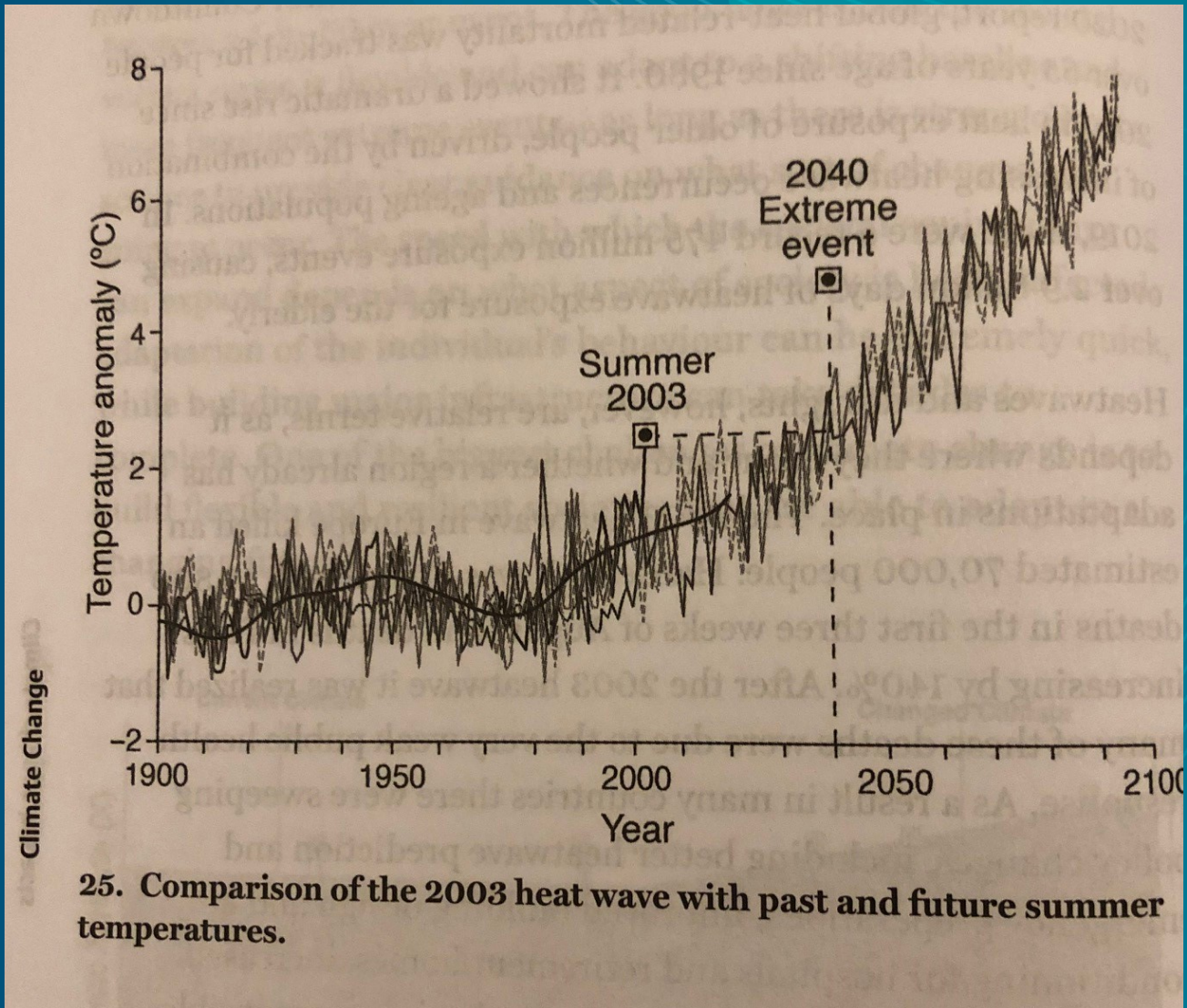
The UK experienced a short but exceptional heatwave in late July. On 25th, temperatures across eastern England widely reached 35 to 36 °C and a temperature of 38.7 °C was recorded at Cambridge Botanic Garden, setting a new all-time UK temperature record, exceeding 38.5 °C at Faversham, Kent on 10 August 2003. Two other stations, including Faversham, also exceeded 38 °C and a further 10 stations across the south-east, Midlands and East Anglia exceeded 37 °C.

July 2019





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Summary:

Paull Holme Strays MR achieved its habitat and species targets

but, is the benefit tapering as elevation continues to rise?

and, what is the future for stored organic carbon?

[#REWILD](#) [#PhD](#) 4/6 Optimising blue carbon storage in estuaries using rewilding and eco-engineering approaches with Dr Rob Thomas, <https://bit.ly/3ES15lm>

[H2020](#) REWRITE coastal rewilding bid led by University of Nantes

Letters of support required

Acknowledgements: DataCube Services for Copernicus, IMMERSE NSR