Building islands for ecosystem restoration: fish and birds as indicators of ecosystem functioning

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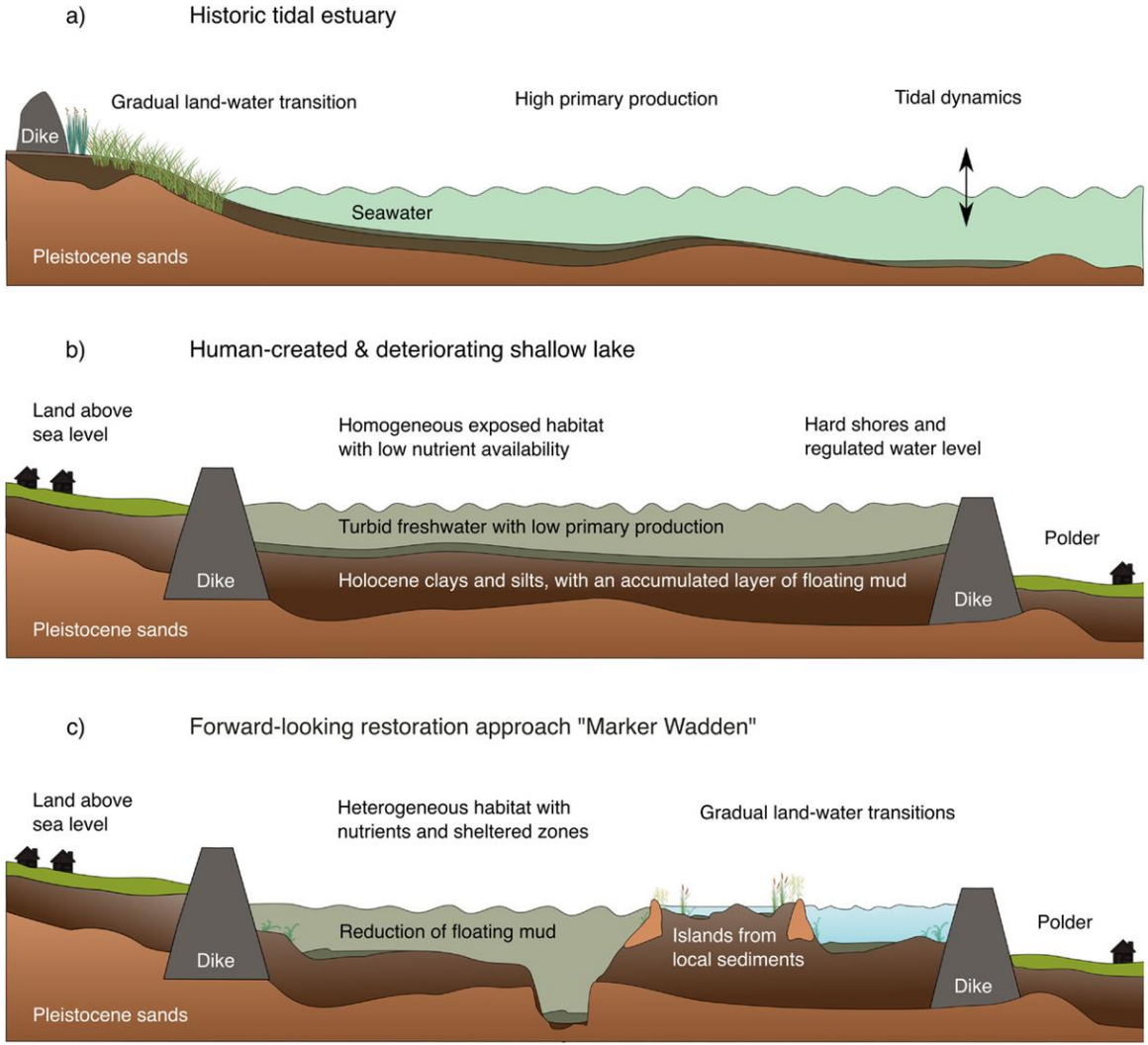
NIOO

KIMA
Kennis- en Innovatieprogramma Marker Wadden



Cut-off and Embankments – 'Safe from Flooding':

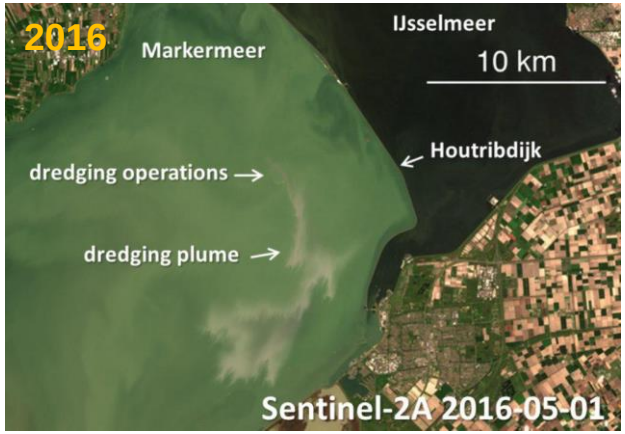
→ Estuary to lake
→ Rip-rap shores with steep slopes
→ Unnatural water level dynamics

Islands Marker Wadden – 'Building with Nature':

→ Gradual aquatic-terrestrial transition zones
→ Sheltered waters with turbid-clear water gradients
→ Deep sand pits

Van Leeuwen et al. 2021

Building wetland islands



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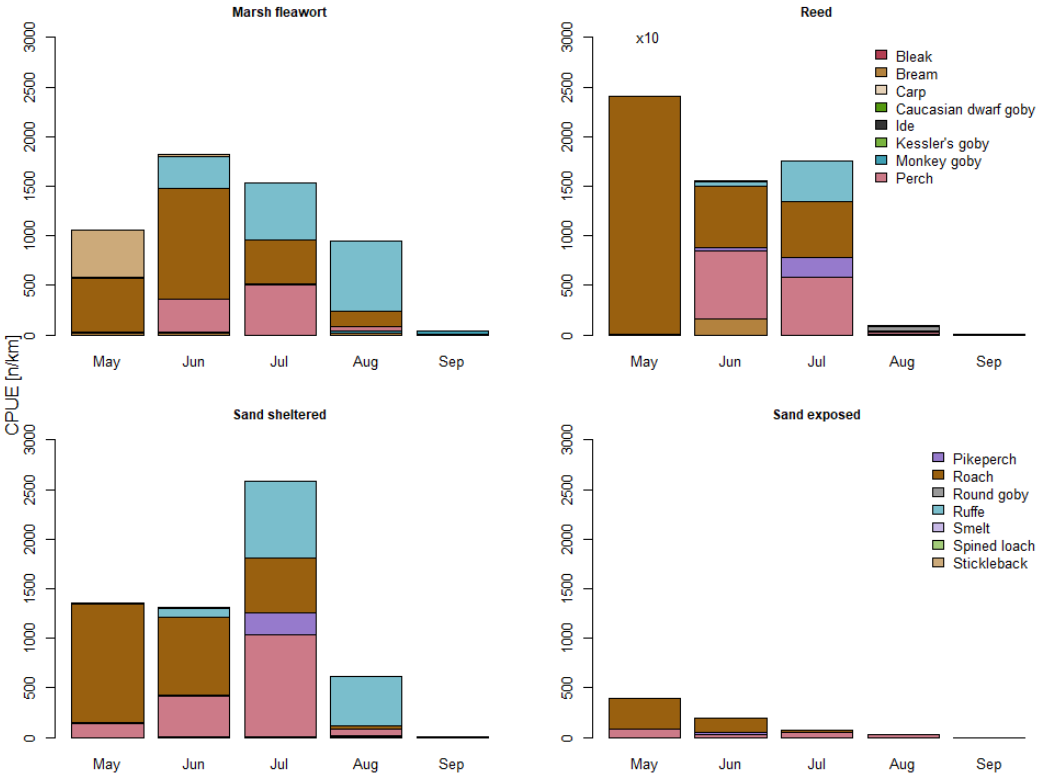
reed

The Marker Wadden archipelago

marsh fleawort
sand sheltered

sand exposed

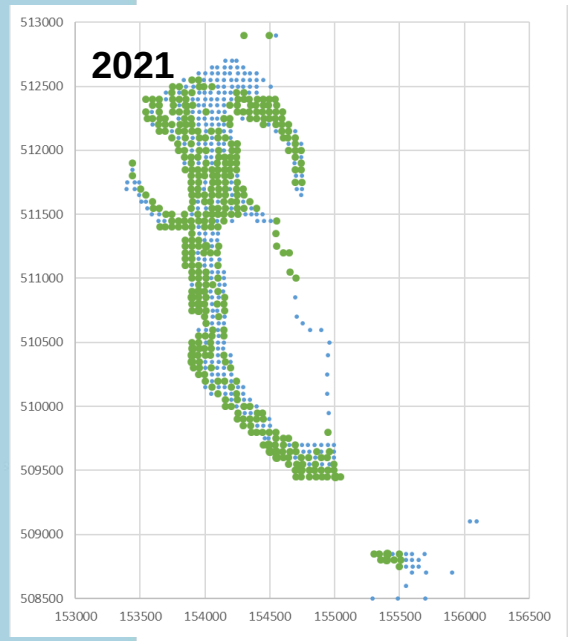


Seasonal dynamics

Spawning/nursery area fish:
(**T**emperature, **F**ood, **S**afety)

Dominance shifts:
roach → perch → ruffe
density declines in August/September

From shore zones to mosaic landscapes



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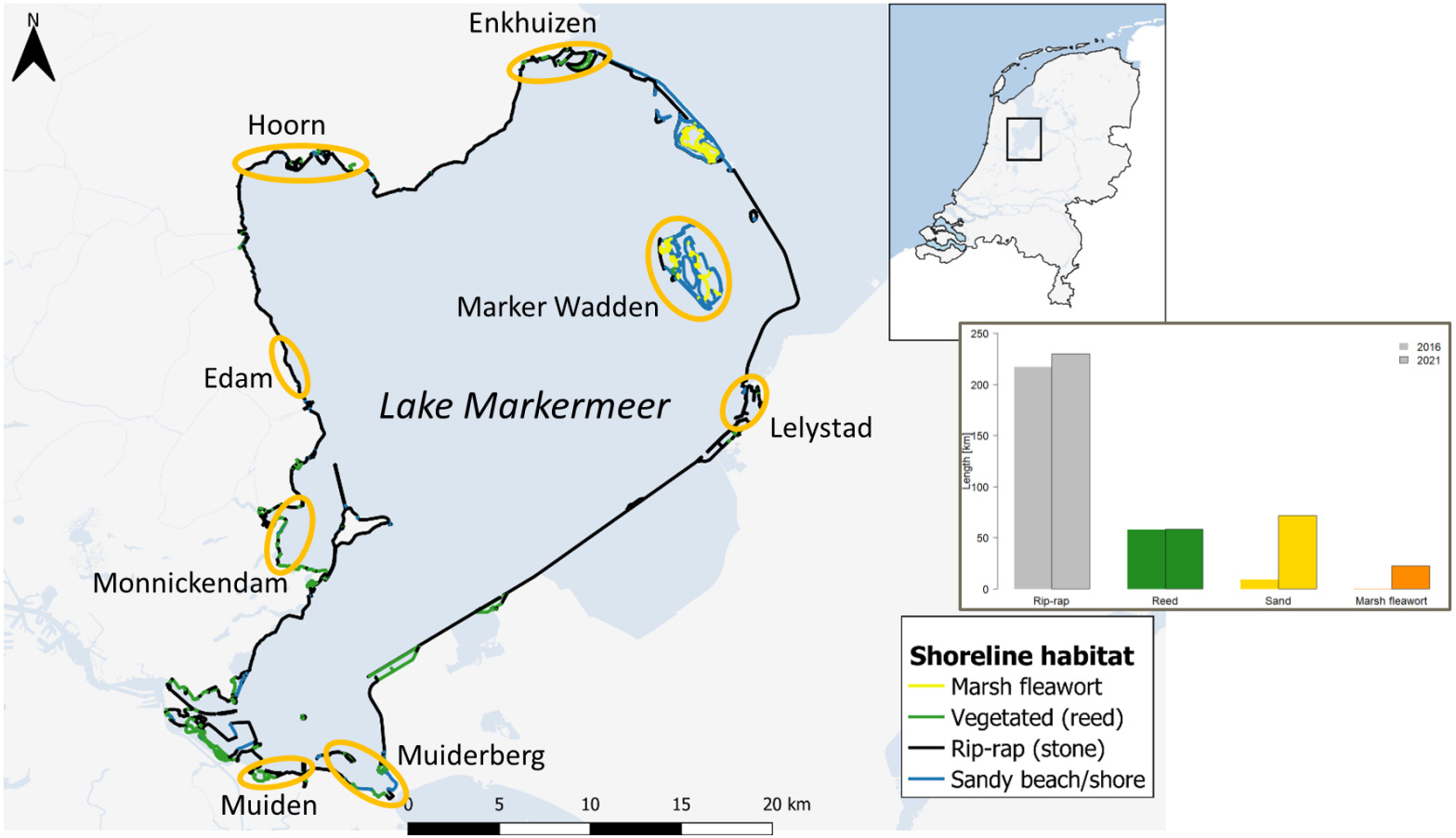
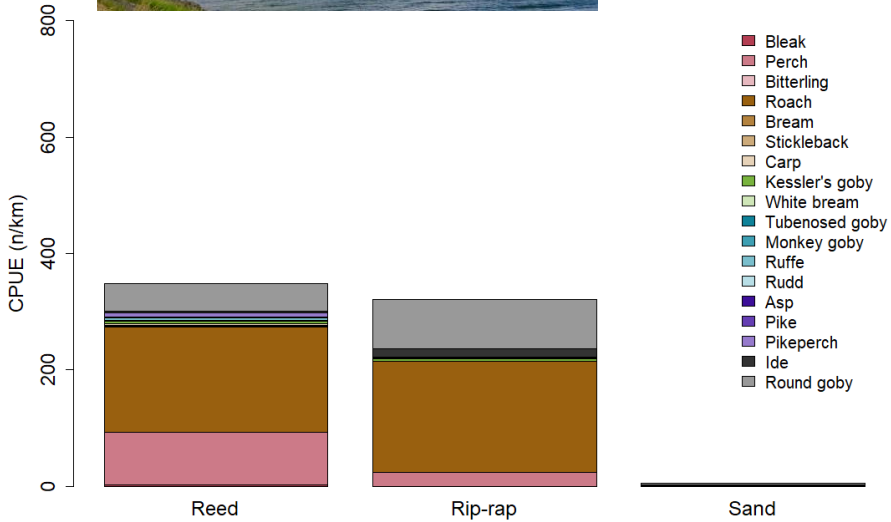
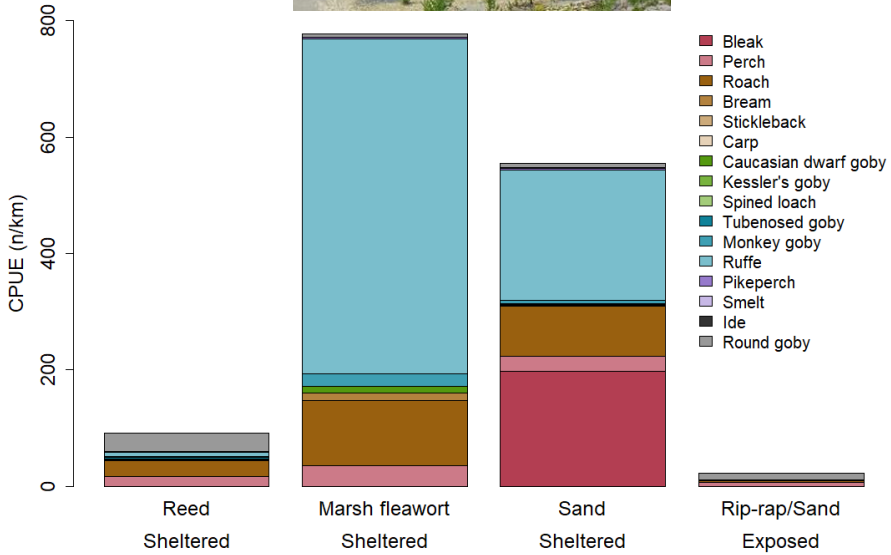

N
Enkhuizen
Hoorn
Marker Wadden
Edam
Lake Markermeer
Lelystad
Monnickendam
Muiderberg
Muiden
0
5
10
15
20 km
Length [km]
250
200
150
100
50
0
2016
2021
Rip-rap
Reed
Sand
Marsh fleawort
Shoreline habitat
Marsh fleawort
Vegetated (reed)
Rip-rap (stone)
Sandy beach/shore

Lake Markermeer ←→ Marker Wadden





August

harbour | on/between islands | outside |

deep | *very shallow* | *deep* |

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(1) Shallow shore zones are very important for young fish. The use of these shore zones is very dynamic over the season (species composition, density).

(2) Create mosaic landscapes with fractal, gradual land-water transition zones and shallow sheltered waters with high connectivity to open water