Marker Wadden “candy shop” for birds?

Historic analysis of a degrading lake and options to increase production

Ruurd Noordhuis & Mariëlle van Riel

13 december 2016
Marsh birds versus waterbirds

“Bird paradise in Lake Markermeer will finally be realized”
Markermeer: problems, causes and remedy

Problems:
Bad image Lake Markermeer
Poor Conservation Status Natura 2000
Poor status some WFD metrics

Causes:
Incomplete system; low habitat diversity
Clay sediments: suspended silt locked in lake
Low production

Remedy:
Improve balance between water quality, habitat diversity, water level fluctuation and connectivity
Incomplete water bodies: silt in Markermeer
Unequal division of habitats over compartments

IJsselmeer
sand, channels

Ketelmeer
Riverine aspects

Markermeer
clay, silt

Borderlakes
shallows, plants

Legend:
- Sand
- Gravel-sand
- Loam
- Clay
- Peat
- Loose sand or gravel, soft silts

IJsselmeer
Markermeer
Borderlakes

-10 -5m
-5 -2m
-2 -1m
-1 -0,5m
-0,5 -0,2m
-0,2 -0m
0 -0,2m
Water balance 1975 - 2013

Residence time increased to 1.5 years

Very short residence time
IJmeer
Changes Dissolved P in large rivers and lakes
PCA plot 1976-2014:

- visibility
- nutrients
- CI
- O2 summer, RH max
- water level
- Chl-a summer
- Chl-a winter
- DOC
- O2 min, winter
- suspended matter

Graph shows the principal component analysis plot for the period 1976-2014, with various data points and markers for different parameters.
Changes c. 1980, c. 1998:
Filterfeeders Markermeer under pressure

Decrease growth of mussels
Switch species composition phytoplankton

Share of selected cyanobacteria II

Share of selected cyanobacteria

13 december 2016
IJsselmeer: no decrease of primary production

V. Harezlak; BLOOM / DELFT-3D
Markermeer: algae locked in flocks with silt

Aggregation and sedimentation

Aggregation of algal cells with suspended particles **often** results in the **sedimentation** of algae (Guenther and Bozelli, 2004; Verspagen et al., 2006; Deng et al., 2015; Guangyuan et al., 2015).

Modified from de Lucas Pardo et al., 2015

Aphanizomenon sterical repulsion

Aphanothece sedimentation

de Lucas Pardo et al., 2015
Benthic algae; inversed seasonal pattern
Alternative options: non-filterfeeding benthos
Alternative options: shallows with macrophytes

- Total cover 2013
- *Pot. perfoliatus* 2016
- *Chara* 2016
Alternative options: shallows with macrophytes

Response of birds: return of Pochard
Learning from other projects: Kreupel IJsselmeer
One of 5 dominant species by 2014 and increasing

Fish Lake Markermeer, sandy banks

Fish Lake Marken, open water

Fish Lake Markermeer, reed banks

Fish Lake Markermeer, stone banks

Deltareas
Food production inside the swamp – Marsh birds

Food production in the lake – Colonial piscivores, wintering waterbirds

Open water food chains

• Pelagic chain Daphnids - Smelt
• Dreissenid mussel chain
• Other benthos

Shallow water macrophyte chains

• Herbivores
• Benthivores/omnivores
• Alternative fish prey

Lateral nutrient / organic fluxes – water level fluctuations
Marker Wadden: Candy shop; only if .....