

Dublin, July 11, 2007

Capacity for sustainable shellfish production in the Netherlands

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- characteristics Dutch shellfish culture
- problems and perspectives
- comparison with other Keyzone areas



IMARES

WAGENINGEN UR

IMARES: NEW INSTITUTE

Former Fishery Institute merged
with 2 other groups

ECOLOGY

ENVIRONMENT

FISHERY

AQUACULTURE

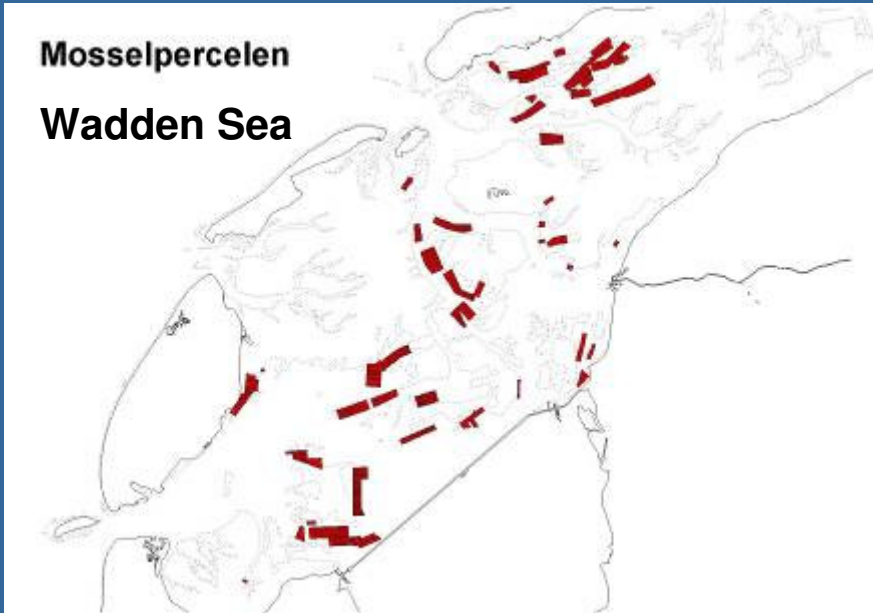
MUSSEL CULTURE: Based on
Wadden Sea and Oosterschelde



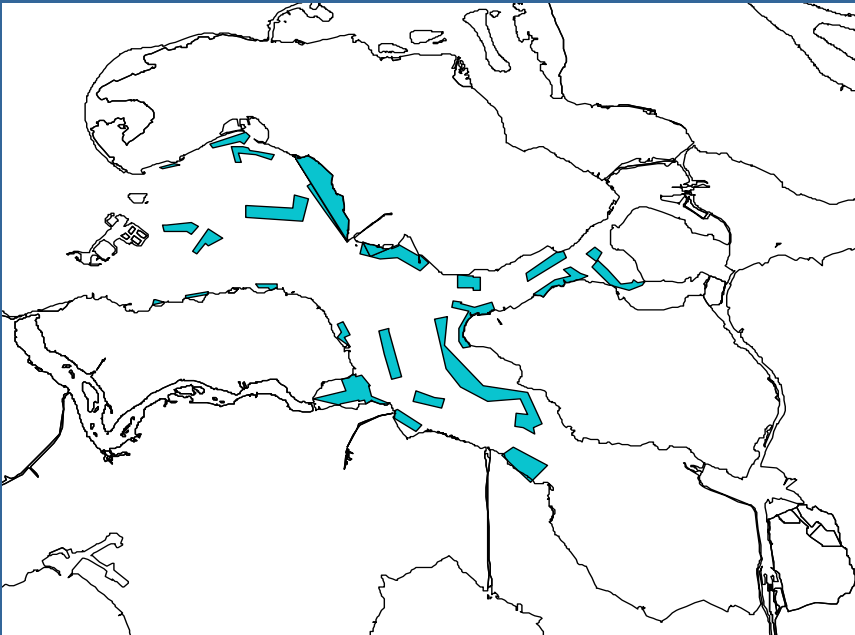
IMARES

WAGENINGEN UR

Mosselpercelen
Wadden Sea



Oosterschelde



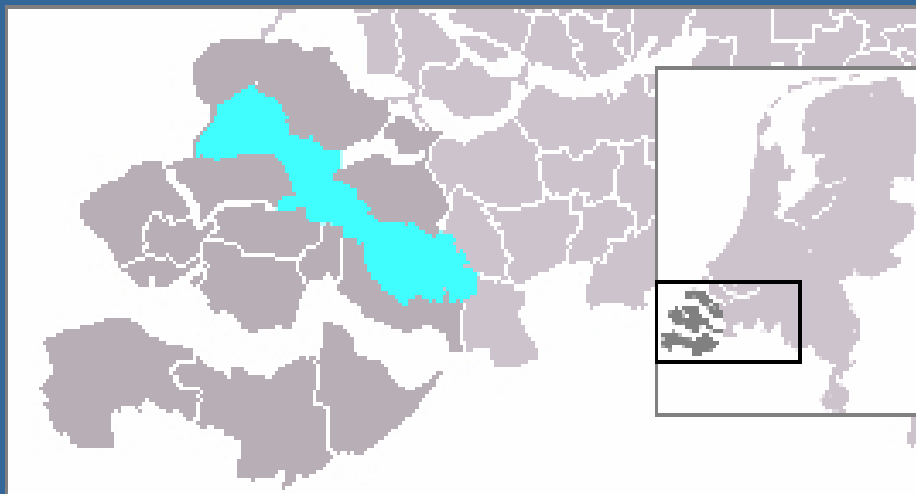
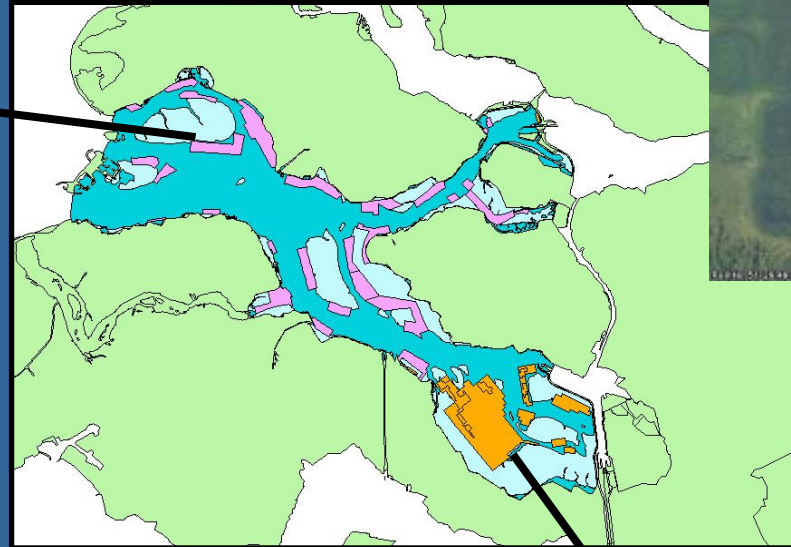
Wadden Sea:
Resource of natural seed
Good growth
Risk of storm damage

Oosterschelde :
Lower growth rates
Better protected
Transplantation of seed and
halfgrown to the OS:
Not vice-versa

Bottom culture mussels and oysters Oosterschelde

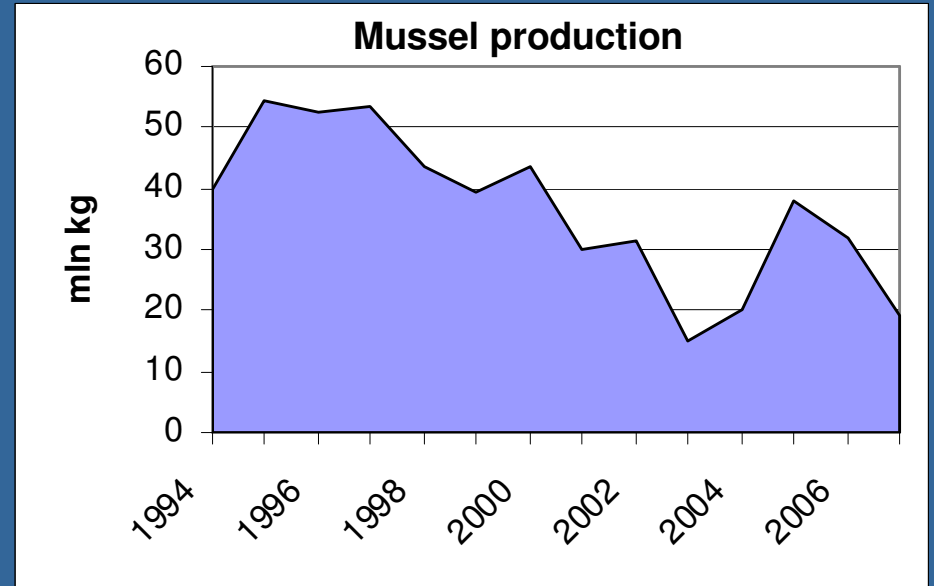
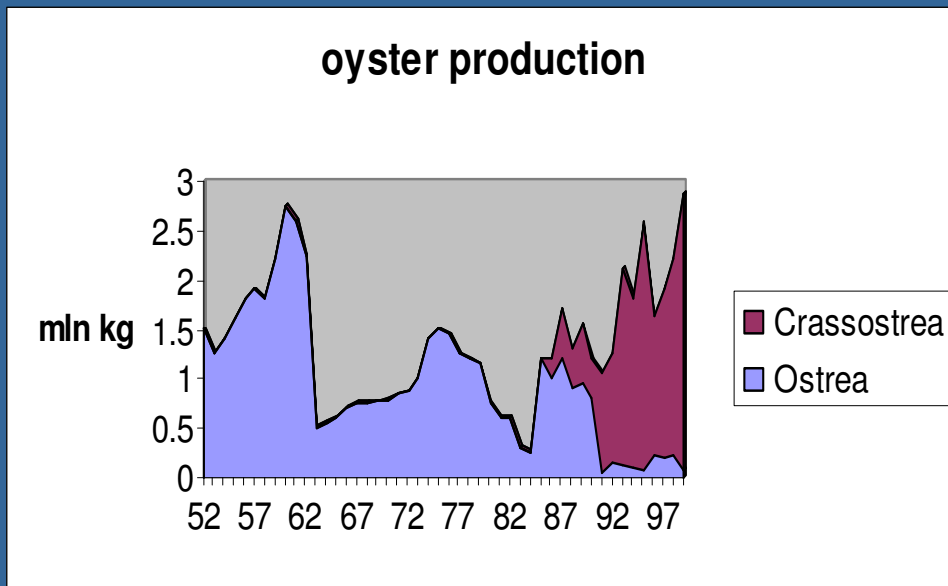
Musselplots

2000 ha



Oysterplots: 1550 ha

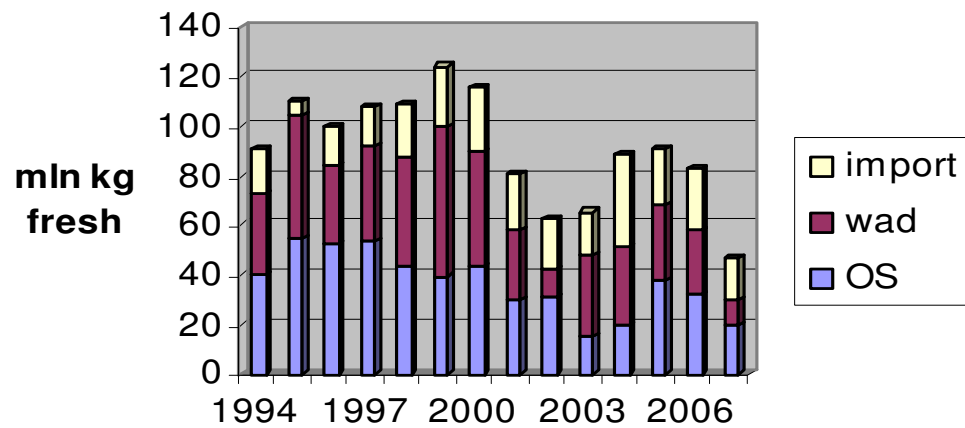




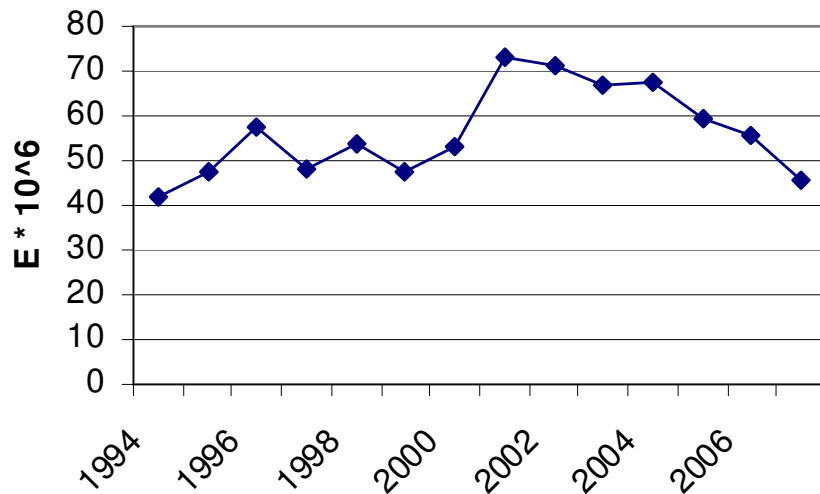
Oyster culture changed from flat to Japanese oysters, due to Bonamia disease.

Production areas
Oosterschelde and Lake Grevelingen

Mussel production OS
ca 10* oyster production



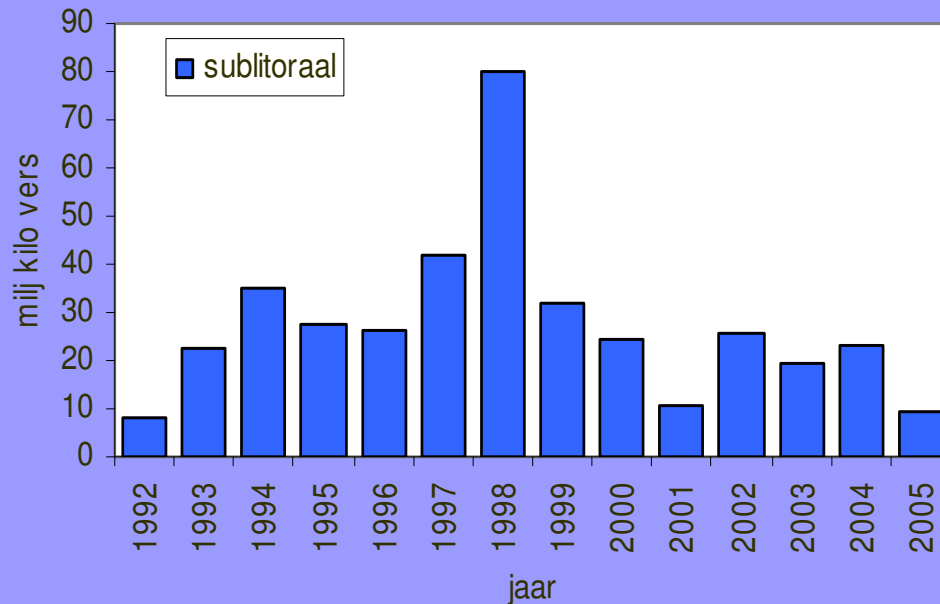
Total mussel production:
OS + Wad + import



landing values

Decreasing trends

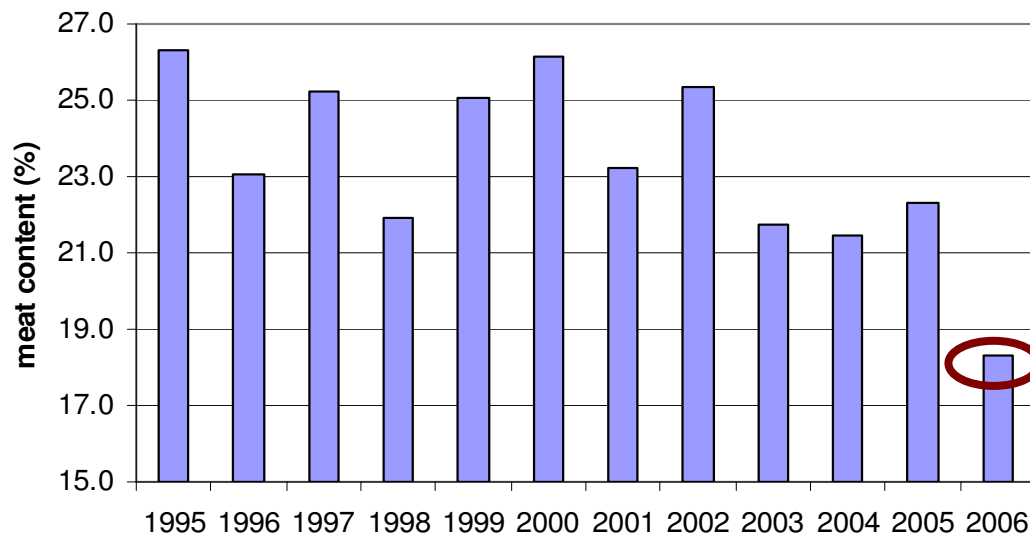
Het bestand wilde mosselen in het voorjaar in de Waddenzee



Wild stocks
Wadden Sea:

major seed
resource.

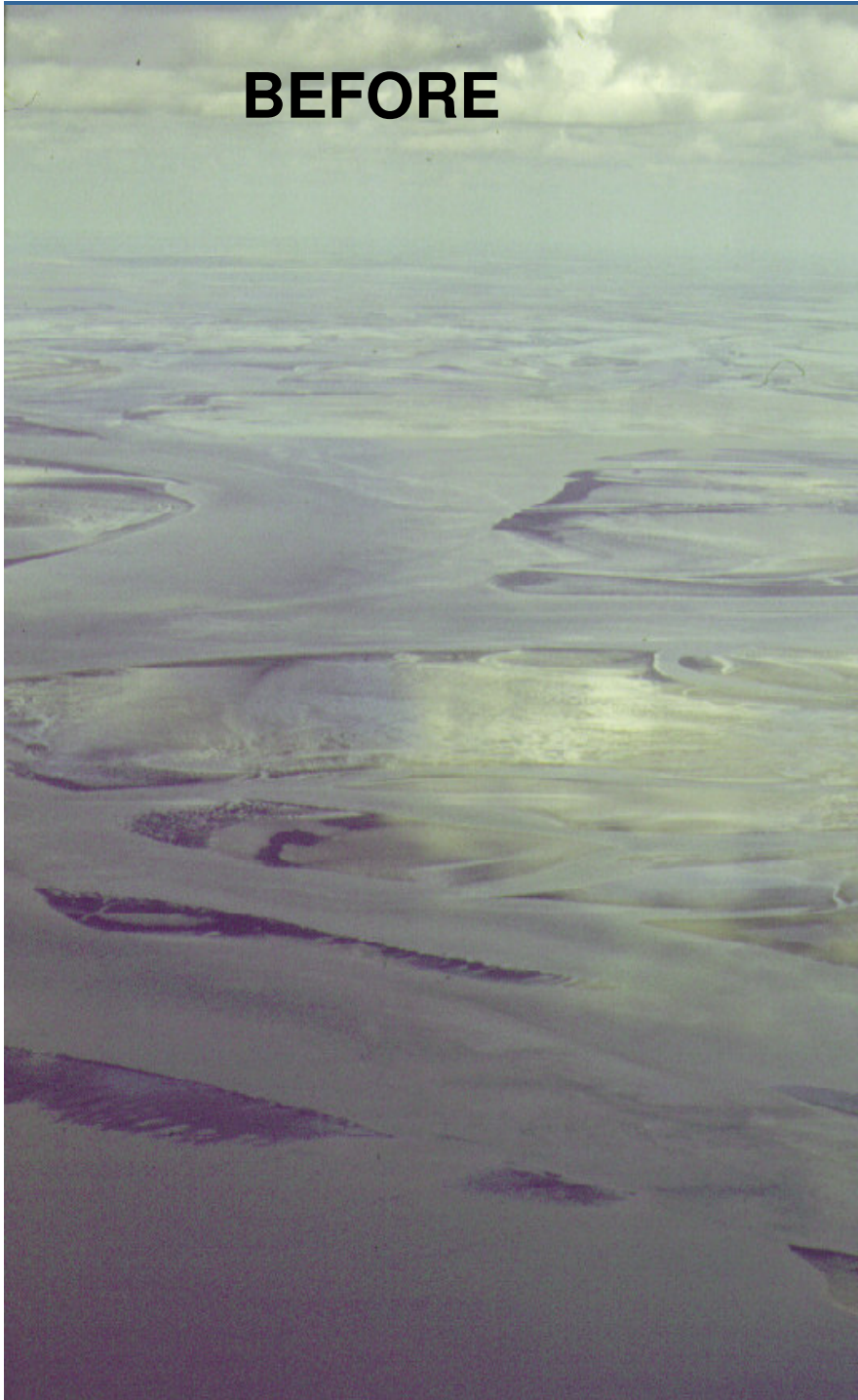
Low stocks



Meat content of
mussels landed
in NL (from
Oosterschelde)

Low value 2006

BEFORE



AFTER

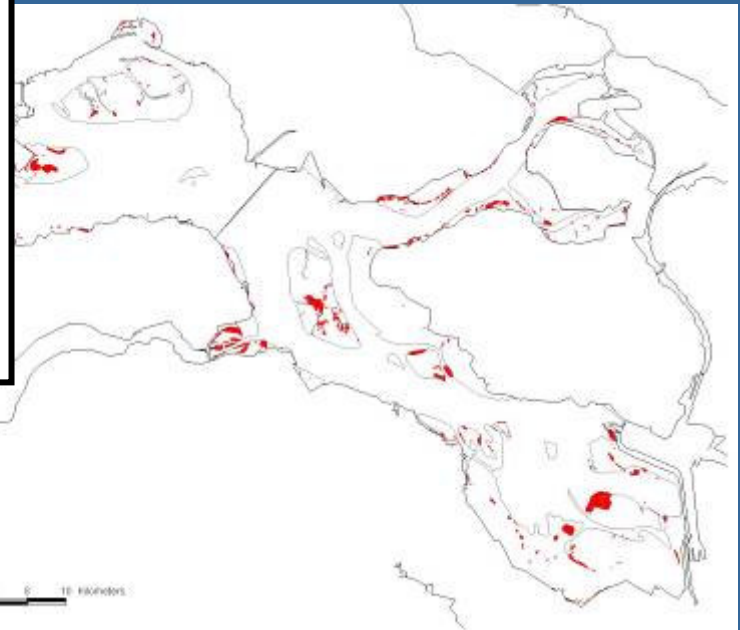
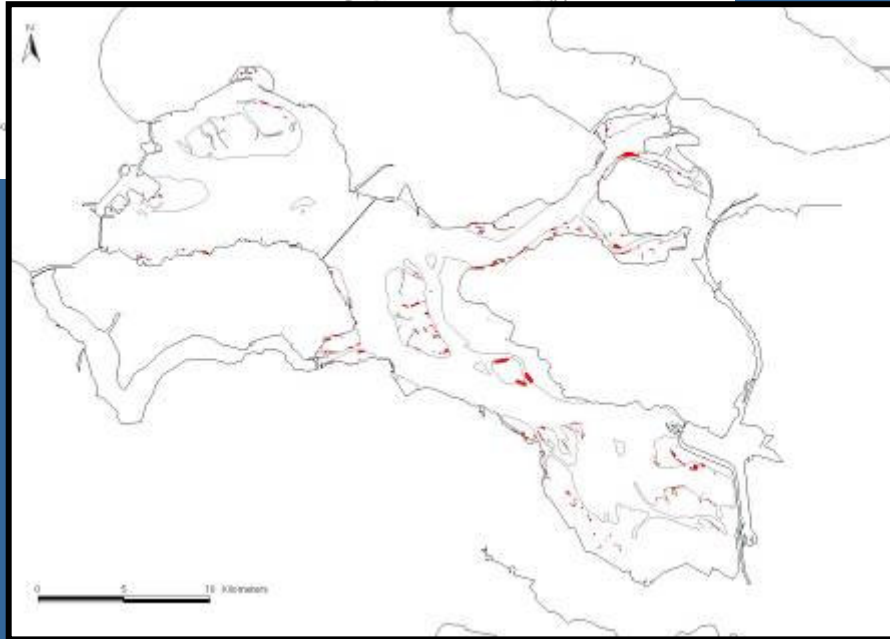
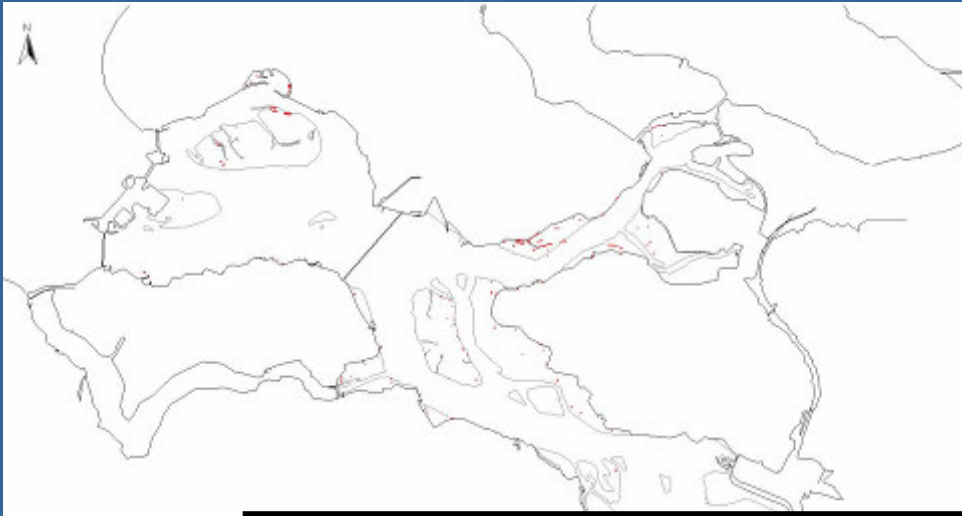


Expansion of wild pacific oysters, after introduction in 1964

1980: 30 ha

1990: 300 ha

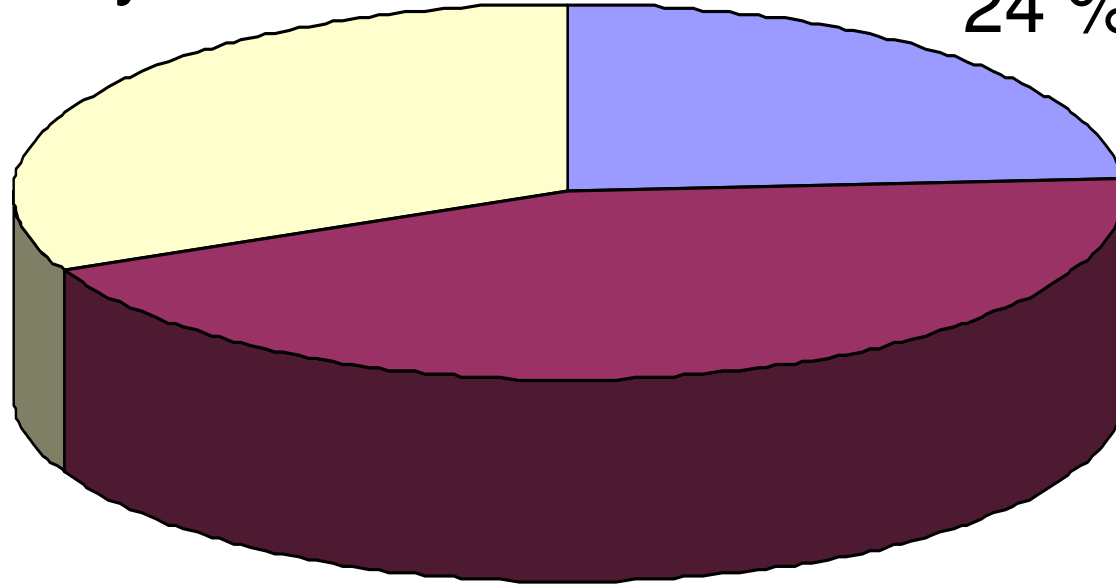
2002: 700 ha



OS total: 14 g ADW/m²

Oyster 32%

Cockle
24 %



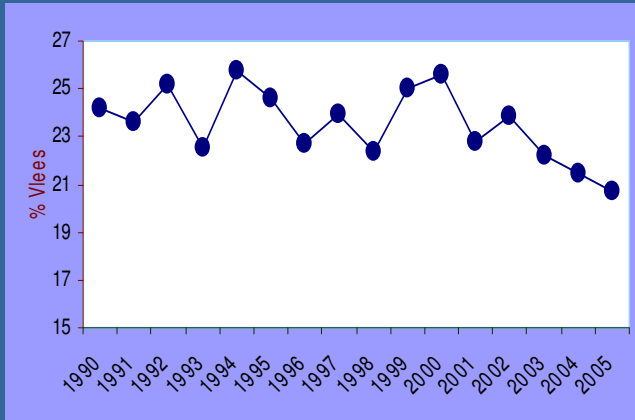
Mussel 44 %

2005

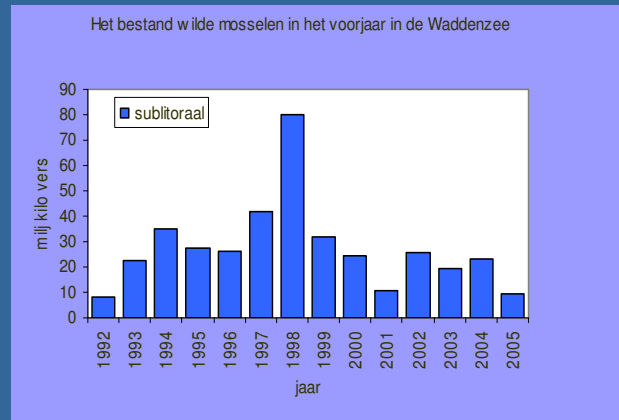


Other factors: parasites,
predation, local factors, ..

Problems & perspectives :



MUSSEL QUALITY
decreasing



SEED AVAILABILITY
limitations



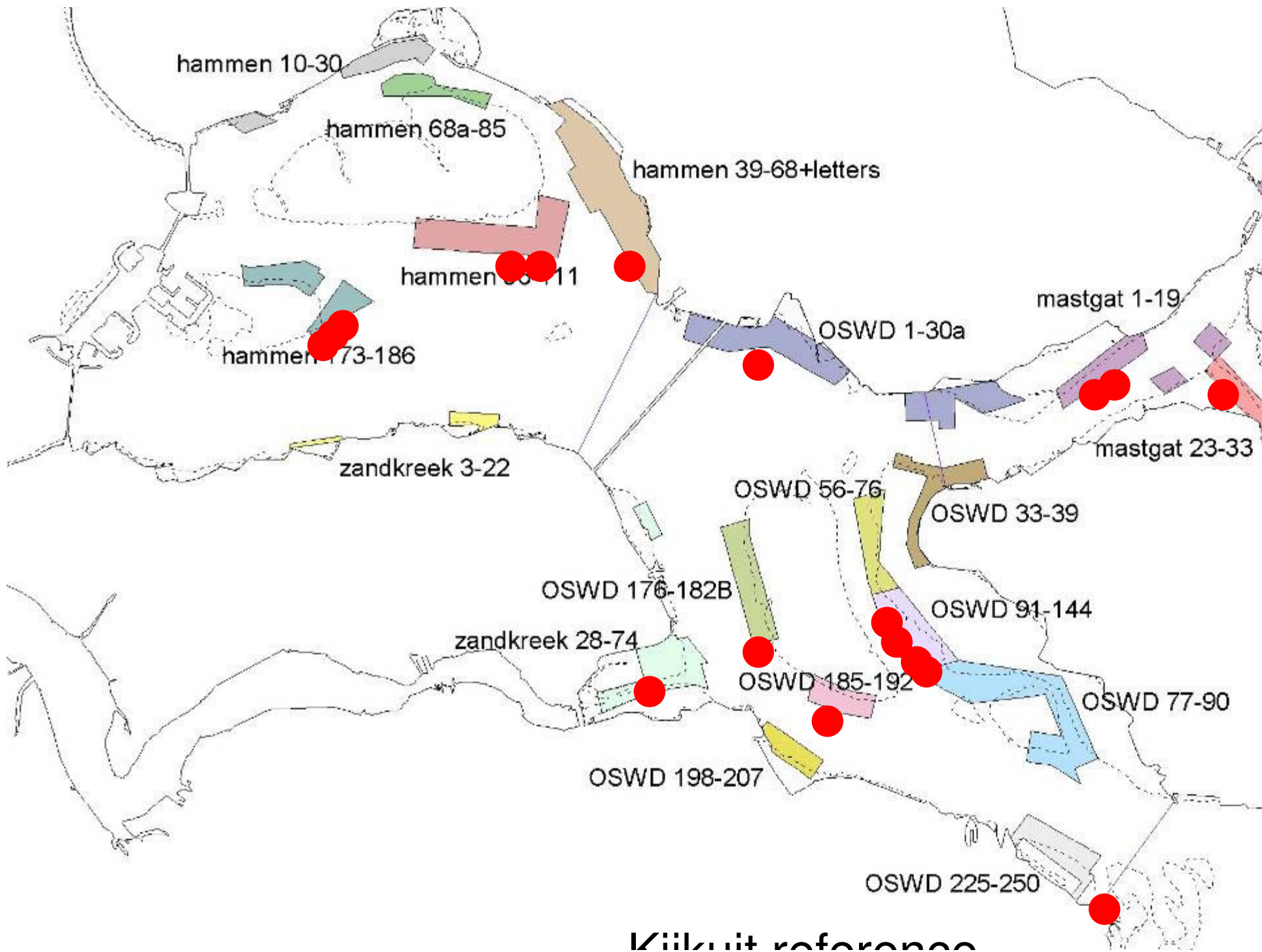
FOOD/HABITAT
competing claims

The industry wants to:

- improve product quality
- reduce uncertainty in (seed) resources
- make more efficient use of resources



carrying capacity studies: Keyzones

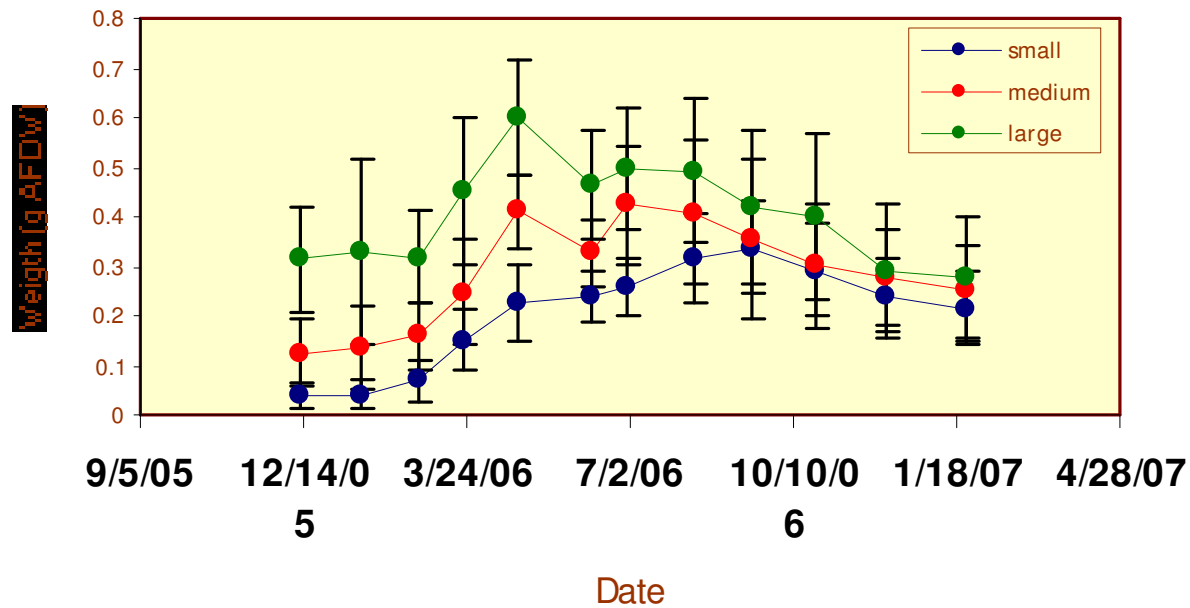
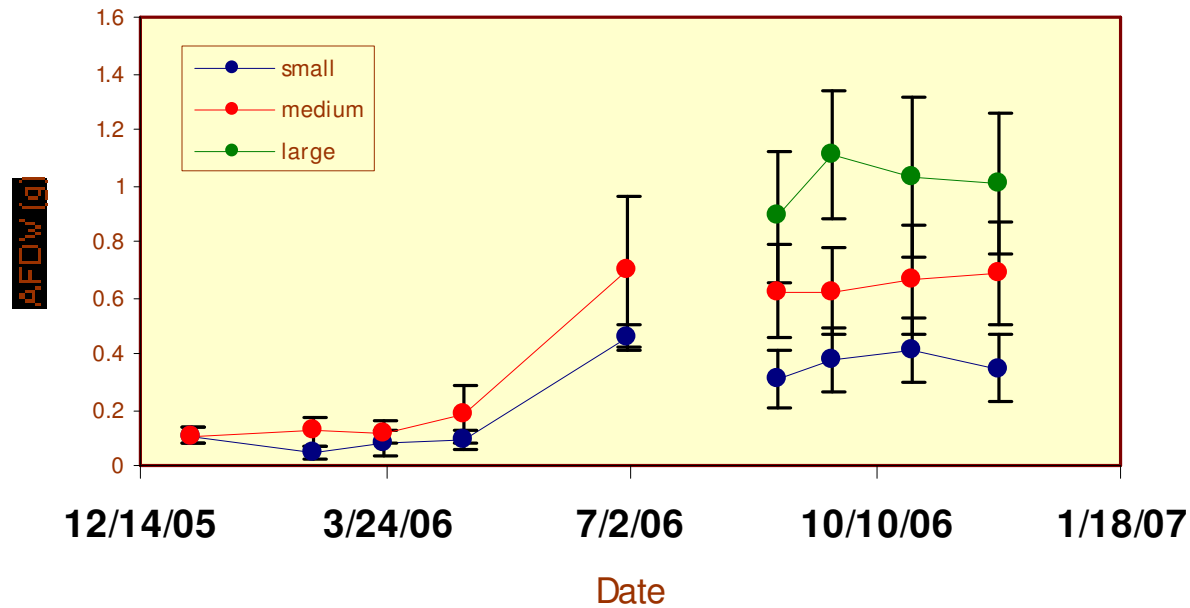


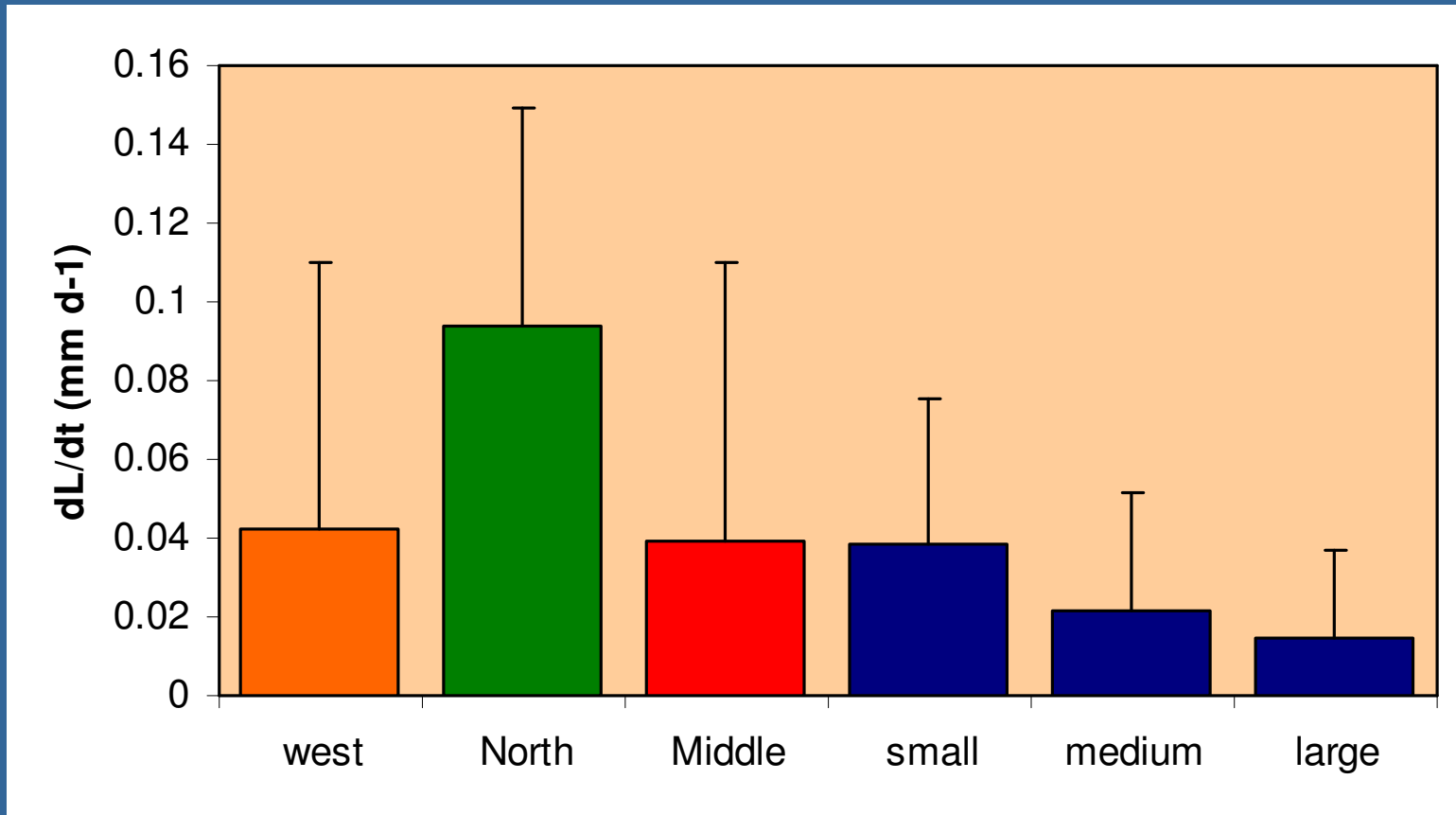
Kijkuit referentie

Growth of Oysters

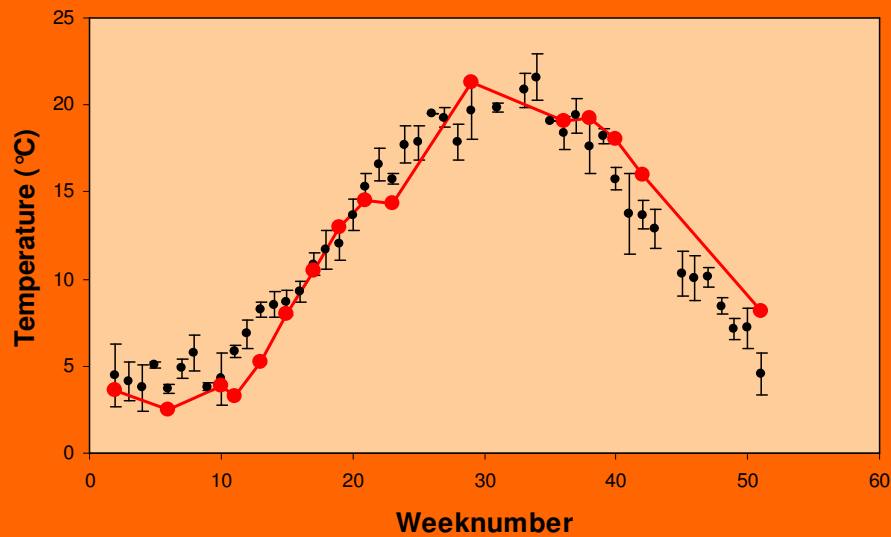
and

Mussels at ref station 2006





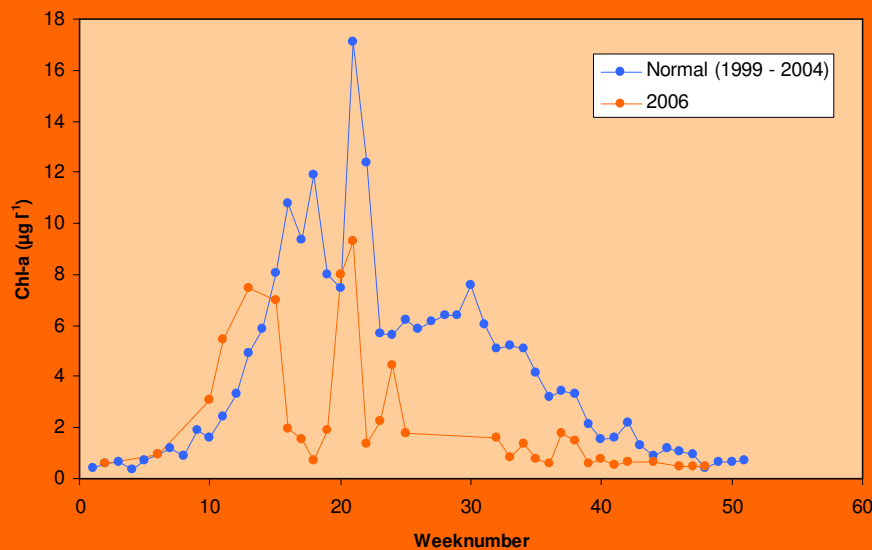
Growth rate mussel plots compared with kijkuit
Better growth on plots in north: more food



Water
temperature

Line: 2006

Dots: 1999 - 2005

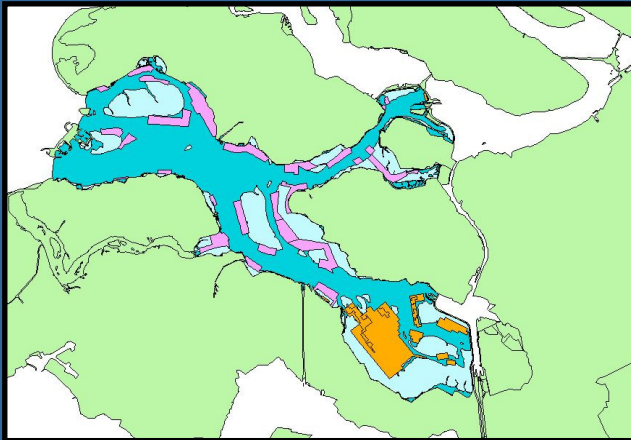


Chlorophyll

red: 2006

blue: 1999 - 2004

2006: extreme: climate? , to be tested with model scenarios



system	Area (km ²)	Depth (m)	Volume (10 ⁶ m ³)	Tidal range (m)	Residence time (days)	Average annual Chla (mg/m ³)	Total phyto biomass (10 ⁶ gC)	Primary production (gCm ⁻² y ⁻¹)
Oosterschelde 2005	351	8	2808	3.25	40	5	421.20	300
Loch Creran	65	20	1300	2	10	1	39.00	200
Clew Bay	312	15	4680	5	10	1.25	175.50	200

OS and CB : similar size

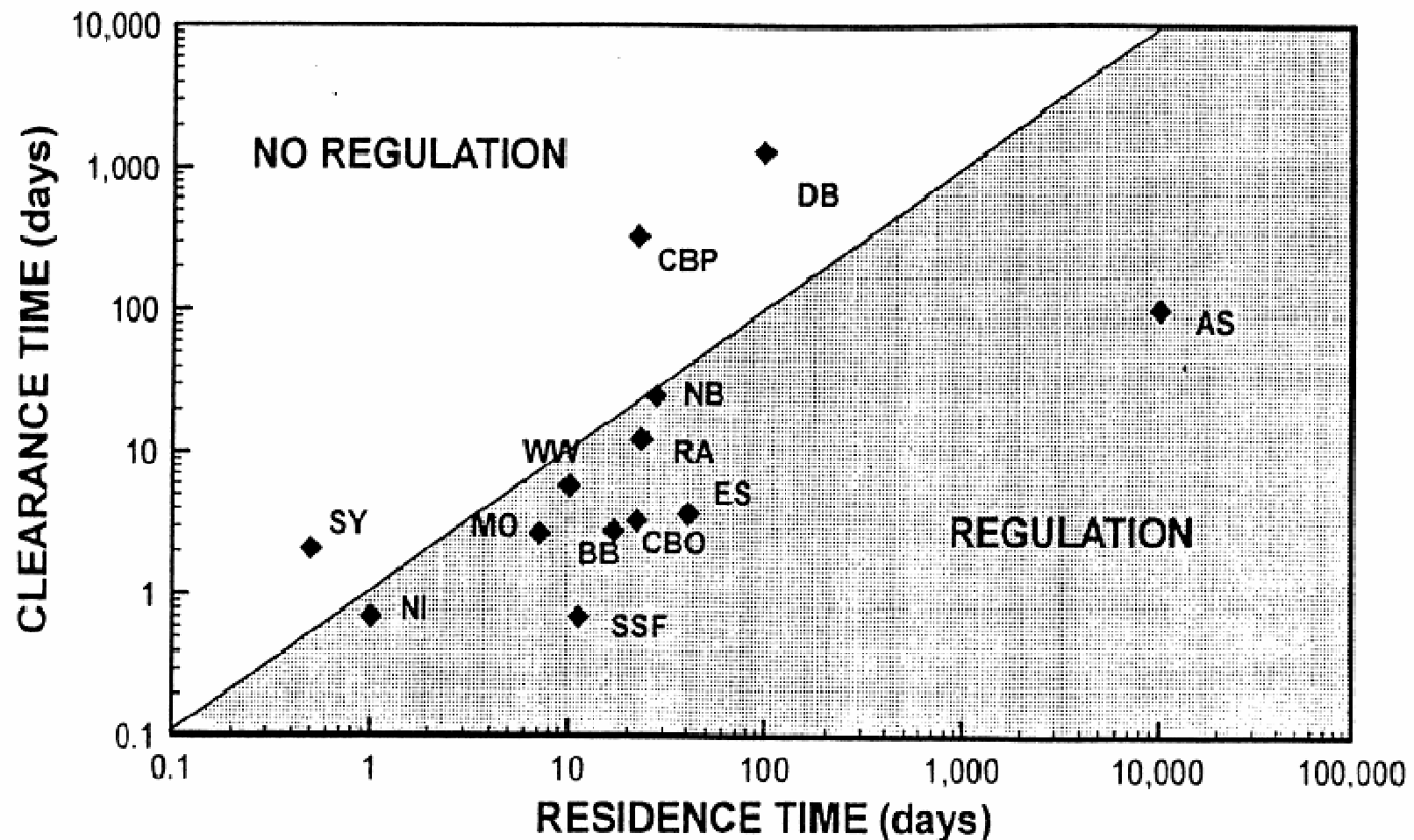
OS : CHL >

OS : residence time >

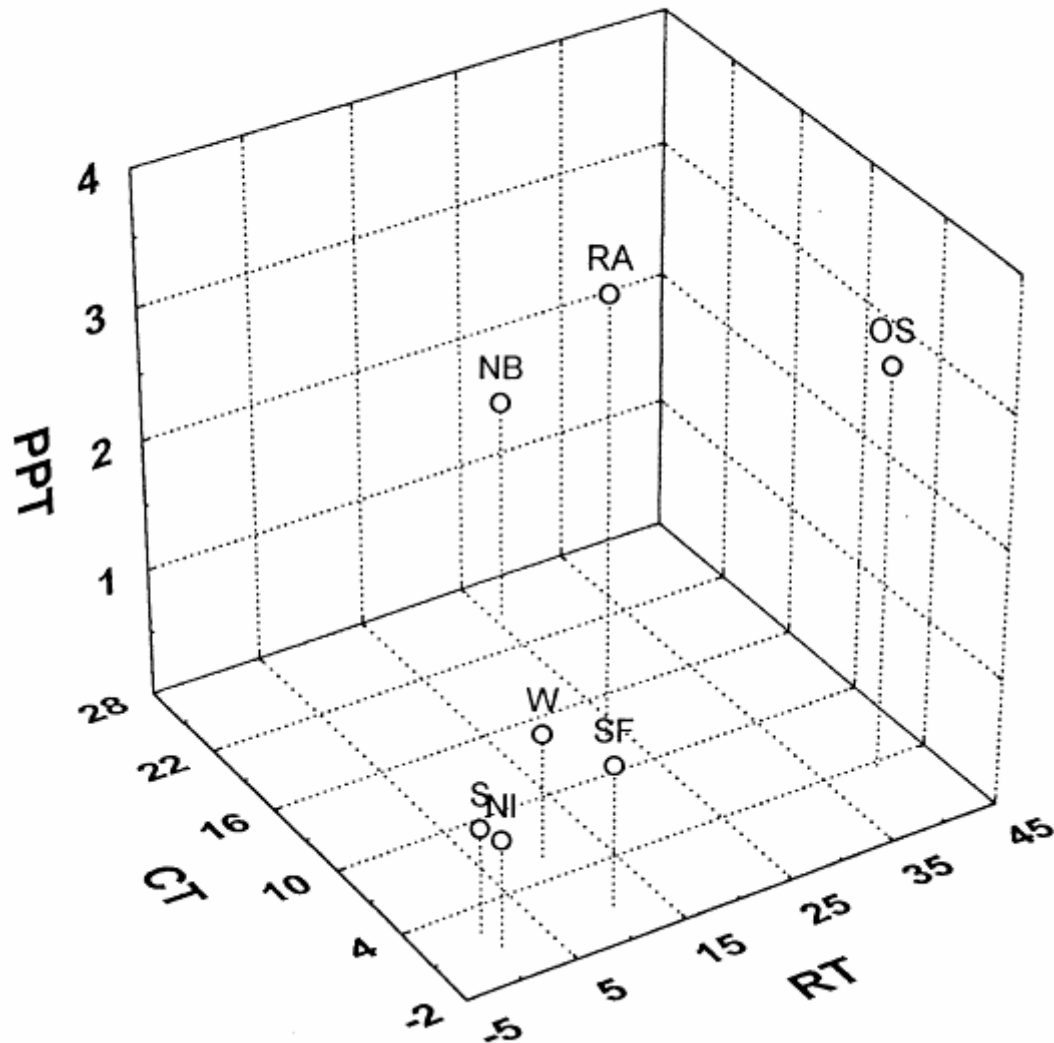
INDEX

clearance time = time to filter the water body

residence time = time to exchange the water body



TURNOVERS (OUTLIERS DELETED)



Residence time

Clearance time

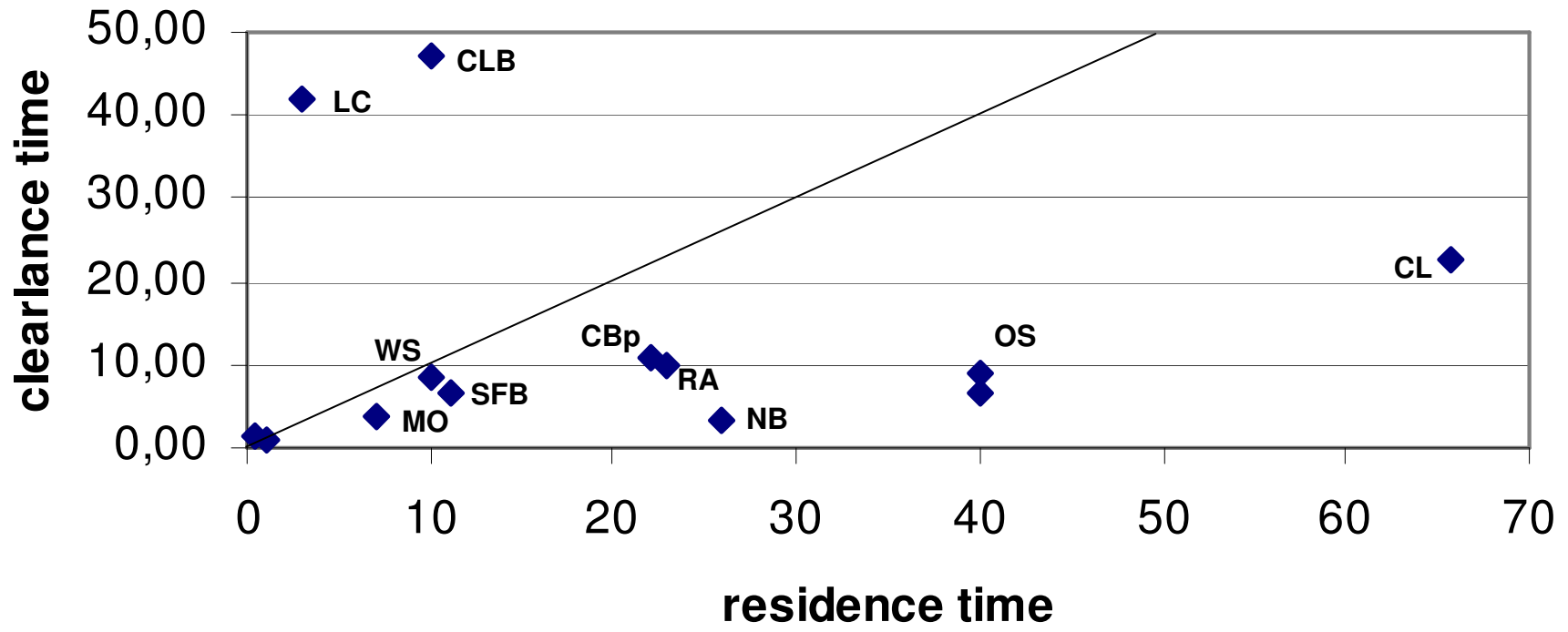
Primary production
time

= time to renew the
phytoplankton stock

	System PP (10 ⁶ gCd ⁻¹)	PP turnover-time	total biomass (10 ⁶ g) ADW	biomass cultured animals	Bivalve clearance time (day)	CT/RT	CT/PPT
Oosterschelde	288.00	1.46	5000.00	2500.00	9.06	0.23	5.17
Loch Creran	35.62	1.10	500.00	50.00	41.94	4.20	38.30
Clew Bay	170.96	1.00	1600.00	160.00	47.18	4.72	46.00

OS, LC, CB: similar productivity

OS : high biomass: short clearance time



Carrying capacity index:

If $CT < RT$ (filter feeder regulation) and

$CT > PPT$: 'undergrazed' ($CT/PPT \gg 1$)

$CT = PPT$: Maximum exploitation

$CT < PPT$: overgrazed ($CT/PPT < 1$)

	CT/RT	CT/PPT
Oosterschelde	0,23	5,17
Loch Creran	4.2	38
Clew Bay	4,7	46

Oosterschelde: filter feeder regulation (CT<RT)

LC & CLB: no regulation (CT>RT)

Oosterschelde: close to overgrazing

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