

Ten years of adjusted tidal barrier management to enhance glass eel migration at the Belgian coast! What have we learned?

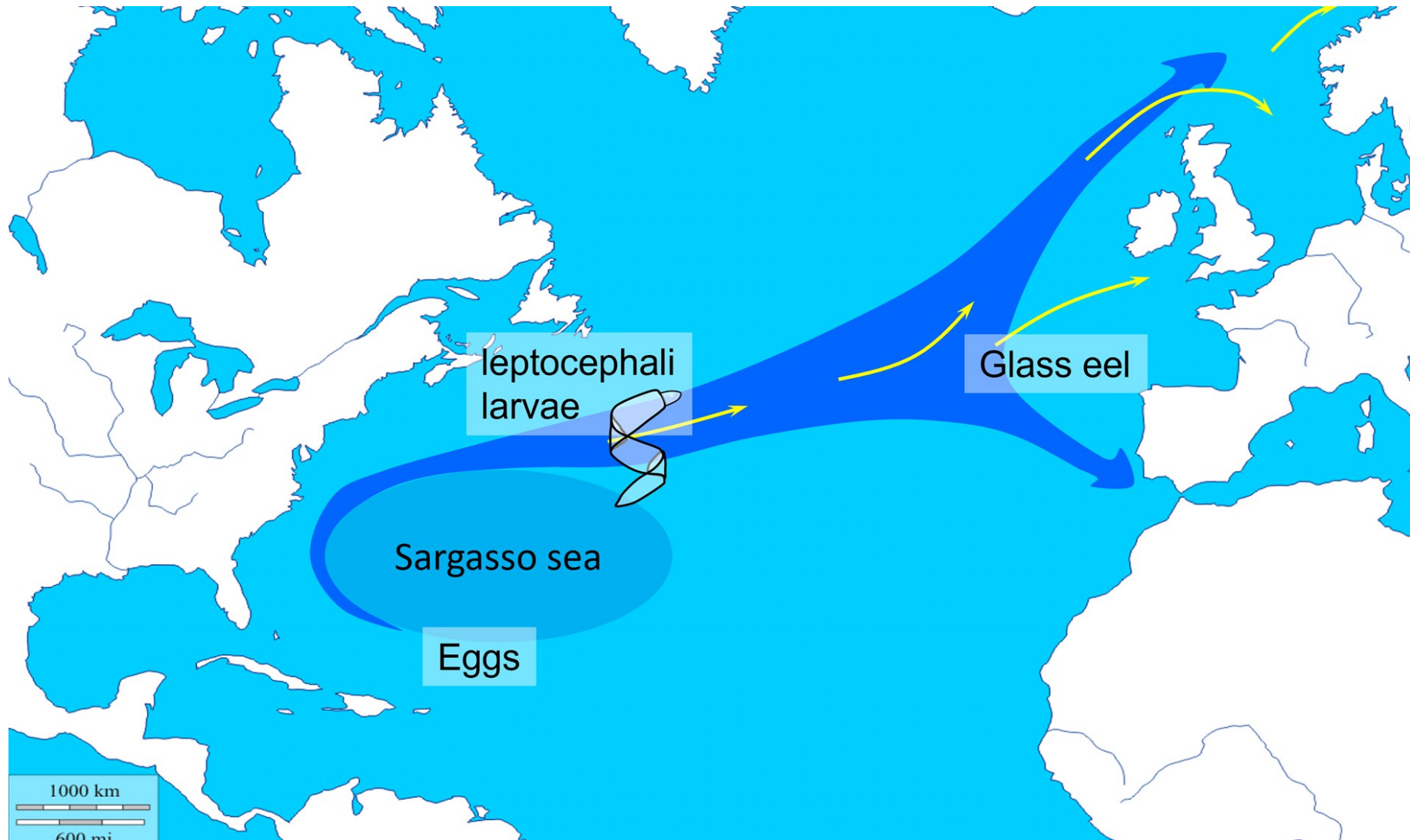
Team Aquatic Management – INBO

David Buysse, Lore Vandamme, Pieterjan Verhelst, Jeroen Van Wichelen, Ine Pauwels & Johan Coeck

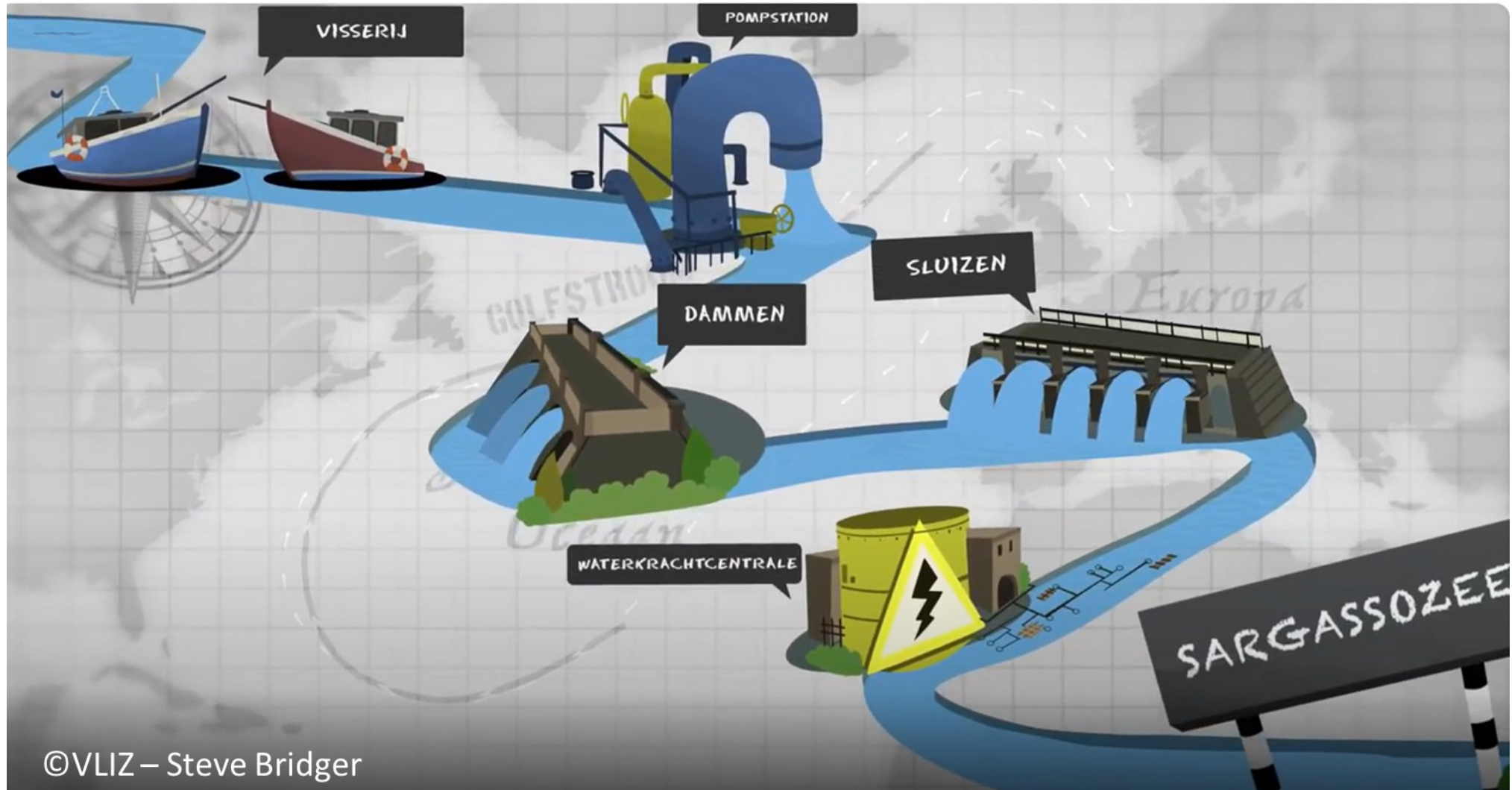
RESEARCH INSTITUTE
NATURE AND FOREST



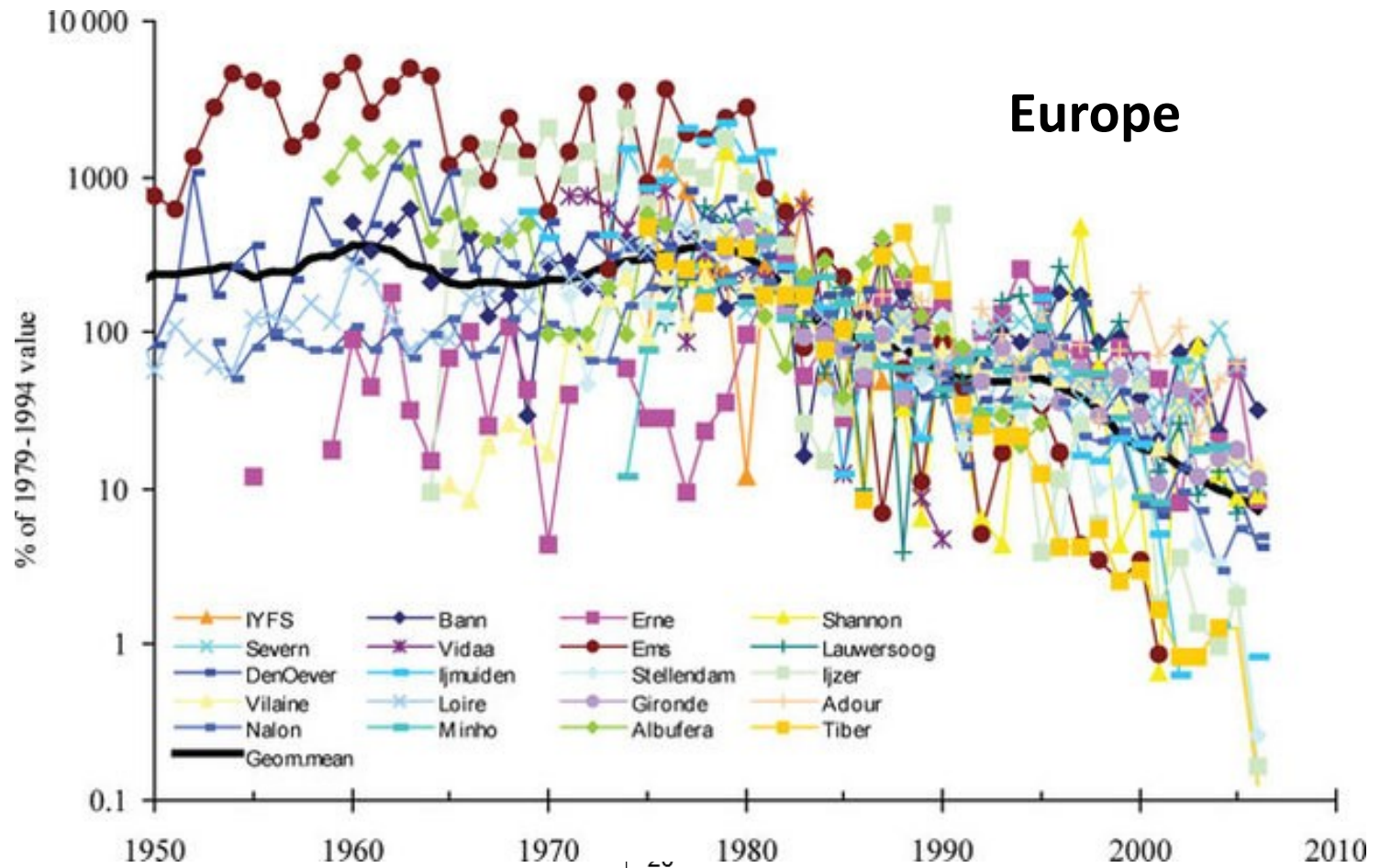
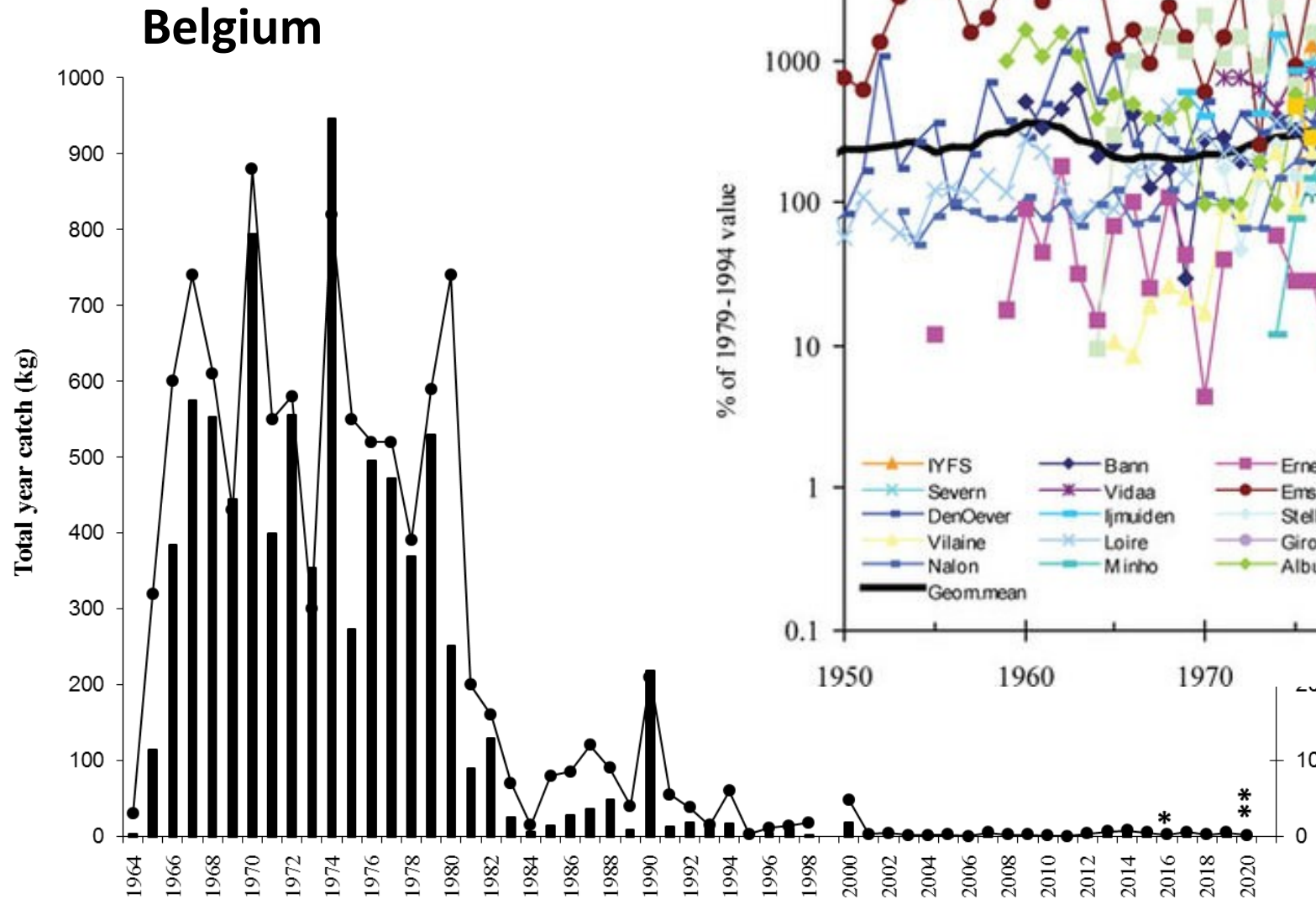
An unobstructed migration route between the sargasso sea and freshwater growth habitat in Europe is crucial for the European eel



What they get when they arrive ...



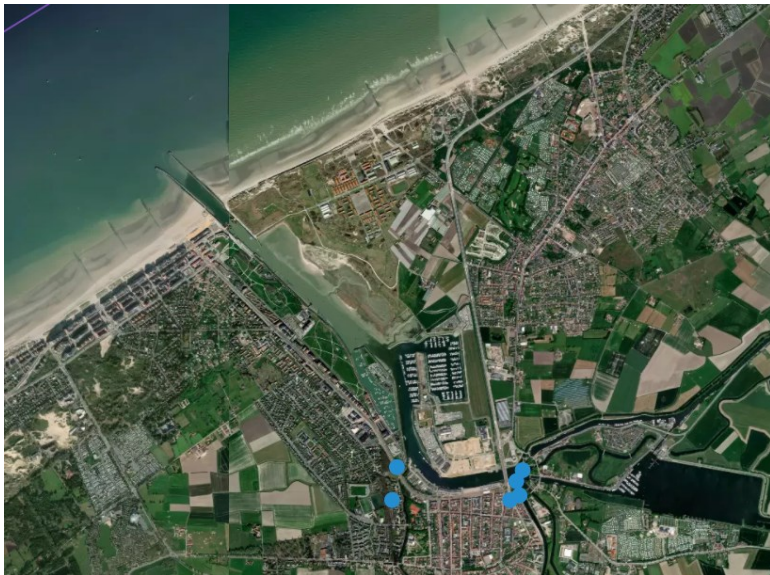
Consequently, the glass eel total year catches and max. day catches near European coasts crashed



So now they are critically endangered according to the IUCN red list

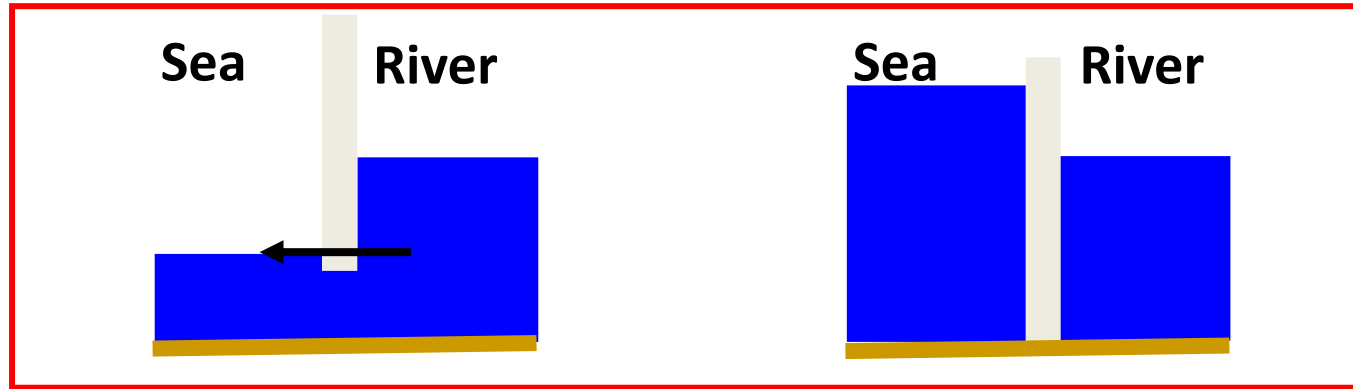


This pressie: focus on tidal barriers (close to the sea)

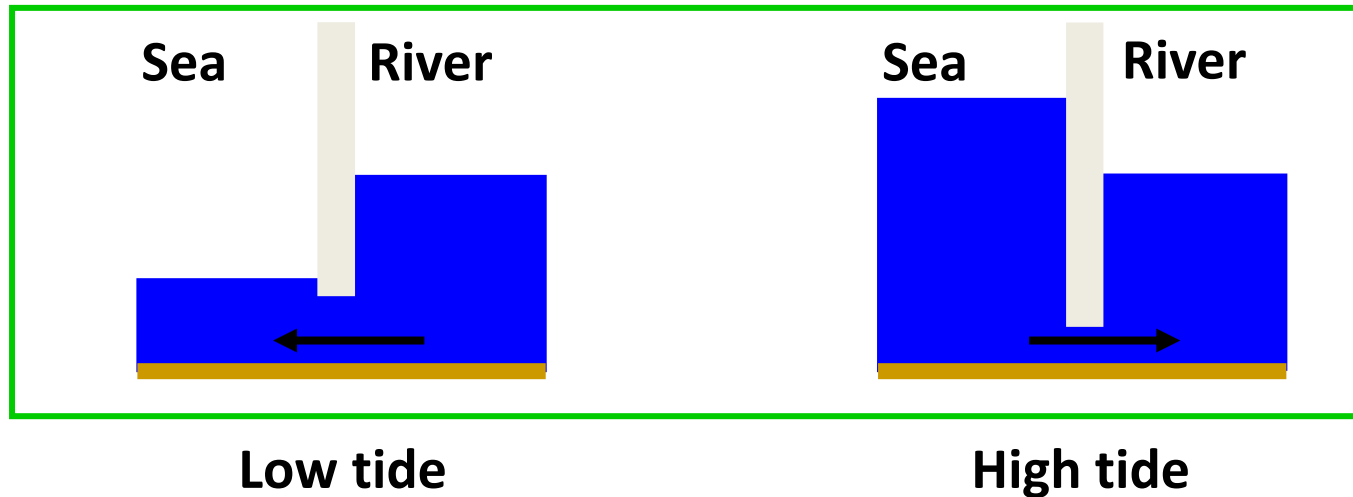


This pressie: focus on tidal barriers (close to sea)

Usual tidal barrier management



Solution!? Adjusted tidal barrier management!

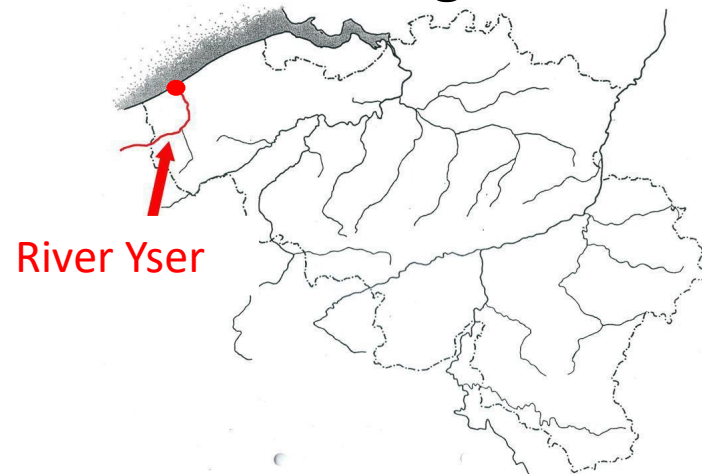


The case of the river Yser tidal barrier (Belgium)

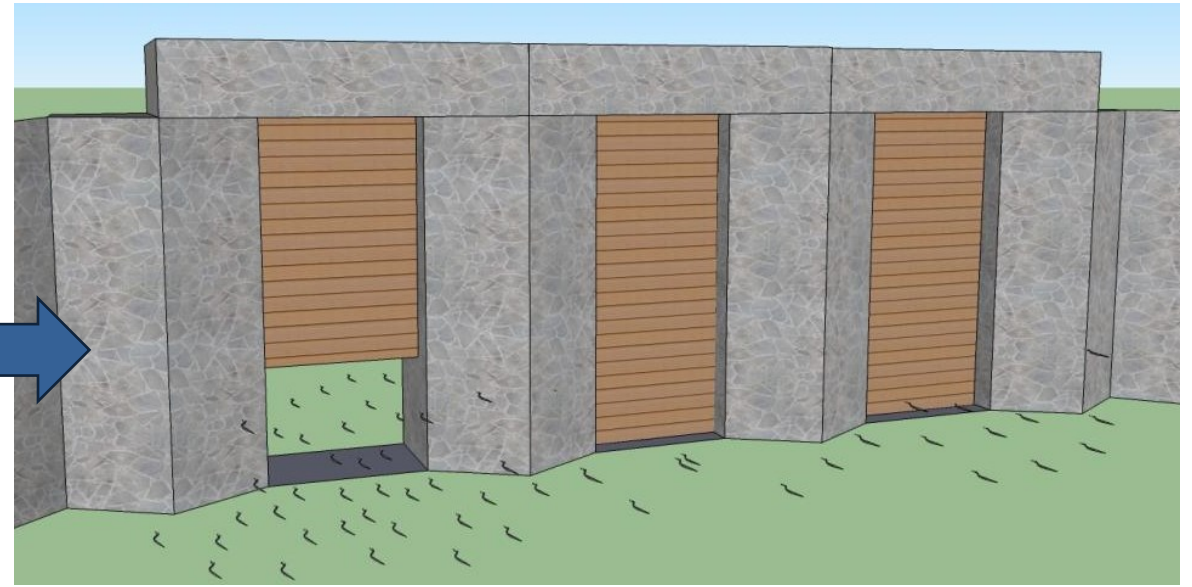
Estuary of the river Yser



Belgium

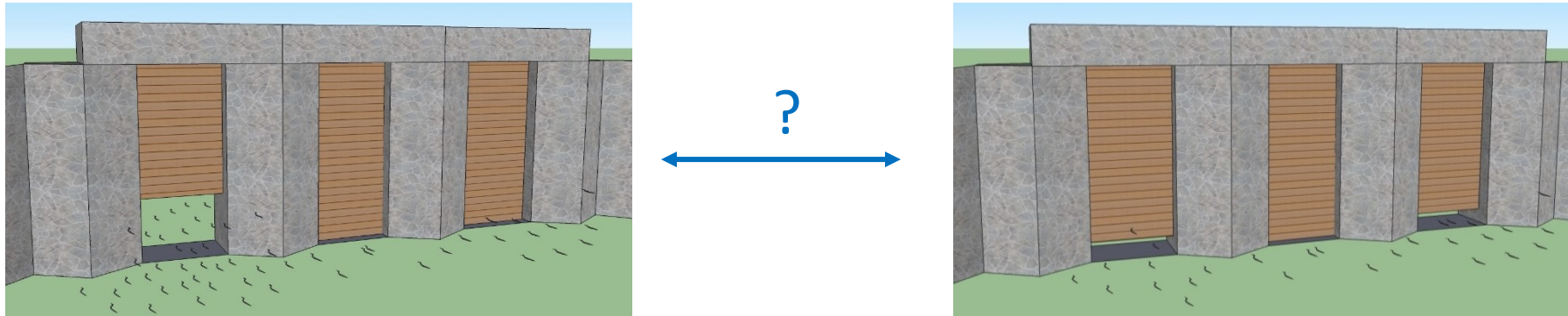


The case of the river Yser tidal barrier (Belgium)

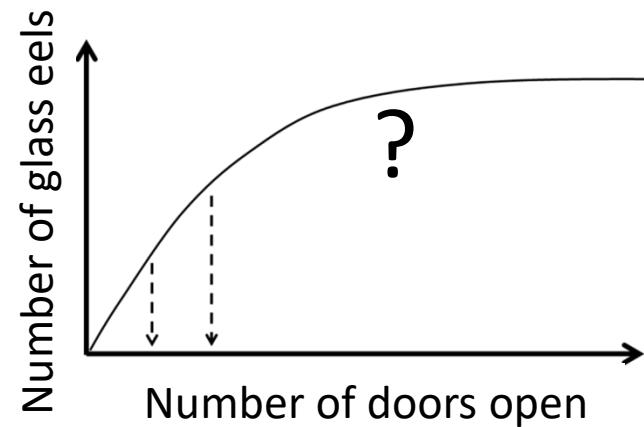


Research questions

1. Higher number of glass eels entering?
2. Do we better open one door more, or several doors less?



3. Is there a point of saturation in the number of incoming glass eels?



Research questions

4. Is the incoming number of glass eels varying within one tidal cycle?
5. Can we still prevent too much salt water coming in?
6. Can we adapt it on other sites too?
7. What is finally the effect on the eel population inland?

Methods

- Fyke net fishings at either one or several doors for multiple tidal cycles over three years



Research questions and answers

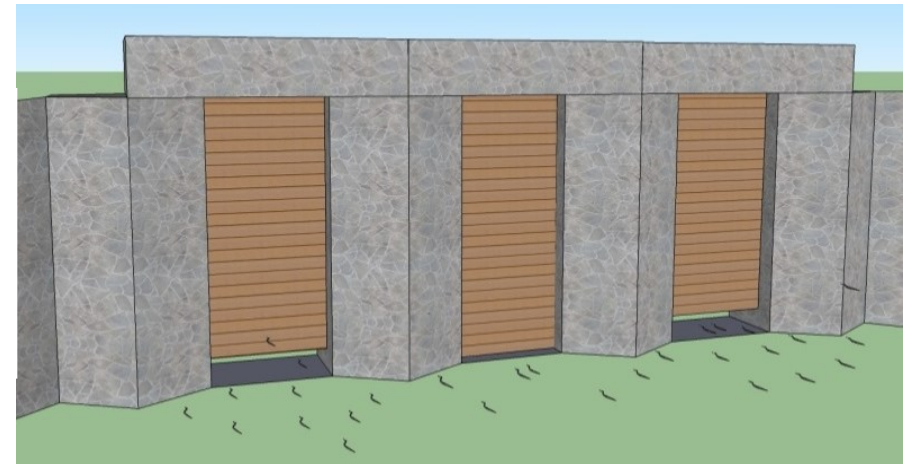
1. Higher number of glass eels entering?

- **Yes → 200 x more when one gate opened 10 cm**

(+/- 632 per tidal cycle) ↔ (+/- 3 glass eels per tidal cycle at closed door)

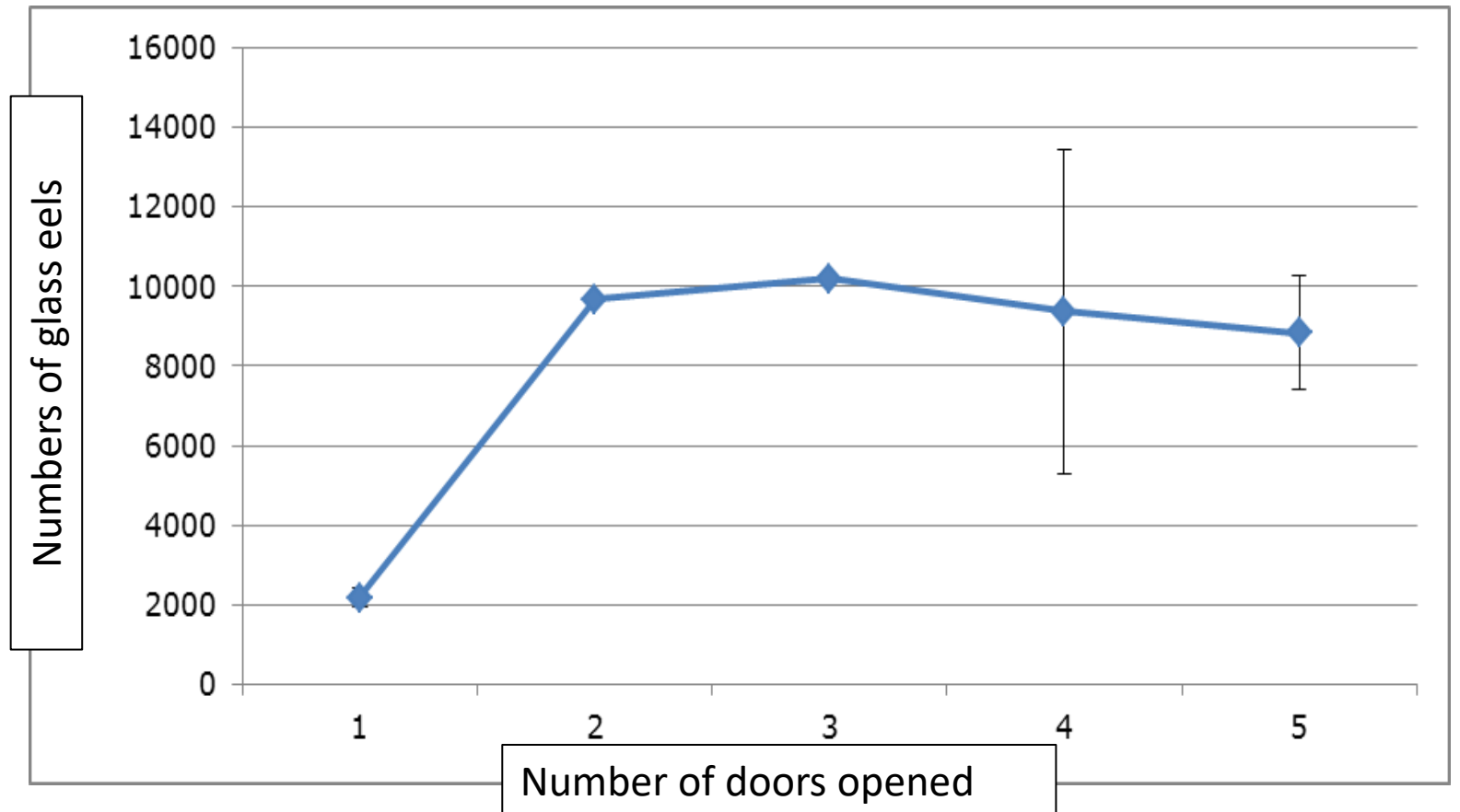
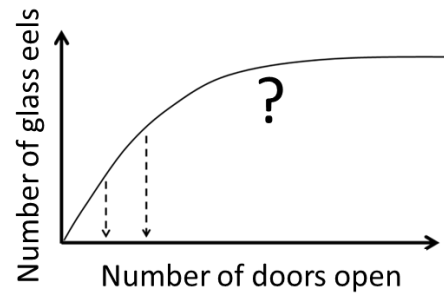
2. Do we better open one door further, or several doors less?

- **We better open one door further**



Research questions and answers

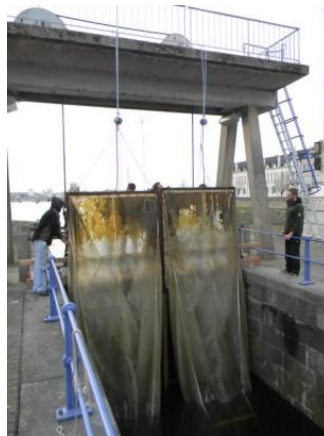
3. Is there a point of saturation in the numbers of incoming glass eels?
- **The max number of entering glass eels was reached from three doors opened onwards**



- A total of 85036 glass eels entered over 20 tides
- Around 34 kg / 20 tides

Research questions and answers

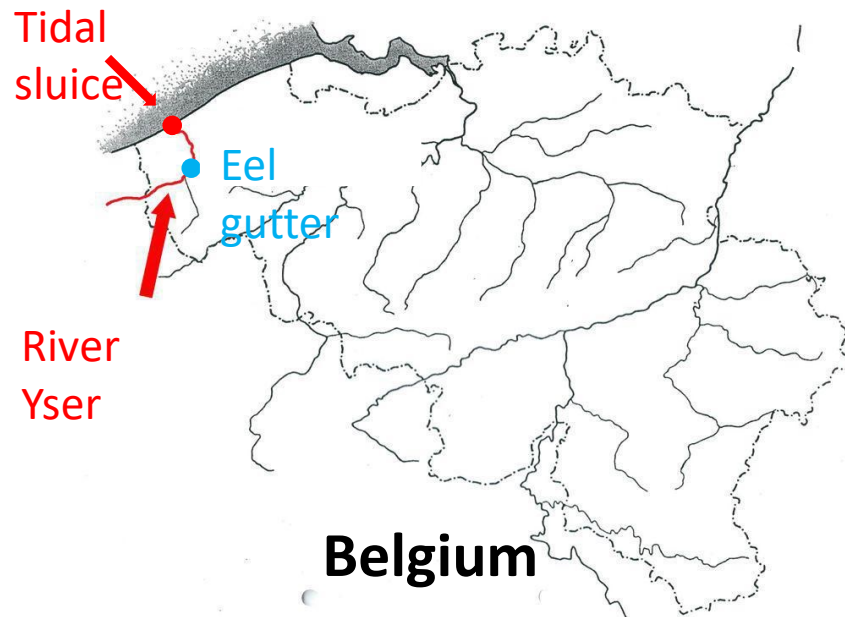
4. Is the incoming number of glass eels varying within one tidal cycle?
 - **Yes. The highest numbers of entering glass eels was within 1 hour at high tide (max. height)**
5. Can we still prevent too much salt water coming in?
 - **Yes we can, but it is source of serious and difficult debate!**
6. Can we adapt it on other sites too?
 - **Yes we can**
(arrows point to other study sites)



Research questions and answers

7. What is finally the effect on the eel population inland?

- Fyke net fishing
- Eel gutters
- BACI = Before, After, Control and Impact



BACI

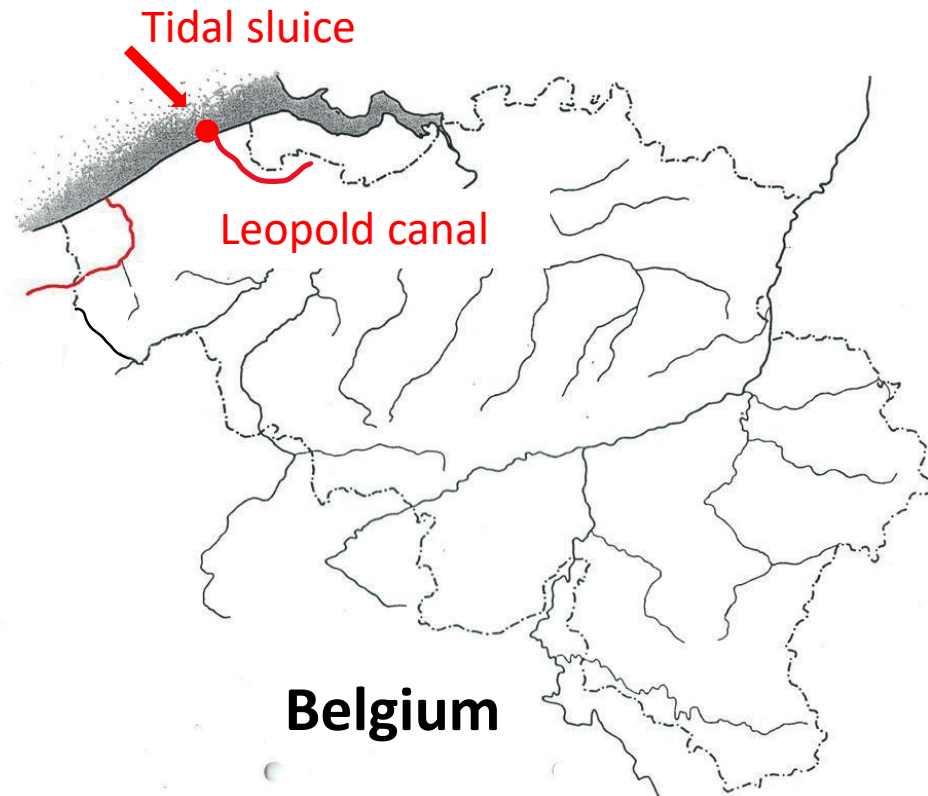
- Eel gutter at pumping station
- March-June 2023
- Total 167 kg for 37 566 individuals (elvers and glass eels)

Research questions and answers

7. What is finally the effect on the eel population inland?

We want **Before After Control Impact** ...

→ other (Belgian) study site **BACI** (Leopold canal)



- Eel stock monitored every summer **since 2014**
In 4 stretches

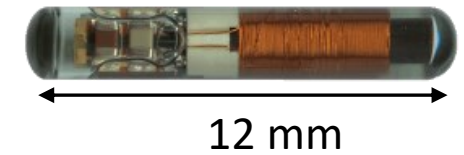
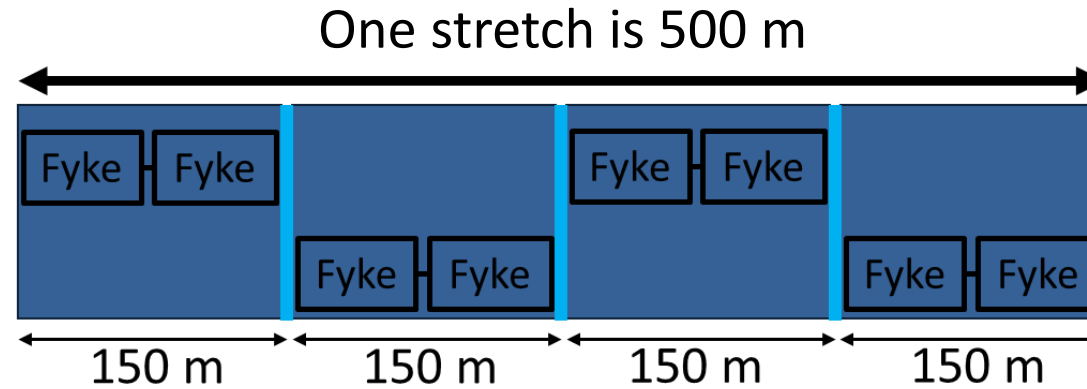


Adjusted
barrier
management:
2014 (B) (I)
2016 (B) (I)
2017 (B - A) (I)
2018 (A) (I)
2019 (A) (I)
2020 (A) (I)
2021 (A) (I)

Research questions and answers

7. What is finally the effect on the eel population inland?

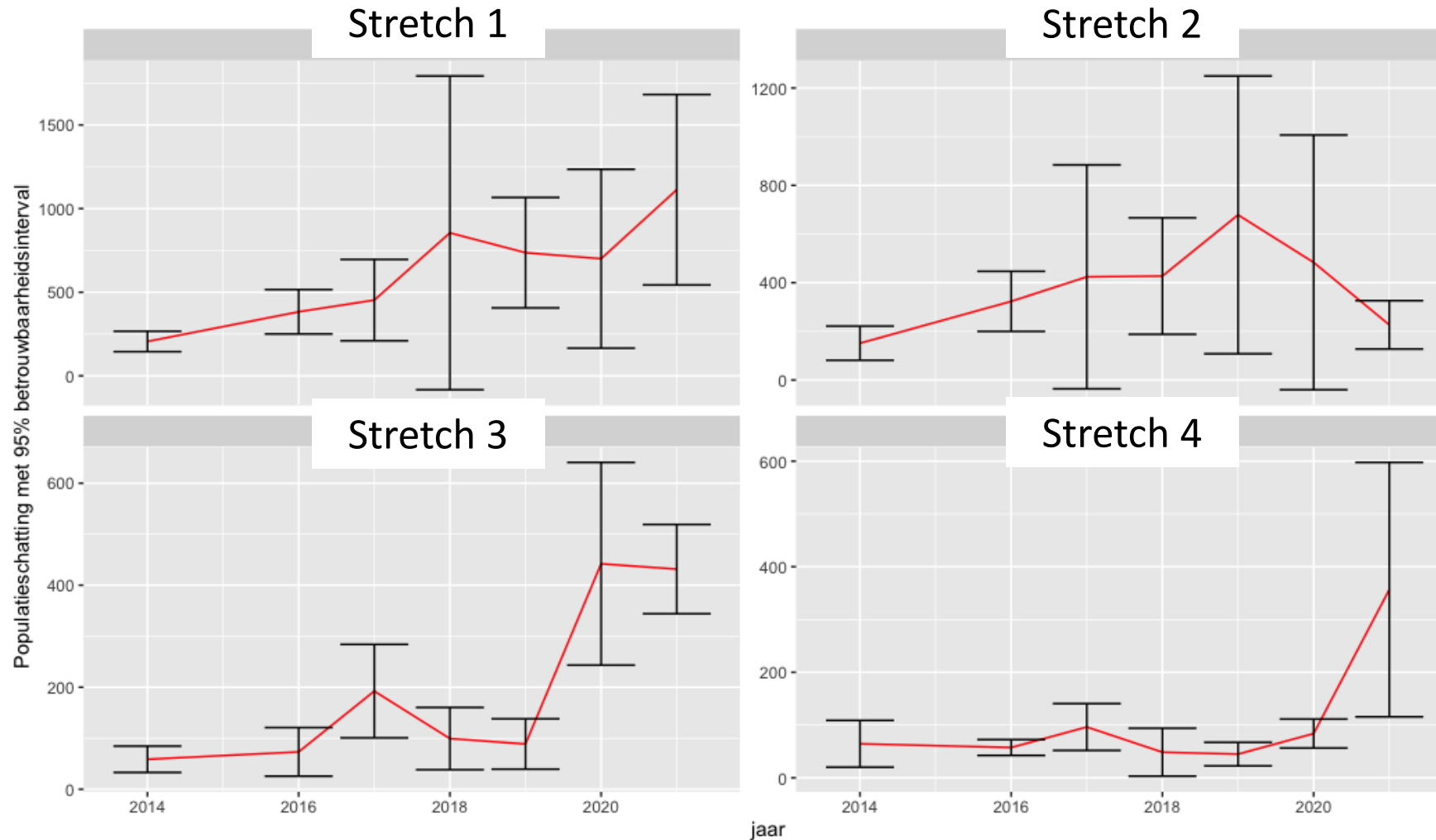
Leopold canal case – yearly fyke net catches and mark-recapture since 2014



Research questions and answers

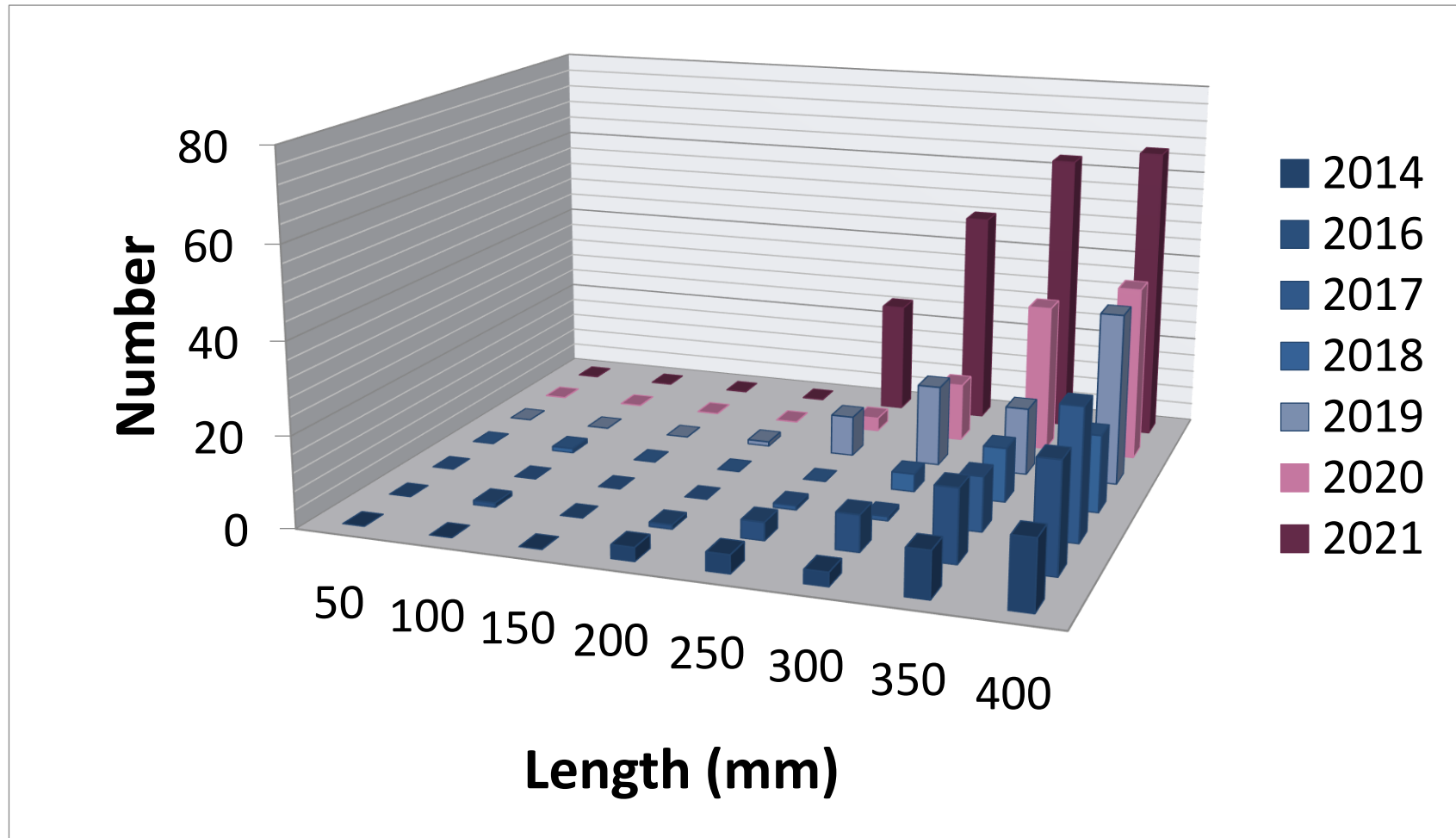
7. What is finally the effect on the eel population inland?

Leopold canal case – results



Research questions and answers

7. What is finally the effect on the eel population inland? Leopold canal case – results



Research questions and answers

7. What is finally the effect on the eel population inland?

Leopold canal case – results

7.A) And what is the effect on the Ecological Quality Ratio's for the European Waterframework Directive?

River Yser

periode	bekken	Gem EQR	se	95% betrouwbaarheidsinterval
2010-2012	IJzer	0,372	0,025	0,323 - 0,42
2013-2018	IJzer	0,498	0,015	0,469 - 0,527
2010-2012	Leie	0,197	0,042	0,115 - 0,279
2013-2018	Leie	0,359	0,027	0,306 - 0,412
2010-2012	Brugse Polders	0,279	0,034	0,213 - 0,345
2013-2018	Brugse Polders	0,353	0,025	0,305 - 0,402
2010-2012	Gentse Kanalen	0,331	0,052	0,229 - 0,433
2013-2018	Gentse Kanalen	0,381	0,032	0,318 - 0,445
2010-2012	Roven-Schelde	0,266	0,063	0,142 - 0,39

Leopold canal

2009 EQR :

0,12 = Bad quality (for fish)

2022 EQR :

0,59 = Average quality (for fish)

Conclusions

- Adjusted tidal barrier management is a cost-efficient way of solving (smaller) tidal barriers
- Not site specific for barriers of this size
- Positive effect on the eel stock
- Positive effect on the fish index (EWFD)

DIY

- Define the best way of door openings
 - How many?
 - How high?
 - Best spots for attracting glass eels with fresh water
- Discuss potential salt intrusion problems with other stakeholders and managers and monitor the salt intrusion
- Define a good BACI monitoring of your adjusted tidal barrier management



Thank you!

Eel illustrations used in this presentation belong to Steve Bridger © VLIZ
created for the PhD of Pieterjan Verhelst

Glass eel pictures are from our colleague Nico De Regge (INBO)

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