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Session B1: Fish-Friendly Management of First Dams in the Tidal Area of the Gironde Estuary (France, SW)

Vanessa Lauronce
MIGADO

William Bouyssonnie
MIGADO

C. Rigaud
Irstea

Fish-friendly management of first dams in the tidal area of the Gironde estuary (France, SW)

Innovations and best practices

V. Lauronce, W. Bouyssonnie

MIGADO

With Irstea technical and scientific collaboration

C. Rigaud, Irstea

And with partnership

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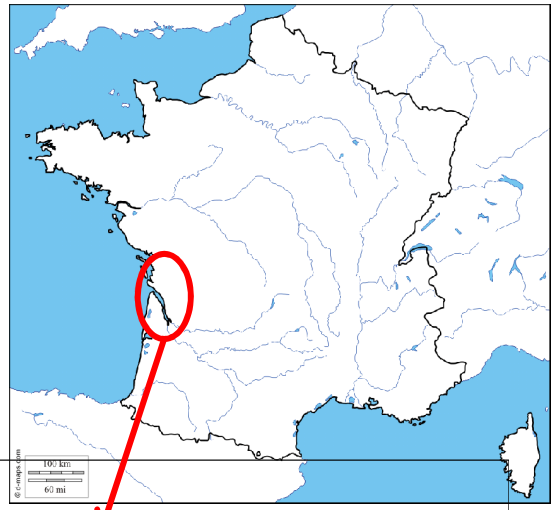
Gironde LE DEPARTEMENT

SMBV JCC

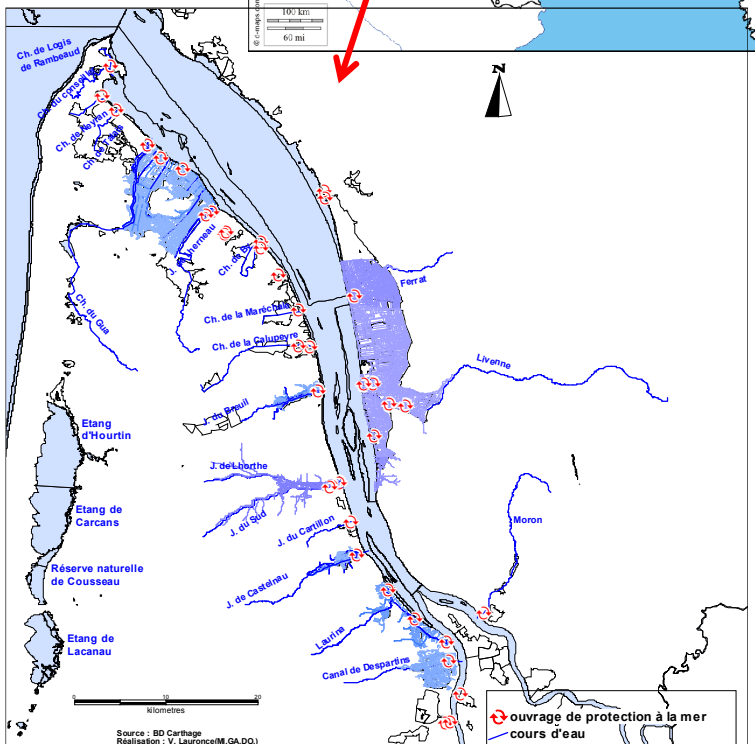
Fish-friendly management of first dams in the tidal area of the Gironde estuary, France (SW)

Gironde salt estuary : the largest in European (*75 km long, surface 635km²*)

Many diadromous species still present (*Shads, salmon, lampreys, sturgeons and eels*)



All along the two banks, numerous marshes with available growth habitats very important for eels



Only 10% connected with estuary because of tidal barriers

37% may be connected by implementing effective and low cost management measures

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✓ **Various types of gates**

Tide gates

Horizontal flag gate

Tide gates with window present in the gates

⇨ **All these barriers aim to prevent floods and to limit entrance of salt or brackish water into the up-stream marshes**

Objective of the studies

⇨**Facilitate upstream fish migration (multi-species)**

⇨**Limit the impacts on the upstream marshes**

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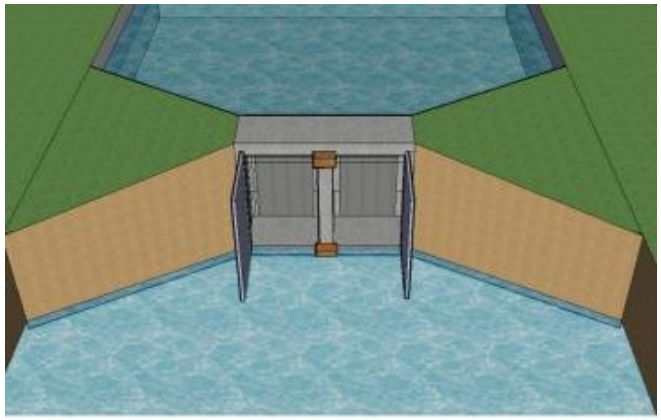
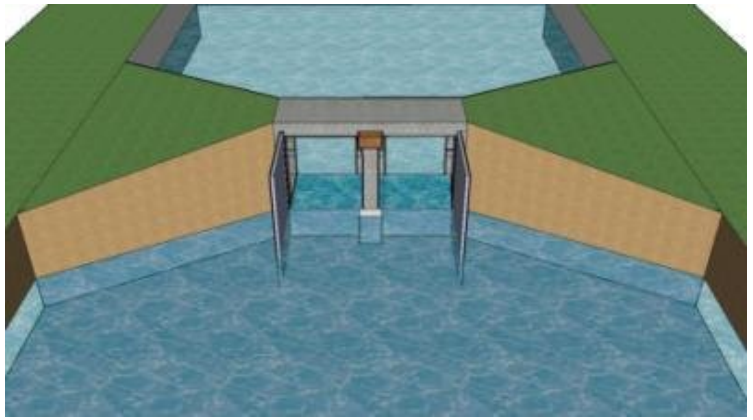
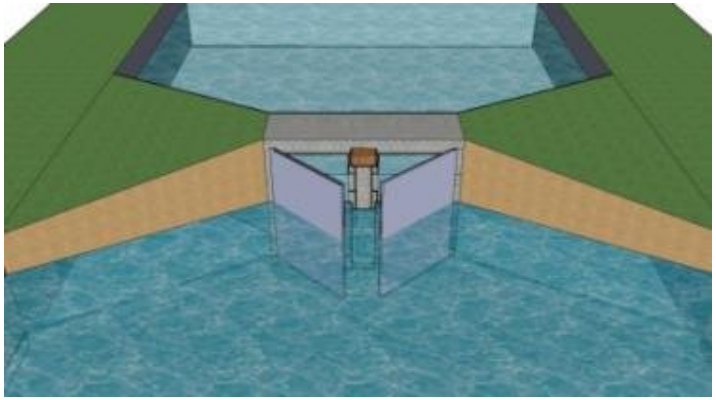
✓ **Why is the upstream fish migration blocked by these tidal weirs ?**



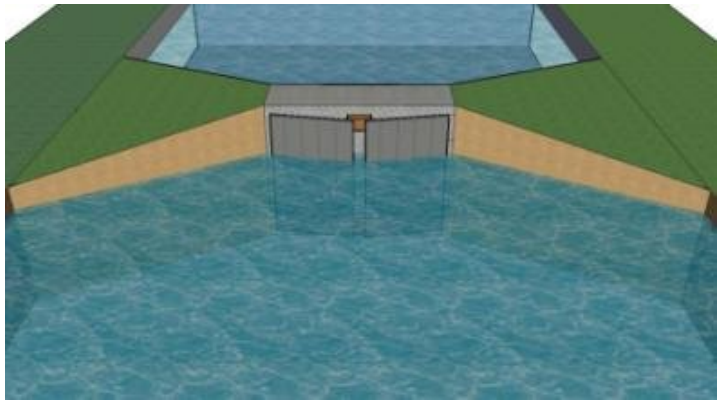
Low tide – doors are open



Beginning of the rising tide – doors begin to close



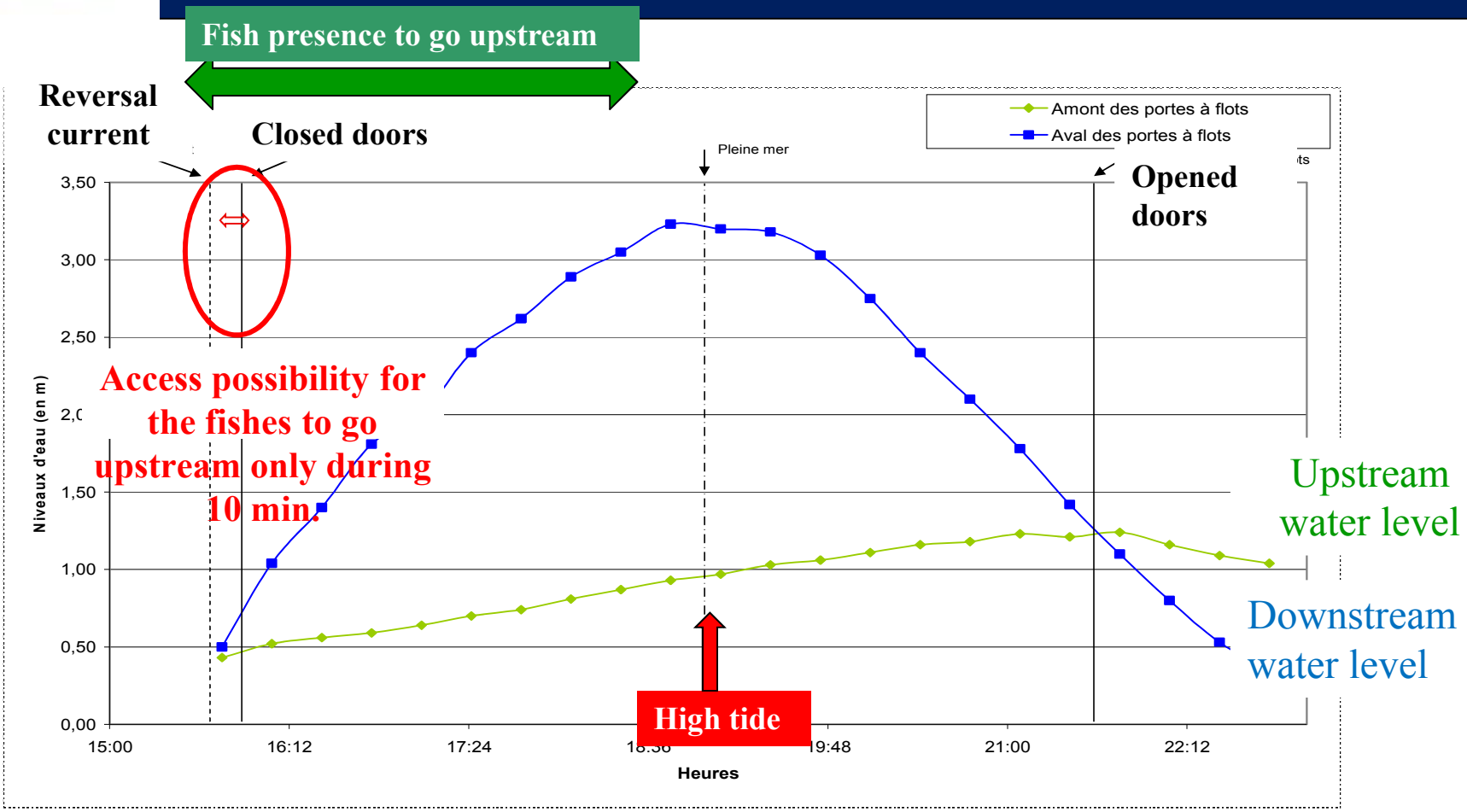
Rising tide – doors still closing



High tide – doors are closed and the fishes blocked

Illustrations : D. Filloux, 2011

Management of first dams in the tidal area



⇒ **Glass eels and young estuarian and marine species are mainly present between the reversal current and the high tide** (2 - 3 hours)

⇒ **but, 90% of the flood tide doors are closed 5-10 minutes after the reversal current**

Fish-friendly management of first dams in the tidal area of the Gironde estuary, France (SW)

⇒ **Test of different systems to optimize upstream accessibility**

Wooden blocks preventing the total closure of the doors

Stiffeners (« raidisseur ») to slow down the closure and allow seasonal adjustments

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Optimized management of the window sometimes present in the door or gate

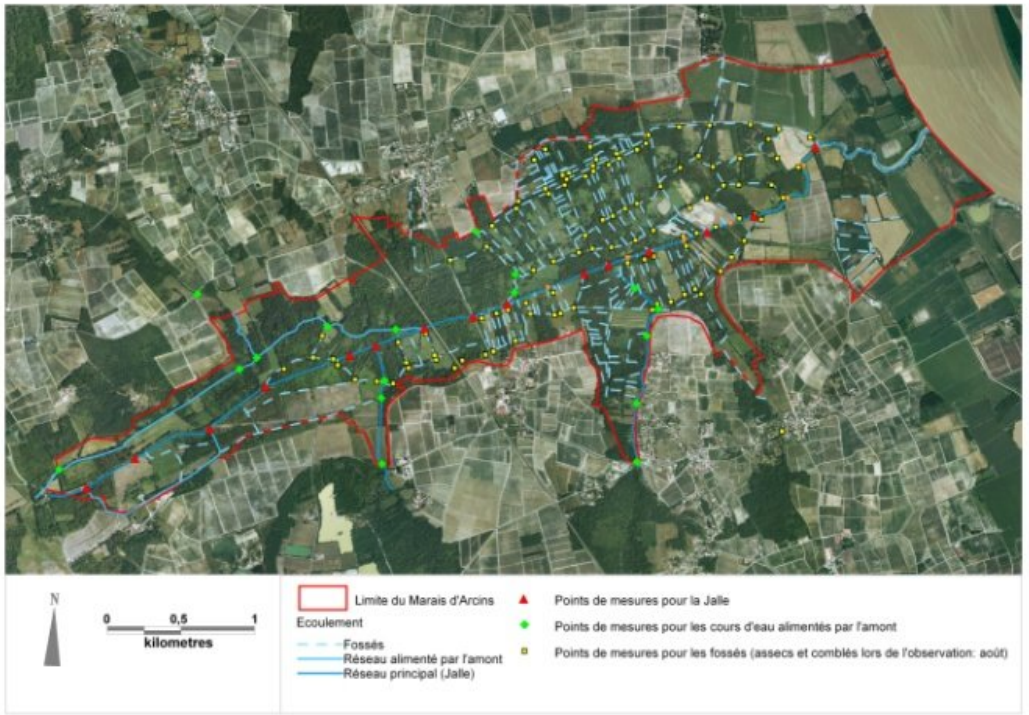
Telescopic gate allowing to keep a defined upstream water level

Fish-friendly management of first dams in the tidal area of the Gironde estuary, France (SW)

⇒ **Important informations to be collected to choice and to calibrate the best system for a given site (a dam / a marsh)**

Description of the **upstream marshes land-use to propose compatible measures**

Topographic data to estimate the **maximal acceptable volum of water which can be introduced upstream during a tide**



Hydraulic data to carry out simulations (*water level at the tide, river flow…*)

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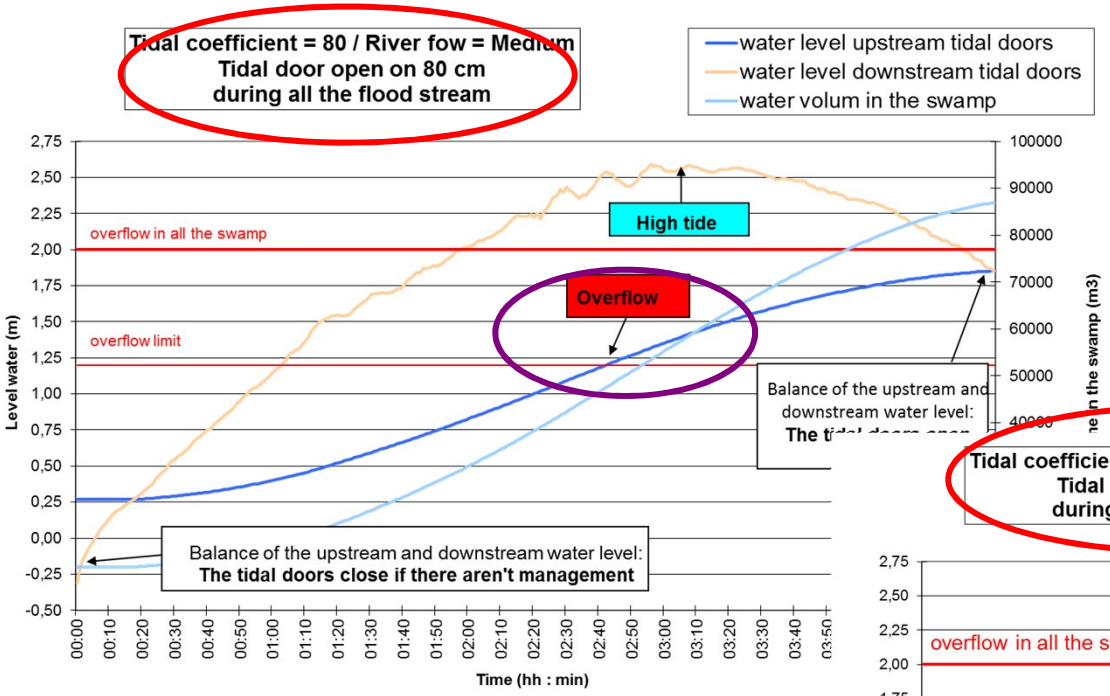
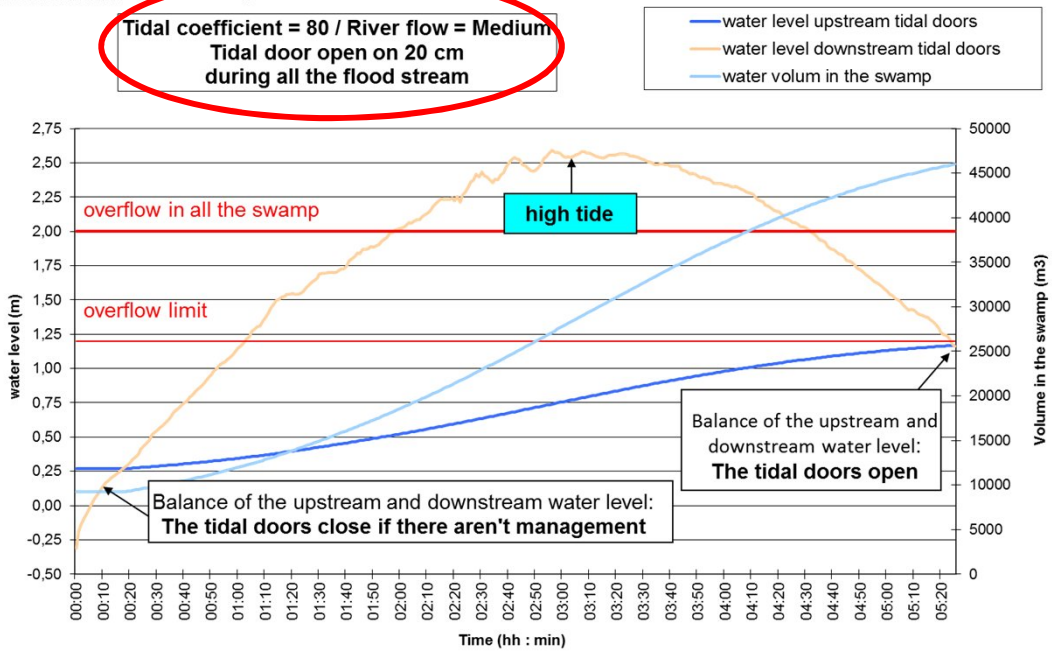
✓ **Hydraulic simulations** to adjust systems to respect the different constraints (according to acceptable volume, upstream swamp uses, tidal coefficient, river flow….)



Different proposal and simulations with different systems and tidal coefficients (50, 80 et 100)



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✓ Result of hydraulic simulation

✓Scenari choice according to acceptable volume

For example : Laffite marsh – acceptable volume = 5 000 m^3 in summer and 20 000 m^3 in winter

Proposal of a double management summer / winter with different openings according to season

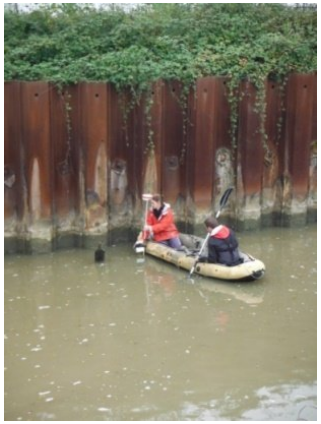
Managements	Max water level in the swamp	Max flow from dowstream	Entrance volume in the swamp from dowstream
Stiffeners open on 5 cm	1.95 m	0.50 m3/s	5 000 m3
Stiffeners open on 10 cm	2.10 m	0.90 m3/s	9 500 m3
Stiffeners open on 20 cm	2.30 m	1.70 m3/s	16 700 m3
25 cm large identation at 2.30 m from the ground	1.75 m	0.26 m3/s	1 600 m3
50 cm large identation at 2.30 m from the ground	1.85 m	0.55 m3/s	3 200 m3
100 cm large identation at 2.30 m from the ground	2.00 m	1.10 m3/s	6 400 m3
200 cm large identation at 2.30 m from the ground	2.20 m	2.20 m3/s	12 800 m3

Use of stiffeners, so entrance volume water lowers because valves close it slowly during the rising tide

Fish-friendly management of first dams in the tidal area of the Gironde estuary, France (SW)

- ✓ **Monitoring to check measures efficiency**
  - ❑ **No floods in the upstream marshes**

- ❑ **Upstream salinity and suspended matter monitoring**



⇨ **No impact of salinity and incoming suspended matter**

- ❑ **Fish monitoring downsteam the obstacle (hand-held dip nets) to check blockage or predation**

⇨**No apparent blockage**

Fish-friendly management of first dams in the tidal area of the Gironde estuary, France (SW)

- ✓ **Monitoring to check measures efficiency**

- **Upstream fish monitoring (during commercial fishery with scientific traps)**
  - To check species taking advantage of the management measures,
  - To understand the timing of presence and passage of the different species (*during the tidal flow, day/night, all along the year,….*),
  - To optimise management measures giving first results

Fish-friendly management of first dams in the tidal area of the Gironde estuary, France (SW)

- ✓ **Monitoring to check measures efficiency**
- ❑ **Upstream fish monitoring (during commercial fishery with scientific traps)**

- ✓ Experimental fisheries in the 5 experimental sites since 6 years (31 experimentations)
- ✓ Sessions at different tidal coefficients (*50 to 110*) during all the rising tide
- ✓ Net visited every 20 min. to evaluate the migration rhythm

Fish-friendly management of first dams in the tidal area of the Gironde estuary, France (SW)

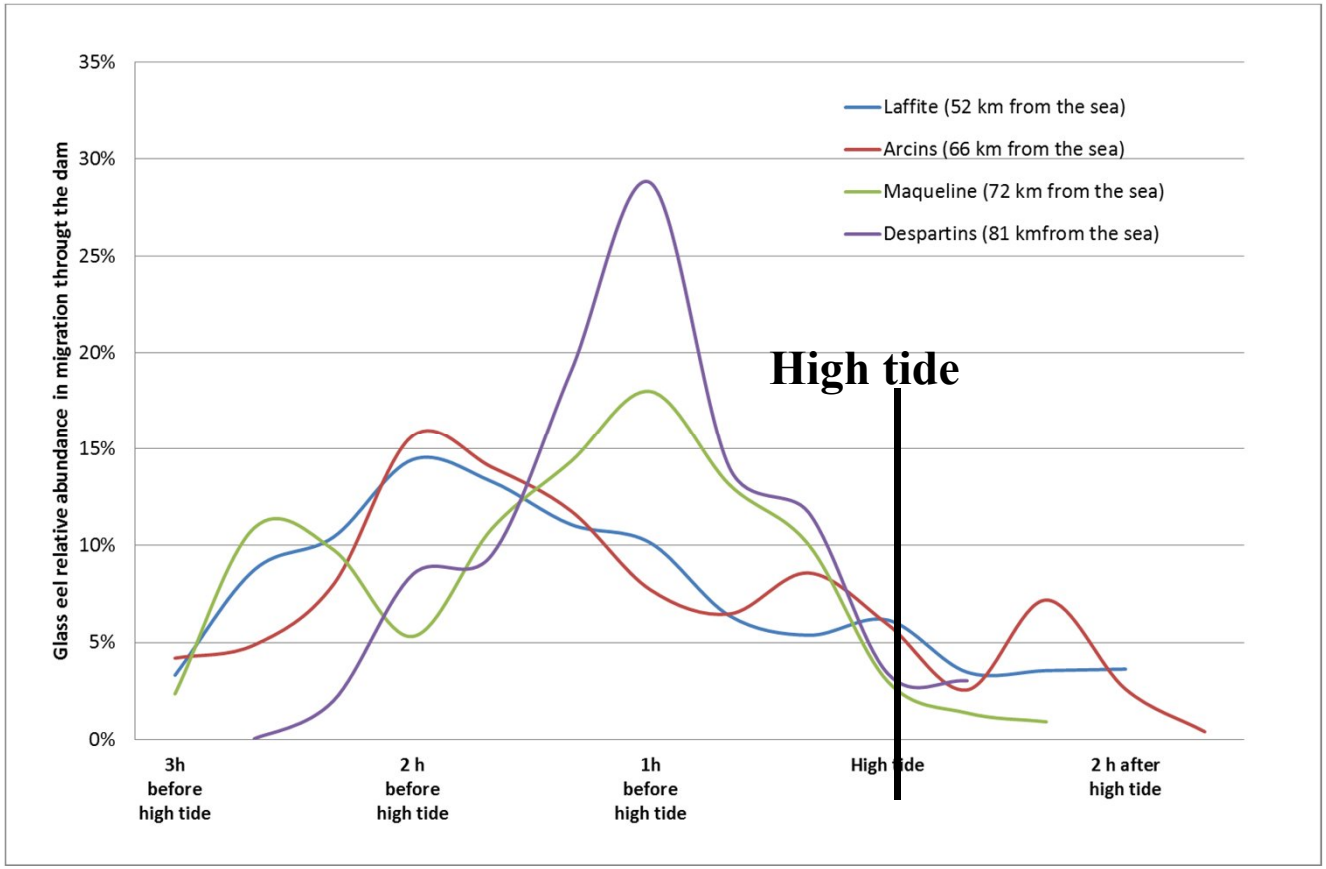
- ✓ **Monitoring to check measures efficiency**
- ❑ **Upstream fish monitoring (during commercial fishery with scientific traps)**

More than 15 different observed species

A mean of 75 juveniles observed by minute of water admission

Fish-friendly management of first dams in the tidal area of the Gironde estuary, France (SW)

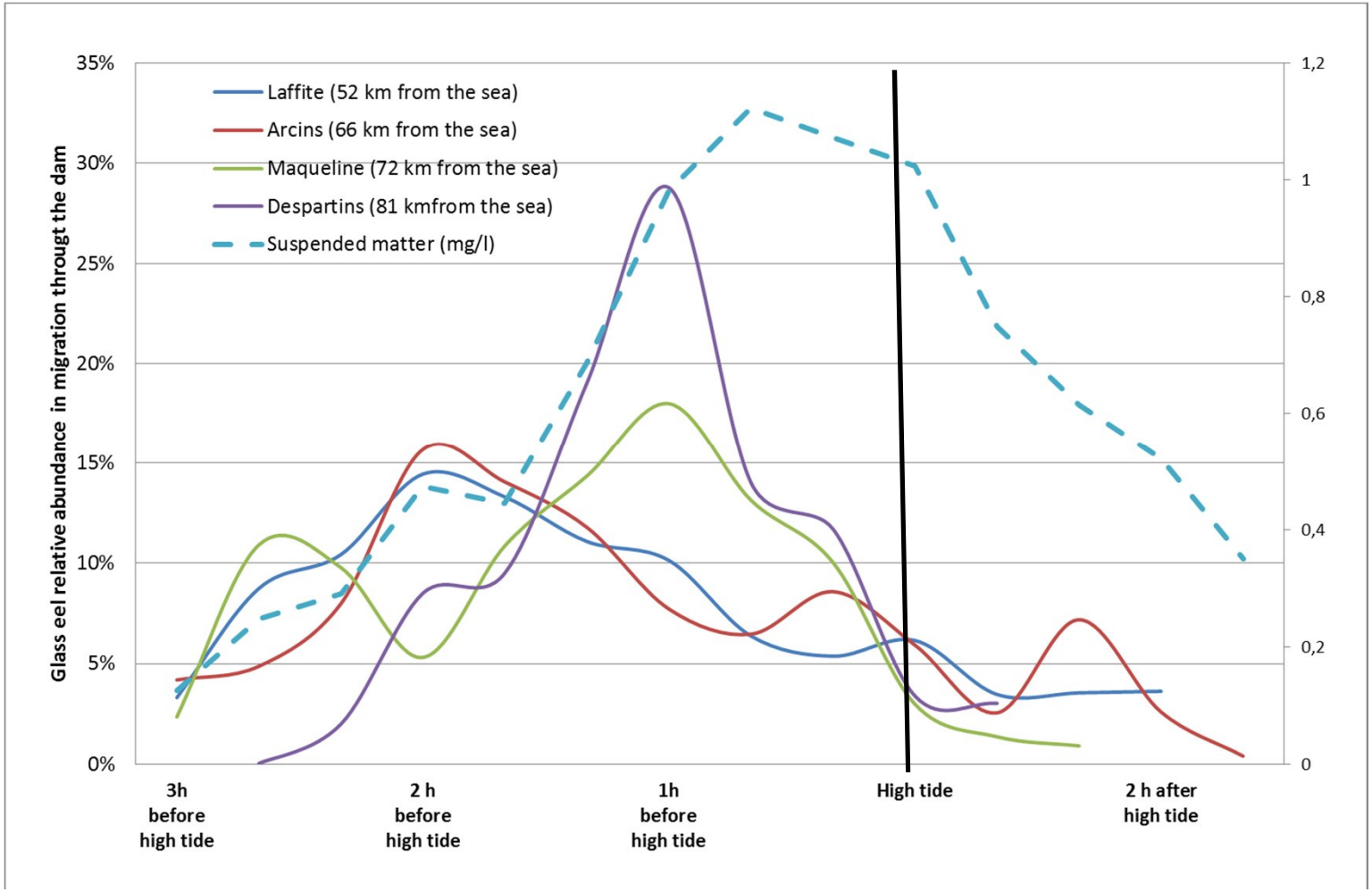
- ✓ **Monitoring to check measures efficiency**
- Glass eels enter during the **first part of the tidal flow**
- One hour before high tide, **80% of glass eels** have already passed through the obstacle (possibility to close the dam before the high tide to prevent incoming of salt water or to reduce significantly the admitted water volume)



Fish-friendly management of first dams in the tidal area of the Gironde estuary, France (SW)

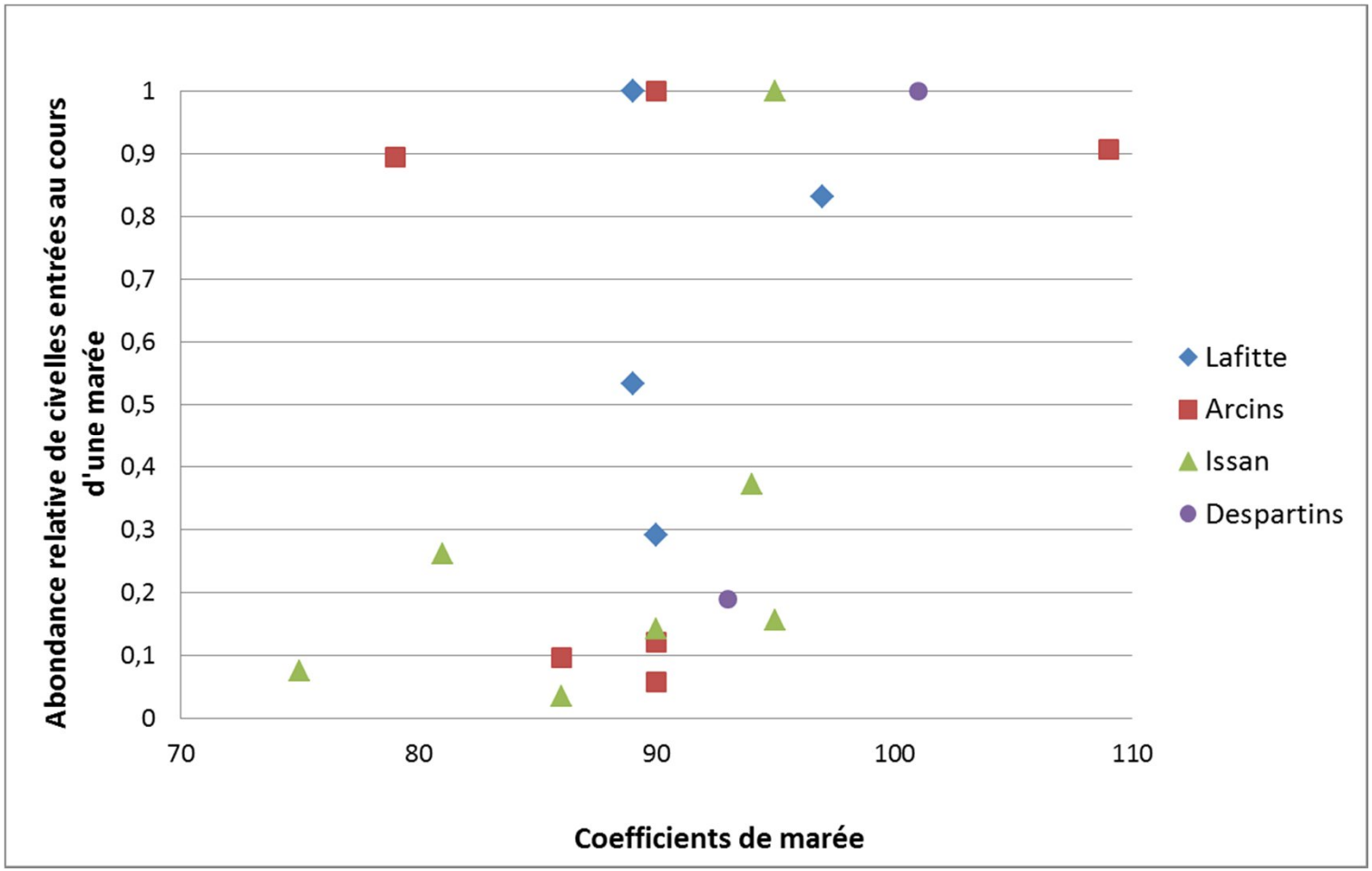
✓ Monitoring to check measures efficiency

- Suspended matter and glass eels display a similar rhythm



Fish-friendly management of first dams in the tidal area of the Gironde estuary, France (SW)

- ✓ **Monitoring to check measures efficiency**
  - ❑ No correlation between glass eel abundance and tidal coefficient



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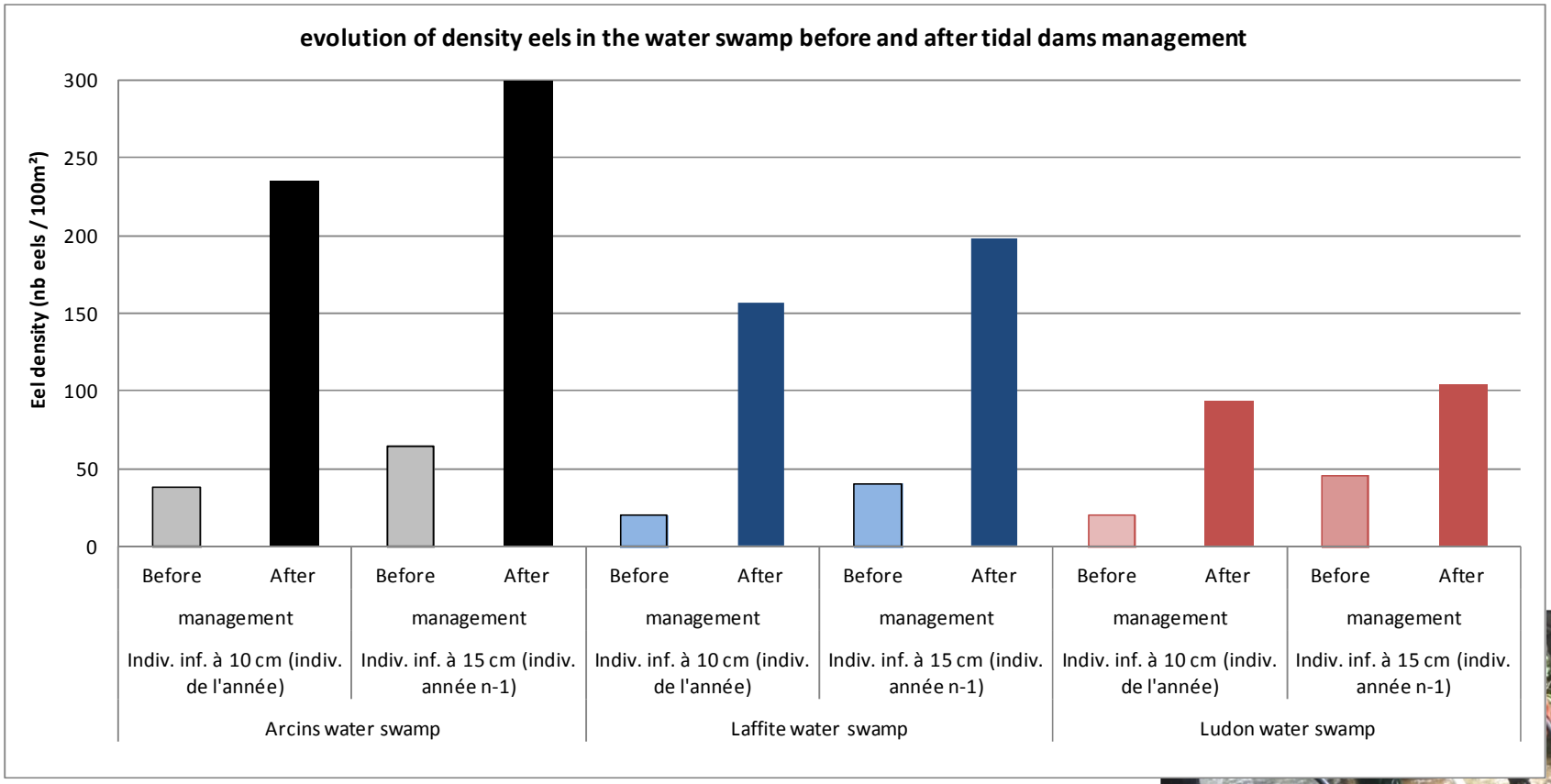
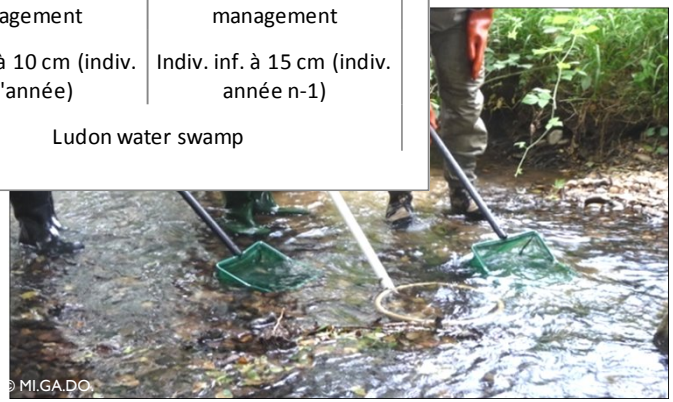
- **Electrofishing surveys are performed to monitor the trend of glass eel densities in the upstream marshes**





Significant increase of glass eel densities after implementation of the management measures

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The first benefits and inconvenients of these management system

Management system	Benefit	Inconvenient	Approximate cost
Wooden blocks	- Cost-effective - **System totally autonomous**	- Need to have the **same management all the year.** - Poor salinity or swamp accepting salinity - Install at less 6 blocks to not deform the doors	60€ /blocks, and 6 blocks by gate
Stiffeners	- **Allow different management according seasonal needs** - **Water volume admission lower** - Autonomous system, no apparent from exterior	- More expensive to install	1 500€ / stiffener (2 stiffeners for horizontal flag gate, and 4 with a tidal doors)
Optimized management of a window present in the tidal door	- **Allow different management according to seasonal needs or coefficient**	- **Poaching more easily** with windows in the top of the doors, -**Visible from the exterior** (water admission can afraid people) - **Important supervision to prevent manipulation from people**	3 500€ / window
Telescopic gate	-Management can be different according to season - Possibility **to conserve an important water level upstream and to manage it according to needs**.	-**Important supervision to prevent manipulation from people** - Visible from the exterior	

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Conclusions

- Those systems are cost-effective and compatible with upstream land-use for a high number of tidal weirs and areas

- Benefit to many species

- Such systems may be operating during all the migration season and all tidal coefficients (*no correlation with the tidal coefficient or distance to the sea*). Possibility of seasonal adjustements for some of them

- Other systems are probably possible and should be tested to comply with managers specific needs

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Thank you for your attention

Financial and technical partnerships

Le programme de restauration de l'anguille est cofinancé par l'Union Européenne. L'Europe s'engage en Aquitaine avec le Fonds européen de développement régional

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