PASSAGE EFFICIENCY AND BEHAVIOUR OF ADULT SEA LAMPREY IN A VERTICAL-SLOT FISHWAY

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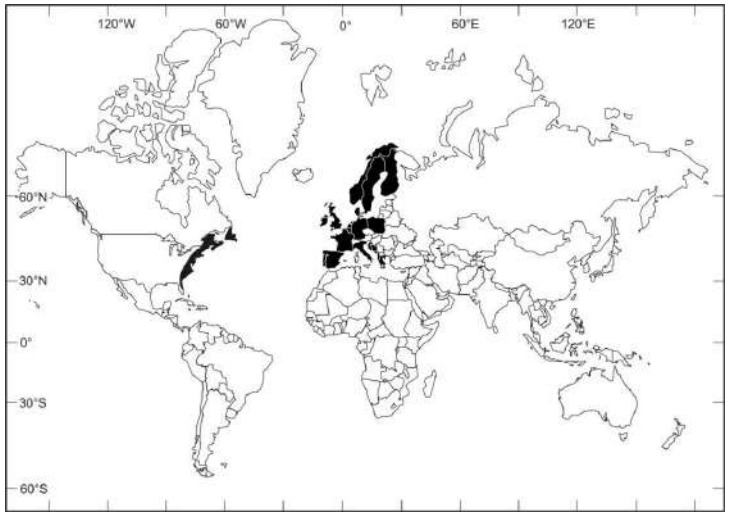
Outline

- Sea lamprey background
- Coimbra fishway (River Mondego) case study
- Fishway counts and efficiency
- Lamprey behaviour (downstream /negotiation / upstream)
- Pre a post operational monitoring
- Future rehabilitation measures

Sea lamprey background

- Anadromous species (1.2 m length; 2.3 kg weight)
- Worldwide distribution - both sides North Atlantic
- “Vulnerable” (Portuguese Red List, 2005)
- “Least concern” (Global IUCN Red List, 2014)
  - Pop. trend: stable

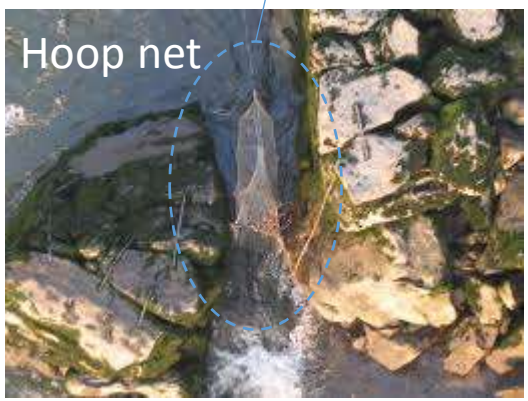


Threats - commercial fishing

FYKE net

Drift TRAMMEL net

PESQUEIRAS (traps)



Threats – obstacles to migration

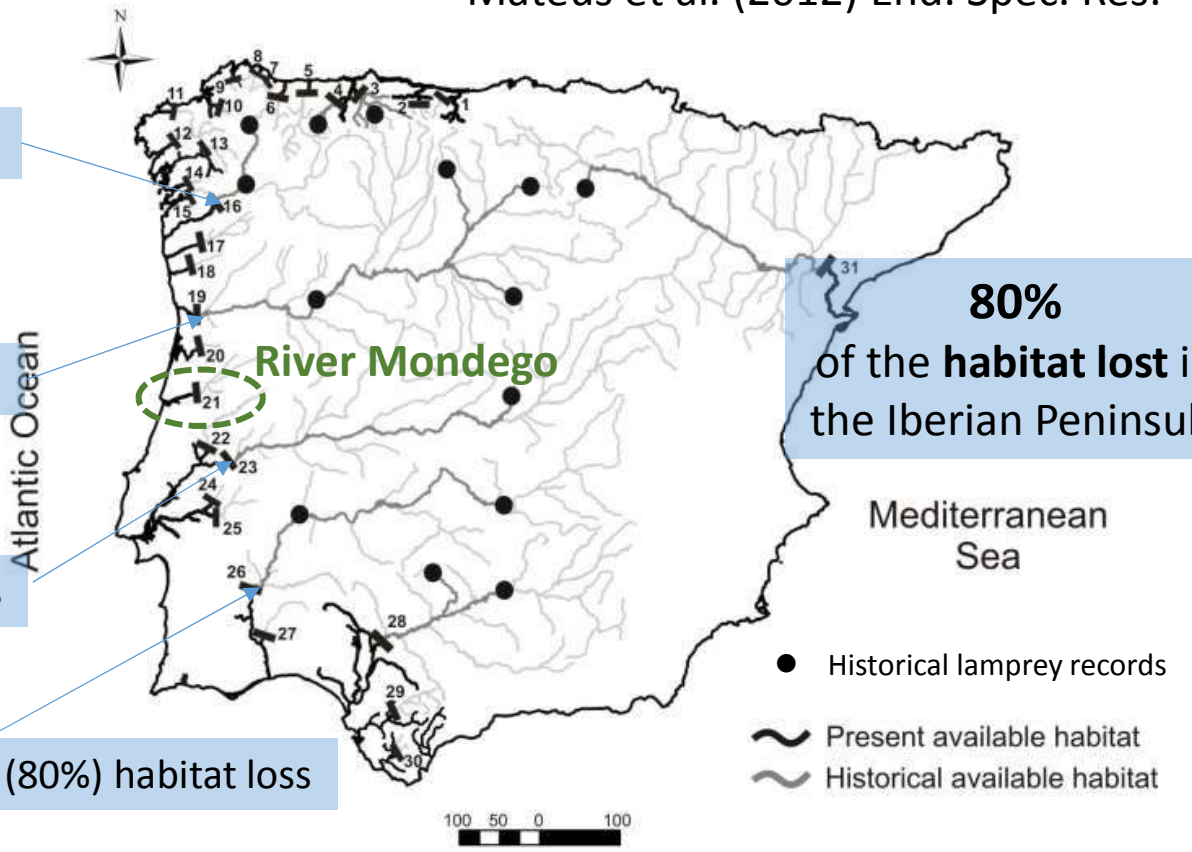
Mateus et al. (2012) End. Spec. Res.

MINHO – 174 km (69%) habitat loss

DOURO – 496 km (96%) habitat loss

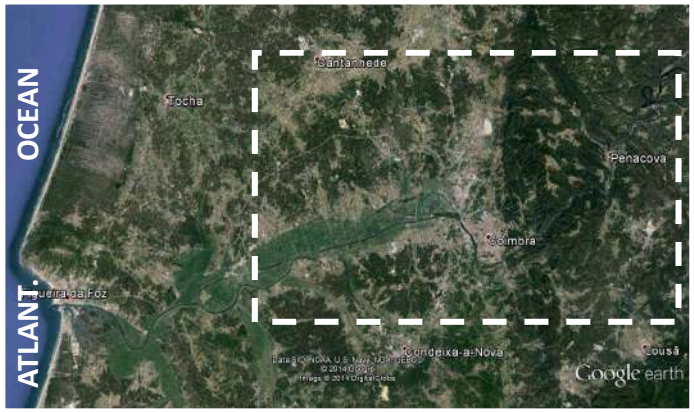
TEJO – 483 km (76%) habitat loss

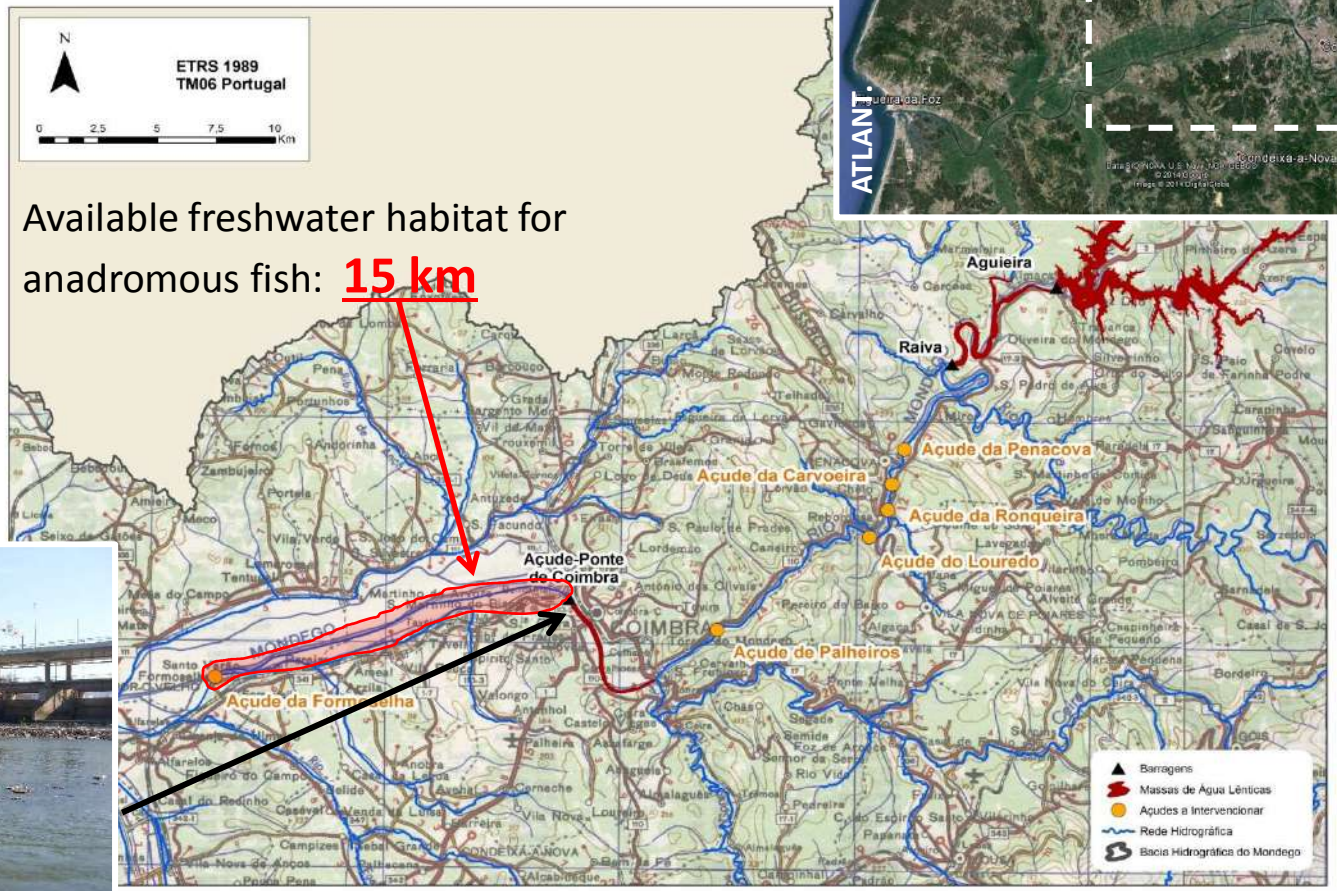
GUADIANA – 516 km (80%) habitat loss

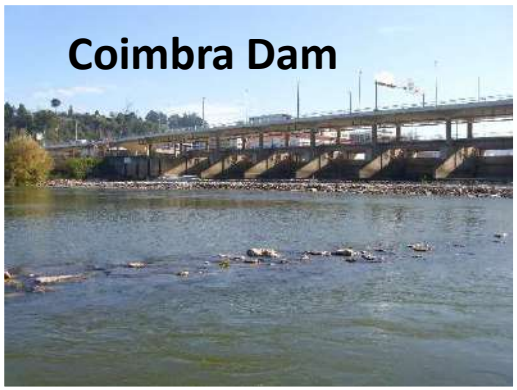


80%
of the **habitat lost** in the Iberian Peninsula

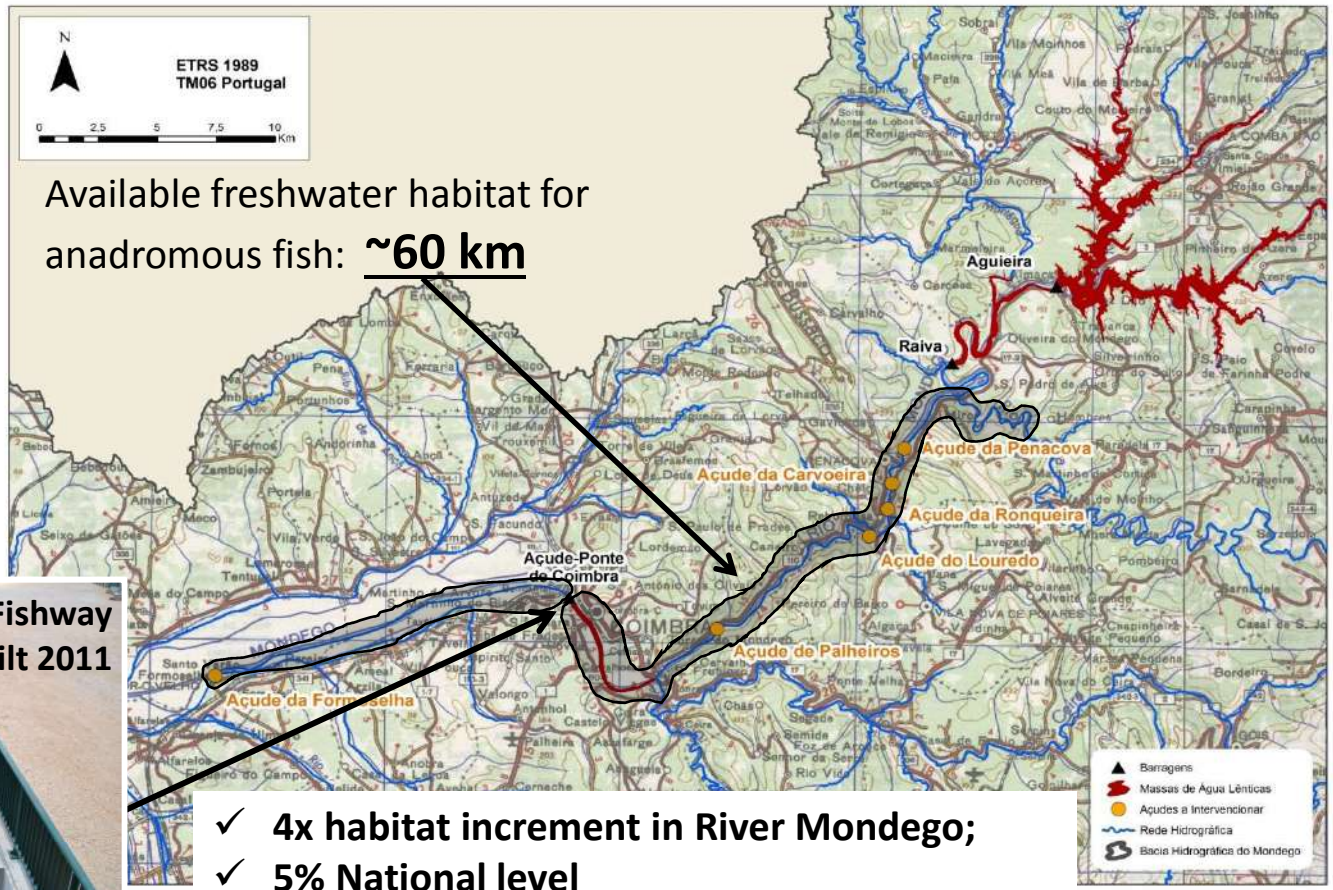
River Mondego







River Mondego



- ✓ **4x habitat increment in River Mondego;**
- ✓ **5% National level**

Coimbra Dam/fishway

Top view

FLOW

ENTRANCE

FLOW

EXIT

Coimbra Fishway

Monitoring building

Passagem para peixes

Coimbra

Coimbra fishway
Entrance

Passagem para peixes
Coimbra

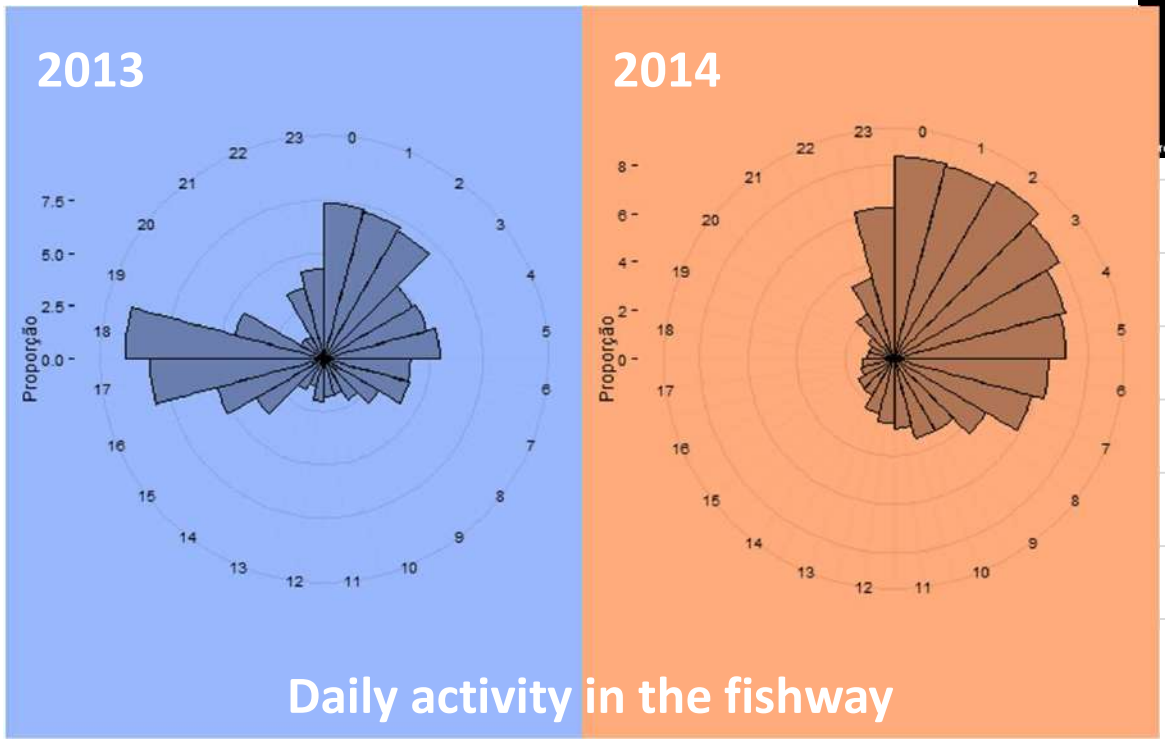
Fishway characteristics	
Length	125m
Nº pools	23
Pool dim.	4.5x3.0m
Pool depth	1.5-2.0m
Flow discharge	1-1.5m^3s^{-1}
Attraction flow	+0.5-1.0m^3s^{-1}
Current veloc. (slots)	1.2-1.5ms^{-1}
Dissipated power	<150Watt/m^3

2.5m^3s^{-1}

Passagem para peixes
Coimbra

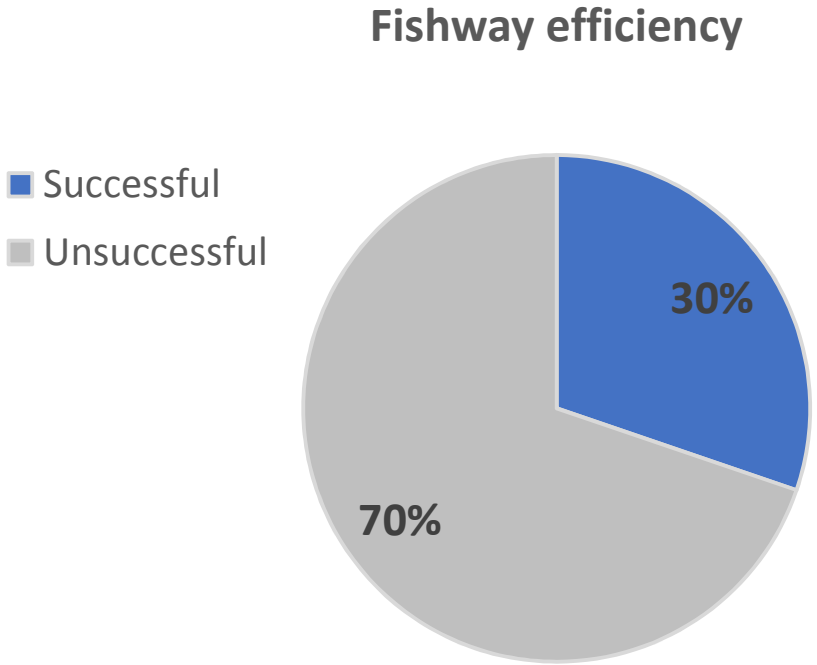
Fishway lamprey counts

LAMPREY counts



Fishway efficiency for lampreys

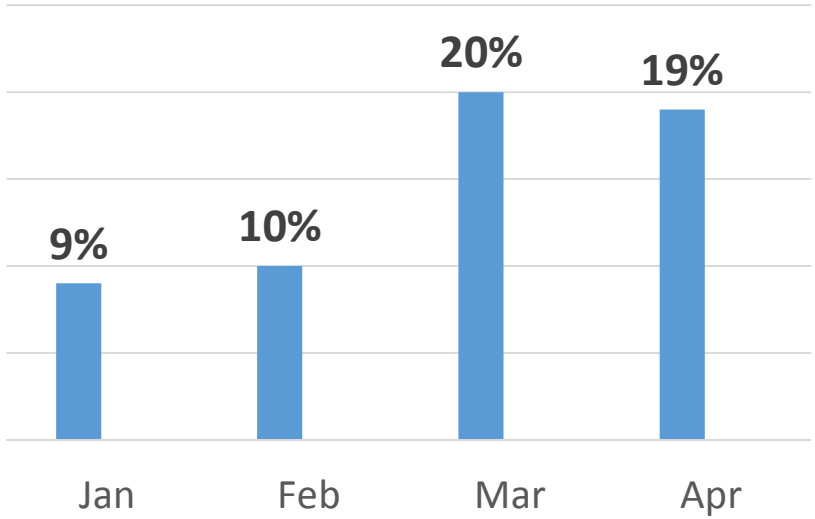
PIT tagging 2014 spawning season

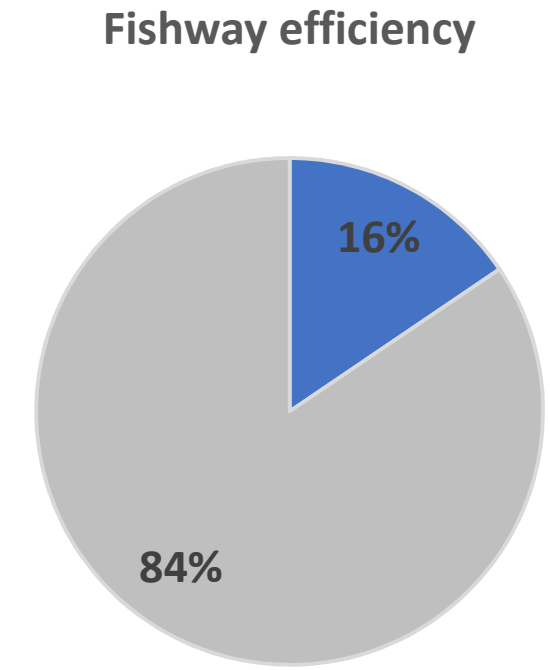


#225 sea lampreys **PIT tagged** in April 2014

Fishway efficiency for lampreys

PIT tagging 2015 spawning season

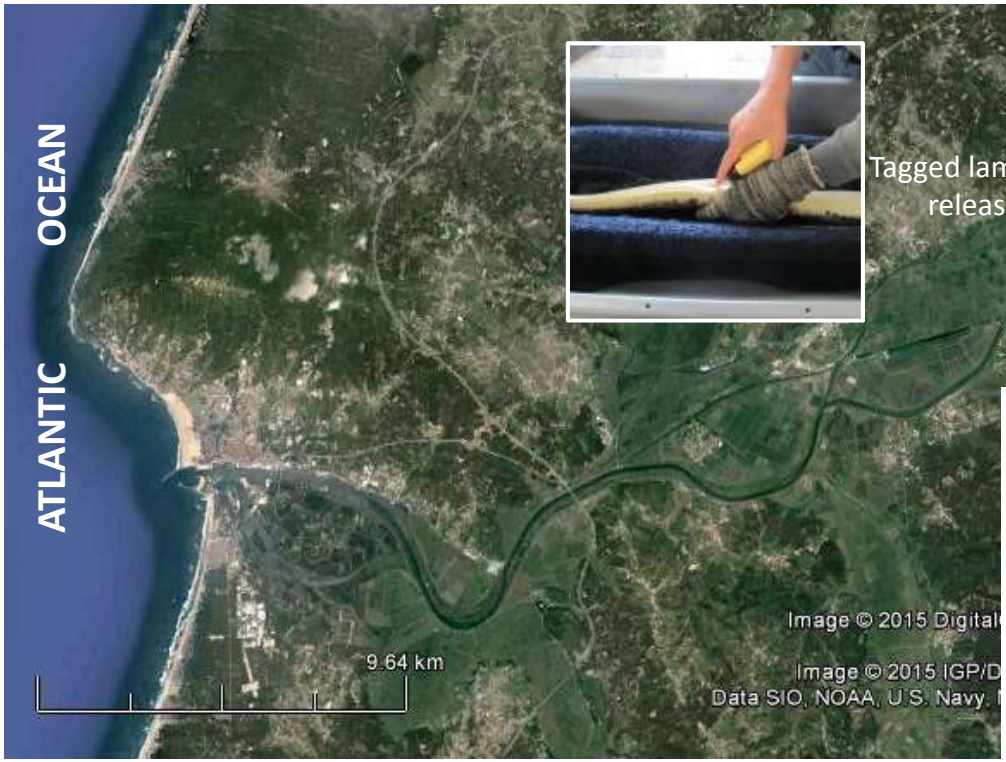




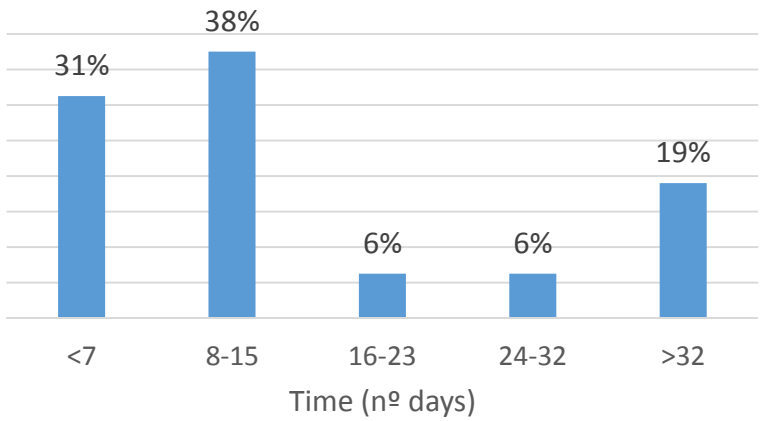
#103 sea lampreys **PIT tagged** Jan-Apr 2015

Lamprey behaviour

Downstream behavior - PIT telemetry

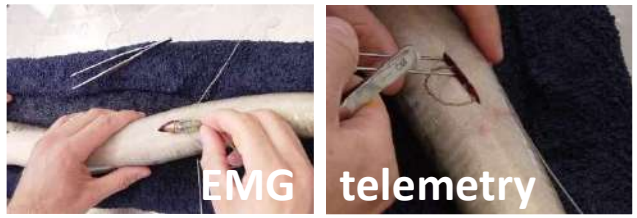


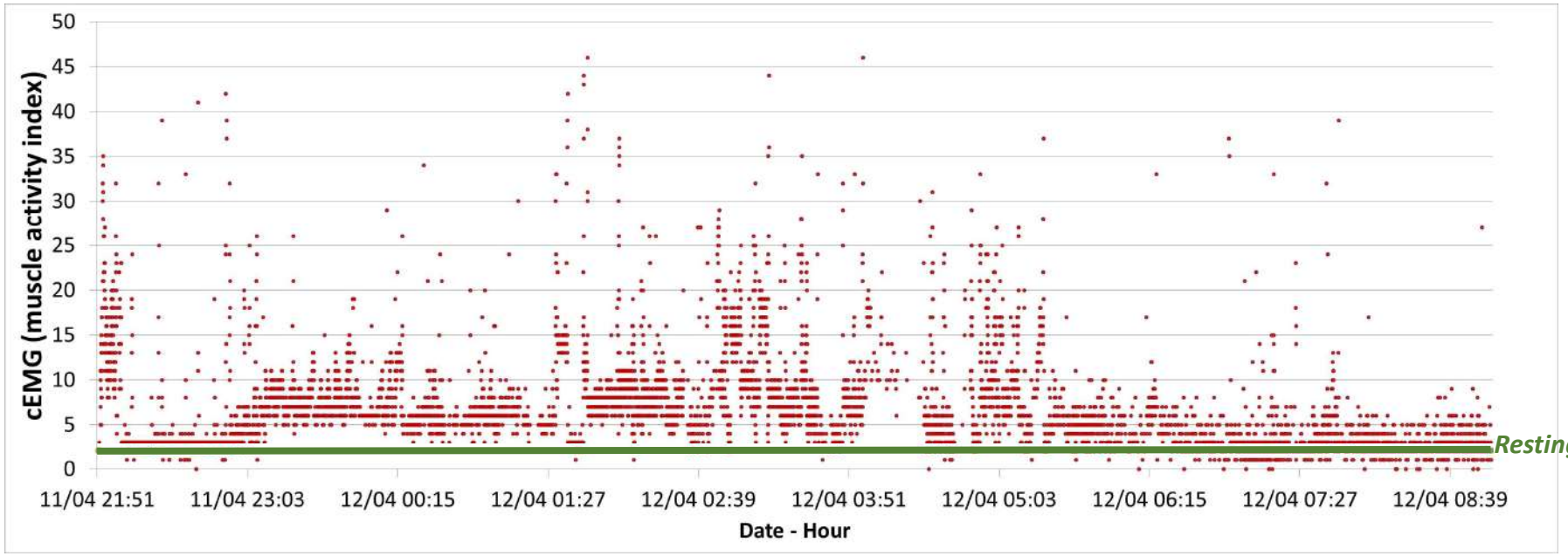
Time between release and 1st detection at the fishway PIT antenna



Lamprey behaviour

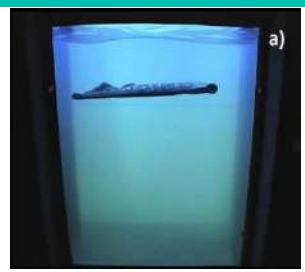
Downstream behavior – EMG radio telemetry



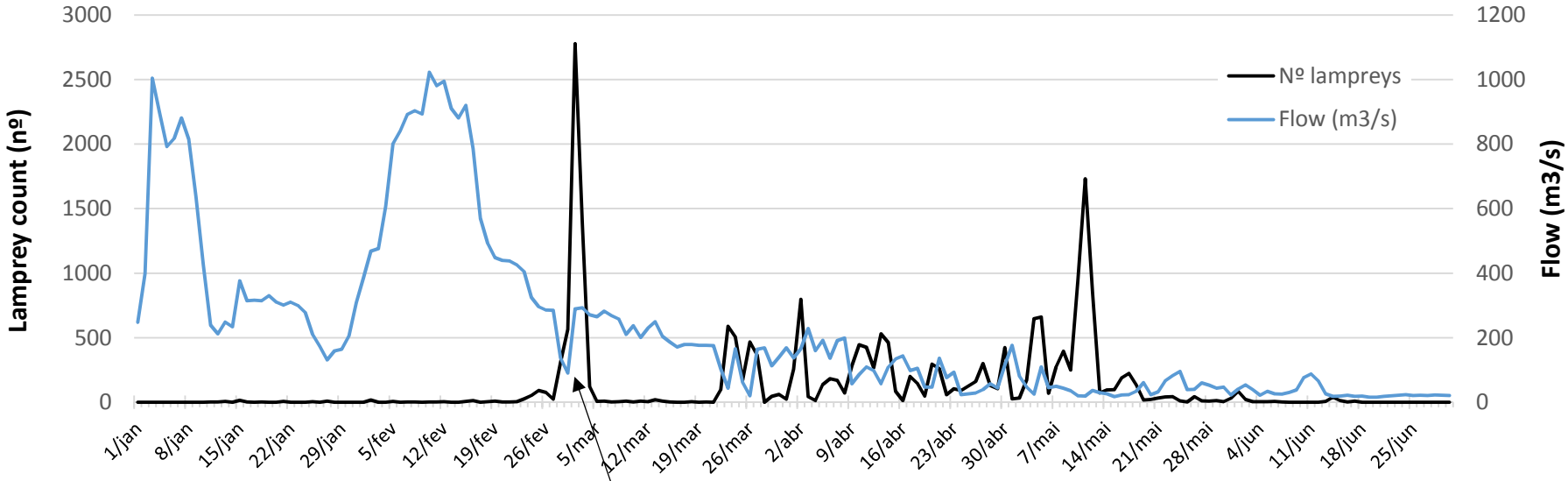


Lamprey behaviour

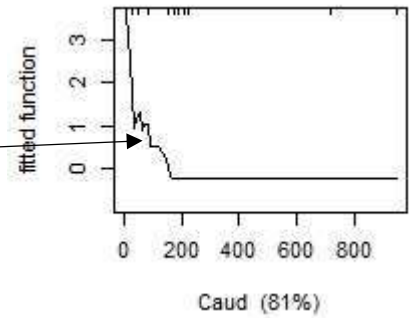
Downstream behavior - attraction efficiency



2014 spawning season



Fishway **efficiency decreases** with **high flows (<50-100m³s⁻¹)**



Statistical Model
(developed with independent data 2013)

Lamprey behaviour

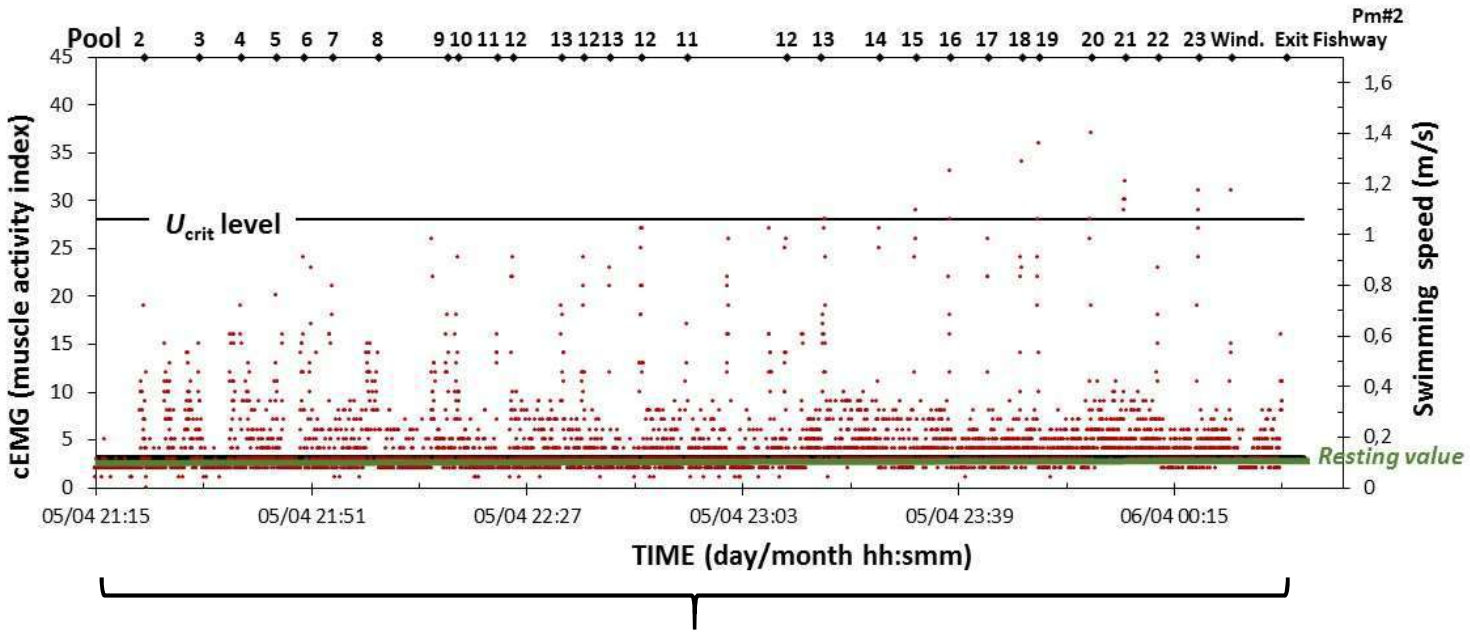
Downstream behavior - attraction efficiency

400 m³/s
(flood flow)

20 m³/s
(regular flow)

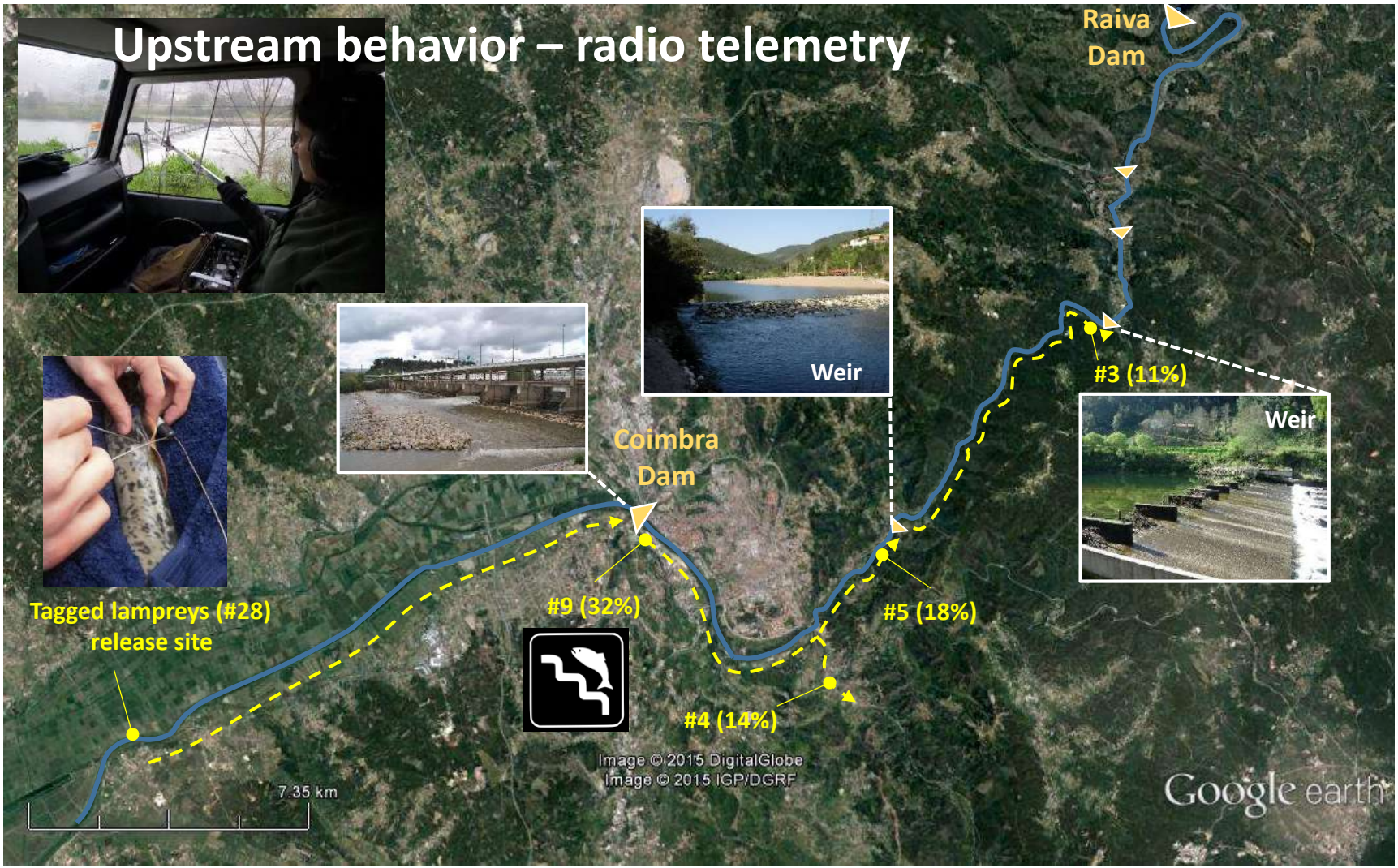
Lamprey behaviour

Fishway behavior – EMG radio telemetry



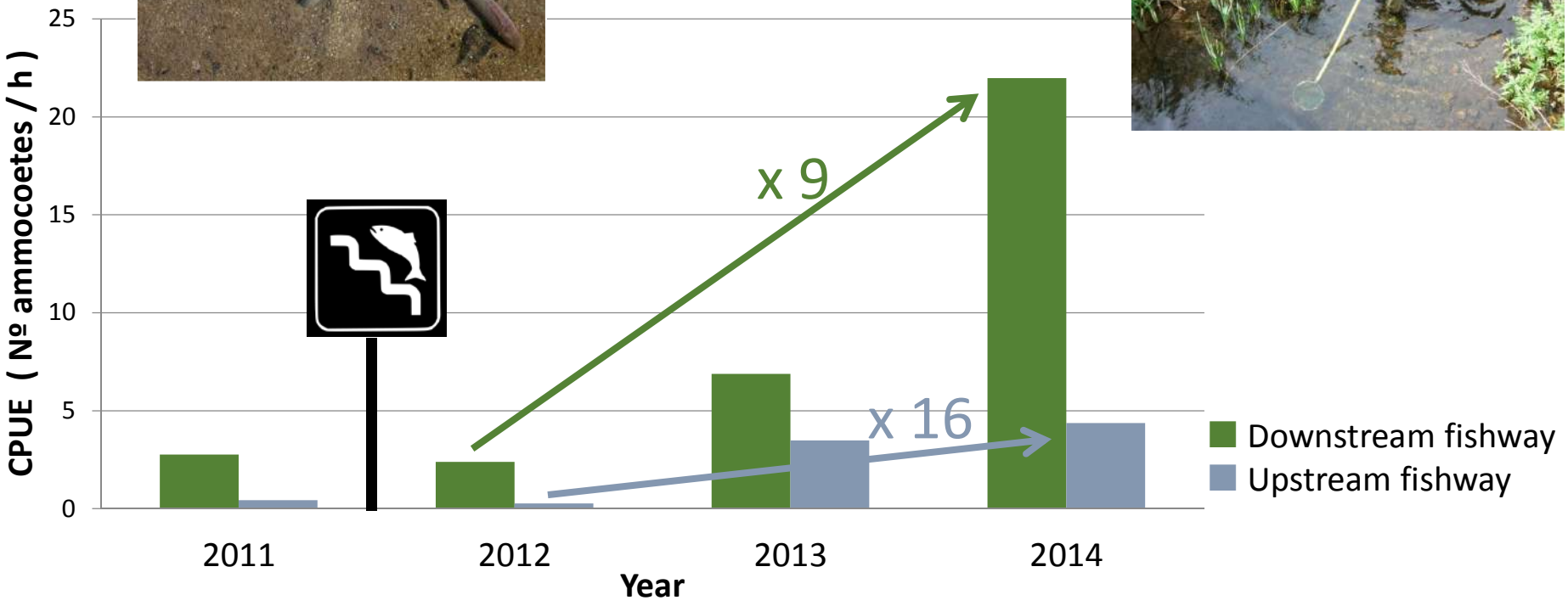
~3 h to negotiate

Lamprey behaviour



Is it working?

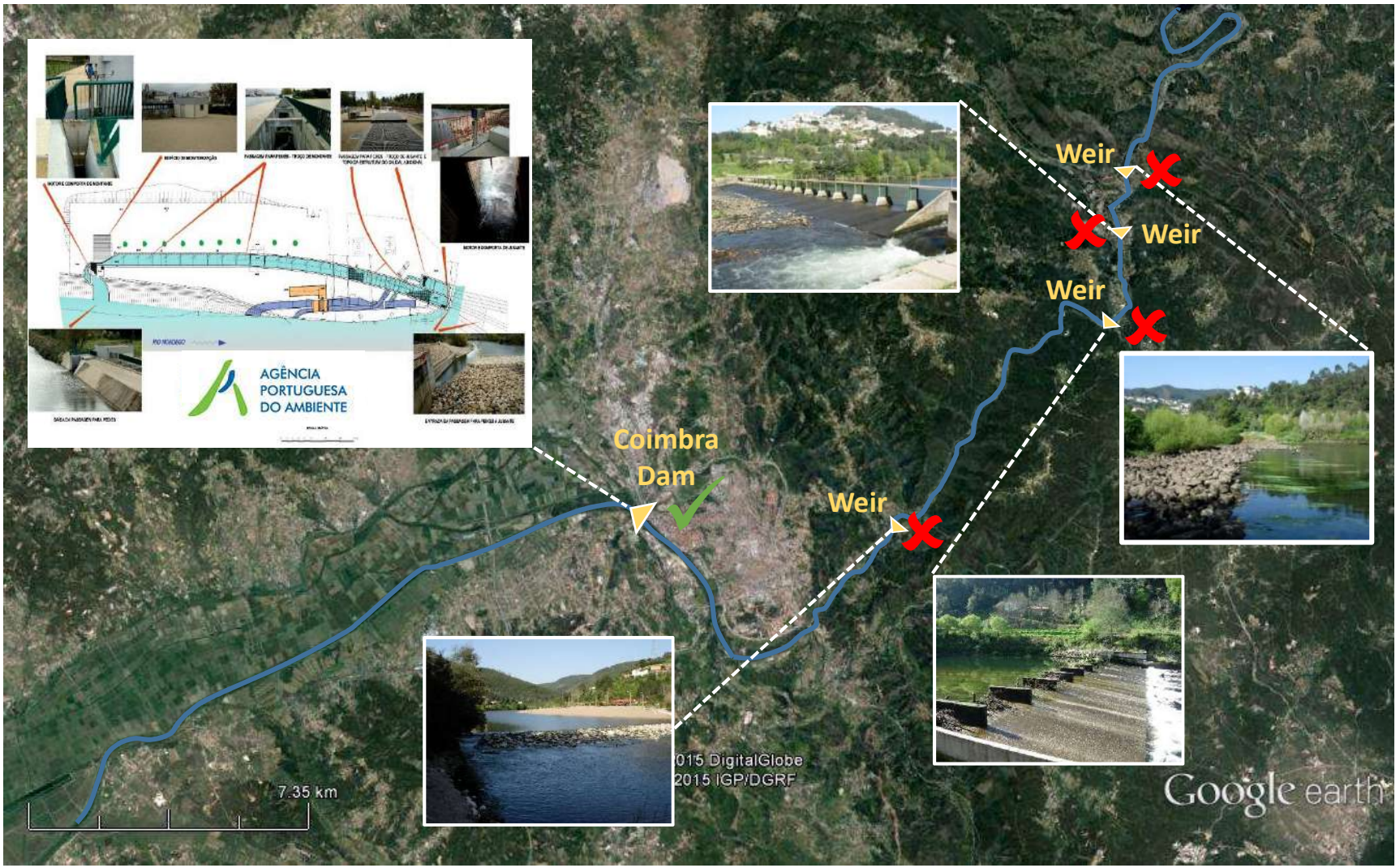
Pre a post operational monitoring – lamprey abundance



Conclusions

- Efficiency range from 16-30%, varies along the spawning season and between years;
- Between 1 day and 2 weeks to transpose/find the fishway;
- Attraction efficiency is highly conditioned by flow ⇨ manage flow release to increase it;
- ~3h to negotiate the fishway with relatively reduced muscle effort;
- Considerable increase in ammocoete abundance in the upstream stretch during post operational period;
- Additional obstacles that need to be solve!

Future Work - more unblocking



Future Work - Habitat rehabilitation Project

http://www.rhpdm.uevora.pt/

Acknowledgements

Funding:

- Coimbra fishway monitoring program (http://apambiente.wix.com/pppeixescoimbra)
- PROMAR project - Habitat restoration for diadromous fish in River Mondego (http://www.rhpdm.uevora.pt/)