



Overcoming river fragmentation

The need for harmonized and standardized procedures to operate and monitor fish passage in large river systems - the case of sturgeons

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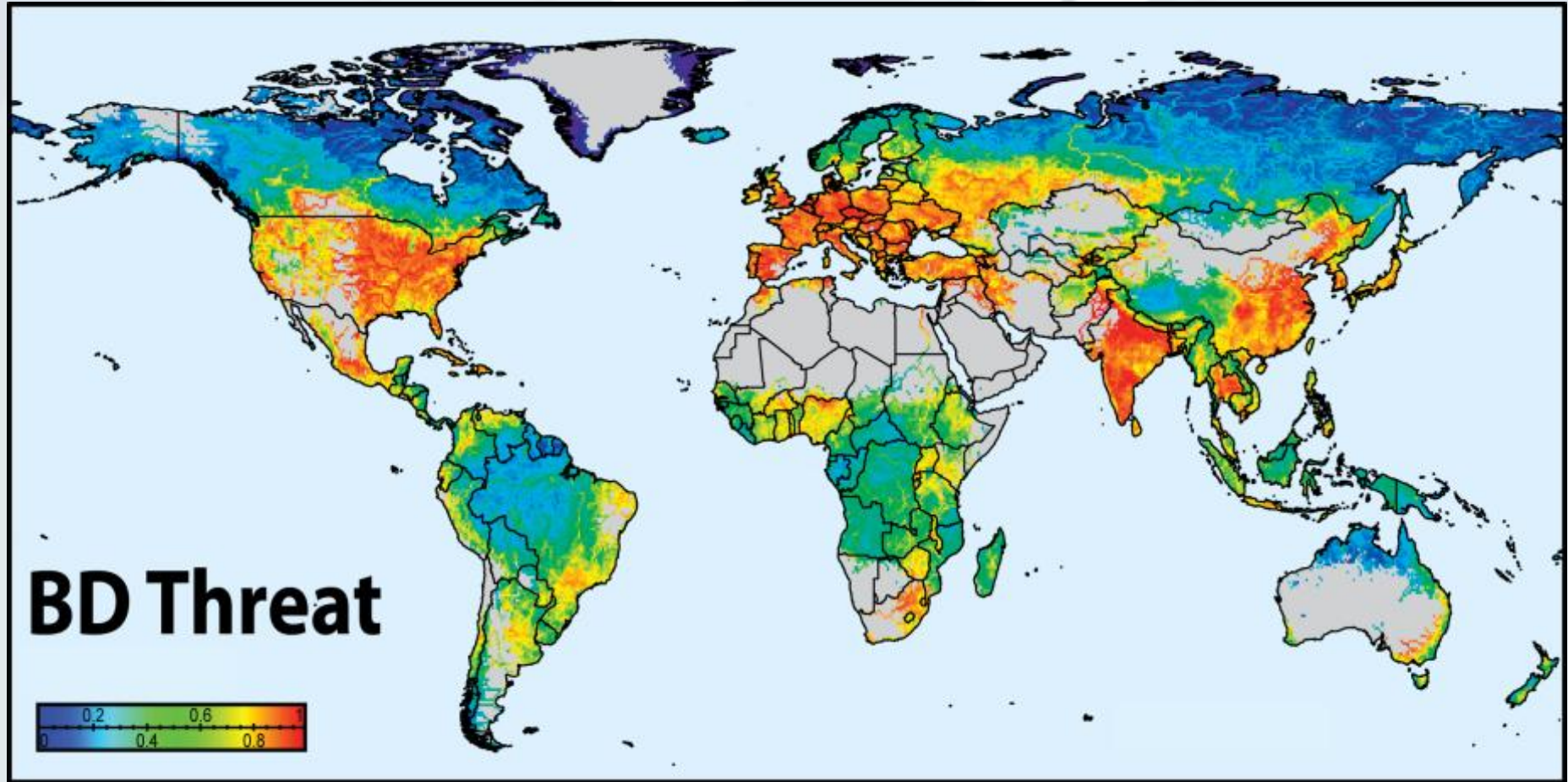


Overview

- What is river fragmentation?
- River fragmentation in the Baltic
- Effects and mitigation measures
- Effectiveness of mitigation
- Monitoring
- Conclusions



Human impacts



«The Global Freshwater Fish Crisis»



<http://www.iucnredlist.org/>

- Freshwaters represent the most threatened of all ecosystems
- 5 major threats:
 1. pollution,
 2. **damming**,
 3. wetland drainage and water abstraction,
 4. unsustainable fishery
 5. alien species
- "Large dams ... have had major impacts upon species in large rivers and have led to local extinction of numerous migratory species," (IUCN,
- 36 % of 5,685 freshwater fish species assessed are threatened
- all but one of the eight European sturgeon species are Critically Endangered, some of them locally extinct



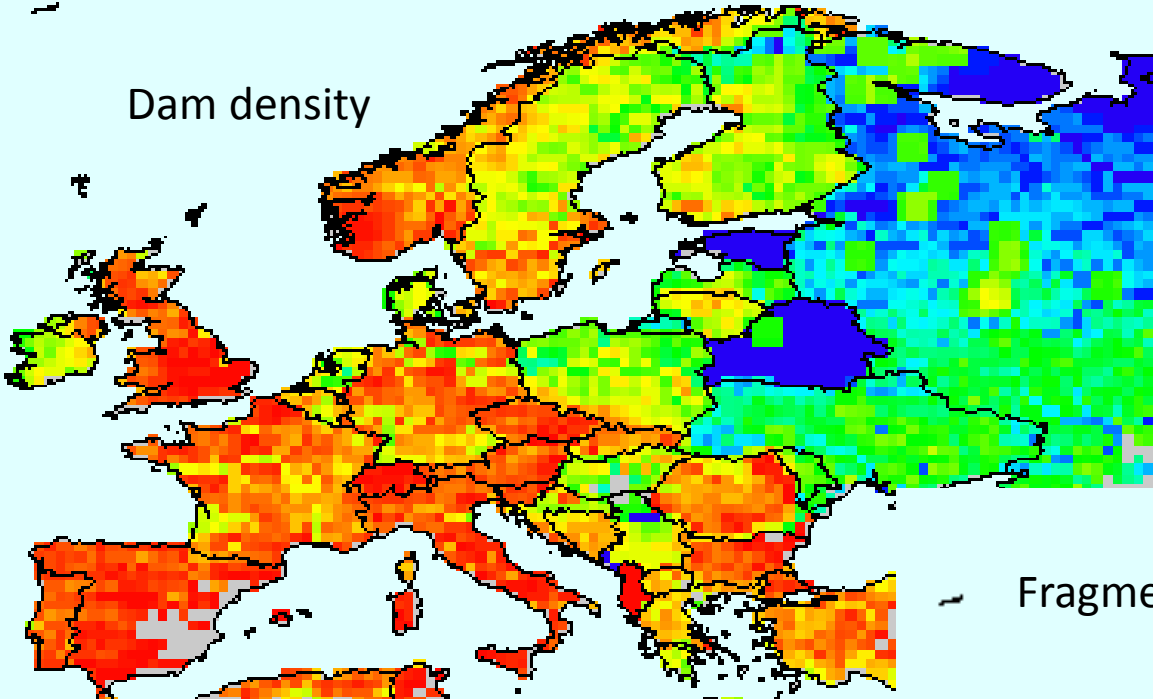
Why are migrations fundamental?

- Different fish species might show very different migration (life) histories and can take place over different spatial and temporal scales, including long distance migrations between marine and freshwater habitats.
- Predominantly, fish migrations are associated with:
 - Spawning
 - Post-spawning
 - Larval displacement
 - Feeding
 - Refuge (compensation after displacement, wintering/dry season)
 - Exploration of new habitats
- **Fish Migrations ensure and maximise reproduction, growth and survival (Northcote, 1978; 1984)**

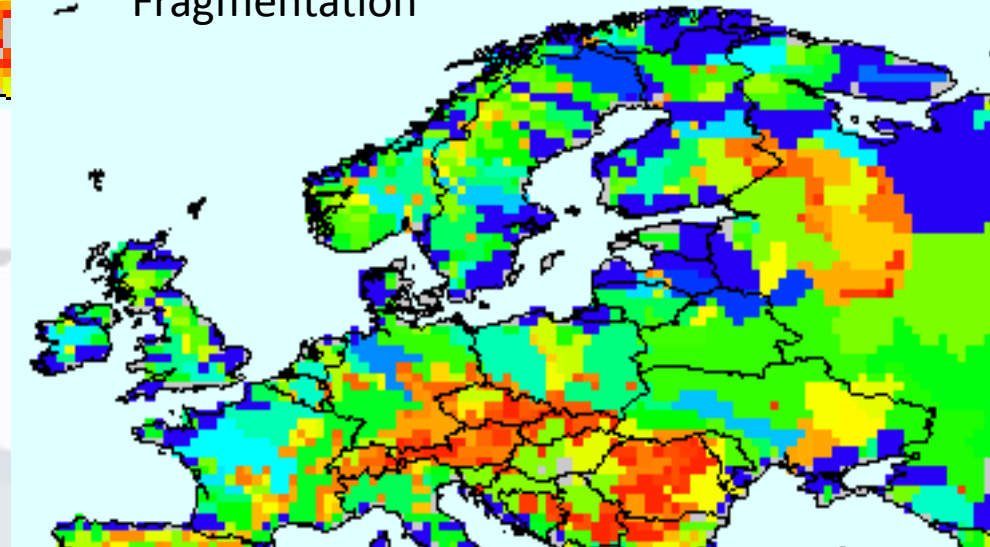
River fragmentation in the Baltic

[t.net](http://www.t.net)

Dam density

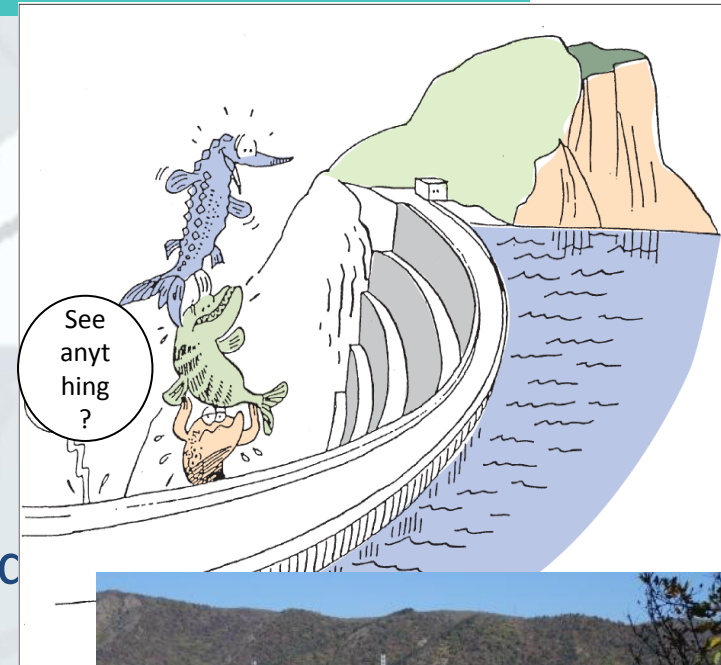


Fragmentation



What is river fragmentation?

- Restriction of longitudinal and/or lateral connectivity
 - Classic example: dams, weirs
- Also:
 - Diking: Isolation of floodplain (palaeopotamon)
 - Groynes and channelization: increased current velocities prevent species migration of poorly mobile species
 - Pollution, channelization: isolation of functional habitat if core dispersal areas are separated too far to become functional
 - Water abstraction: removal of species or temporal river remaining



WFD Status Report 2004

Surface Water Bodies Not At Risk

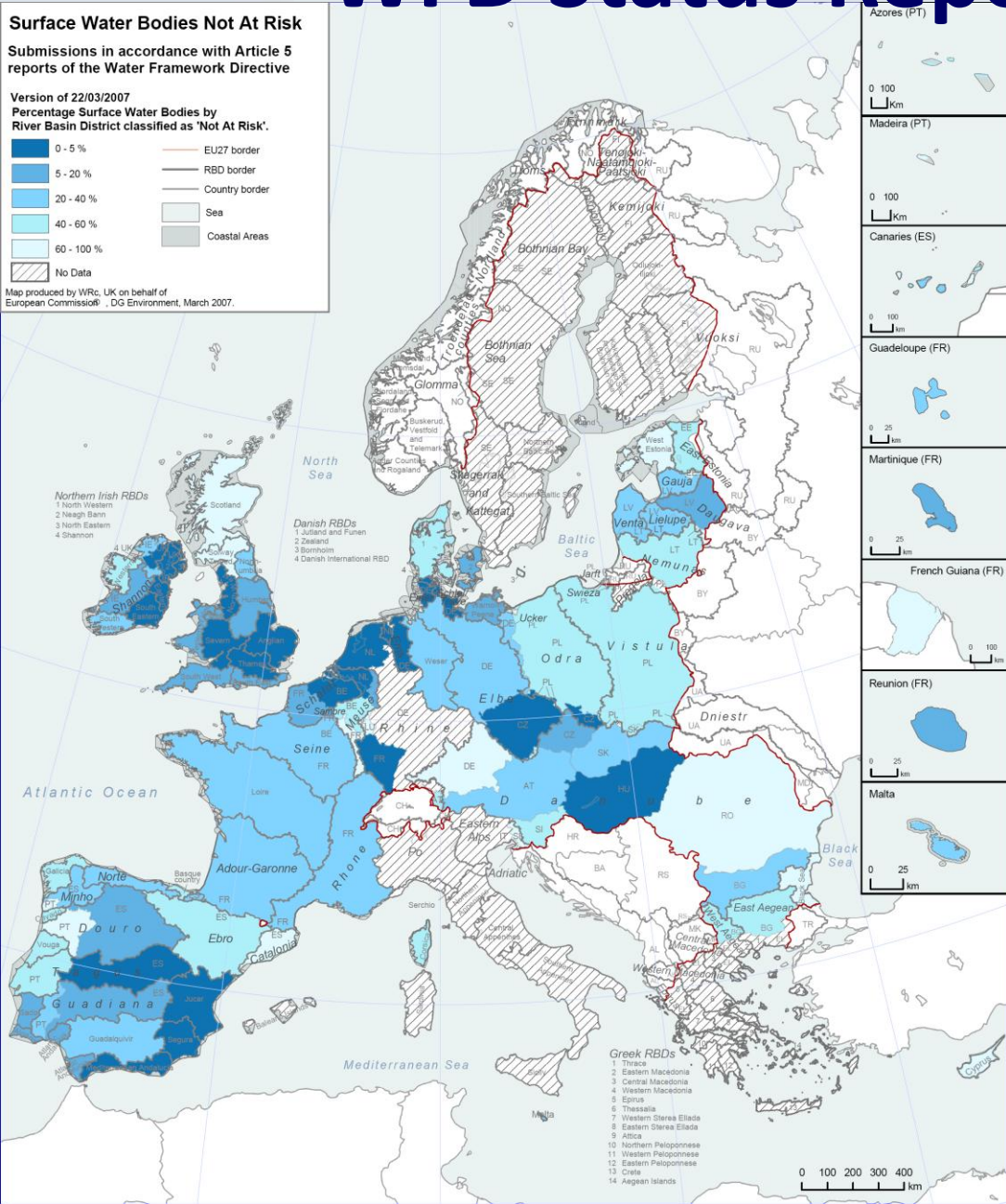
Submissions in accordance with Article 5 reports of the Water Framework Directive

Version of 22/03/2007

Percentage Surface Water Bodies by River Basin District classified as 'Not At Risk'.



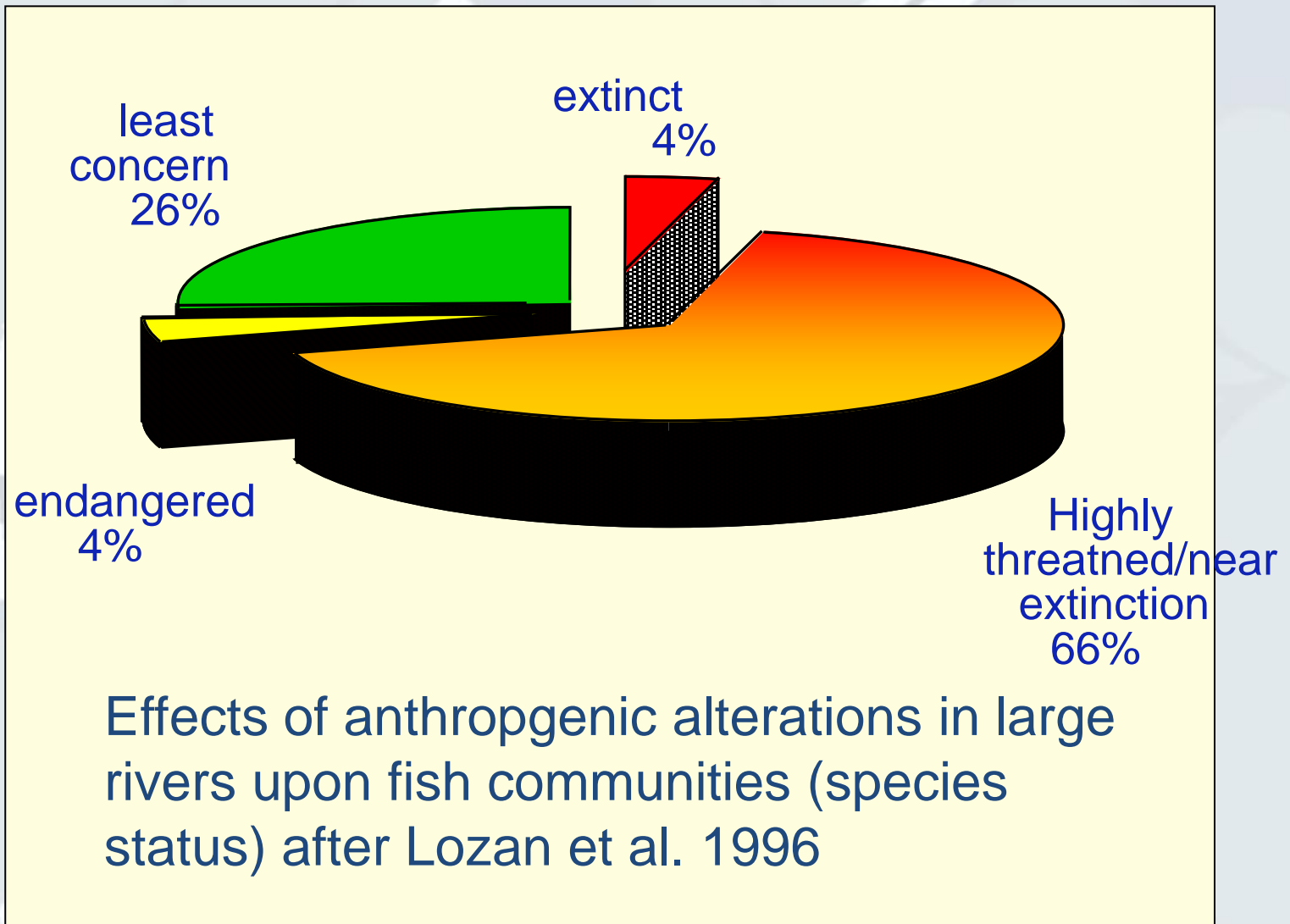
Map produced by WRc, UK on behalf of European Commission DG Environment, March 2007.



EU member states

between 30-96% of all rivers at risk to fail the WFD aims

Effects...



WFD: “Ecological connectivity”



- A river/ construction is freely passable
 - linearly and laterally up and downstream for all typical aquatic organisms
 - Regardless of size, ontogenetic phase, and migration direction
 - This also includes the transport of substrate and matter (river continuum) and
 - is essential type-specific development and stability of aquatic communities

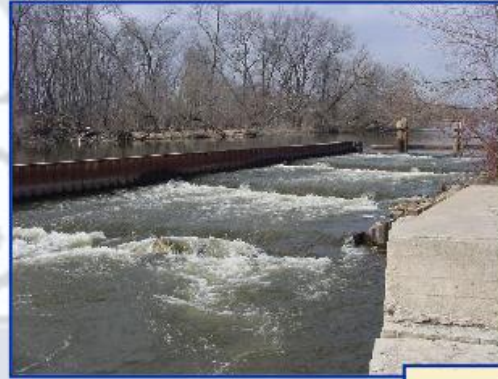
To facilitate migration...

1. Decommissioning of dams and weirs should be the prime target

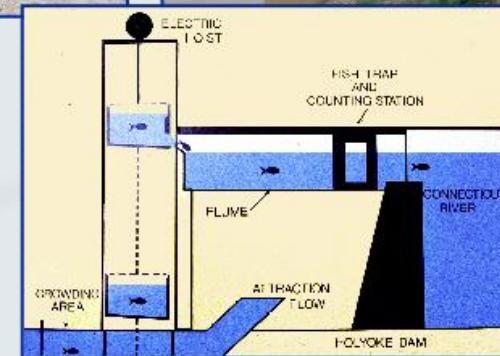


To facilitate migration...

1. Decommissioning of dams and weirs should be the prime target
2. Otherwise: facilitation of fish passage to be secured



- rock ramps (full stream width),
- fish ramps (partial stream width),
- fish pass (separated chute)
- fish bypass (alternative water course)
- fish locks
- fish lifts and
- trap & carry

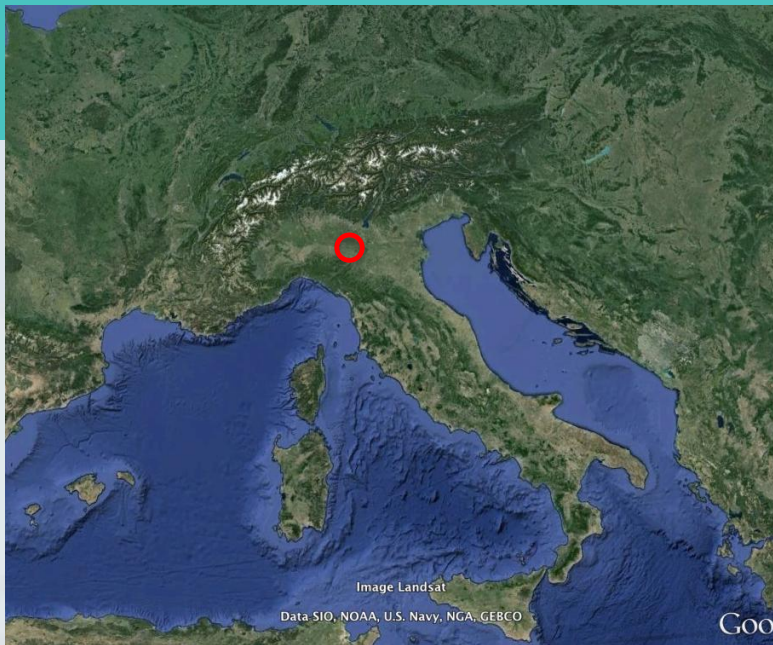


Fish pass design must be based on internationally recognized criteria



- Larinier, M.; J.P. Porcher; F. Travade & C. Gosset (1994): Passes à poissons - Expertises et conception des ouvrages de franchissement. Collection „Mise au point“; Conseil Supérieur de la Pêche, Paris, 336 p.
- DVWK / FAO (2002): Fish passes - Design, dimensions and monitoring. Food and Agriculture Organization of the United Nations in arrangement with DVWK, Rome.
- DWA - Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V. (2005): Fish Protection Technologies and Downstream Fishways - Dimensioning, Design, Effectiveness Inspection. DWA Top-ics, July 2005
- DWA - Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V. (2014): Merkblatt M-509: Fischaufstiegsanlagen und fischpassierbare Bauwerke - Gestaltung, Bemessung, Qualitätssicherung. Hennef, 334 p.

Every choice differing from the criteria reported above must be supported by **updated scientific references**.



Life 1 nat/it/188

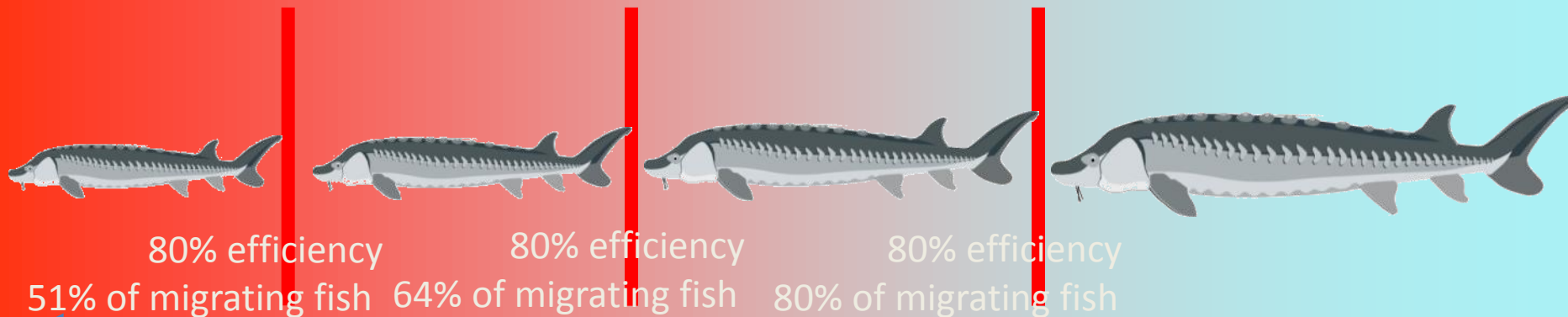
Restoring connectivity in Po River basin
opening migratory route for *Acipenser naccarii**
and 10 fish species in Annex II



<http://www.life-conflupo.eu/prj2013/index.php?lang=en&Itemid=115>

Migration assisting structures

- Are intended to facilitate up- and downstream migration at obstacles



species composition and size distribution

- Must be adapted to capacities of species in question

Fish pass efficiency monitoring



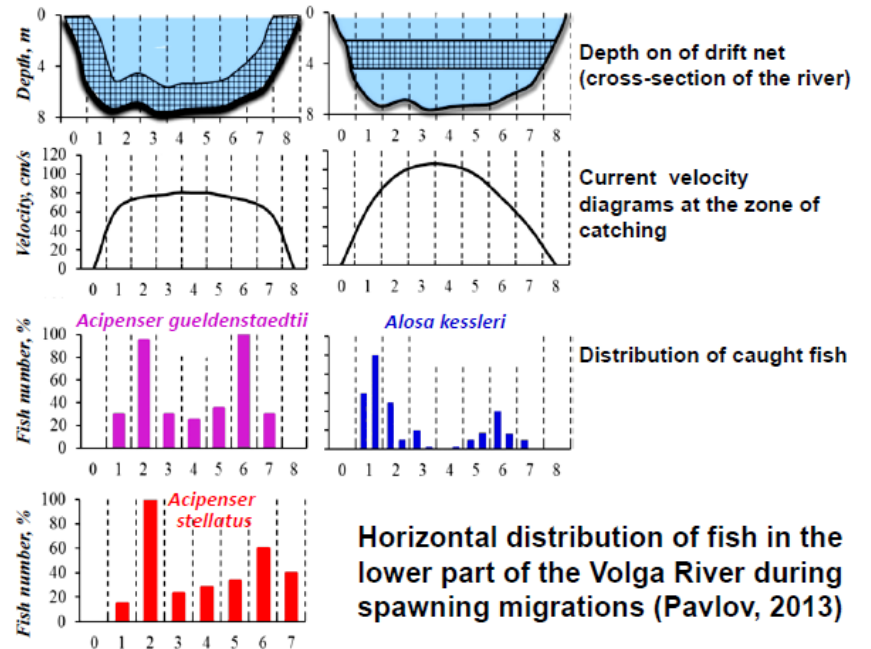
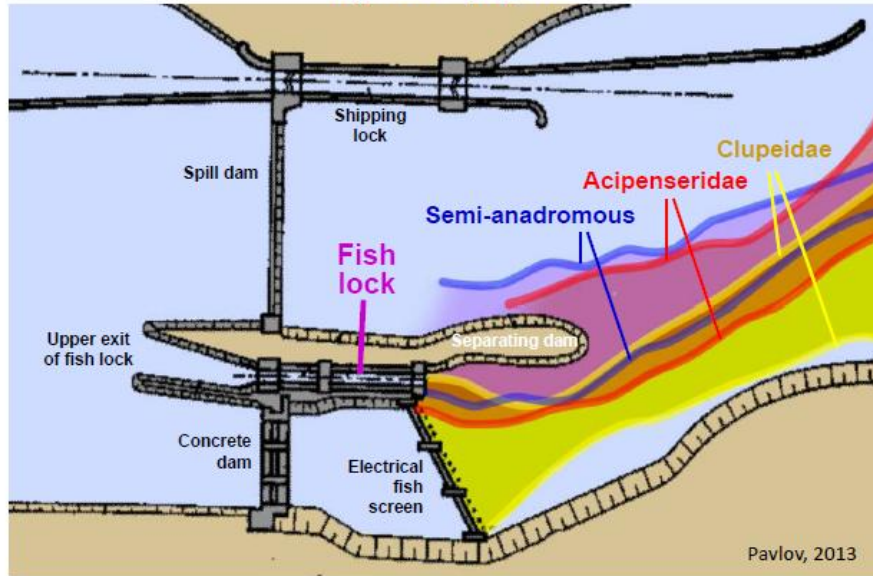
- designed scientifically, using adequate state-of-the-art techniques (e.g. telemetry tracking, RFID pit-tags, etc.) and in case of negative results, adequate **modifications to the fish pass** have be carried out
- Research institutes with a clear background in this specific field must be involved in the design and monitoring phases of the project using standardized procedures.

Important prerequisites

- Knowledge on behaviour, needed for the design of fish passes for (different) European sturgeons
- Life-cycle & population parameters (critical phases & habitats for reproduction and survival;
- Habitat use during different ages and seasons, population sizes etc.)
- Assessment of habitat availability – how much of which type of habitat is still available/required?
- Management of illegal fishery
- Regional and multilateral cooperation
- Support and management of long-term efforts

Fish behaviour

Approach zones of migratory fish to Kochetovskaya hydraulic project



Effectiveness of mitigation

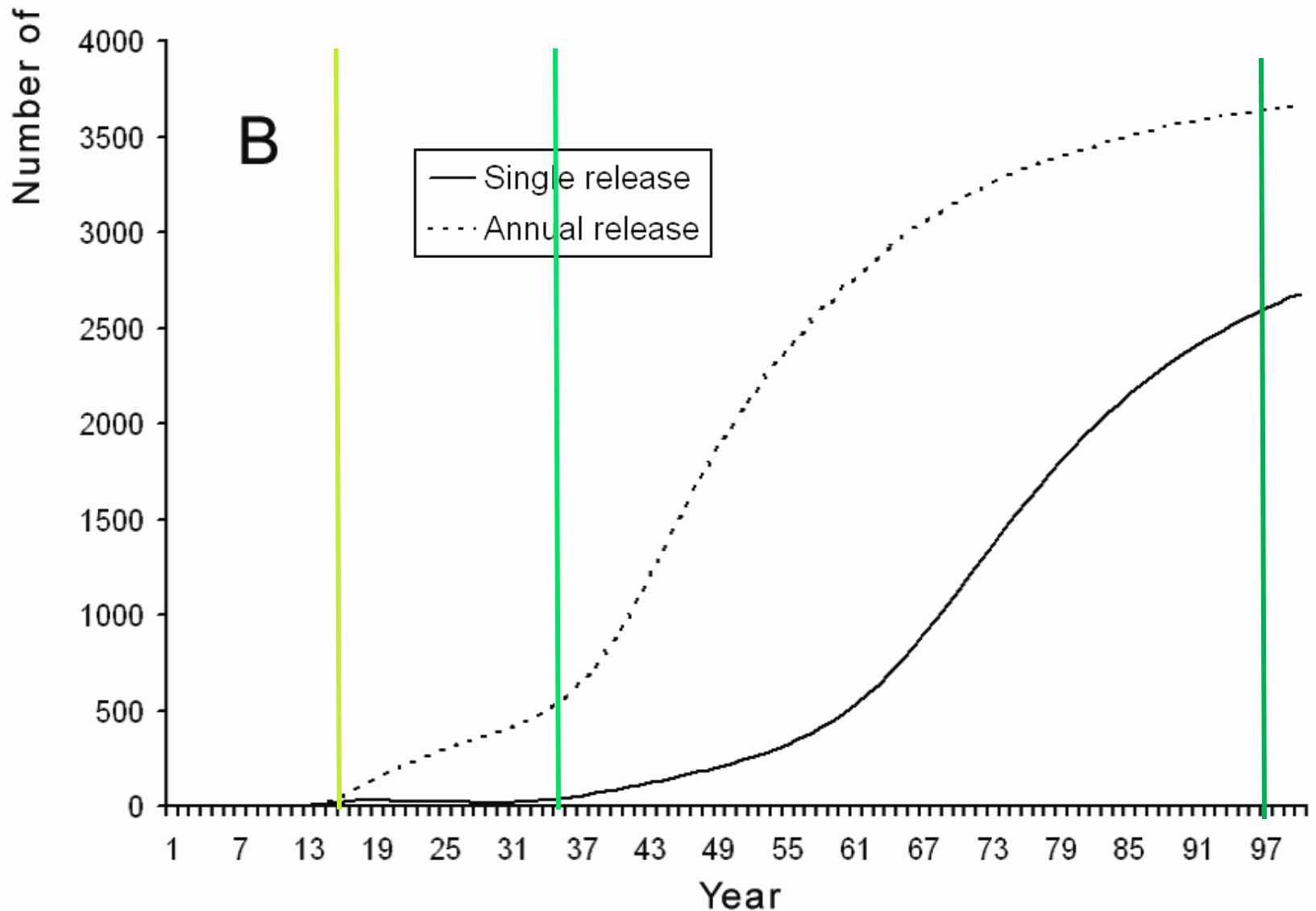
- Target oriented measures are necessary to promote success

Factor	Criteria	Impact
size	Requirement for maneuverability, sustained swimming speed	Dimension of fish pass (depth, width, length), max. swimming capacity
migration behaviour	attracting current, horizontal distribution , time of day, turbulence	Location of fish pass entrance, fish pass depth, dH
swimming capacity	Flow velocity, swimming distance, recovery period, predation risk	Max. flow, roughness of border layer, distance between resting areas

- Monitoring must be carried out under different operational parameters to verify the accomplishment of the target to ensure migration during 90% of the year (324 days)

Timeframe for sturgeon rehabilitation

(n. Jaric & Gessner 2013)



Monitoring requirements

- Multiannual effort
- Taking into consideration the objective of the mitigation measures
- Cover different operational conditions (discharge, season, temperature),
- Quantitative assessment of up- and downstream movement and efficiency
- Including assessment of population segment attempting to migrate
- Standardized approach to allow comparison of results and identification of impacts

Conclusions

- Remediation of fish populations requires information on population structure, community structure, habitat availability and utilization
- These background data need a standardized assessment to be comparable (Helcom TFMF)
- Mitigation measures must be associated with determination of efficiency to allow management adjustment
- The permit must include an option to alter the design if the aim is not fully accomplished
- Interaction between projects to increase efficiency and outreach

Thank you for your attention!

