FISHGUARD

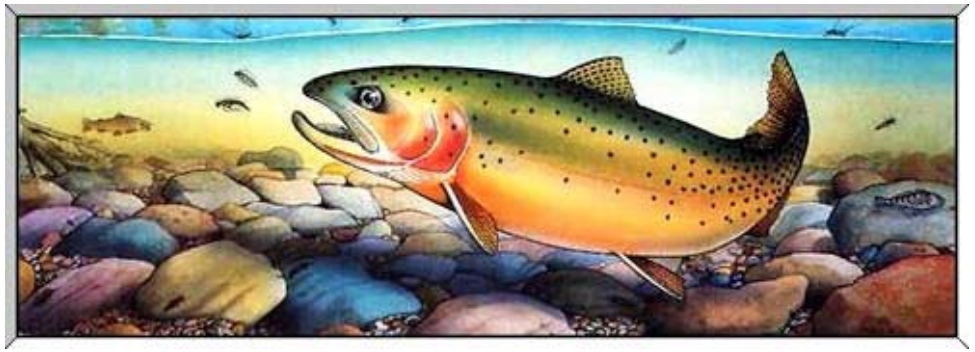
Impact assessment and remediation of anthropogenic interventions on fish populations.

Partners

- Ecophysiology, Biochemistry and Toxicology, University of Antwerp (UA)
  - Subcontractor: Hydraulic Laboratory (AWZ)
- Institute of Forest and Game Management (IBW)
  - Subcontractor: Institute of Nature Conservation (IN).
- Laboratory for Aquatic Ecology, Catholic University of Leuven (KUL).
- Genetic Unit, University of Louvain-la-Neuve (UCL).
- Laboratory of Fish Demography & Hydroecology / Ethology and Animal

Importance of fish migration ?

- Migration between habitats
  - spawning
  - feeding
  - overwintering



- Freshwater: restoration of water quality and hydromorphology of water courses
  - European Water Framework Directive 2000/60/EU (deadline 2015)
  - Benelux Decree M 96 (deadline 2010)

Barriers, e.g. culverts...

The good…


Multiple pipe installation buried and backfilled with native streambed materials and riprap. Pipes are in outlet control

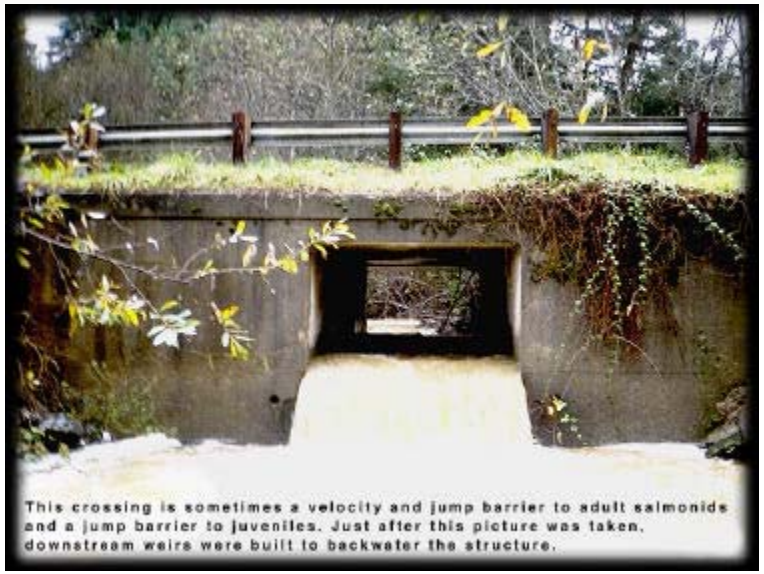

Pipe arch in outlet control. Note the control weir that backwaters the culvert


Good substrate retention and grade control make this crossing passable to local fish

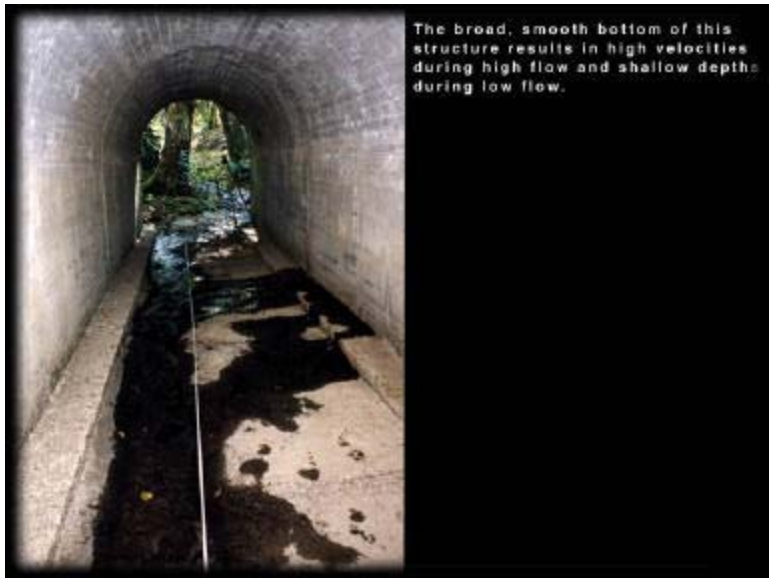
The bad…

Outlet weirs like this need a v-notch to concentrate flow and provide a good leap target. A flat weir confuses fish and produces shallow, high velocity flow that is adverse to fish passage.

Try as she might, this fish did not make it into the current to get where she wanted to go. Neither do most of her peers.



This crossing is sometimes a velocity and jump barrier to adult salmonids and a jump barrier to juveniles. Just after this picture was taken, downstream weirs were built to backwater the structure.

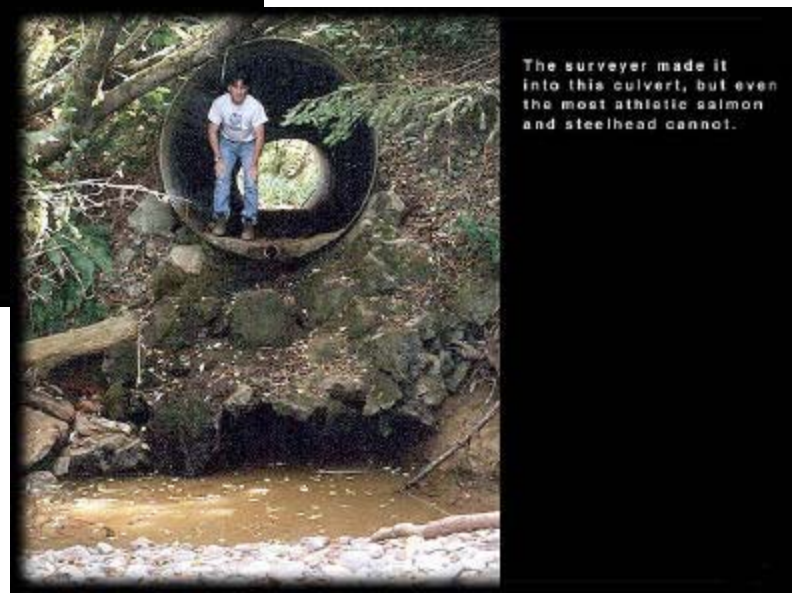


The broad, smooth bottom of this structure results in high velocities during high flow and shallow depths during low flow.

The ugly…


Rusting and damage to the pipe
at the outlet can change passability
and pose a hazard to migrating fish.


Many fish attempt this jump.
Just a few make it. Fewer still
negotiate the entire pipe
to access upstream habitats.


The surveyor made it
into this culvert, but even
the most athletic salmon
and steelhead cannot.

Aim of the project

- Assess the effects of obstacles that impede migration between habitats on biodiversity
  - Effects of physical obstacles (culverts, dams, siphons…)
  - Effects of re-stocking with non-indigenous species or genotypes
- Population structure and size
- Genetic diversity

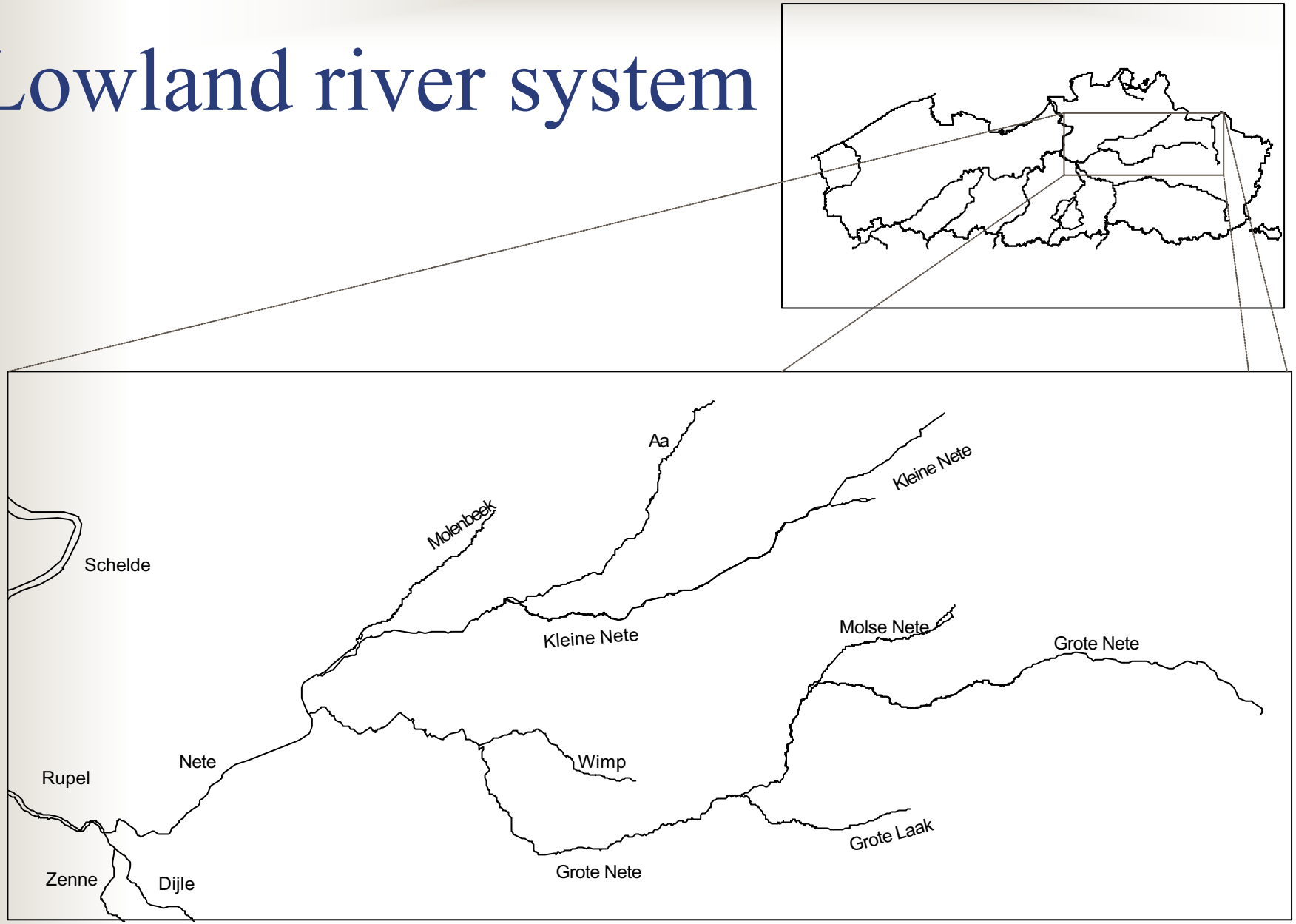
Three-step approach

- A descriptive field-study
- The ecophysiology of fish swimming
- Assessment of the capacity to cross man-made obstacles in the field

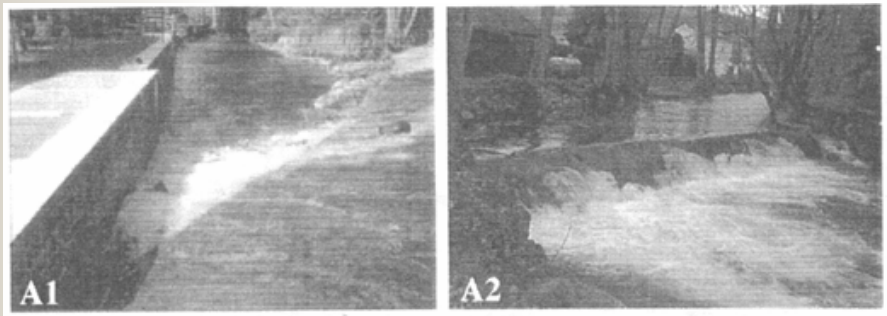
Step one: field-study

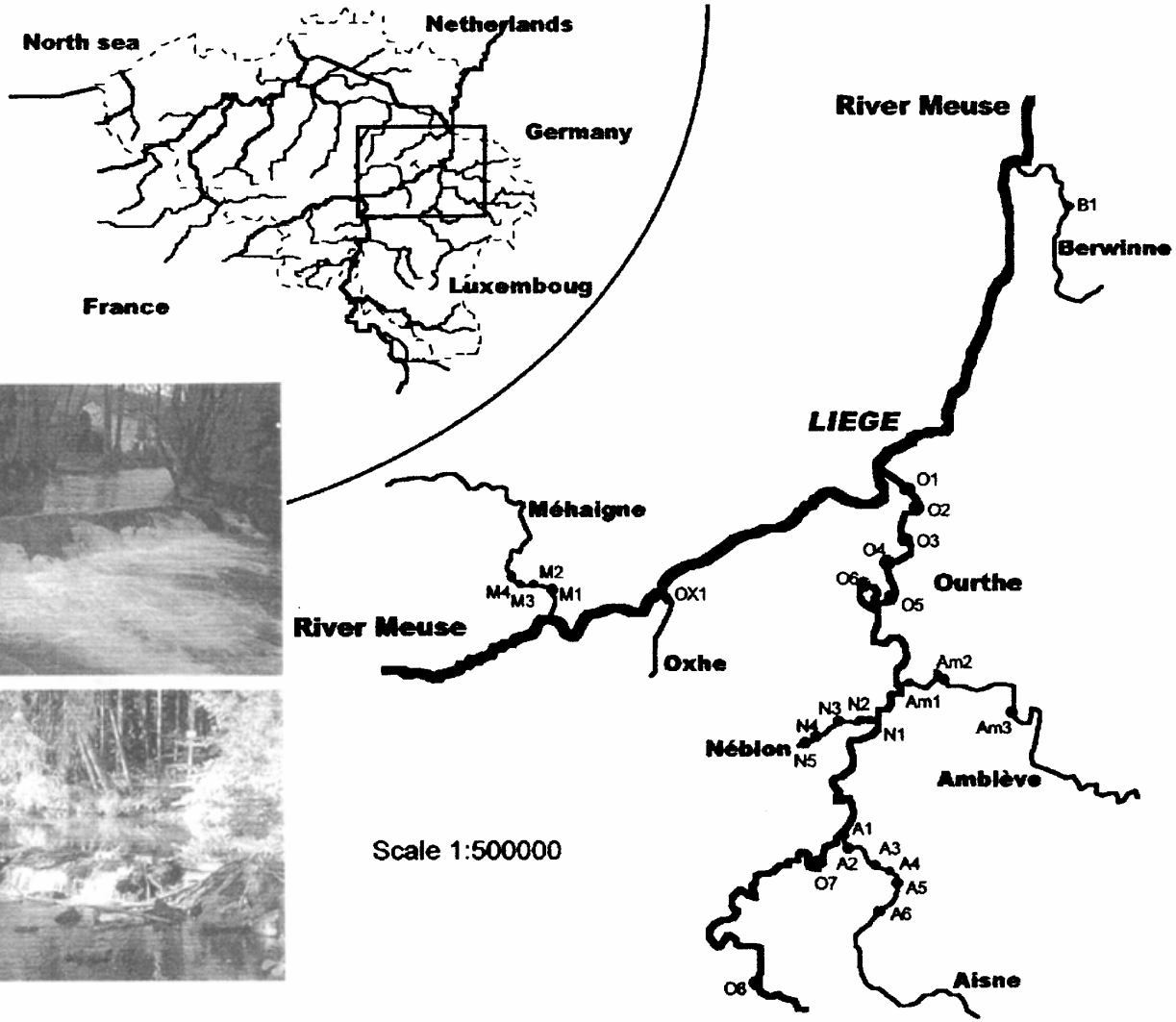
- Fish diversity in the vicinity of various types of artefacts (50 model systems)
  - Upland and lowland river systems in Belgium
  - Different history of restocking

Lowland river system



Upland river system





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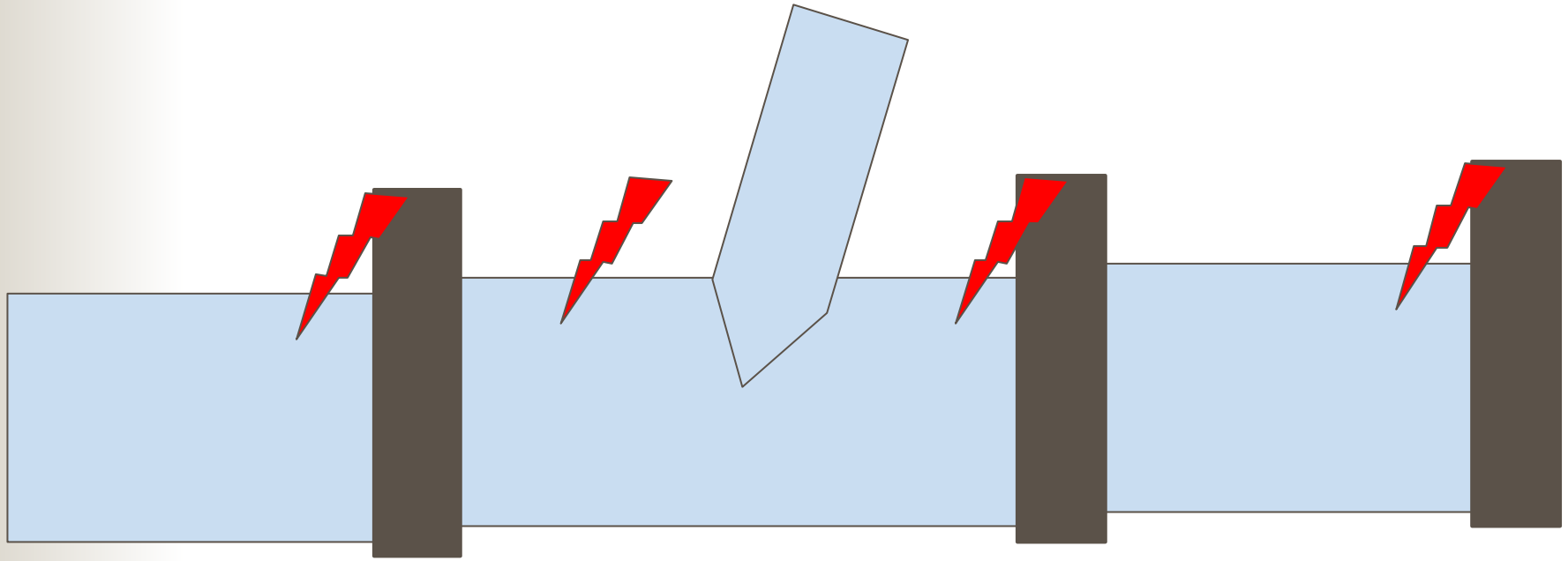
- Analysis of the fish community

Sampling strategy

- 25 different barriers per river system
- 3 model barriers (genetic analysis-telemetry)



Step one: field-study

- Fish diversity in the vicinity of various types of artefacts (50 model systems)
  - Upland and lowland river systems in Belgium
  - Different history of restocking
- Analysis of the fish community
- Analysis at genetic level (microsatellites) of target species

Target species

	Restocked	No restocking
Upland	 Brown trout (*Salmo trutta*)	 Bullhead (*Cottus gobio*)
Lowland	 Roach (*Rutilus rutilus*)	 Stickleback (*Gasterosteus aculeatus*)

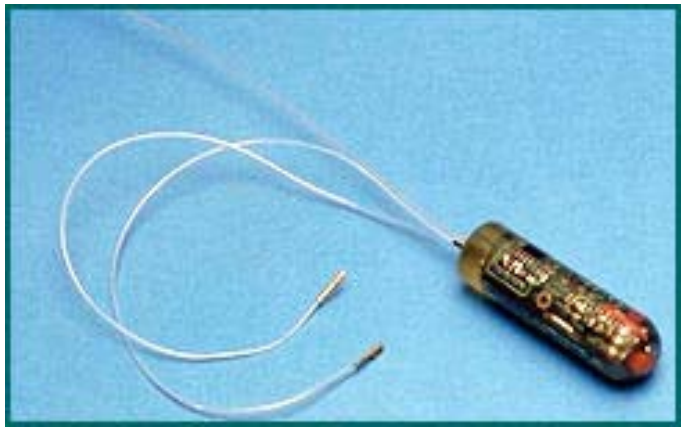
Step two: fish swimming

- Swimming capacity of fish
  - Critical swimming speed, prolonged swimming speed, burst swimming speed
  - Energy expenditure associated with swimming
    - Aerobic and anaerobic energy consumption
    - Electromyography
- Leaping capacity of fish
  - Large flumes mimicking a culvert

Step three: fish crossing

- Radio telemetry and PIT tags
  - On 6 of the model sites
  - EMG telemetry tags for energy expenditure assessment
  - Genotypes of tagged fish are analysed

Radio telemetry



Step three: fish crossing

- Radio telemetry and PIT tags
  - On 6 of the model sites
  - EMG telemetry tags for energy expenditure assessment
  - Genotypes of tagged fish are analysed
- Test predictions of the laboratory model
- Test outcome of genotype studies

Outcome

- User friendly tools for managment of rivers and fish populations in Flanders and Wallonia
  - Manual
    - Predict the severity of obstacles and stocking practices
    - Determining priorities for preservation and remediation
  - Integrated model to predict fish crossing
- Scientific data

First user committee meeting
May 12th, UA, Antwerp

Interested to join? Send your coordinates to
gudrun.deboeck@ua.ac.be