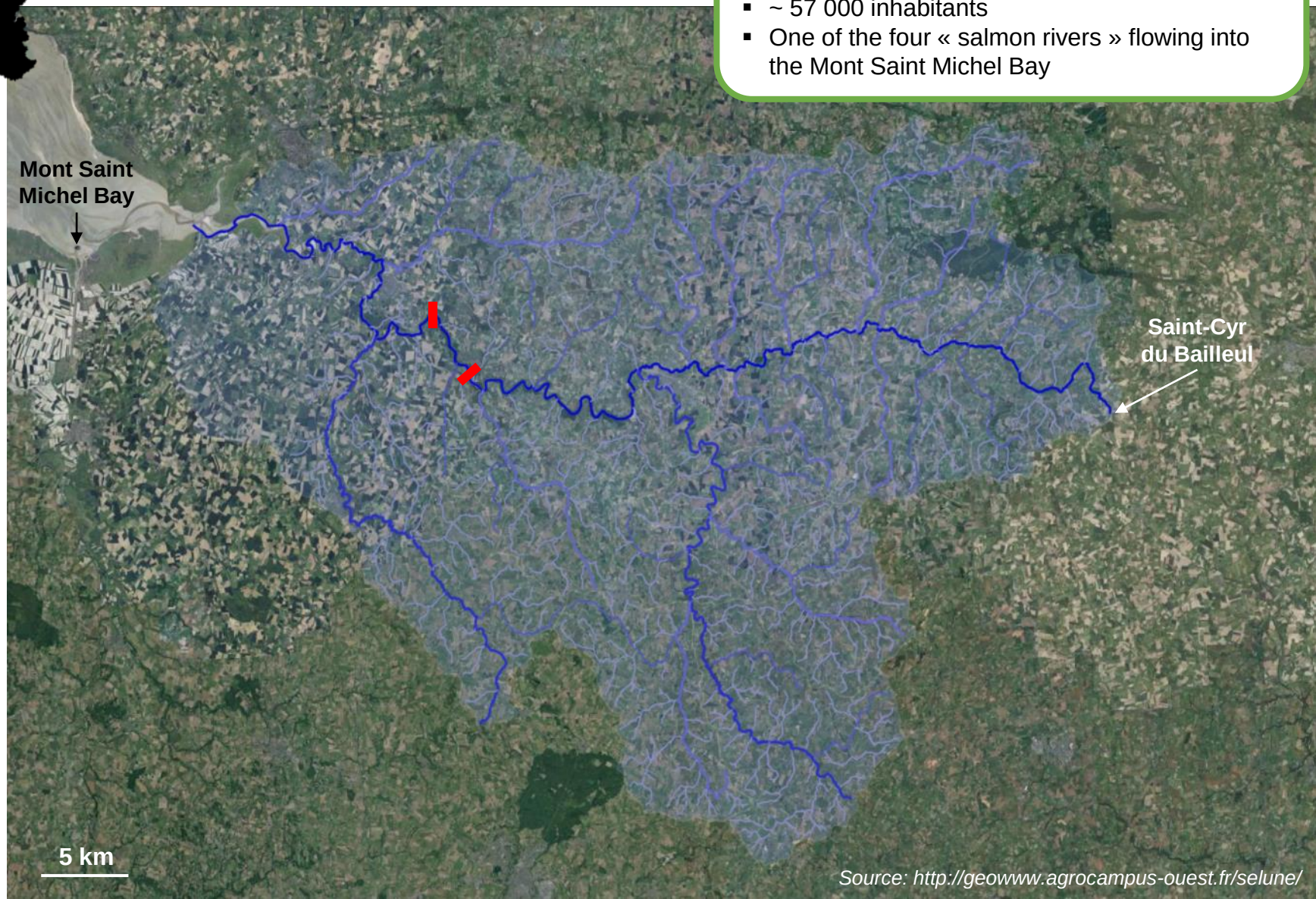
A scientific program to understand the mechanisms of restoration of the Selune River following the removal of two large dams

Laura Soissons, Jean-Marc Roussel ***et al.***

Picture: Observatoire Photographique du Paysage de la Sélune (SMBS & Univ. Paris Nanterre) - http://geowww.agrocampus-ouest.fr/selune/

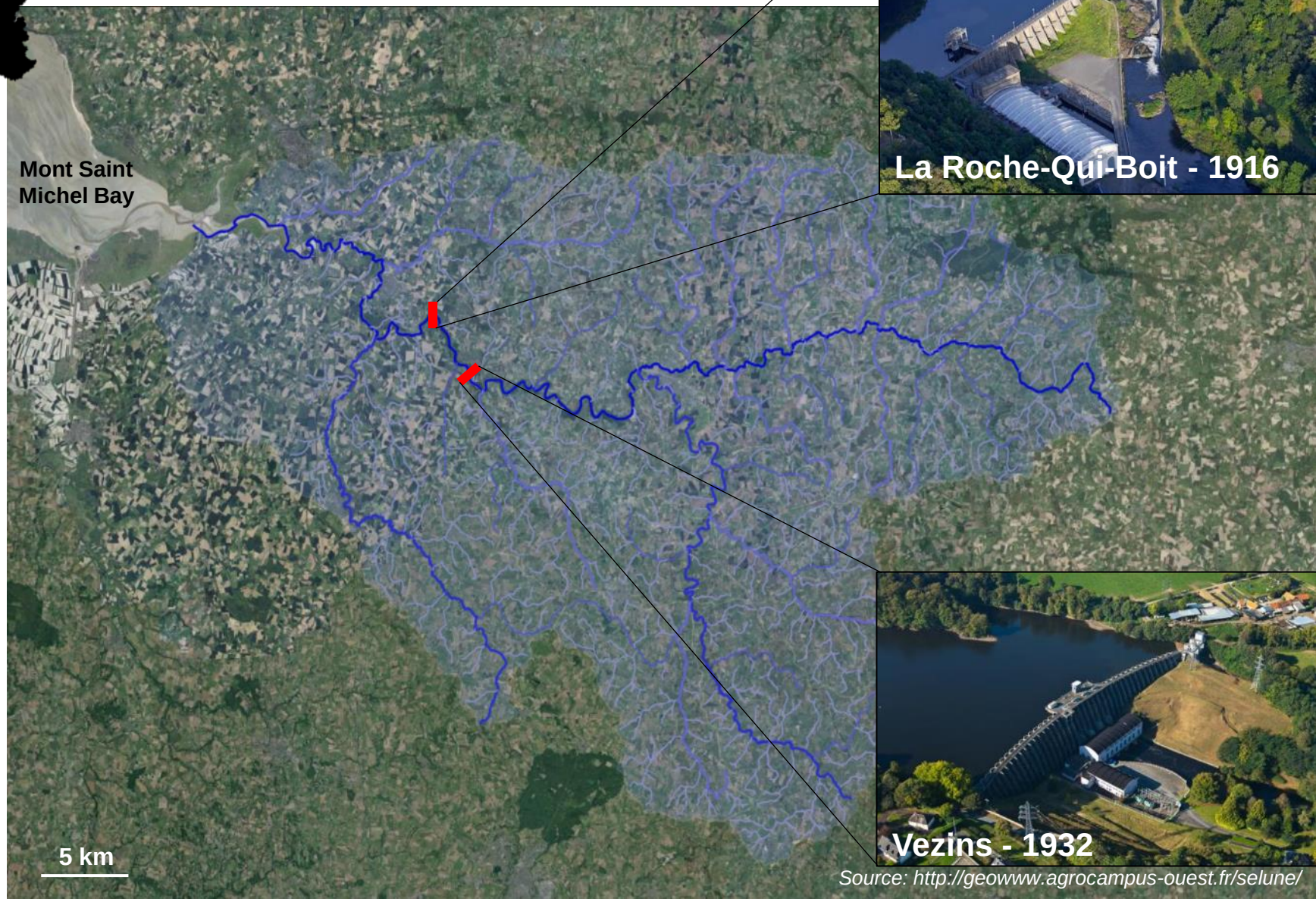
The Selune River and its valley

- La Sélune: 90 km long
- Watershed: 1051 km²
- Agricultural landscape
- ~ 57 000 inhabitants
- One of the four « salmon rivers » flowing into the Mont Saint Michel Bay



Source: http://geowww.agrocampus-ouest.fr/selune/

The Selune River



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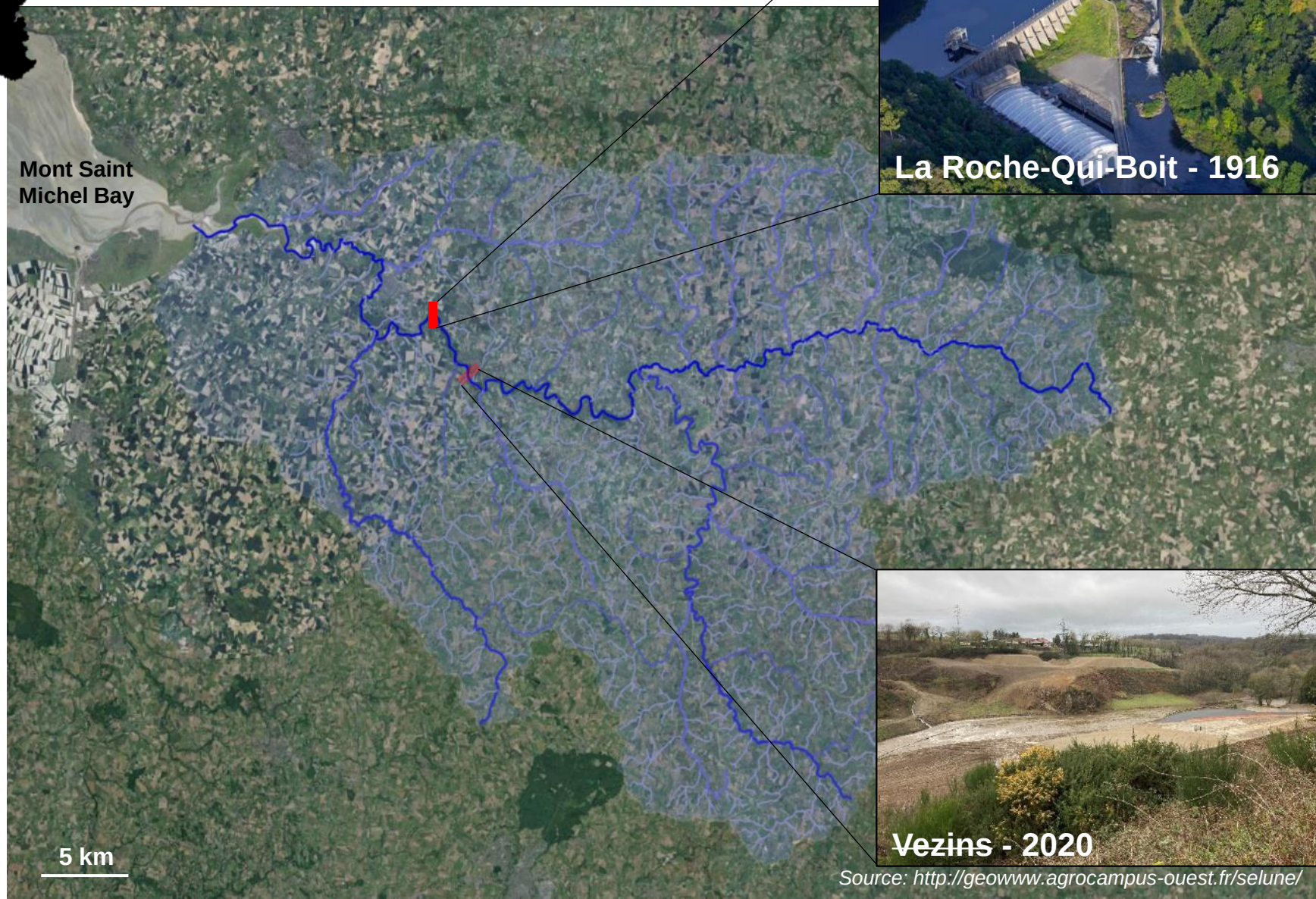
The Selune River



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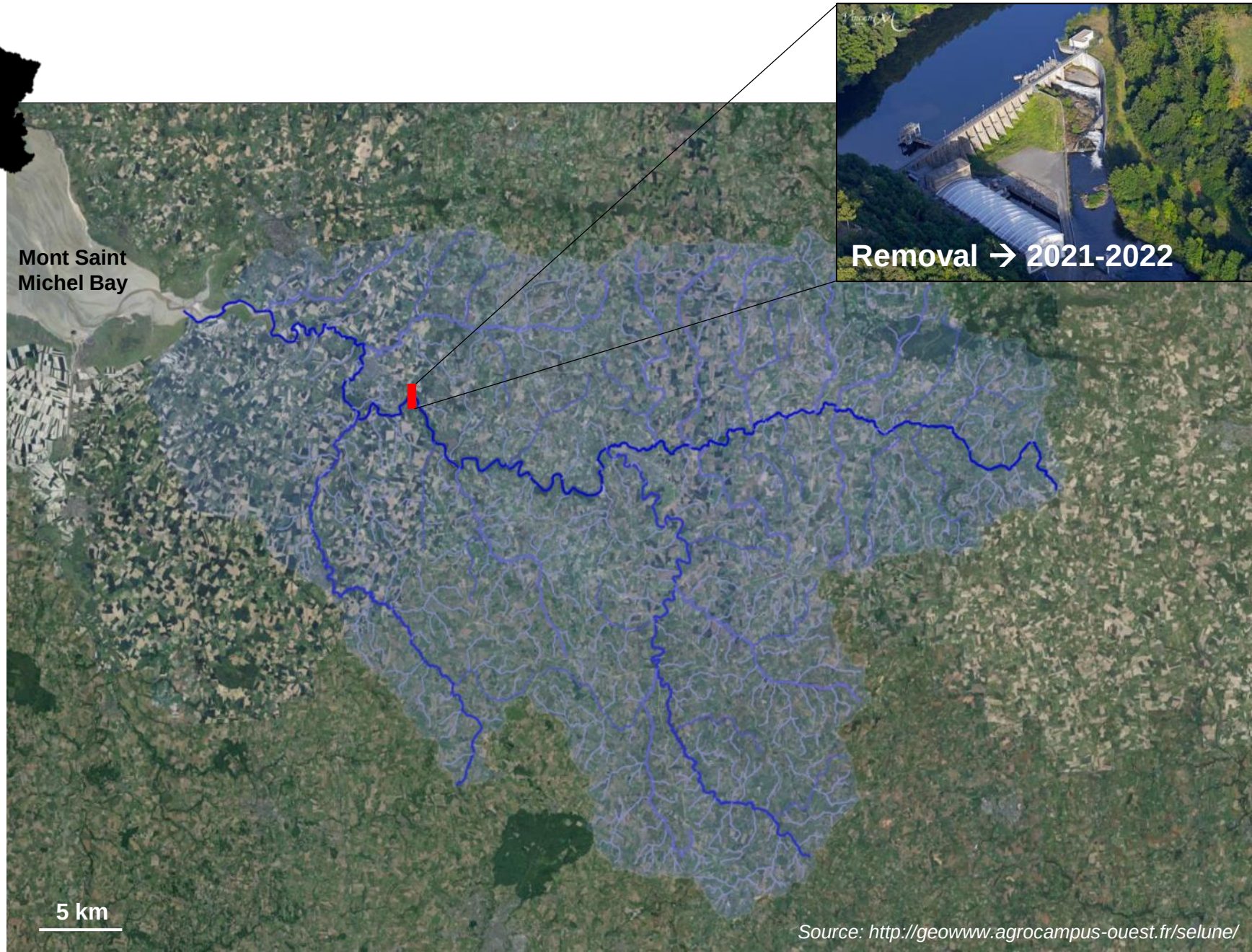
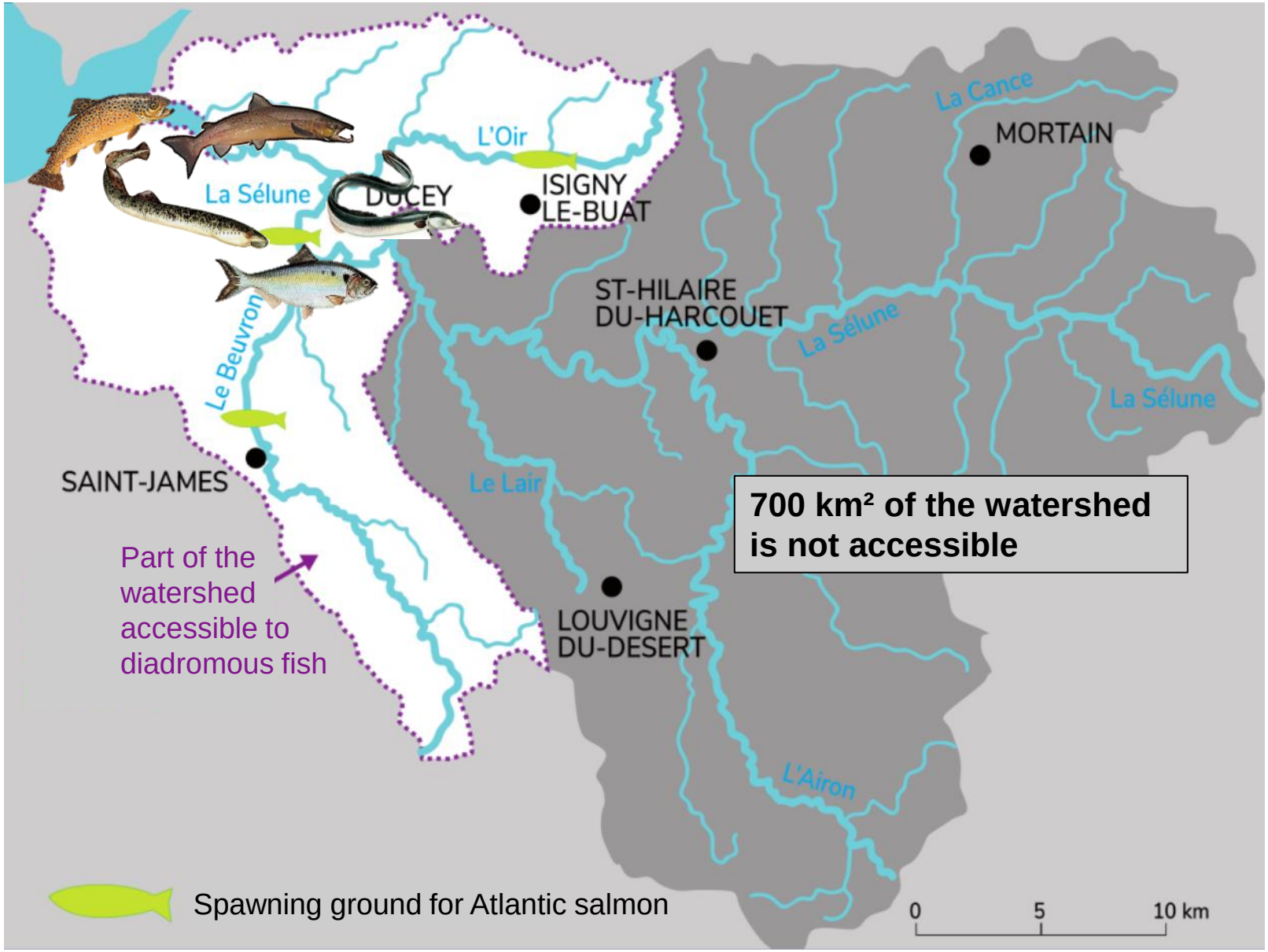
The Selune River



Source: http://geowww.agrocampus-ouest.fr/selune/

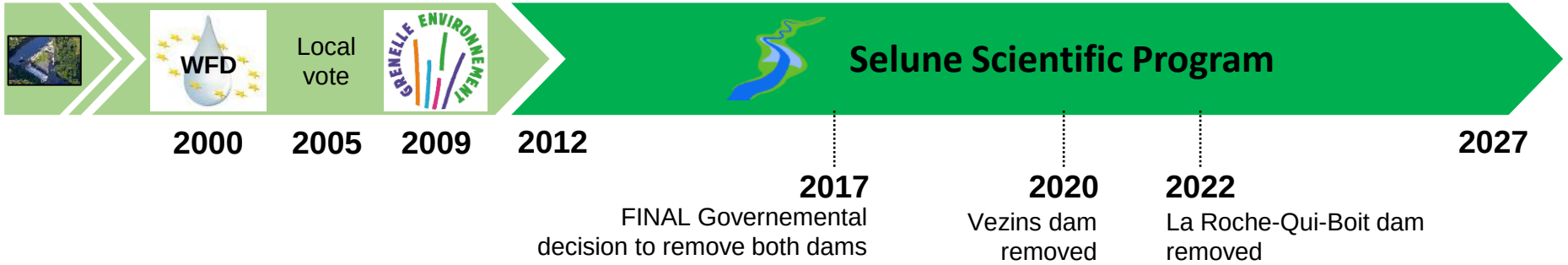
Disrupting the continuity of the Selune River



Source: Direction Départementale des Territoires de la Mer de la Manche (DDTM50)

Restauring the continuity of the Selune River

→ Remove both dams and follow the restoration process



Pictures: Observatoire Photographique du Paysage de la Sélune (SMBS & Univ. Paris Nanterre) - http://geowww.agrocampus-ouest.fr/selune/

The scientific program

- **Understanding the mechanisms of restoration** of the Selune River and its valley
- **Provide recommendations** for stakeholders and decision-makers for future restoration actions
  - A **long-term** study divided into three phases

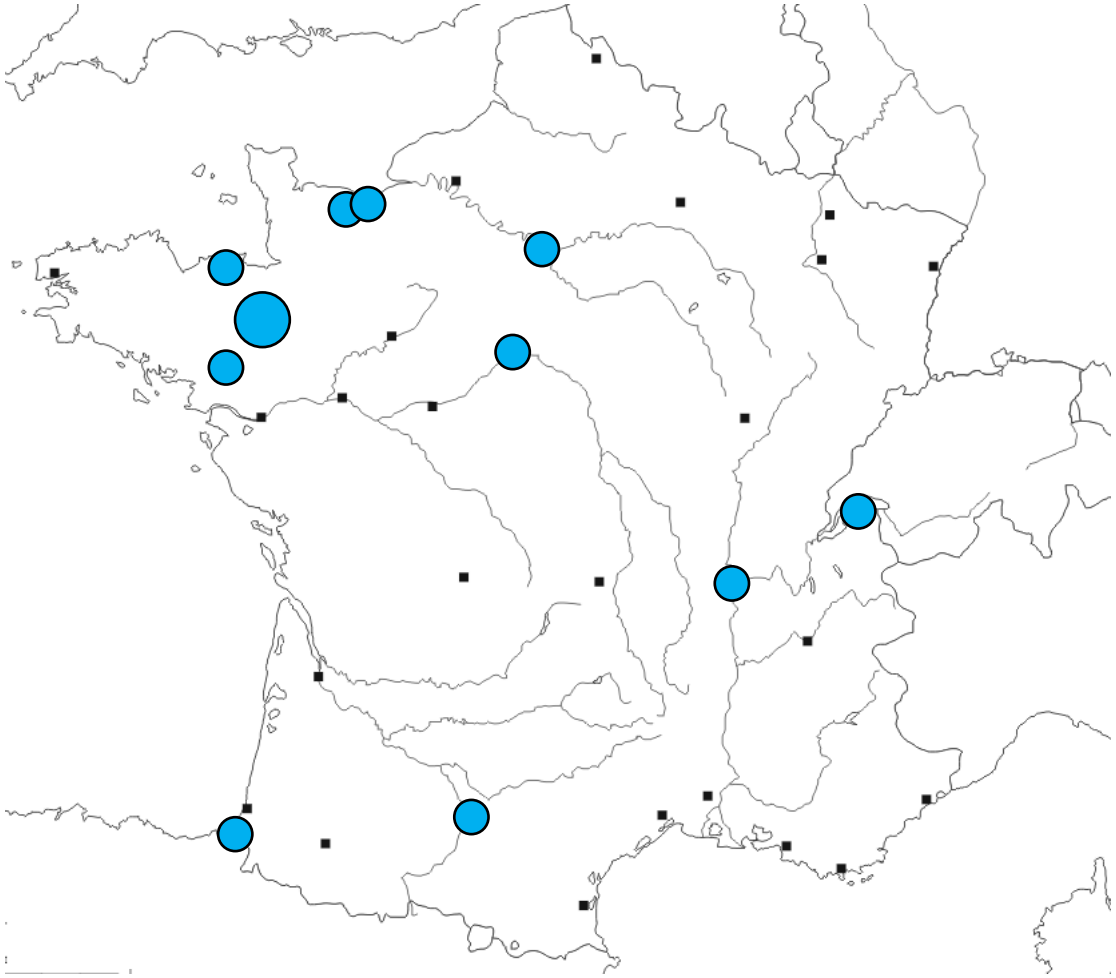
Phase 1 Evaluation	Phase 2 Removal	Phase 3 Restoration
2012 - 2019	2019 - 2021	2022 - 2027

  - A **multi-disciplinary** approach

Territorial dynamics	River dynamics	Biocenosis funtionning and evolution

  - Several **research projects**
  - An **observatory** with its own information system (**SISelune**)

The scientific program: **> 20 research units!**



The scientific program

Territorial dynamics

- Societal impact
- Local acceptance
- Territorial context and changes
- Configuration of local vs. international collectives

Phase 1: 3 projects

Phase 2: 1 project
Observatory

Phase 3: …

River dynamics

- Chemical and sedimentary fluxes
- Hydrological regime
- Geo-morphological changes
- Water quality

Phase 1: 2 projects

Phase 2: 2 projects
Observatory

Phase 3: …

Biocenosis funtionning and evolution

- Changes in ecosystem funtioning
- Interactions between aquatic and terrestrial ecosystems
- Species distribution (native vs. invasive and returning)

Phase 1: 6 projects

Phase 2: 5 projects
Observatory

Phase 3: …

The Selune Observatory

- Long-term monitoring effort through the measurement of various environmental parameters:

Benthic macro-invertebrates	Photosynthe-tic biofilms	Aquatic macrophytes
Riparian vegetation	Diadromous fish	Invasive crayfish
Hydrological, sedimentary and chemical fluxes	Hydro-geomorpho-logy of the river	Photographic observatory of the Selune landscapes

- Make the collected and processed data publicly available with **SISelune (Information System):**
  - Download: http://geowww.agrocampus-ouest.fr/geonetwork/apps/georchestra/
  - See: http://geowww.agrocampus-ouest.fr/selune/
  - Infos: alban.thomas@agrocampus-ouest.fr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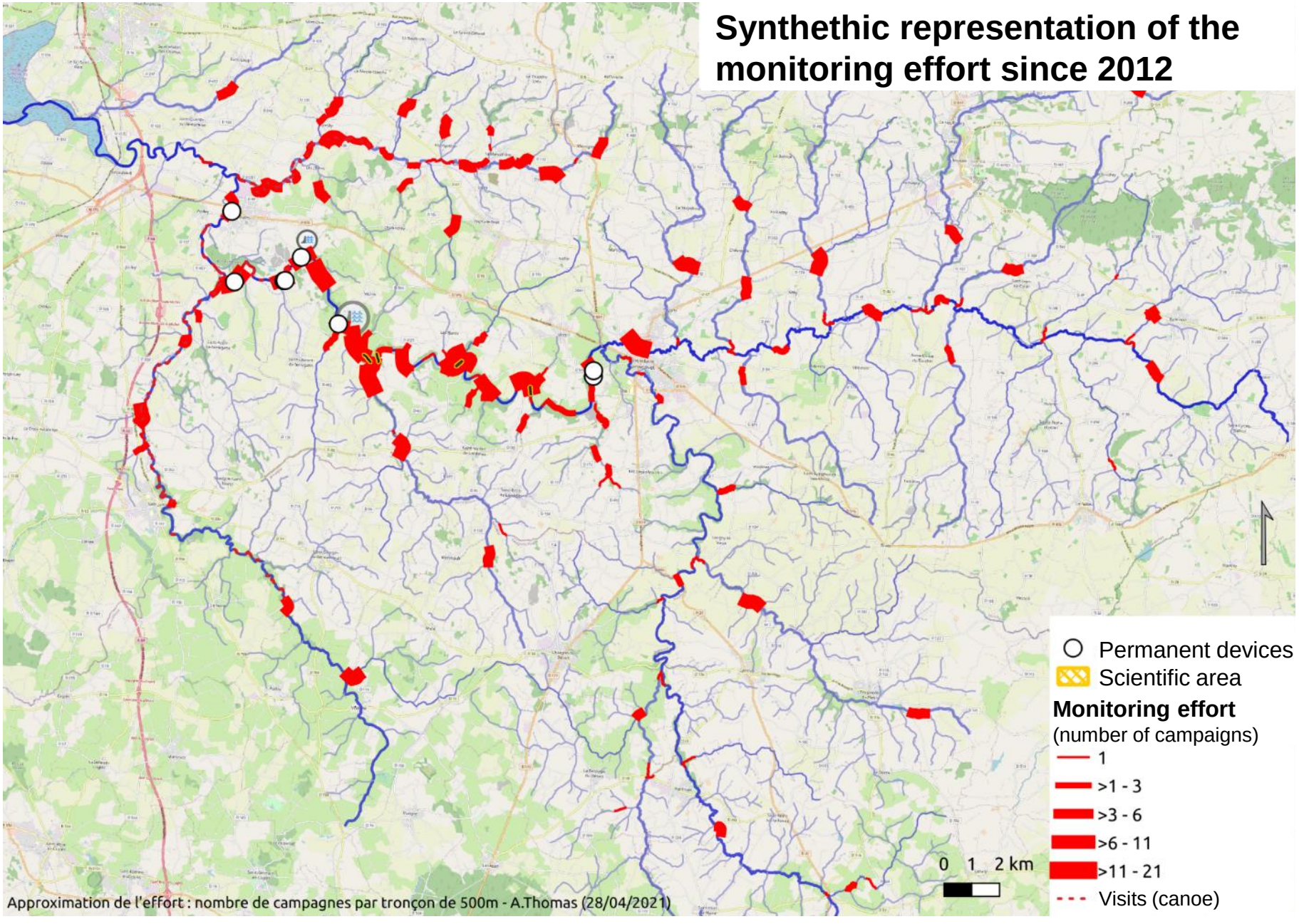
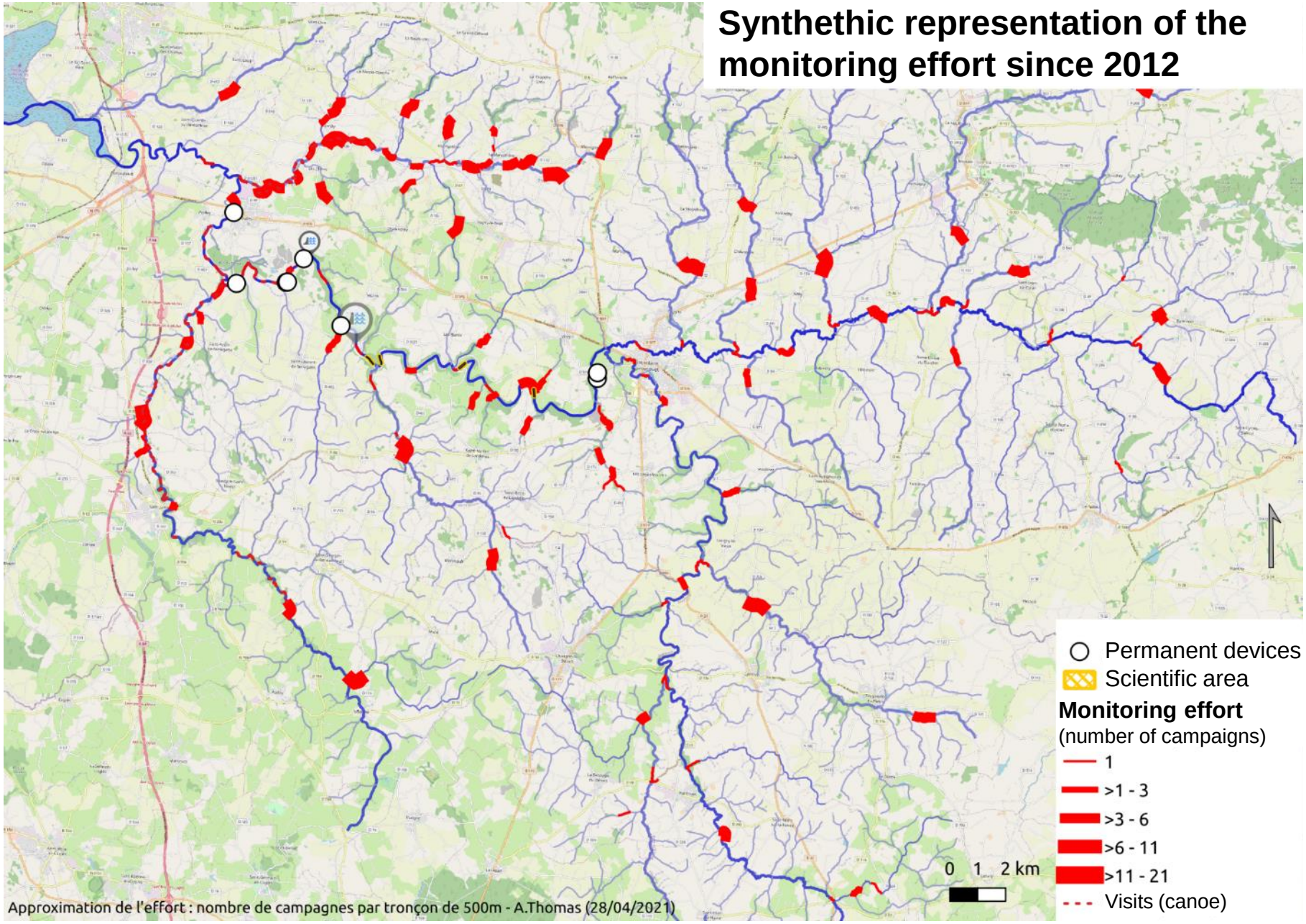
Monitoring effort



Monitoring effort: fish and crayfish communities



Tools to monitor the return of diadromous fish

Monitoring abundance indices & spawning grounds

Telemetry

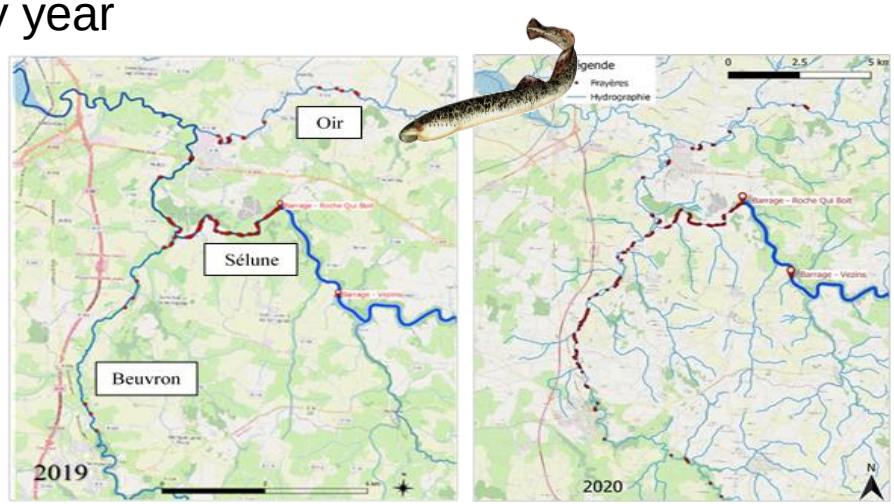
Acoustic camera

eDNA

Monitoring abundance indices and spawning grounds

- Characterise the **demography and expansion** of migratory fish populations
  - **Abundance indices**: once every two years

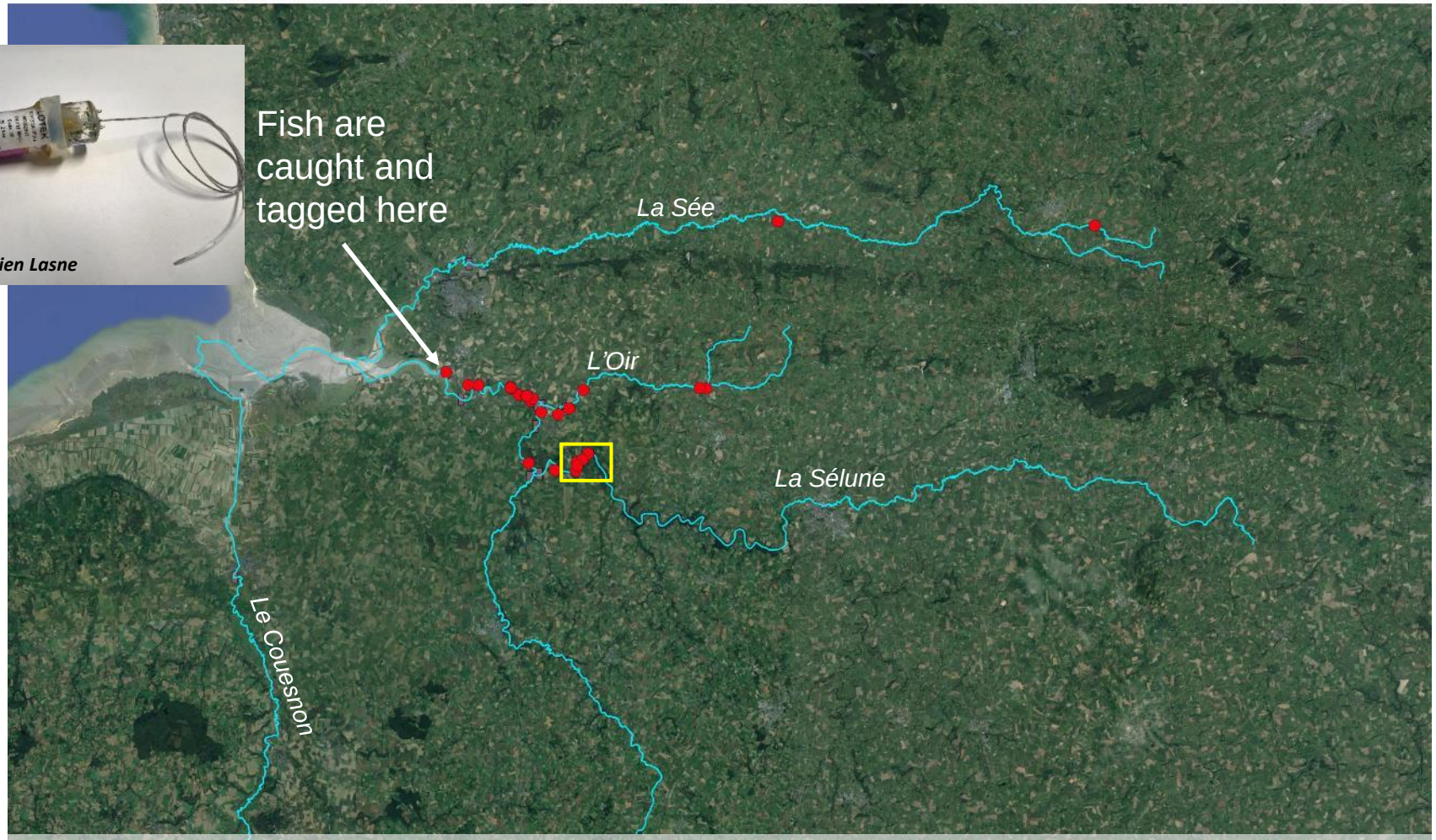
  - **Spawning grounds**: every year



Pictures and data: courtesy of Morgan Druet (morgan.druet@inrae.fr) and Frederic Marchand (frederic.marchand@inrae.fr)

Telemetry

- Studying the **potential for and the dynamics of (re)colonization** of the upstream areas of the Selune valley by diadromous fish → focus on the **Atlantic salmon**



Map and data: courtesy of Emilien Lasne (emilien.lasne@inrae.fr)

0 7.5 15 km

Telemetry

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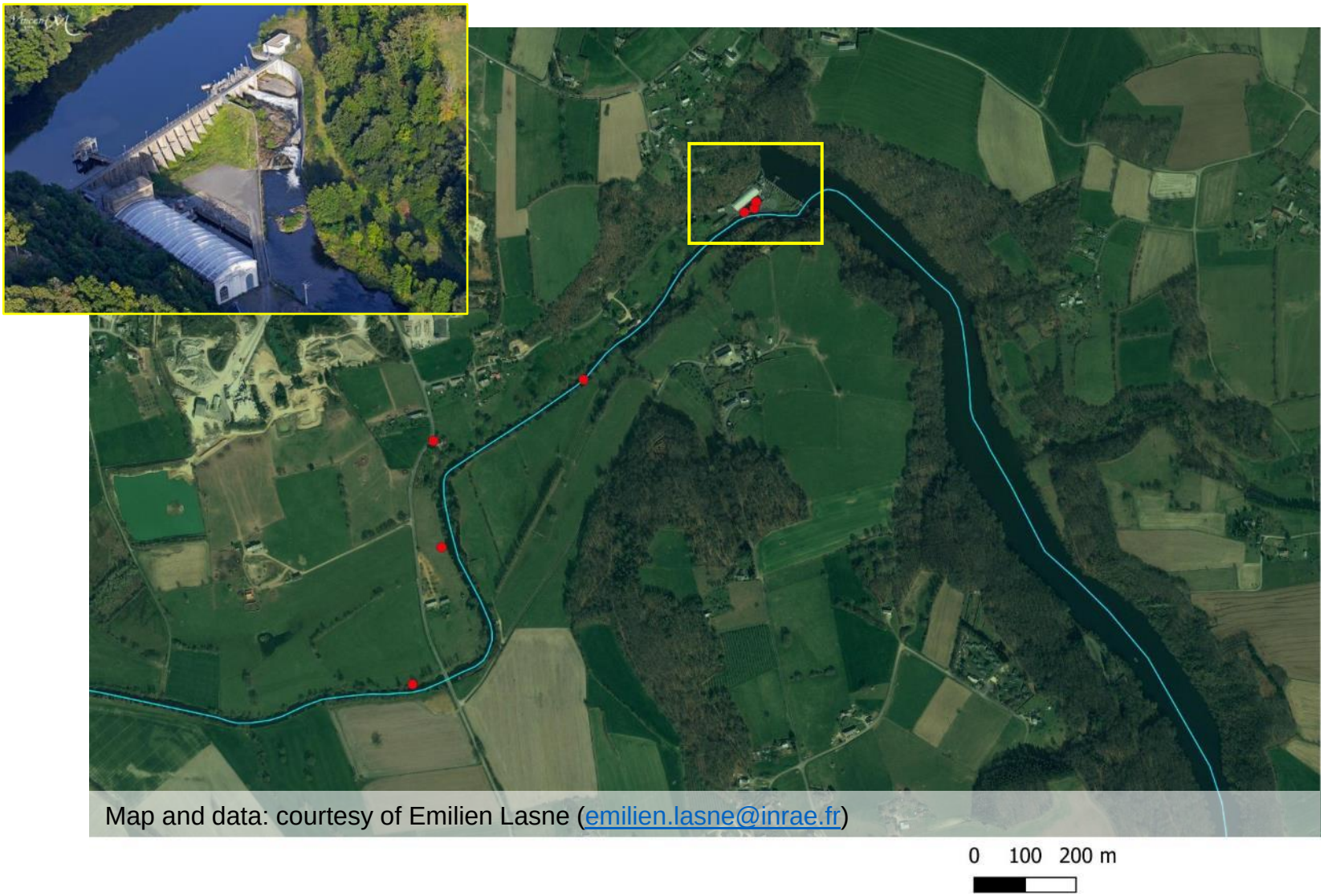
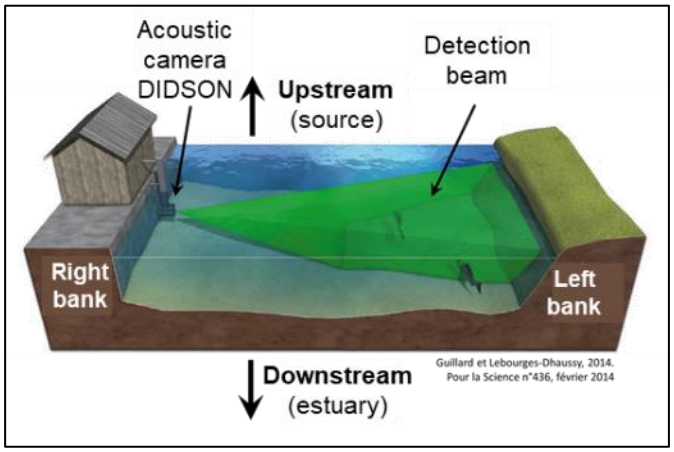
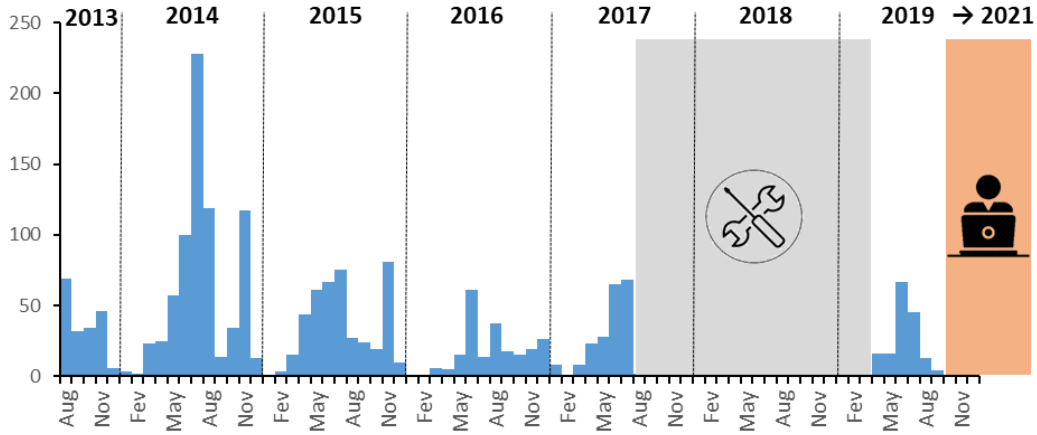


Map and data: courtesy of Emilien Lasne (emilien.lasne@inrae.fr)

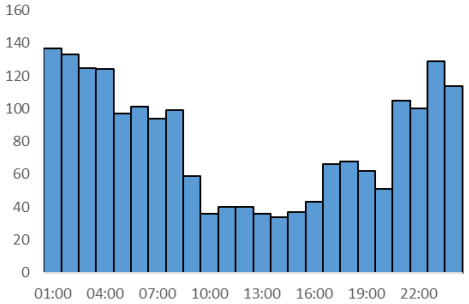
Acoustic camera DIDSON

- Describe the dynamics of diadromous fish and aquatic fauna
  - 1 station: located downstream of the dams
  - R&D project based on the use of acoustic cameras
  - Continuous recordings since 2013 (24/24 and 7/7)

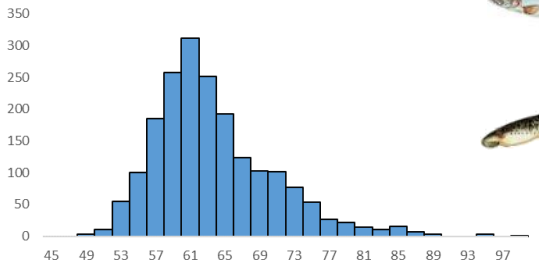




Counts (total or per species):

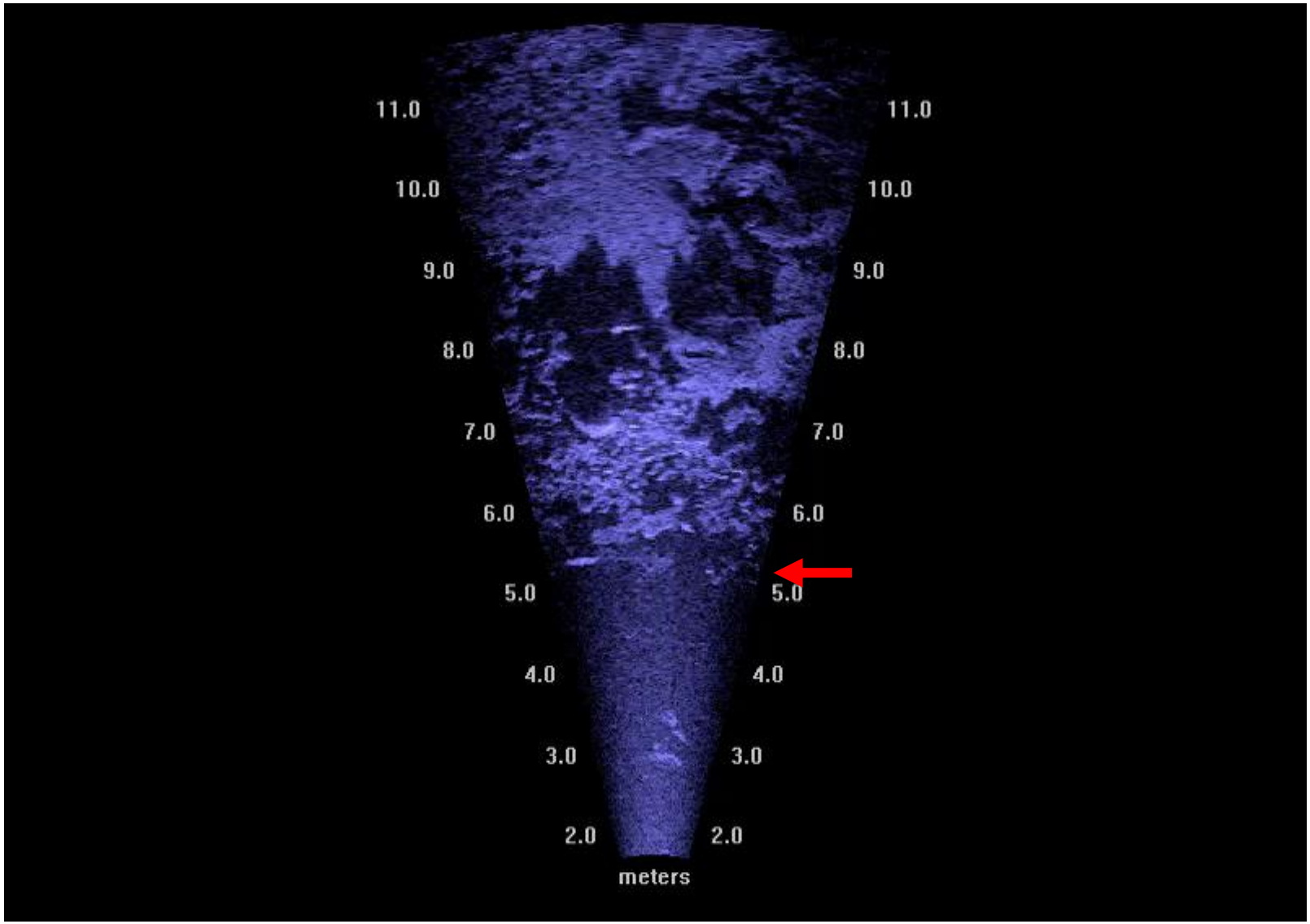


Size distribution:



Graphs and data: courtesy of François Martignac (Francois.Martignac@inrae.fr)

Acoustic camera DIDSON



Video: courtesy of François Martignac (Francois.Martignac@inrae.fr)

eDNA

- Following the return of diadromous fish species in the Selune valley using eDNA
  - Before/after sampling strategy
  - R&D project based on eDNA
  - 30 sampling stations on the Selune and tributaries

Data: Courtesy of Erwan Quéméré (erwan.quemere@inrae.fr)
Map: http://geowww.agrocampus-ouest.fr/selune

Selune scientific program

programme-selune.com

Laura.soissons@inrae.fr

Thank you

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