Action C1

Ex situ stock in Aquarium La Rochelle

Part 1: Rearing results

Jatteau Ph, Dufour S., Morinière P., Baloche S., Gonnet F.

Objectives

Long term objective

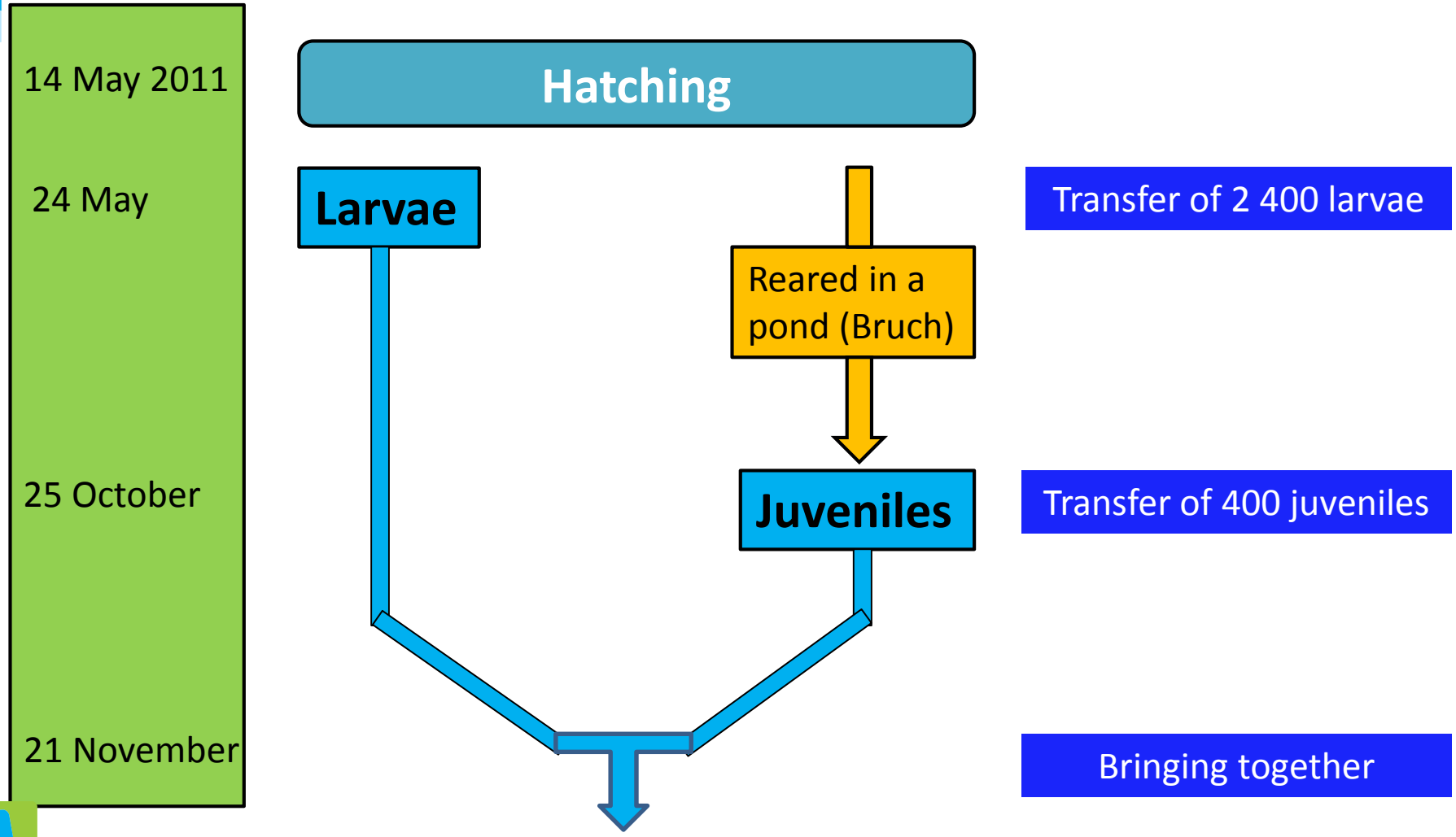
- Reduce the amount of wild adults collected for artificial reproduction purposes

Short term objectives

- Define characteristics and requirements for a tank rearing process from larvae to adult
- Follow and describe the sexual maturation

Origin and transfer of the fish

Fish came from an artificial reproduction managed by Migado (Bruch)



General rearing conditions

Transfer to sea water

May 2011
Arrival

December 2011
7 month-old

8 – 10 ‰

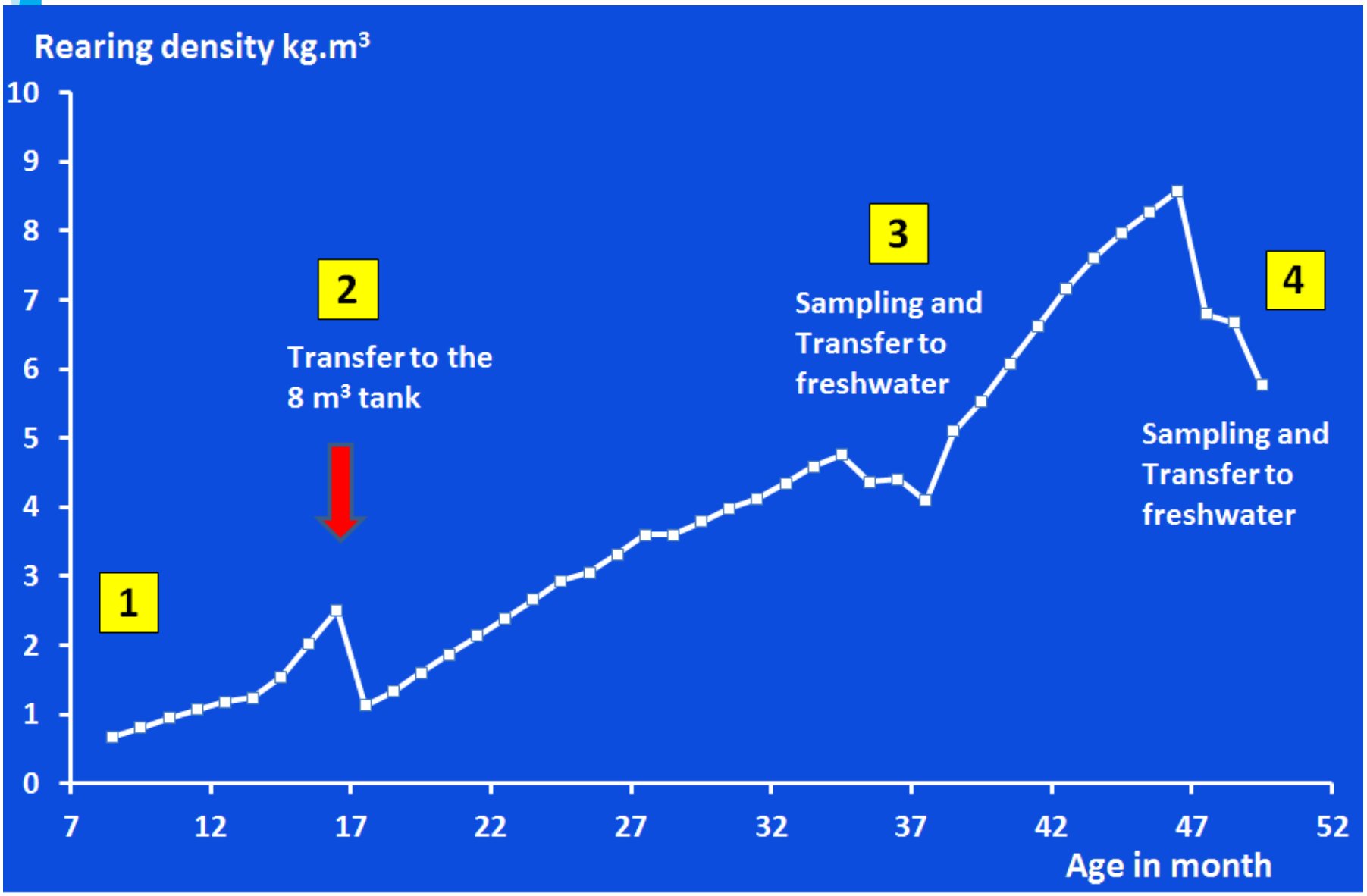
25 - 30 ‰

Temperature

Mean water temperature was 18.4 ± 0.2°C over the 4 years, with seasonal variations

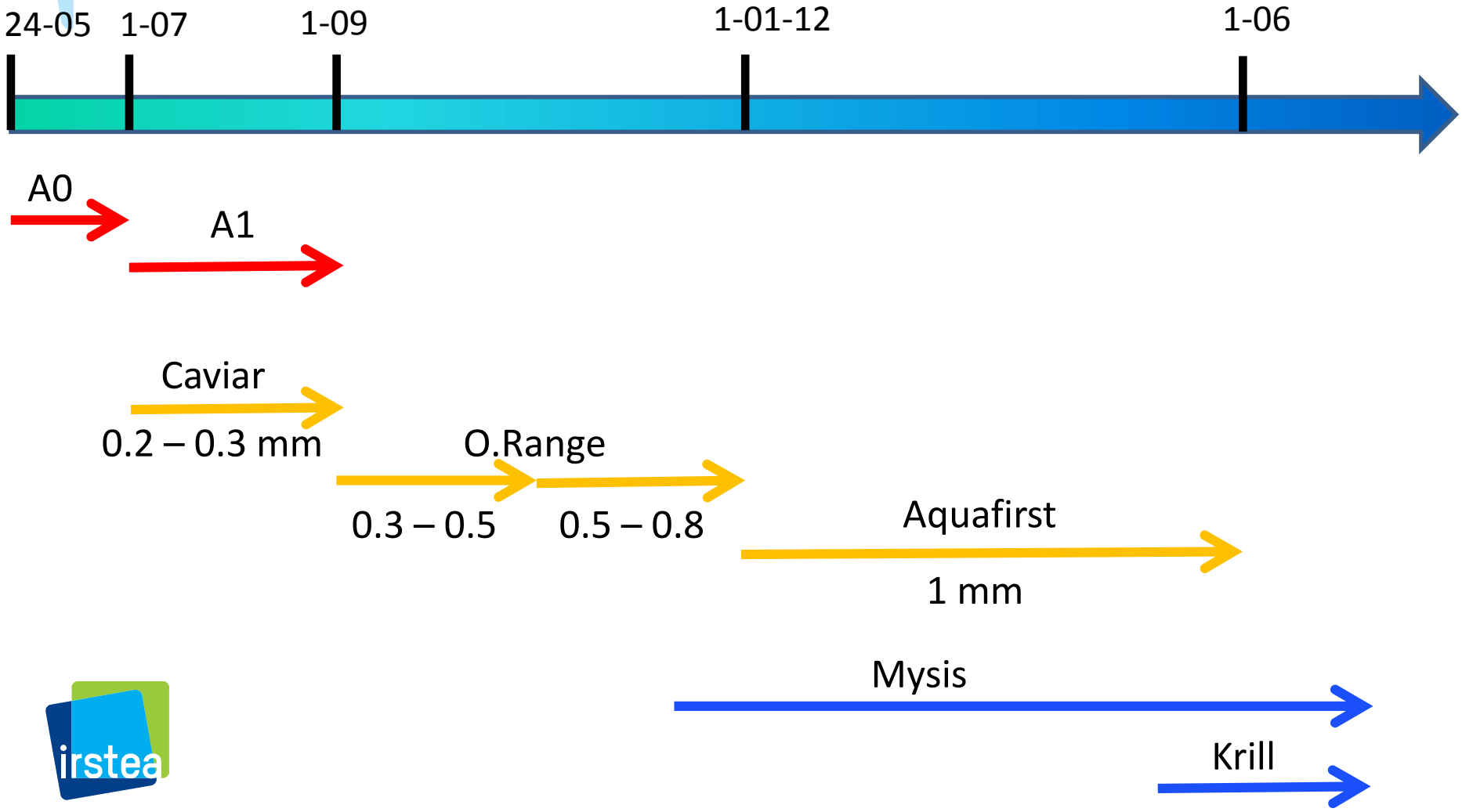
Winter: 17.4 ± 0.3 °C
Summer: 19.6 ± 0.2 °C

Density and rearing system

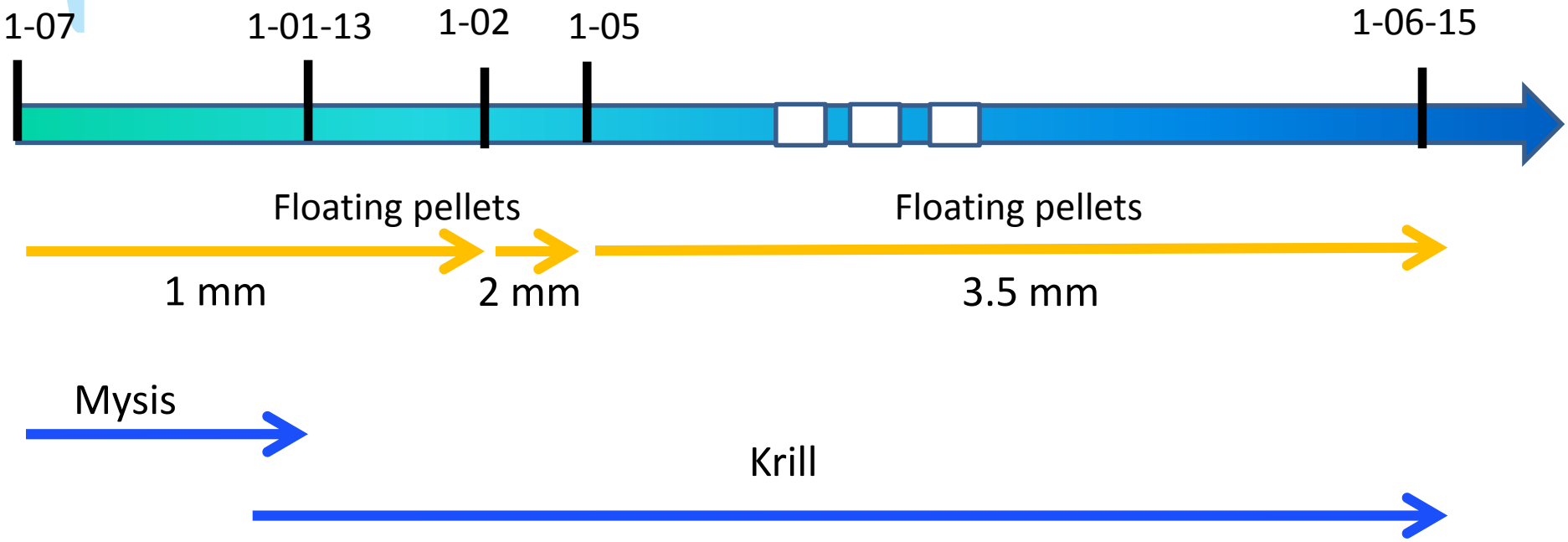


2: The 8m^3 tank

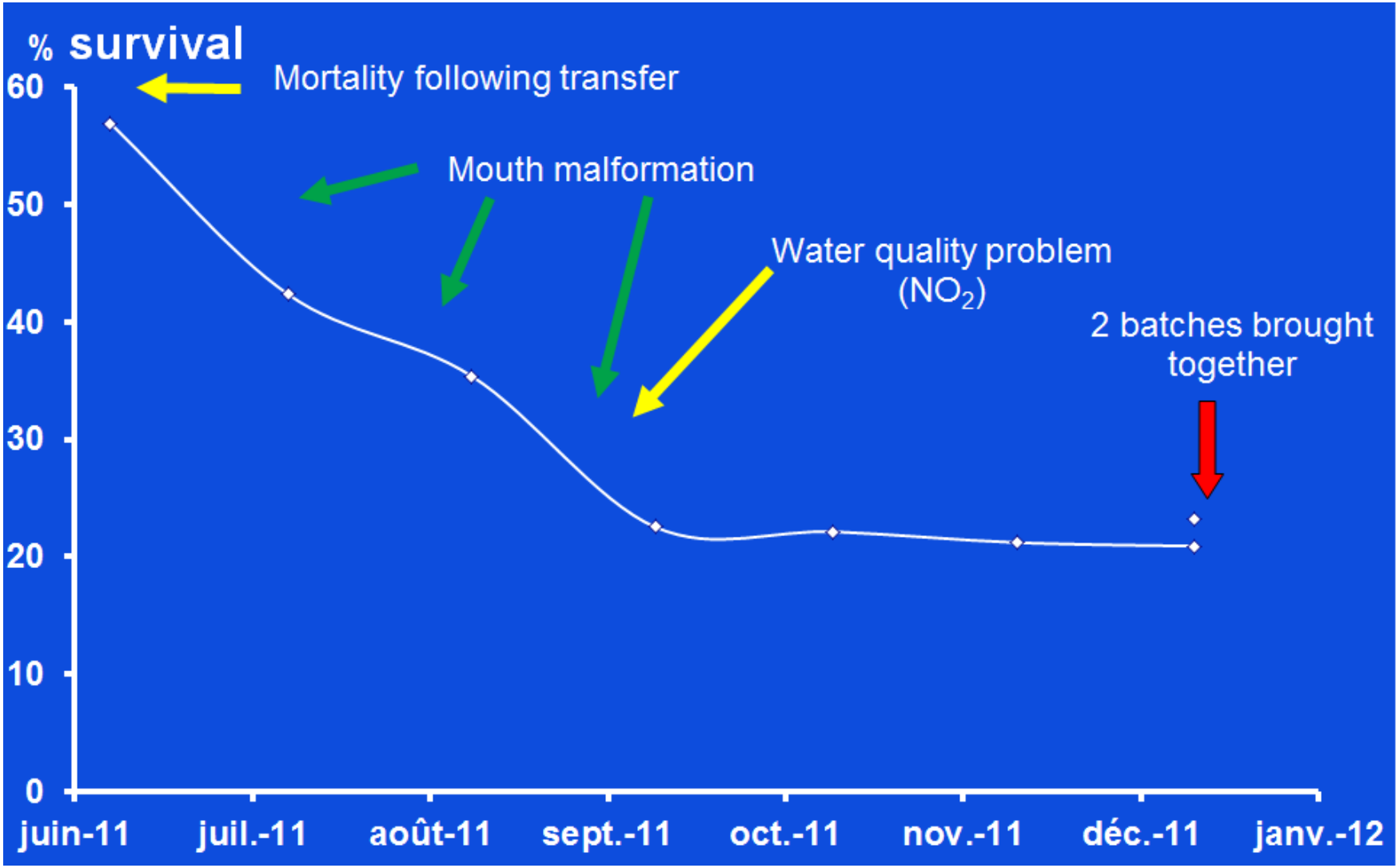
Feeding sequence: First year



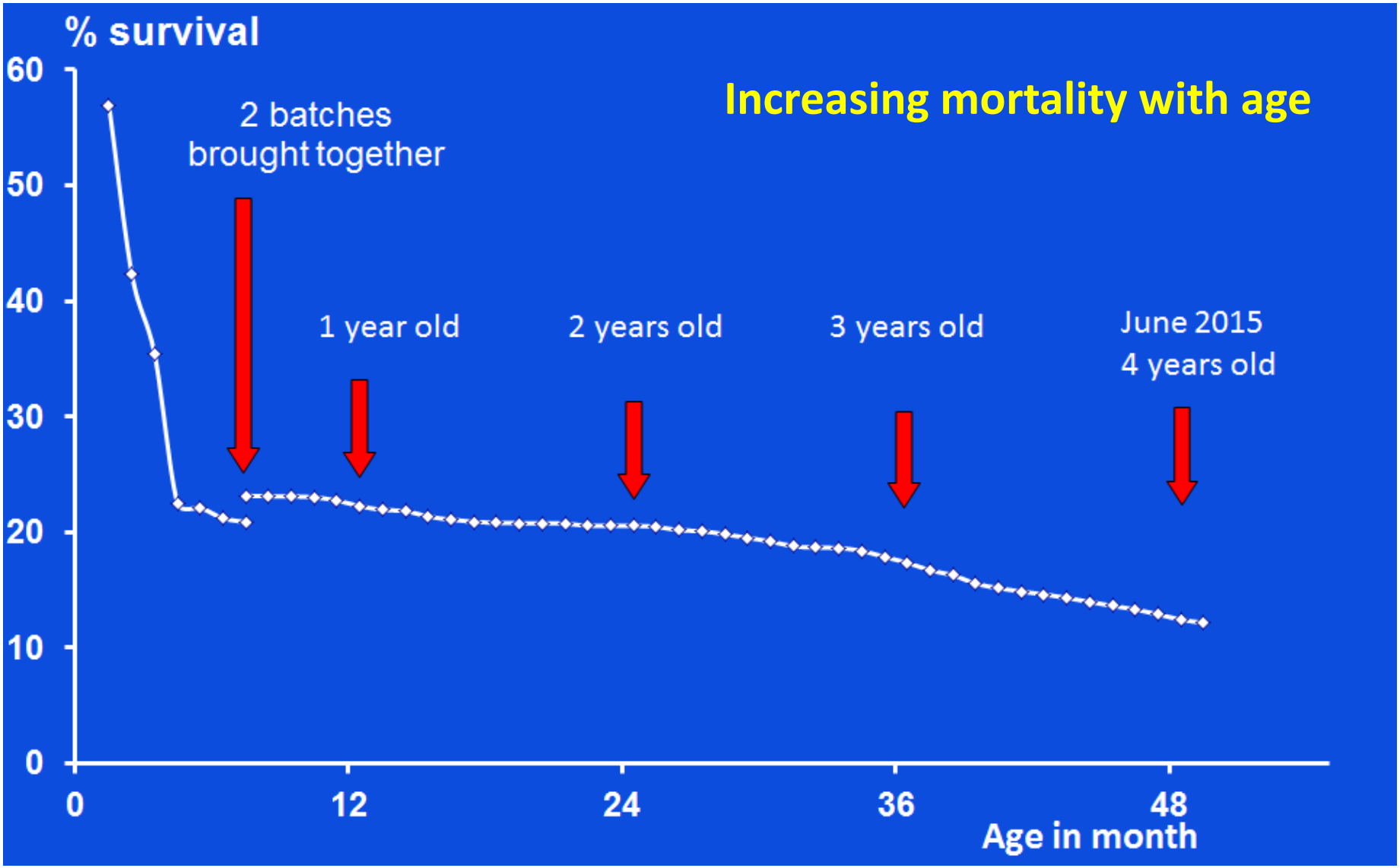
Feeding sequence: Following



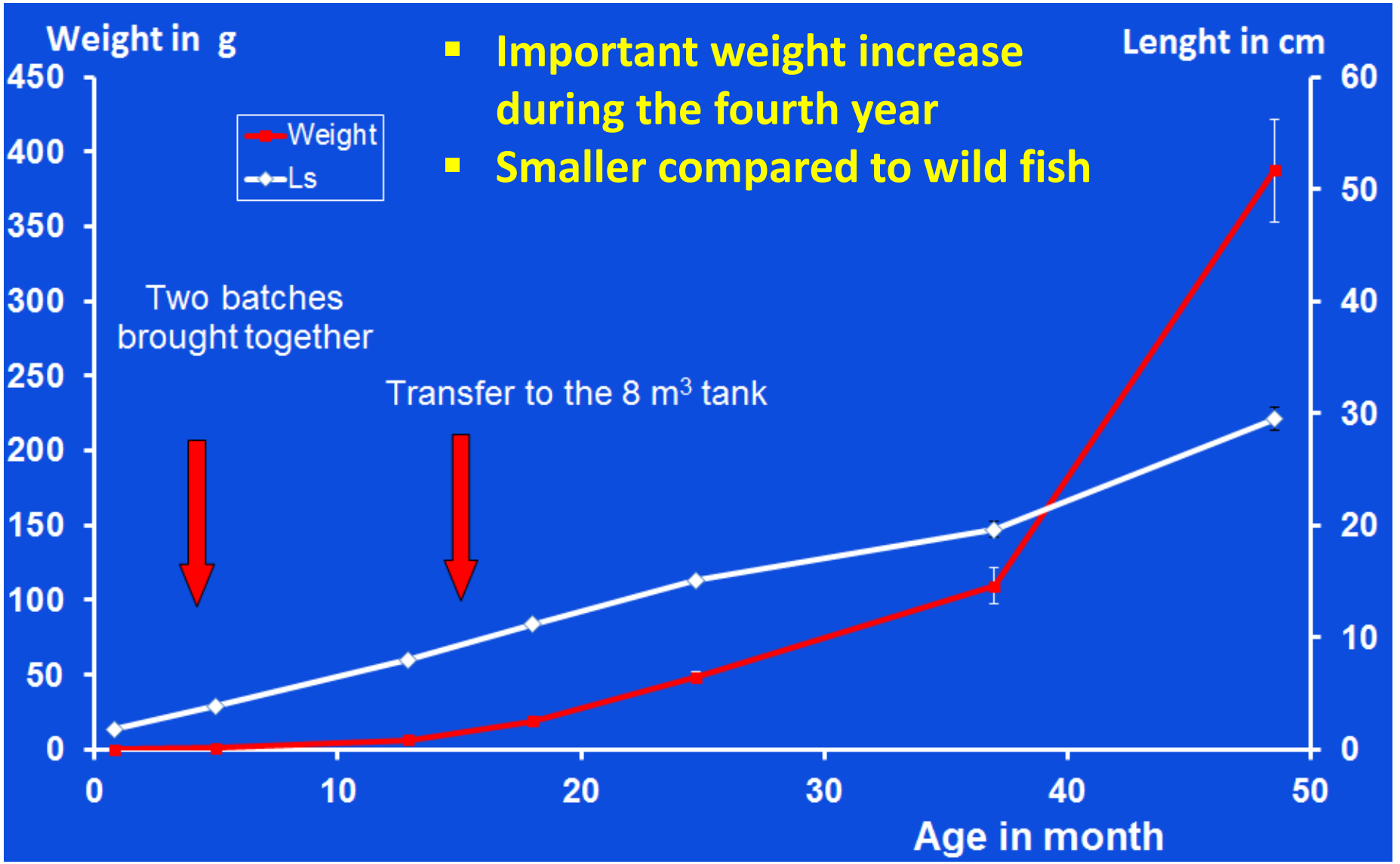
Survival: First 6 months



Survival: whole experiment



Growth: whole experiment



- Important weight increase during the fourth year
- Smaller compared to wild fish

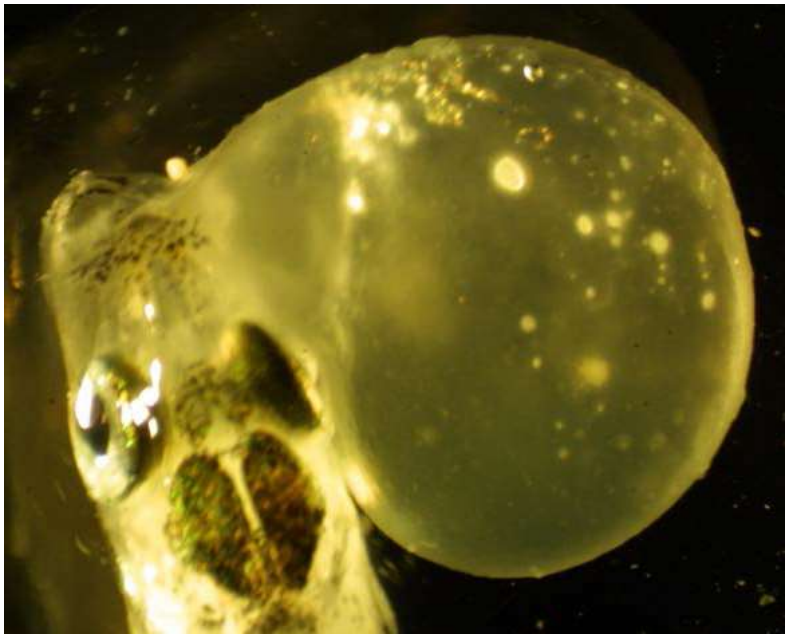
Pathology 1: Mouth malformation

Detected at 1 month old

Huge direct effect on mortality:

87% of dead larvae in July

44% of dead larvae in August and September



Indirect effects:

reduction of growth

delayed mortality

W = 27g - Mean weight at age 3: 110g

Origin of this pathology

Previously observed during shad larvae rearing (Irstea) and in other species (DiMaggio et al., 2015)

Not observed:

- in pond rearing
- in tank rearing with weaning on small size artemia

Potential origin

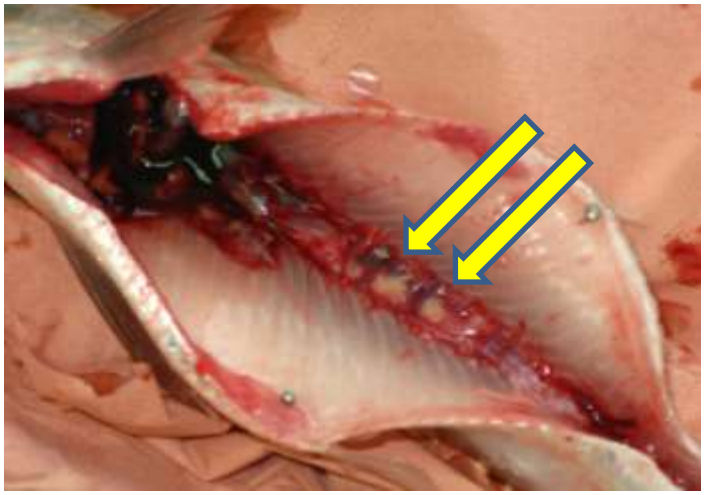
- mechanical: collision or rubbing against the tank walls

- feeding

Pathology 2: Renal nodules

Detected in April 2014 (3-year-old fish)
Stopped in September

Caused the death of around 80 fish



Origin:
Too low pH (7,4) and high concentration of CO_2

Solution:
Installation of a second biological filter with degazing system
Reduction of density (not feasible)

Learnings and results – Rearing part- 1

First months rearing

- Sufficient rearing density to generate an efficient feeding behaviour

  → Minimum recommended: 50 larvae/l

- Salinity probably too high, with potential negative effect on growth

  → Maximum recommended: 5‰ (DiMaggio et al., 2015)

- Mouth malformation: Origin not clear

  → Experimentation needed on first feeding

Learnings and results – Rearing part- 2

Juvenile and subadult rearing

- High risk of escape by jumping fish

  → Minimum recommended: 1 m high net

- Probably too high rearing density with potential negative effect on growth
  - Experimental pilot
  - Not graded

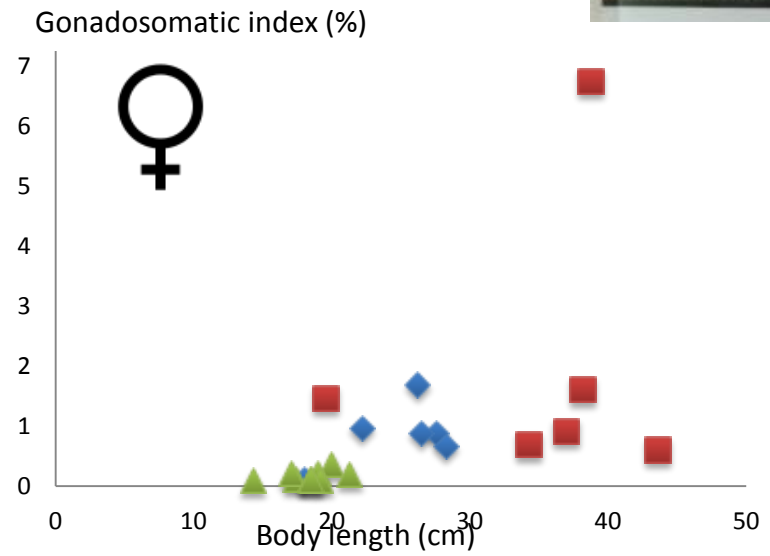
  → Maximum recommended: 2 to 5 kg/m^3 (Lambert and Dutil, 2001)

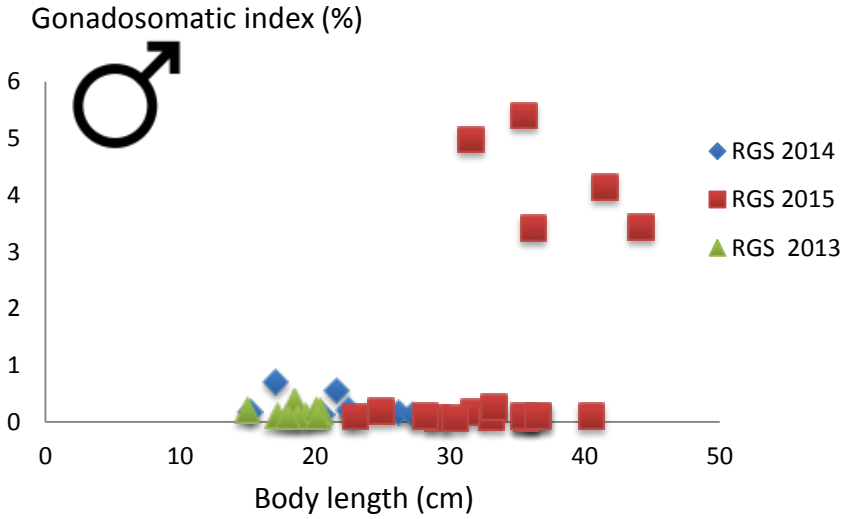
Part 2: Sexual maturation

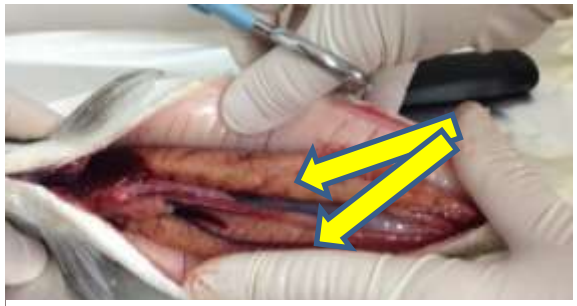
- Samplings realized in June from 2012 to 2015 – 20 fish each year

- Simulation of the migration for reproduction in 2014 and 2015
  - Randomly chosen fish transfered to freshwater

Body growth and gonadal development





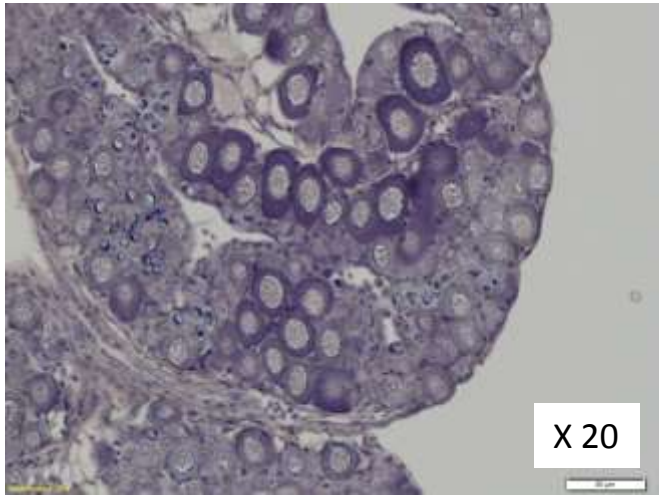


2015 Alosa # 69, GSI: 6.75

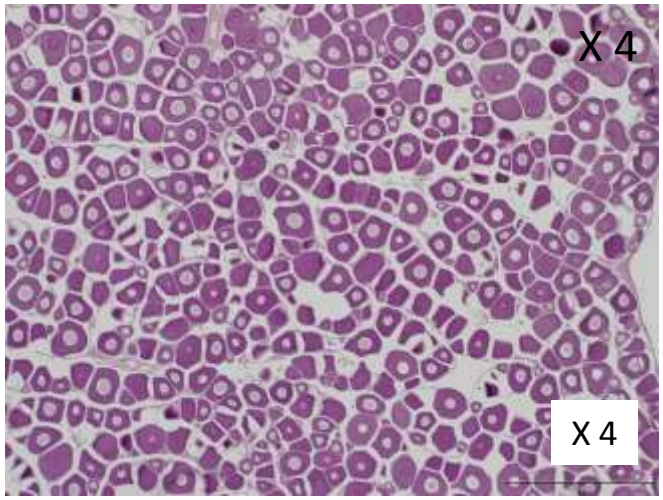
2015 Alosa # 76, GSI: 3.42

Oocyte development - 1

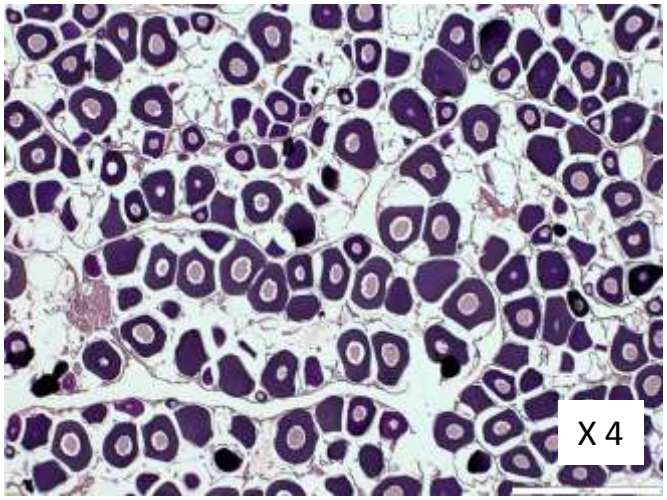
2012



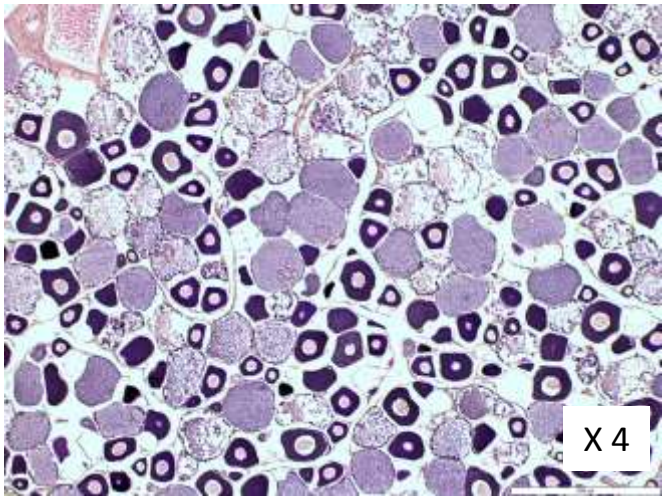
2013 Alosa #40, GSI: 1.14



2014 Alosa #51, GSI: 0.88

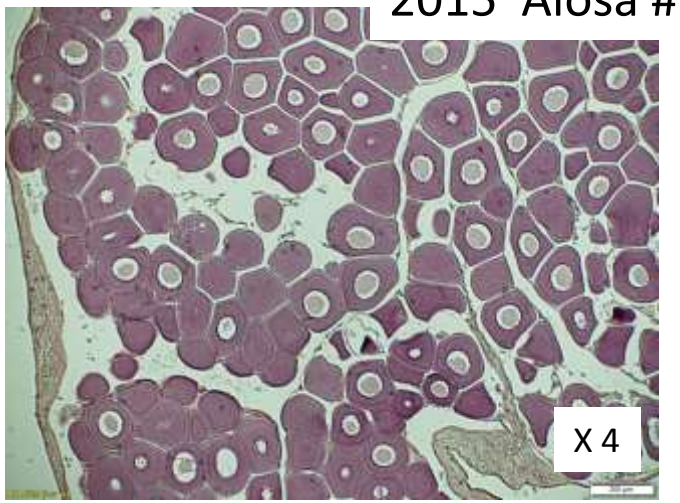


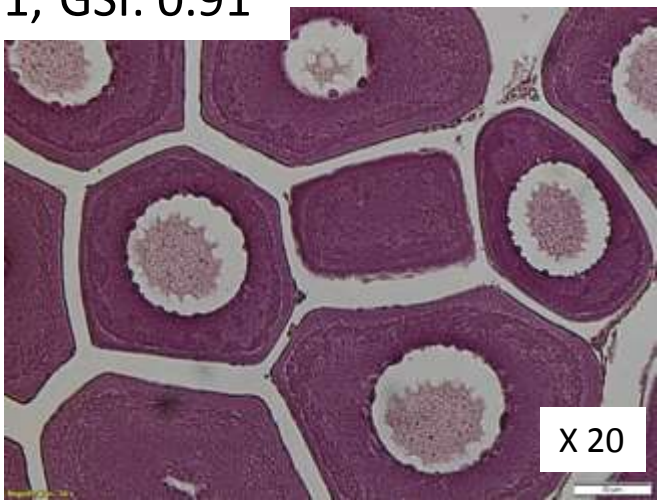
2014 Alosa #55, GSI: 1.69



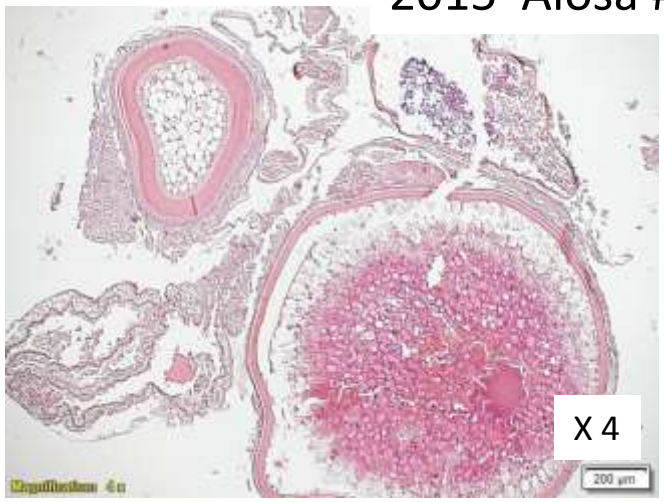
Oocyte development -2

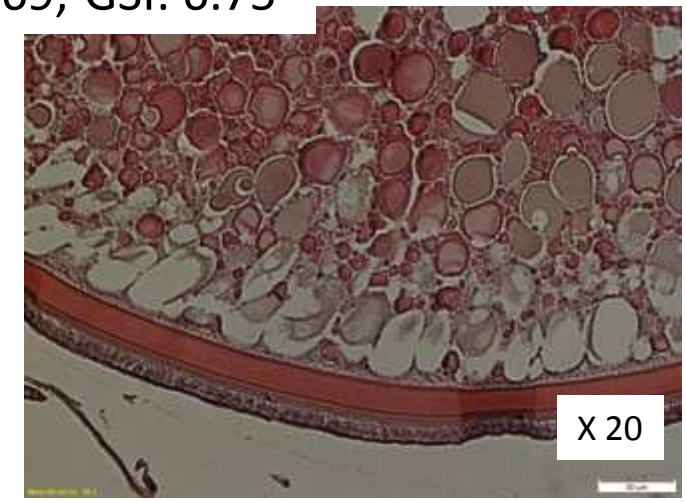
2015 Alosa # 71, GSI: 0.91





2015 Alosa # 69, GSI: 6.75

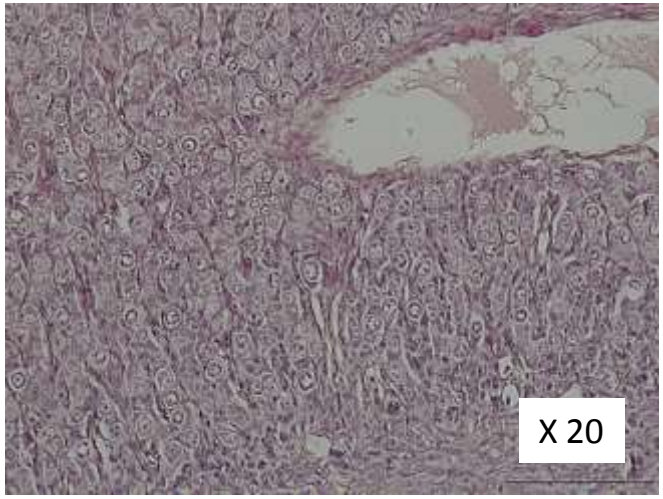




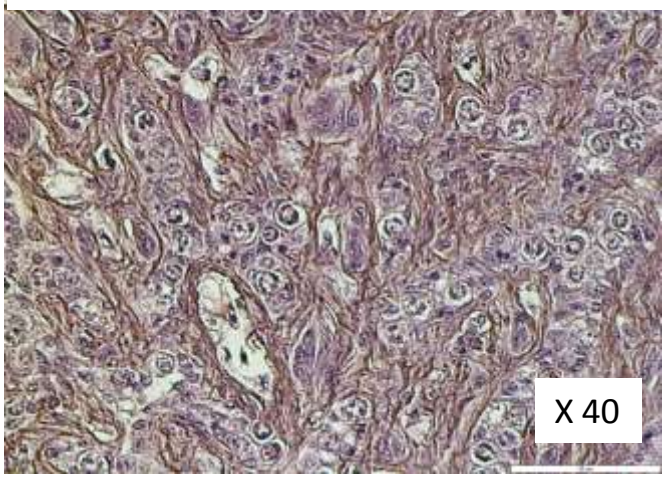
Spermatogenesis - 1

2012

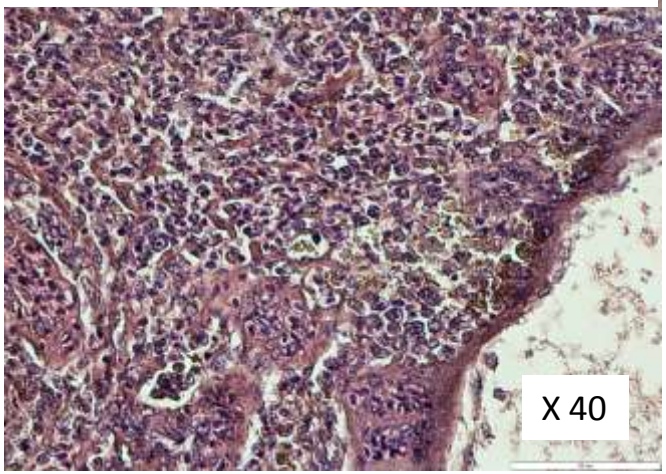
2013 Alose #25, GSI: 0.37



2014 Alosa #49, GSI: 0.17

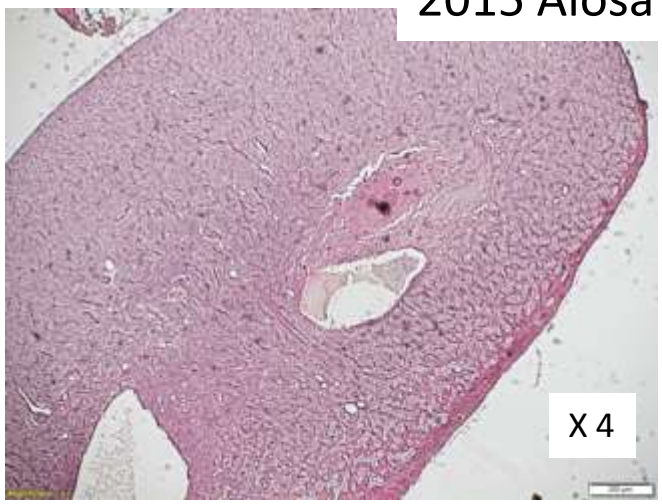


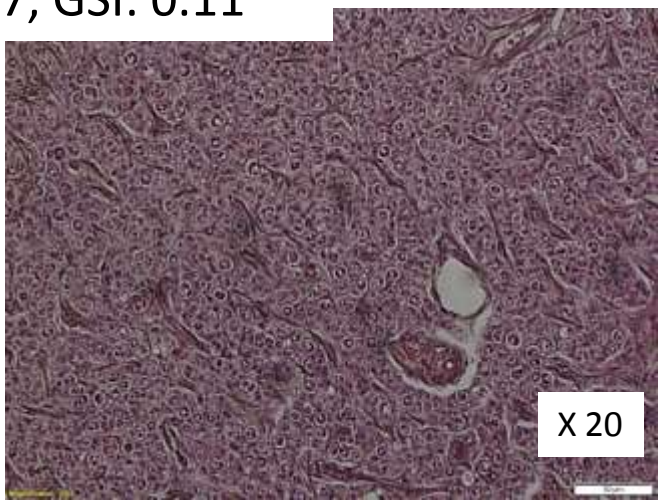
2014 Alosa #53, GSI: 0.70



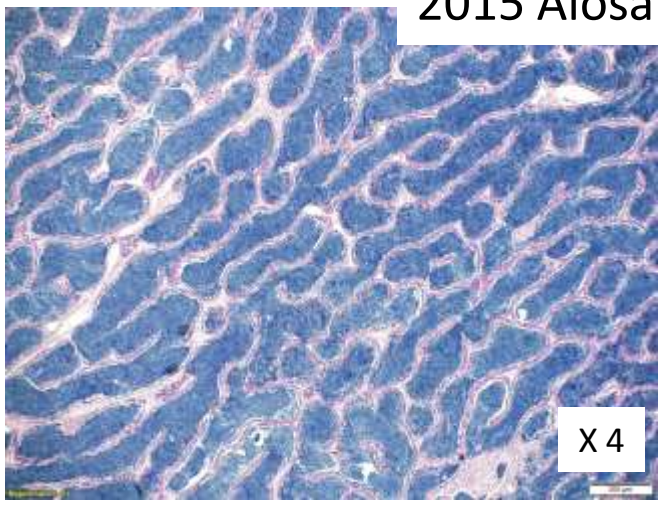
Spermatogenesis - 2

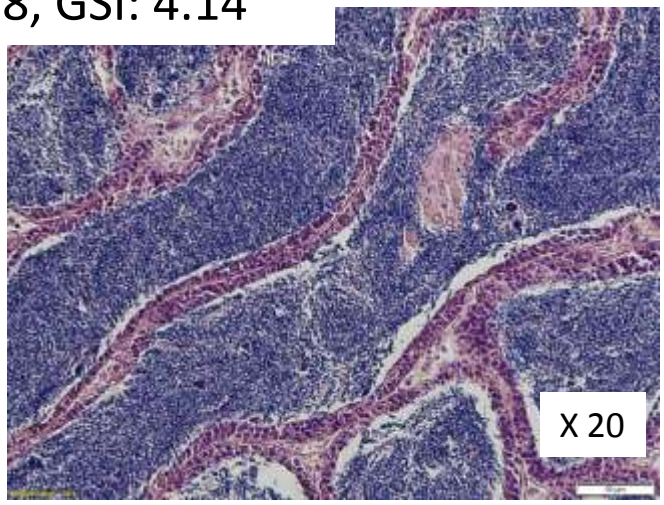
2015 Alosa #77, GSI: 0.11





2015 Alosa #78, GSI: 4.14

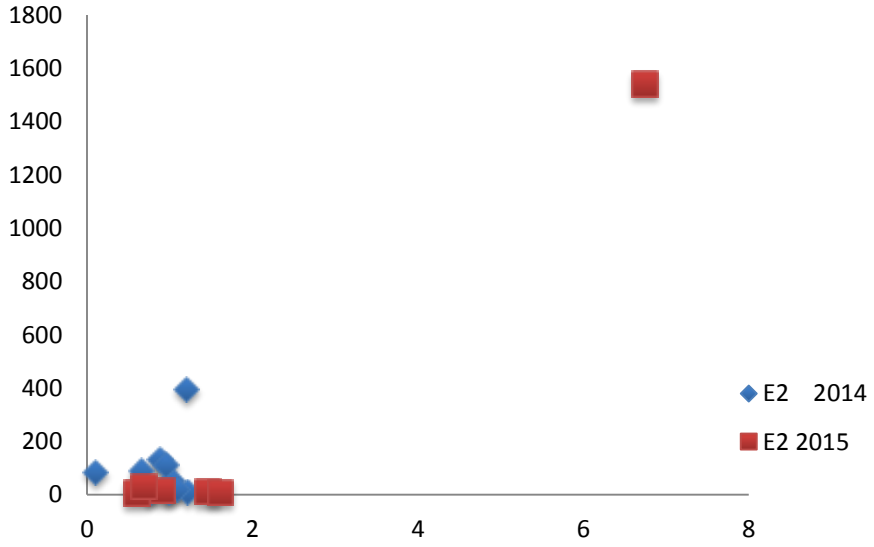




Steroidogenesis

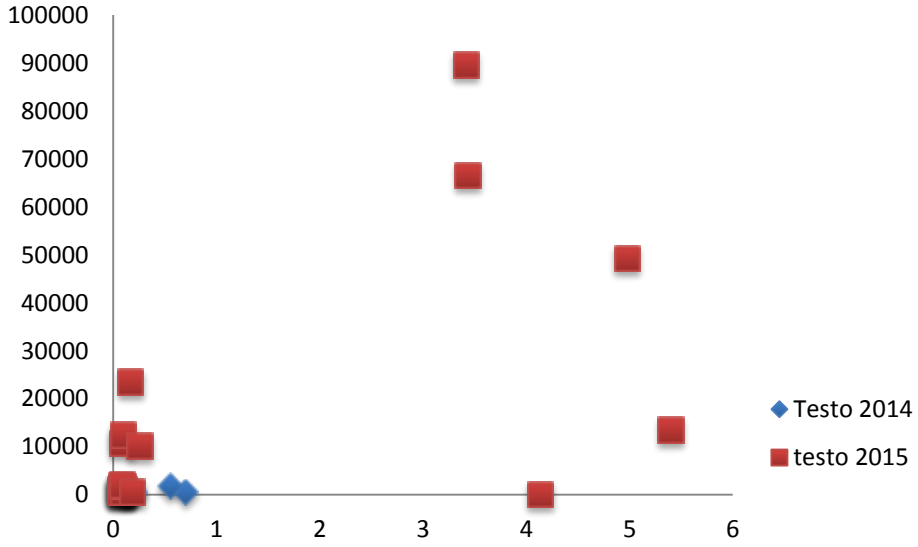
♀

Estradiol plasma levels (pg/ml)



♂

Testosterone plasma levels (pg/ml)



Gonadosomatic index (%)

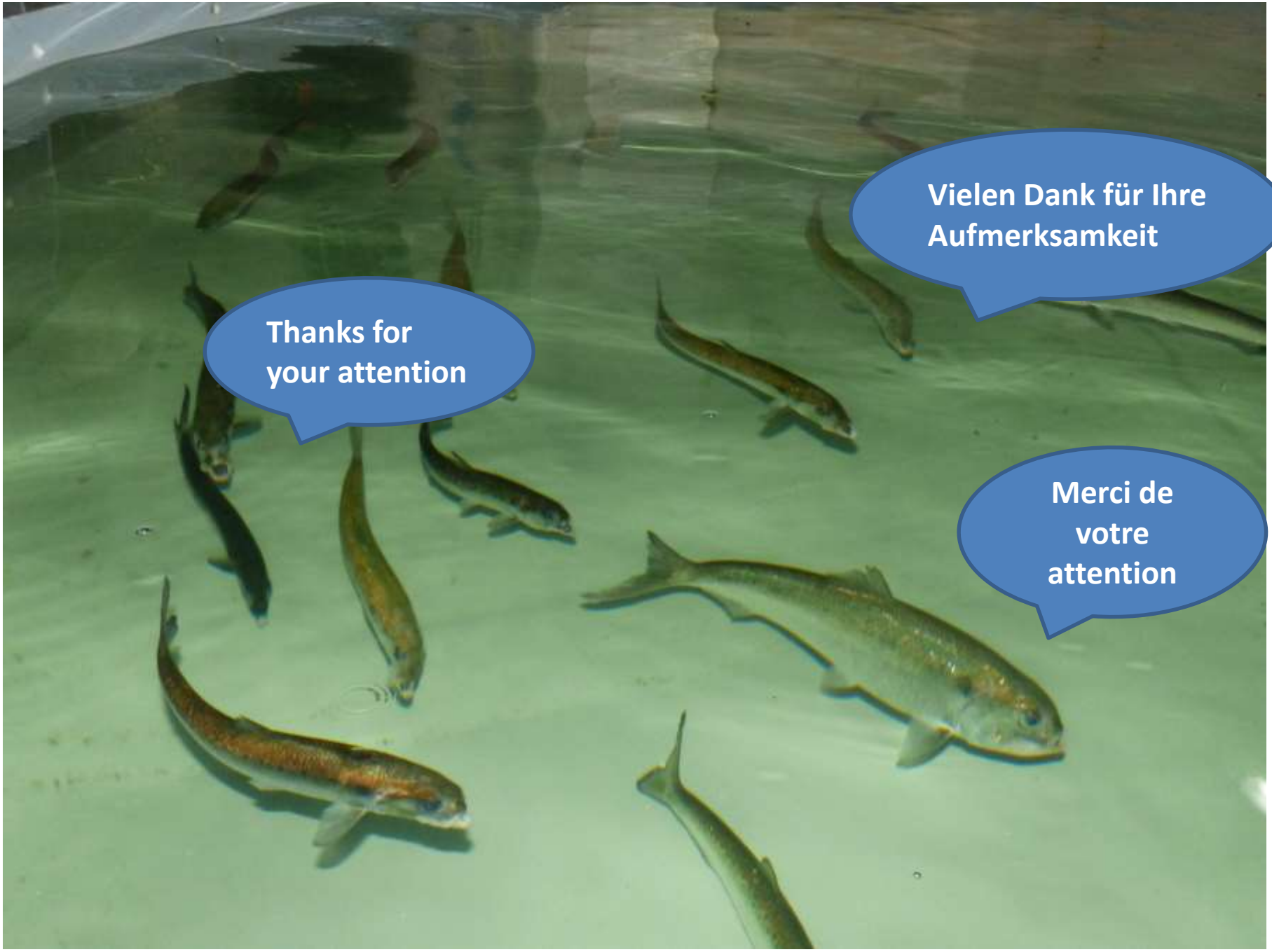
Conclusion – Part 2

Transfer to freshwater

- not yet relevant because fish are not at the right maturation stage for transfer

Gonadal maturation

- Normal development of gonads for both females and males
- First sexually mature fish observed in 2015


Vielen Dank für Ihre Aufmerksamkeit
Thanks for your attention
Merci de votre attention