

Programme LIFE+

FRESHWATER PEARL MUSSEL CONSERVATION IN THE ARMORICAN MASSIF

LIFE09 NAT FR 000583

AN ACTION COORDINATED BY :



Une voix pour la nature
(a voice for nature)

Saving six freshwater pearl mussel *Margaritifera margaritifera* populations in the Armorican Massif (France)

2nd international Meeting on Biology and Conservation of Freshwater Bivalves

Buffalo, NY
USA

October 7th, 2015

Marie Capoulade &
Pierre-Yves Pasco

www.life-moule-perliere.org/accueilmoule.php



COLLINES NORMANDES



Freshwater bivalves in France : 37 species

(Gargominy & al., 2011)

Margaritiferidae : 2 species



Margaritifera margaritifera

Margaritifera auricularia

Unionidae : 9 sp.



Anodonta anatina

Anodonta cygnaea

Potamida littoralis

Sinanodonta woodiana

Pseudanodonta complanata

Unio crassus

Unio mancus

Unio pictorum

Unio tumidus

Sphaeriidae : 22 sp.



Euglesa casertana

Euglesa globularis

Euglesa henslowana

Euglesa hibernica

Euglesa milium

Euglesa nitida

Euglesa obtusalis

Euglesa personata

Euglesa pseudosphaerium

Euglesa pulchella

Euglesa subtruncata

Euglesa supina

Odhneripisidium moitessierianum

Odhneripisidium tenuilineatum

Pisidium amnicum

Pisidium conventus

Sphaerium corneum

Sphaerium lacustre

Sphaerium ovale

Sphaerium rivicola

Sphaerium solidum

Sphaerium transversum

Cyprinidae : 2 sp.



Corbicula fluminea

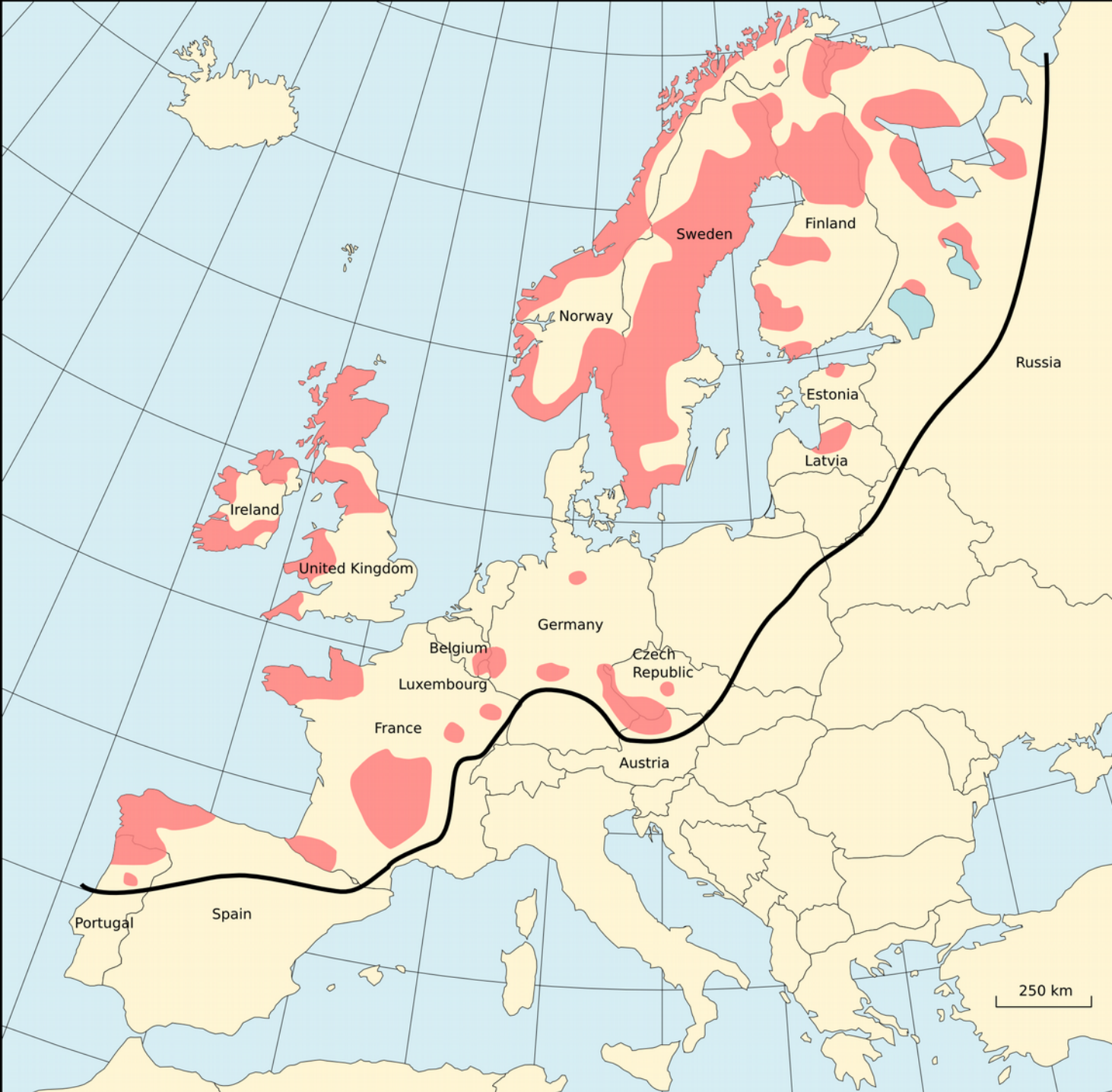
Corbicula fluminalis

Dreissenidae : 2 sp.



Dreissena polymorpha

Mytilopsis leucophaeata

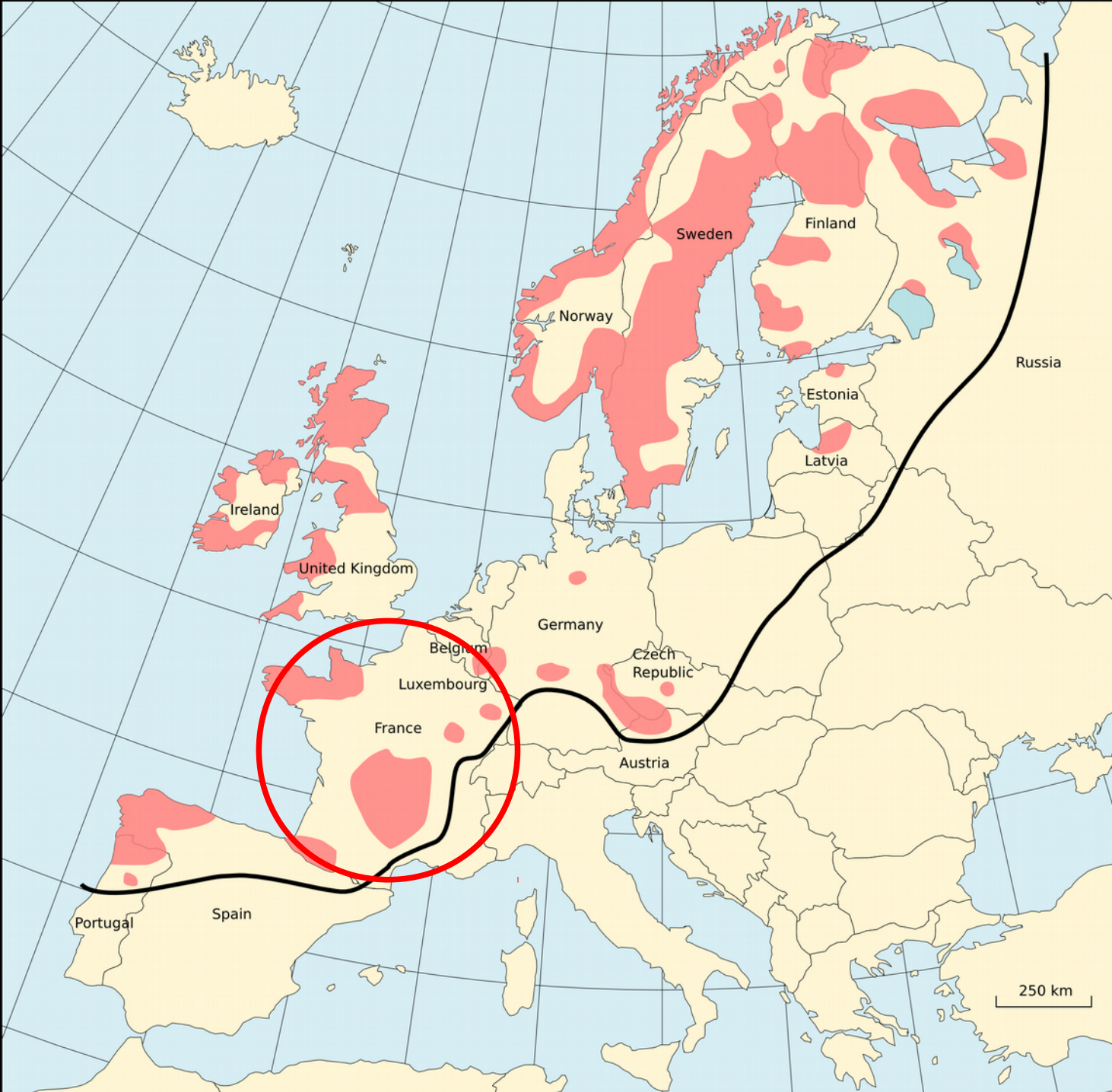


***M. margaritifera* in Europe :**

Norway	143,000,000
Russia	140,000,000
Sweden	39,000,000
Finland	12,000,000
Ireland	12,000,000
UK	12,000,000
Portugal	1,000,000
Spain (Galicia)	188,000
Germany	144,000
France	100,000
Czech rep.	80,000
Austria	50,000
Estonia	40,000
Latvia	25,000
Belgium	2,500
Luxembourg	200

From Geist, 2010 (modified)

Distribution of Freshwater pearl mussel *M. margaritifera* in Europe (from Larsen, 2005, modified)



***M. margaritifera* in Europe :**

Norway	143,000,000
Russia	140,000,000
Sweden	39,000,000
Finland	12,000,000
Ireland	12,000,000
UK	12,000,000
Portugal	1,000,000
Spain (Galicia)	188,000
Germany	144,000
France	100,000
Czech rep.	80,000
Austria	50,000
Estonia	40,000
Latvia	25,000
Belgium	2,500
Luxembourg	200

From Geist, 2010 (modified)

Distribution of Freshwater pearl mussel *M. margaritifera* in Europe (from Larsen, 2005, modified)

M.m. rivers in France (from Cochet, 2004 ; Pasco & Hesnard, 2015 ; several pers.comm.)

Armorican Massif

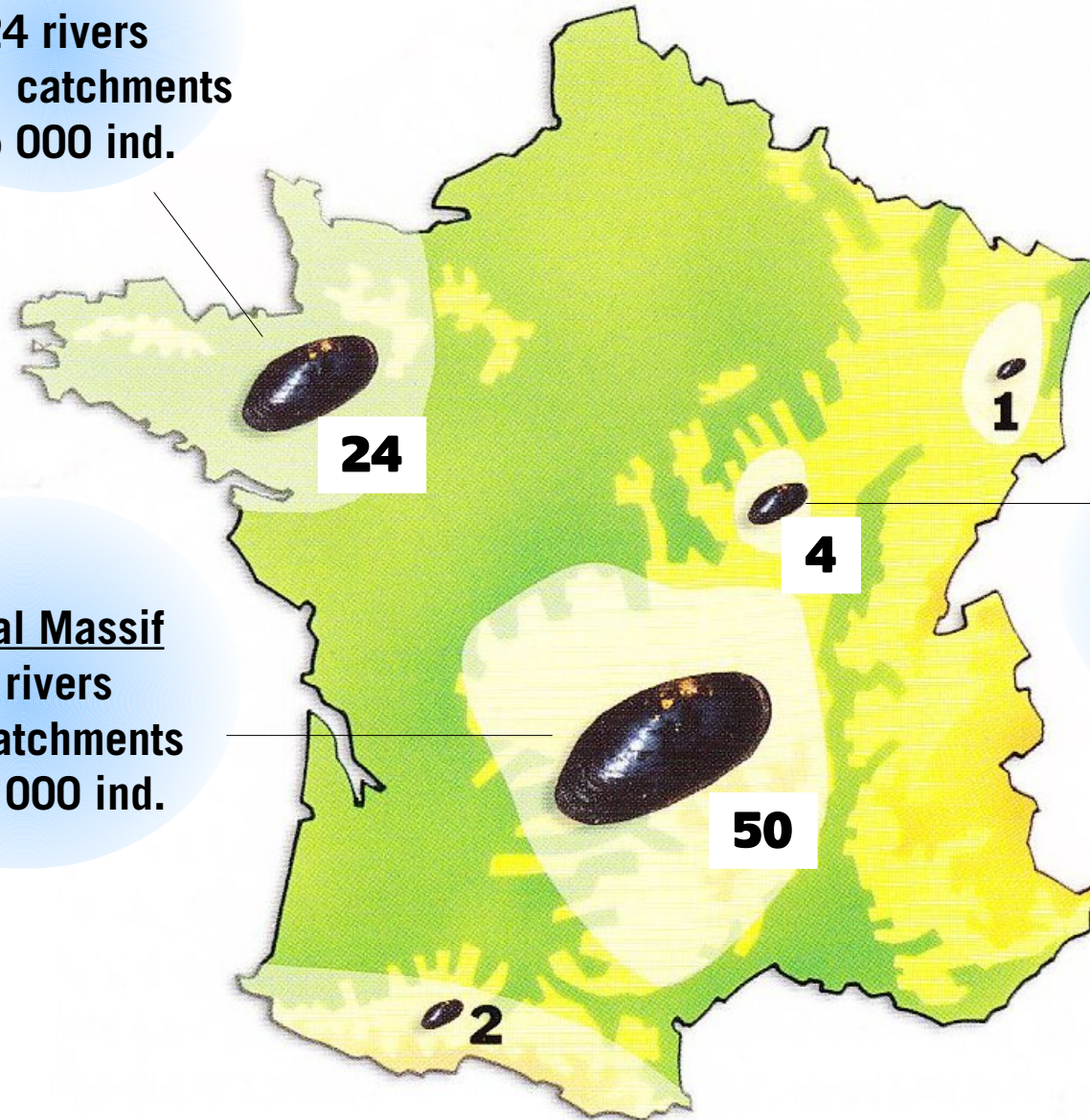
24 rivers
on 11 catchments
~5 000 ind.

Central Massif

50 rivers
on 4 catchments
~101 000 ind.

Morvan

4 rivers
on 1 catchment
~3 000 ind.



Total ~ 109 000 ind.

Programme LIFE+

FRESHWATER PEARL MUSSEL CONSERVATION IN THE ARMORICAN MASSIF

AN
ACTION
COORDI-
NATED
BY :



Une voix pour la nature

LIFE « Mulette » 2010-2016

Why ? Endangered populations :

- Old individuals
- No recruitment
- Small number

Objectives Save the 6 main population known at the creation of the programme

€/\$ 2.5 millions € (~2.8 millions \$)
50% co-founded by the European Commission



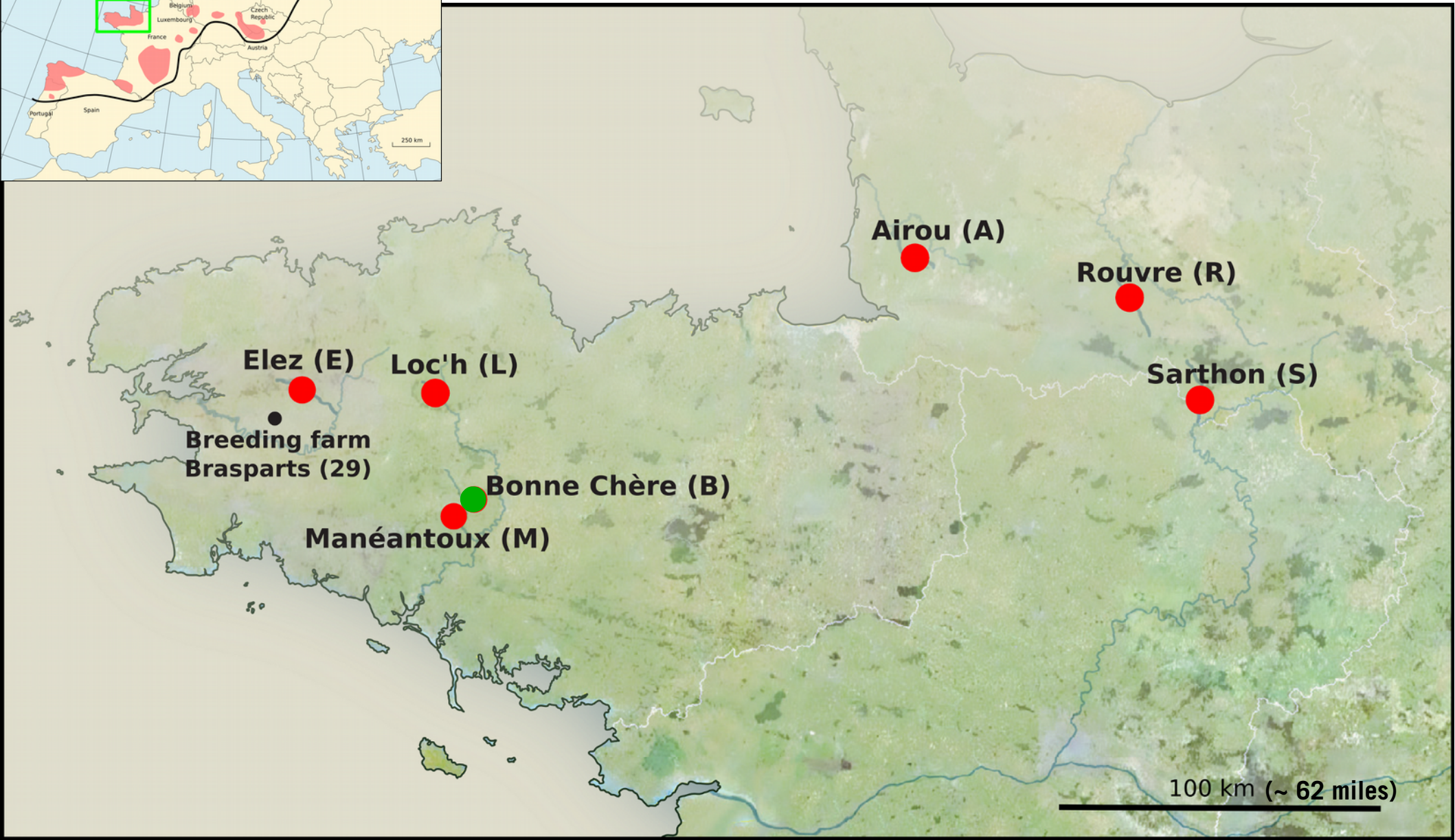
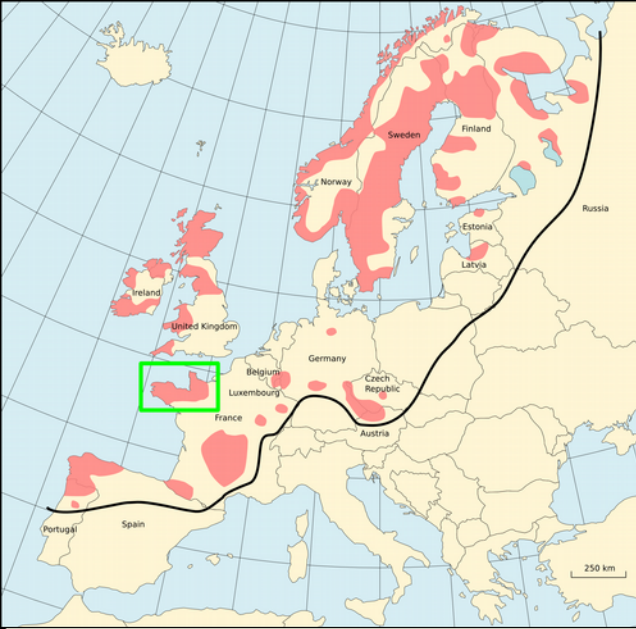
Fédération du Finistère pour la Pêche
et la Protection du Milieu Aquatique



COLLINES NORMANDES



M.m. rivers of the LIFE «Mulette» programme in the Armorican Massif





Bonne Chère



Elez



Loc'h



Airou



Rouvre



Sarthon

Main actions

**Environmental
restoration**

= Extra LIFE



**Environmental
control and survey**

**+ Host fish
& Mussels**



**Ex-situ conservation
and reinforcements**



Environmental restoration

Support current programmes

& creation of new projects with local partners :

Natura 2000 sites extensions

Wetlands diagnostics

Agricultural-environmental help funds

Land purchase

Bank protection from cattle : fences, drinking places

Ecological continuity

Spruce cutting

Waste water station improvement

Improvement of hydraulic management linked to water production and hydropower, etc.



Water quality

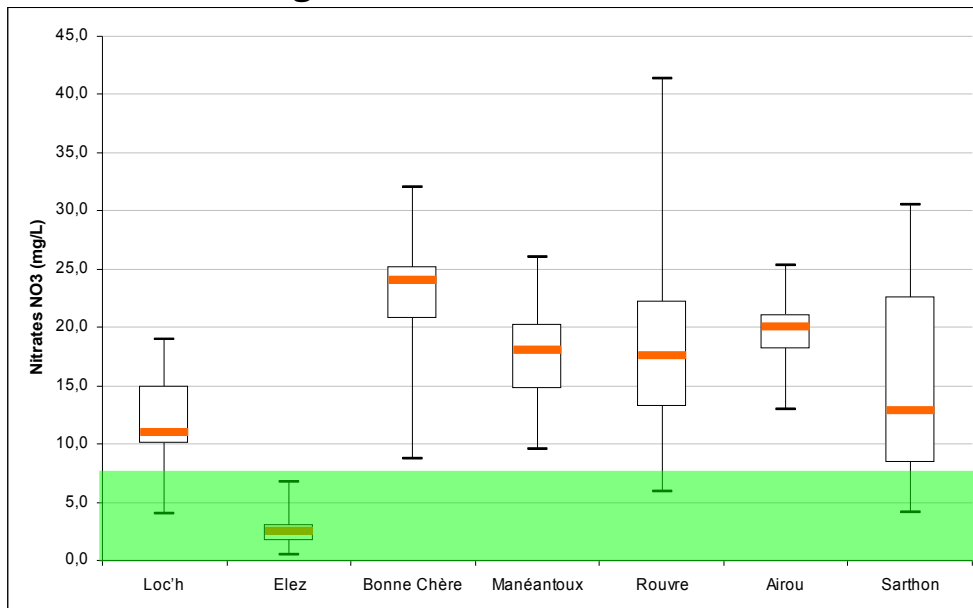
Each month :

- multiparameter : T°C, dissolved oxygene, conductivity & pH
- laboratory : nitrates N03, ortho-phosphates P04

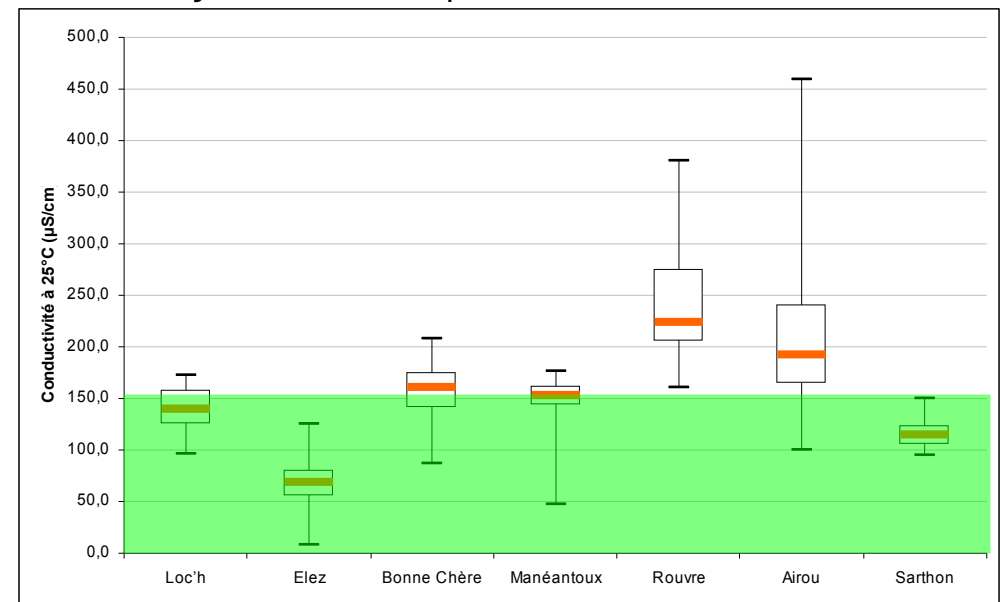
Each hour :

- temperature recorder HOB00167

Nitrates N03 (<8mg/L for *M.m.*)



Conductivity at 25°C (<150µS/cm for *M.m.*)



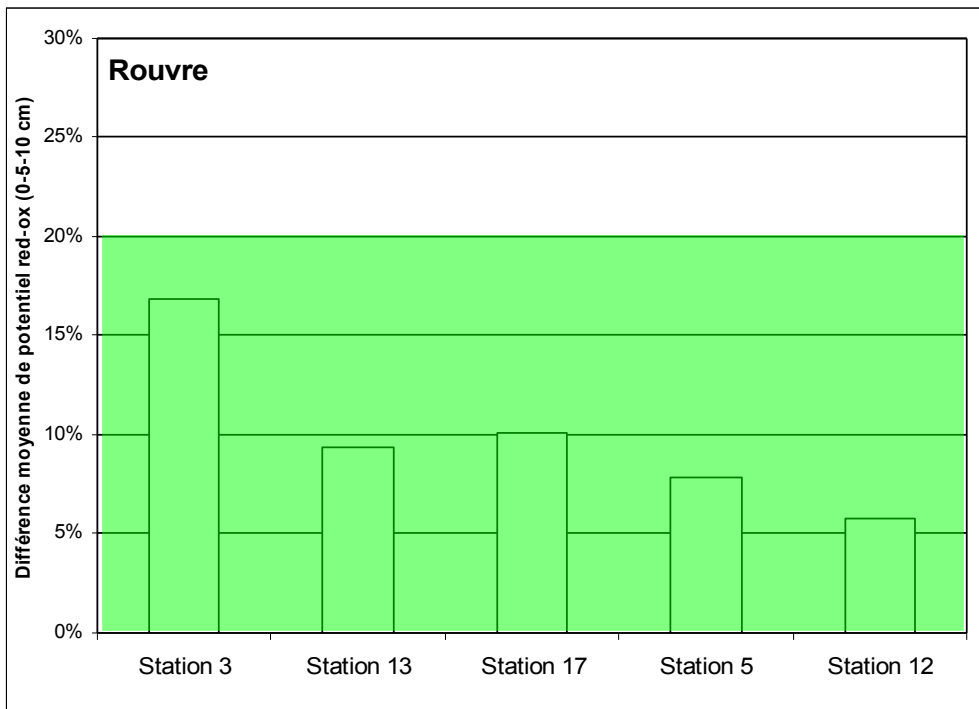
Sediment quality

During low water in summer :

- penetrability
- conductivity and pH gradient at 0 and 5cm depth
- red-ox potential gradient
- hypoxie sticks

To monitor mussel habitat
To look for favourable reinforcement places

Mean red-ox potential gradient (0-5cm depth) : <20% for *M.m.*



From Geist & Auerswald, 2007



Host fish populations

Brown trout mean density since 2011 (per 100 m²)

Bonne Chère	0+ ~ 6.3 1+ ~ 4.9
Manéantous	0+ ~ 7.4 1+ ~ 3.4
Loc'h	0+ ~ 2.2 1+ ~ 11.9
Airou	0+ ~ 3.3 1+ ~ 8.2
Rouvre	0+ ~ 9.5 1+ ~ 5.8
Sarthon	0+ ~ 2.2 1+ ~ 5.0
Elez	0+ ~ 5.2 1+ ~ 2.2

Host-fish preference studies *Salmo salar* vs *Salmo trutta fario*

- Bonne Chère in 2012
- Airou in 2014

And the winner is

...

Salmo trutta fario

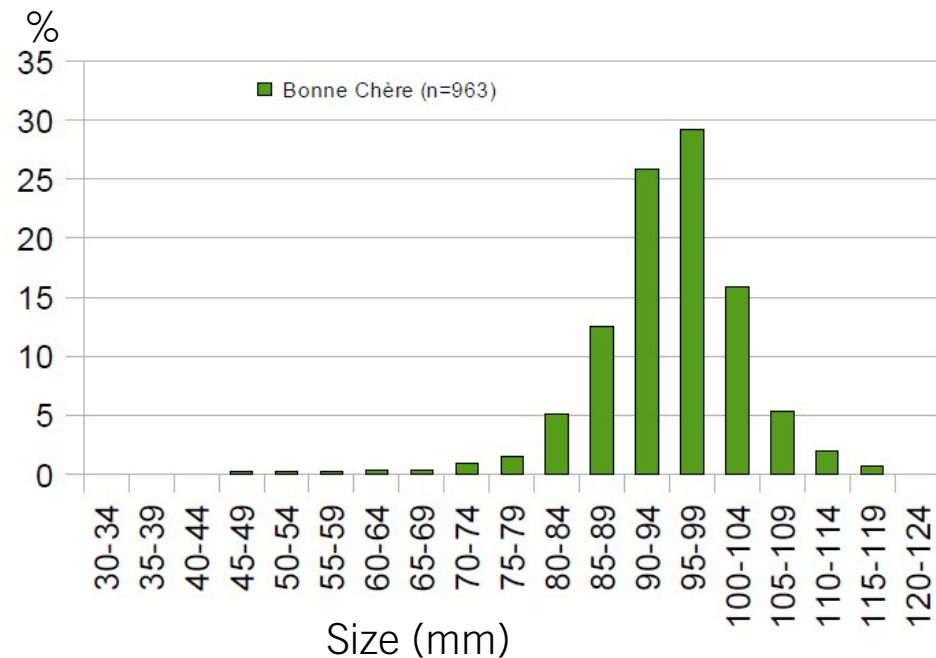


Mussel populations

M.m. mean number per river

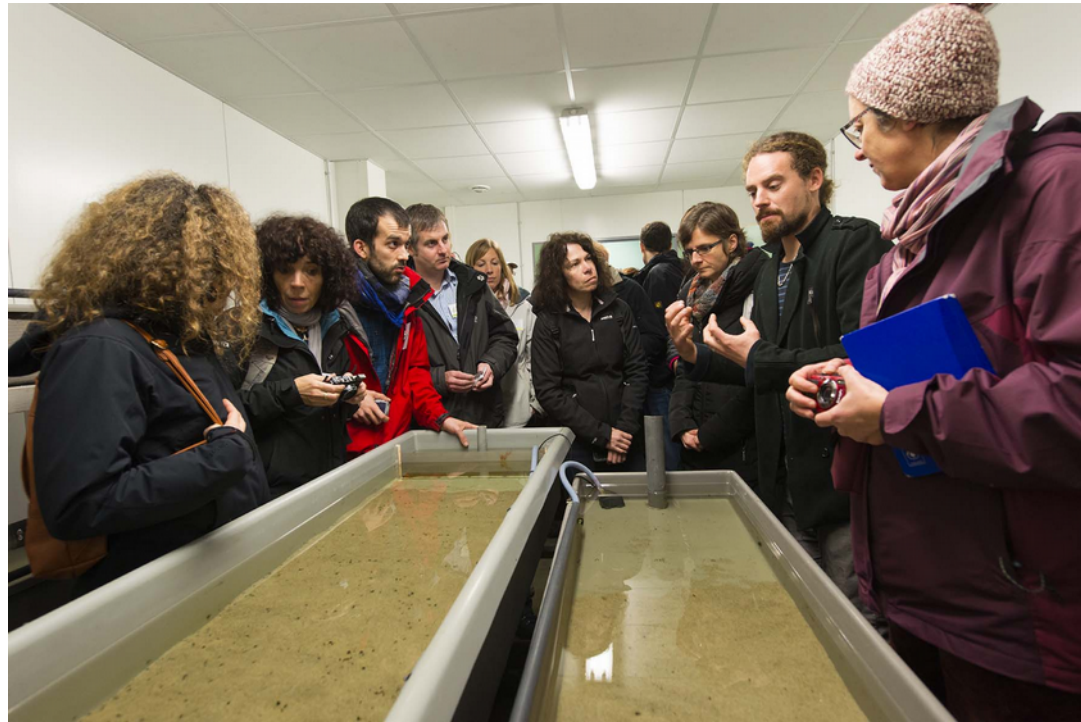
Elez	1,200-1,500
Bonne Chère	2,000-2,500
Loc'h	180-200
Airou	250-300
Rouvre	100
Sarthon	200-250

detectability not the same from a river to another : depend on morphological characteristics



Breeding farm





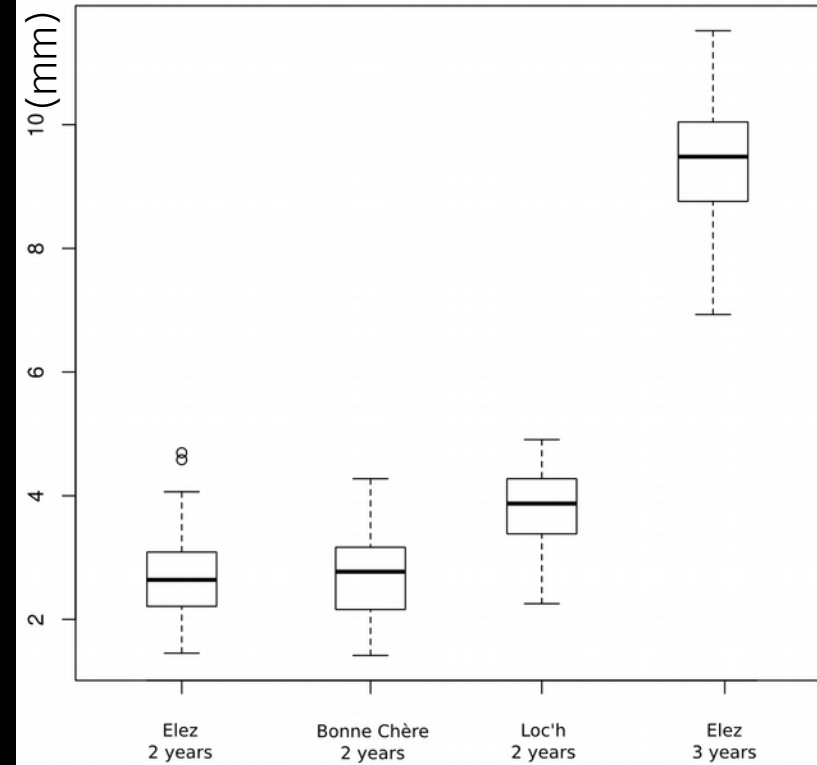
At the breeding farm in June 2015

	Elez	Bonne Chère	Loc'h	Airou	Rouvre	Sarthon
Cohort 0+ 2015	10,000	10,000	0	2,000	15,000	5,000
Cohort 1+ 2014	5,000	10,000	2,000	3,000	0	7,000
Cohort 2+ 2013	2,500	2,500	2,400	0	0	0
Cohort 3+ 2012	1,210	5	30	0	0	0
Total	18,710	22,505	4,430	5,000	15,000	12,000

Total of ~ 77 000 mussels



Length of young mussels (in mm)
(March 2015)



Mean survival rates :

0 to 1 year ~ 60 %

1 to 2 years ~ 80 %

2 to 3 years ~ 90 %

**Global mean survival
rate of 70%**

Reinforcements

Directs



In situ



...see poster

Direct reinforcements

Young mussels

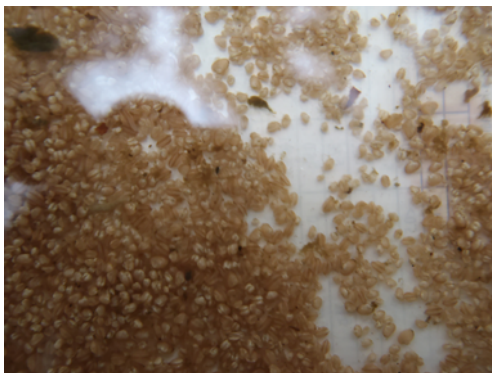
Cohort 0+	> 5 millions
Cohort 1+	180,000
Cohort 2+	4,000
Cohort 3+	0

Local infected host fish

Elez	32
Bonne Chère	321
Loc'h	30
Airou	80
Rouvre	102
Sarthon	63

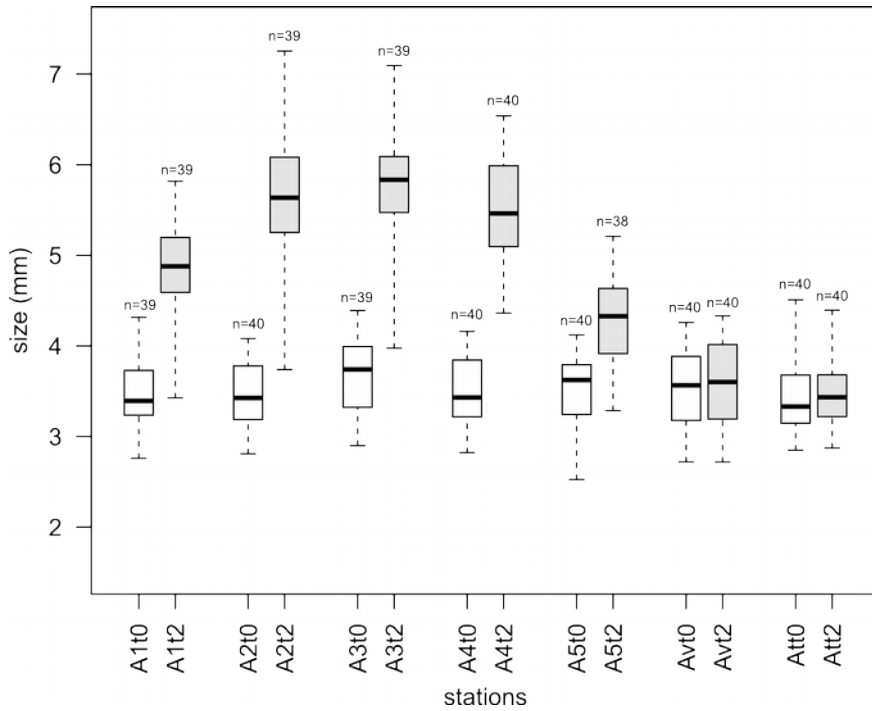
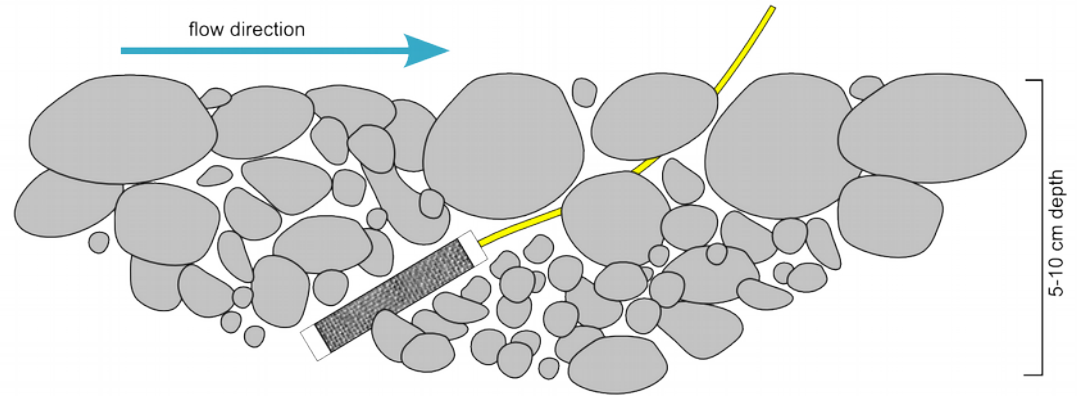
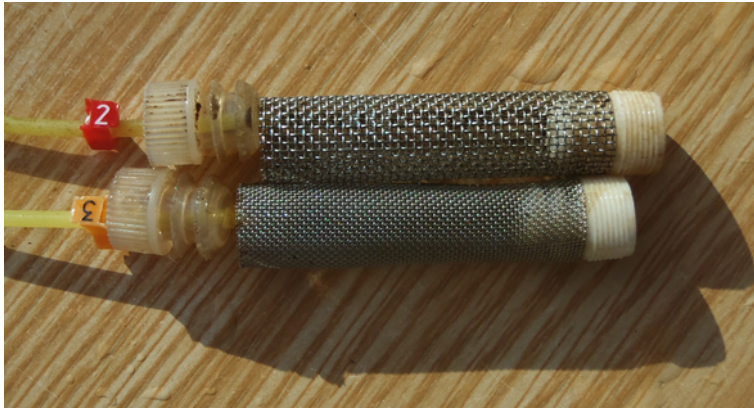
Fish-hatchery infected host-fish (local brown trout)

Elez	5,500
------	-------



Reinforcement experiments and in-situ breeding systems with *Margaritifera margaritifera* in the Armorican Massif (France)

Programme LIFE+ NAT FR 000583 / 1st September 2010 - 31st August 2016



July-September 2015
Mean survival 95 %
Mean growth 0,6 mm (+/- 0,15)

...see poster

And after...

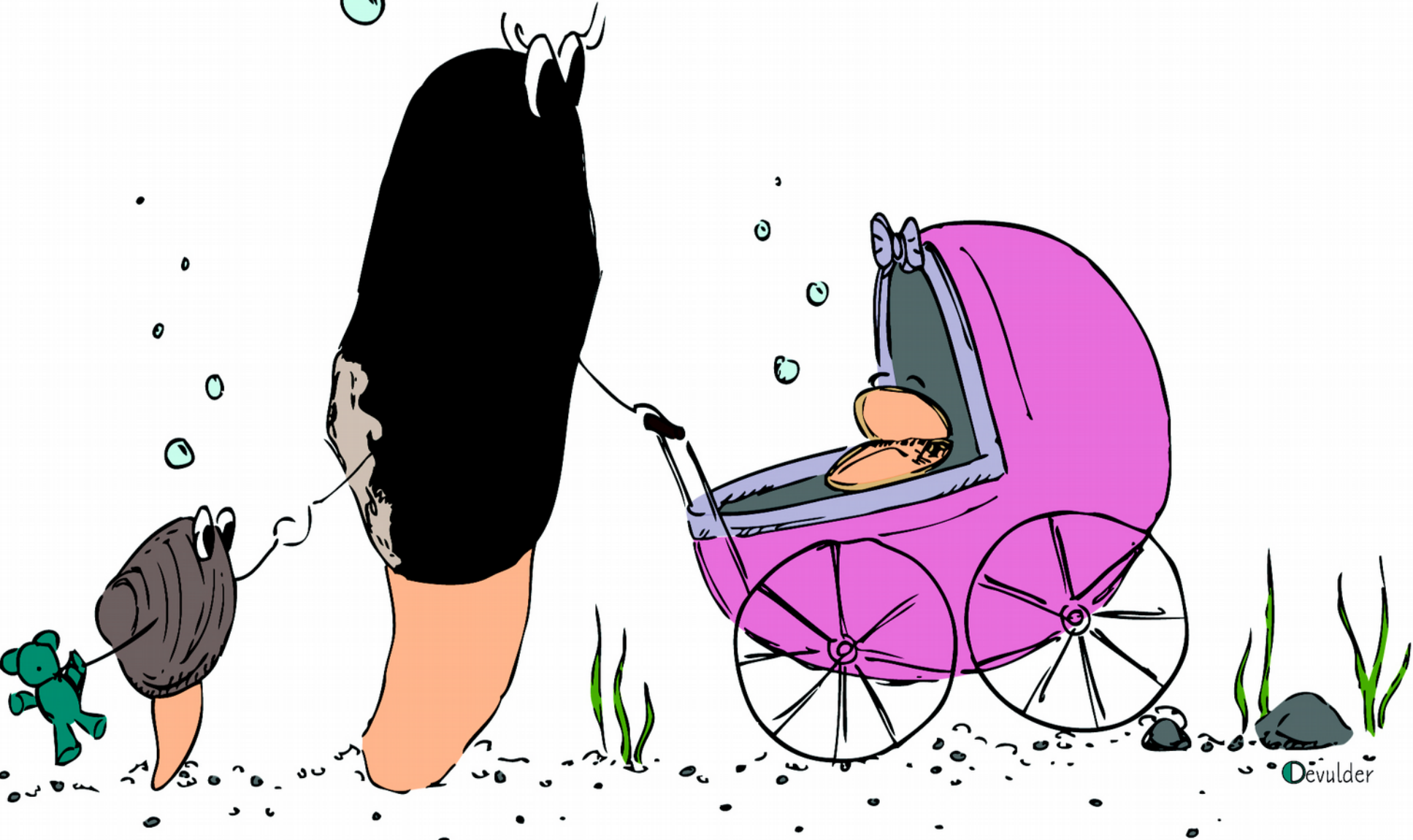


August 31st 2016 : the end ?

populations still endangered...

Regional Action Plan in construction

Thank you !



Devulder