

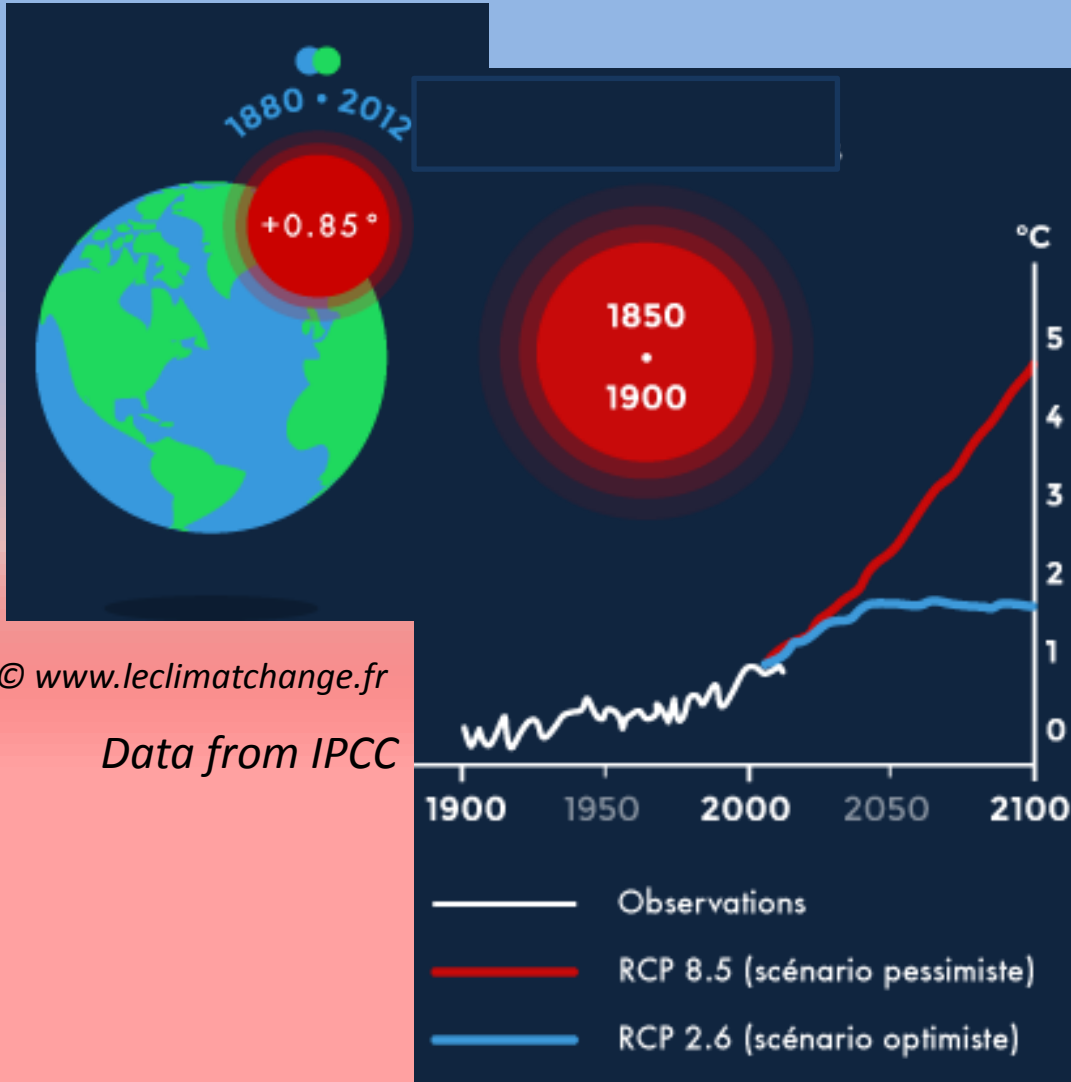
GENETICS OF THERMOTOLERANCE IN RAINBOW TROUT *Oncorhynchus mykiss*



Dupont-Nivet M.,
Crusot M.,
Rigaudeau D.,
Labbé L.,
Quillet E.



*Funded by Métaprogramme
INRA - ACCAF*



© www.leclimatchange.fr

Data from IPCC

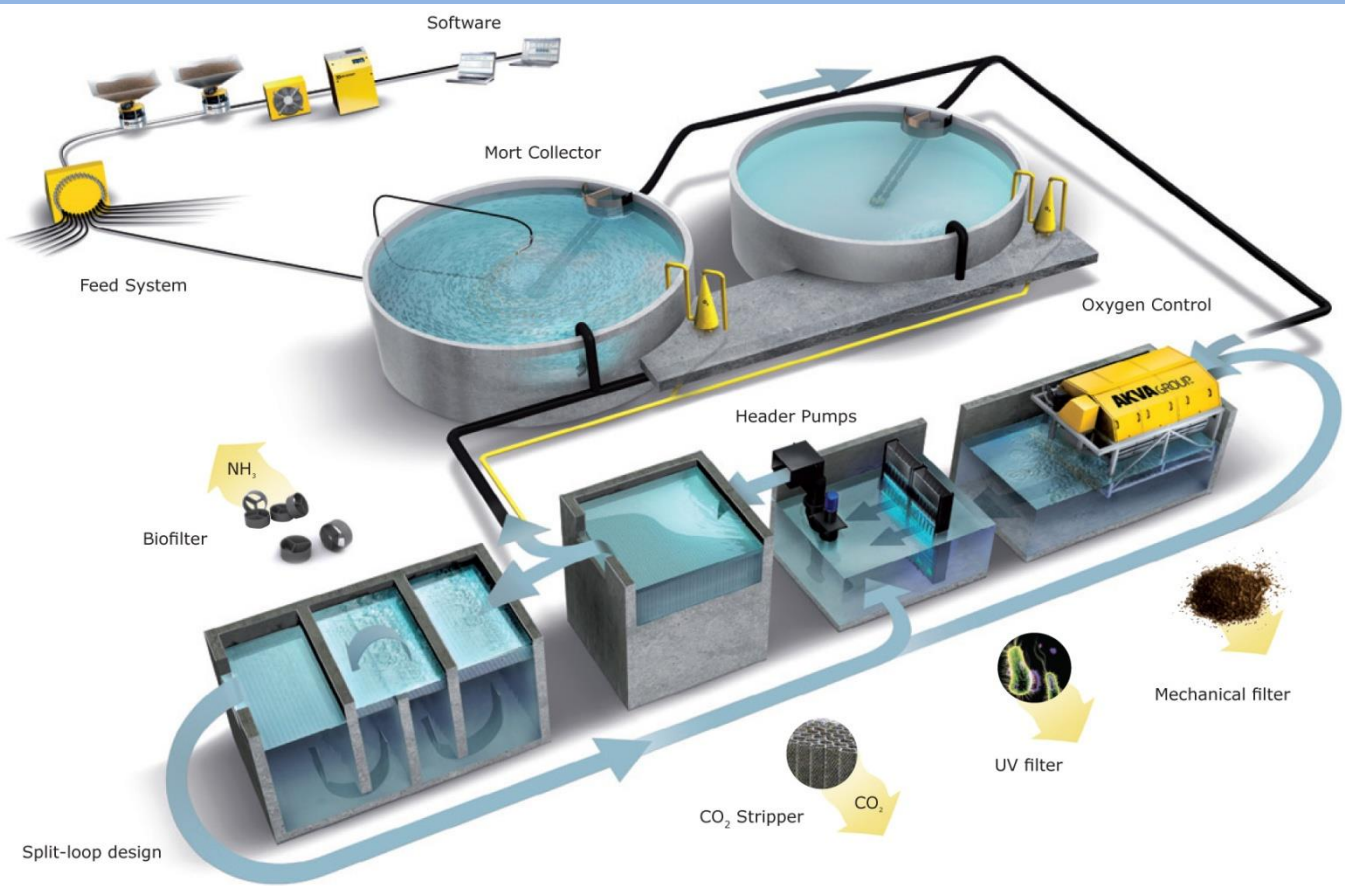
oxygen

pH

muds

extrem events

temperature

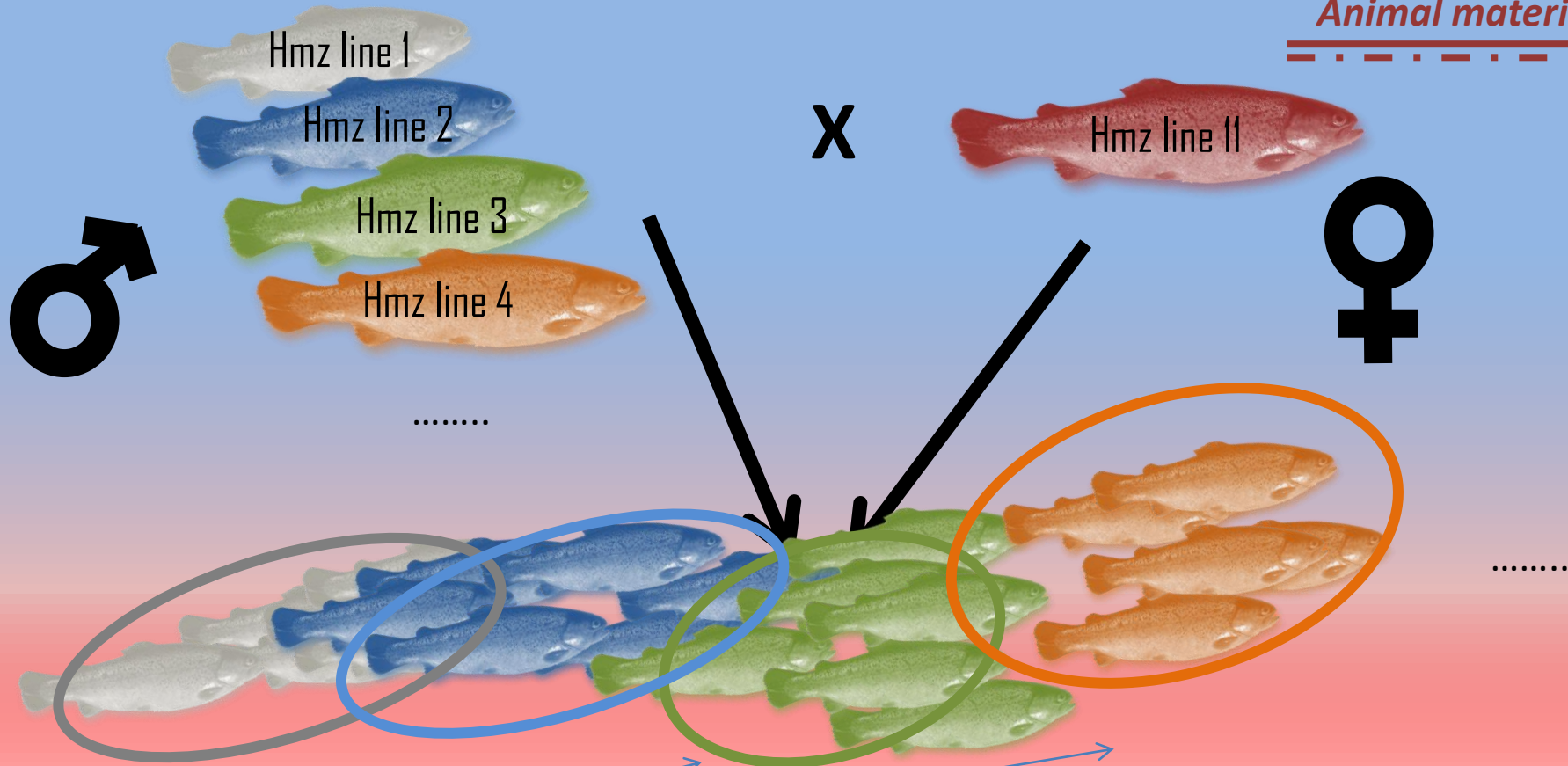


oxygen
pH
muds
Extrem events
temperature

© www.imgkid.com

Genetic variability and phenotypic characterization of thermotolerance in Rainbow trout

Animal material



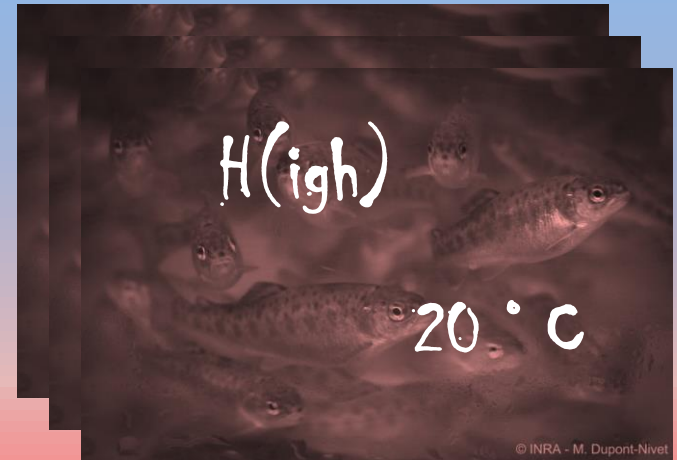
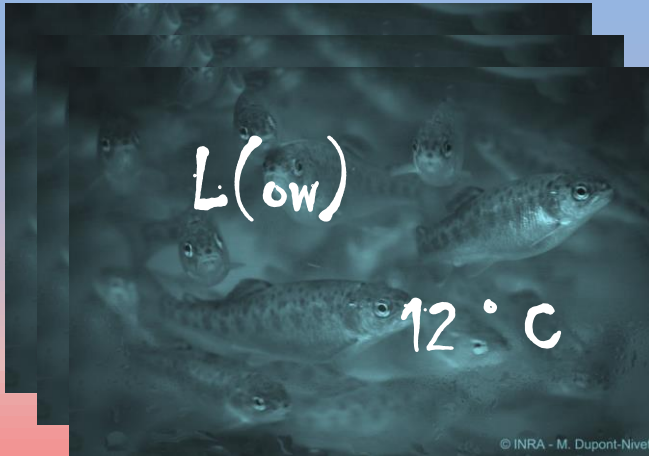
Within each line, all animals have the same genotype

10 isogenic lines - heterozygous
No maternal effect
Only for research use

Initial rearing at 10°C

Chronic 'stress'

Growth optimum : 15-16 °C
But RBT can cope with high range of temperatures

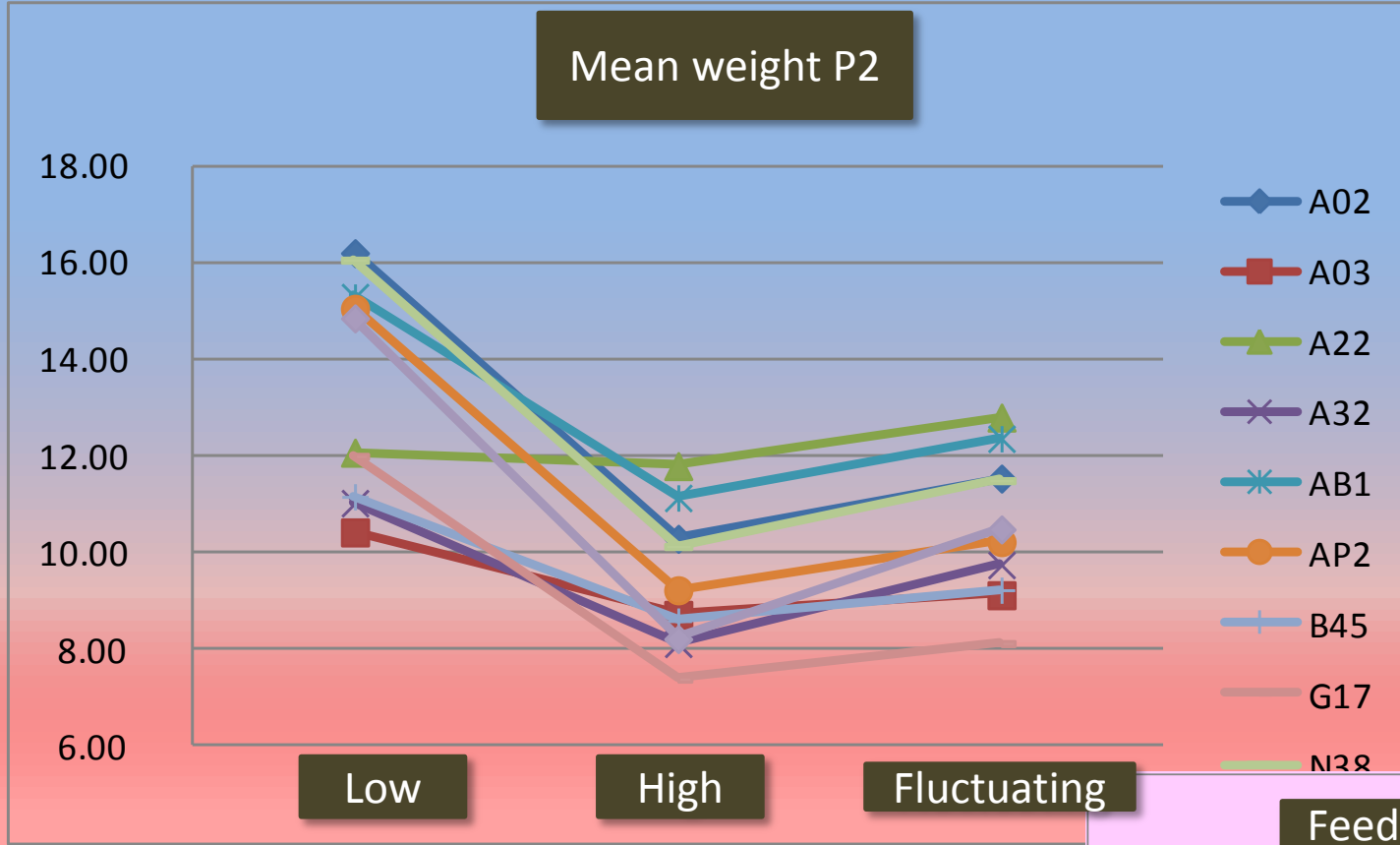


from 4 g to 9-13 g
60 fish/ line/ tank



Mortality
Weight measurements
P0
P1 : + 5 weeks
P2 : + 2 weeks

Mean Weight P2 (after 7 weeks)



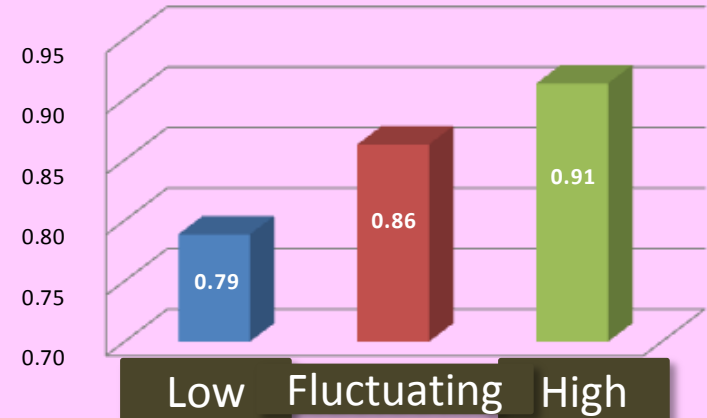
Mean weight

13.5 g

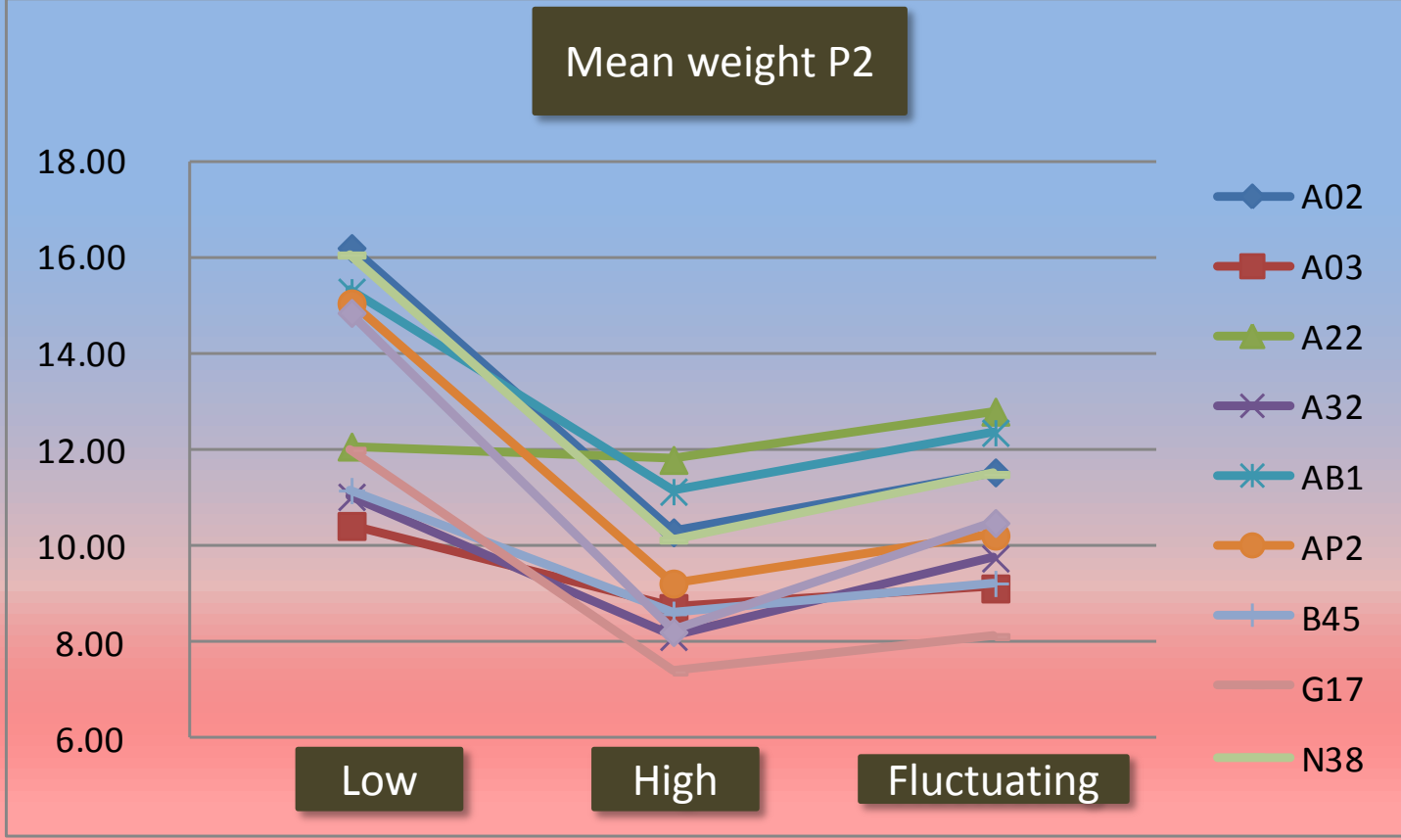
9 g

10.5 g

Feed conversion ratio



Mean Weight P2 (after 7 weeks)



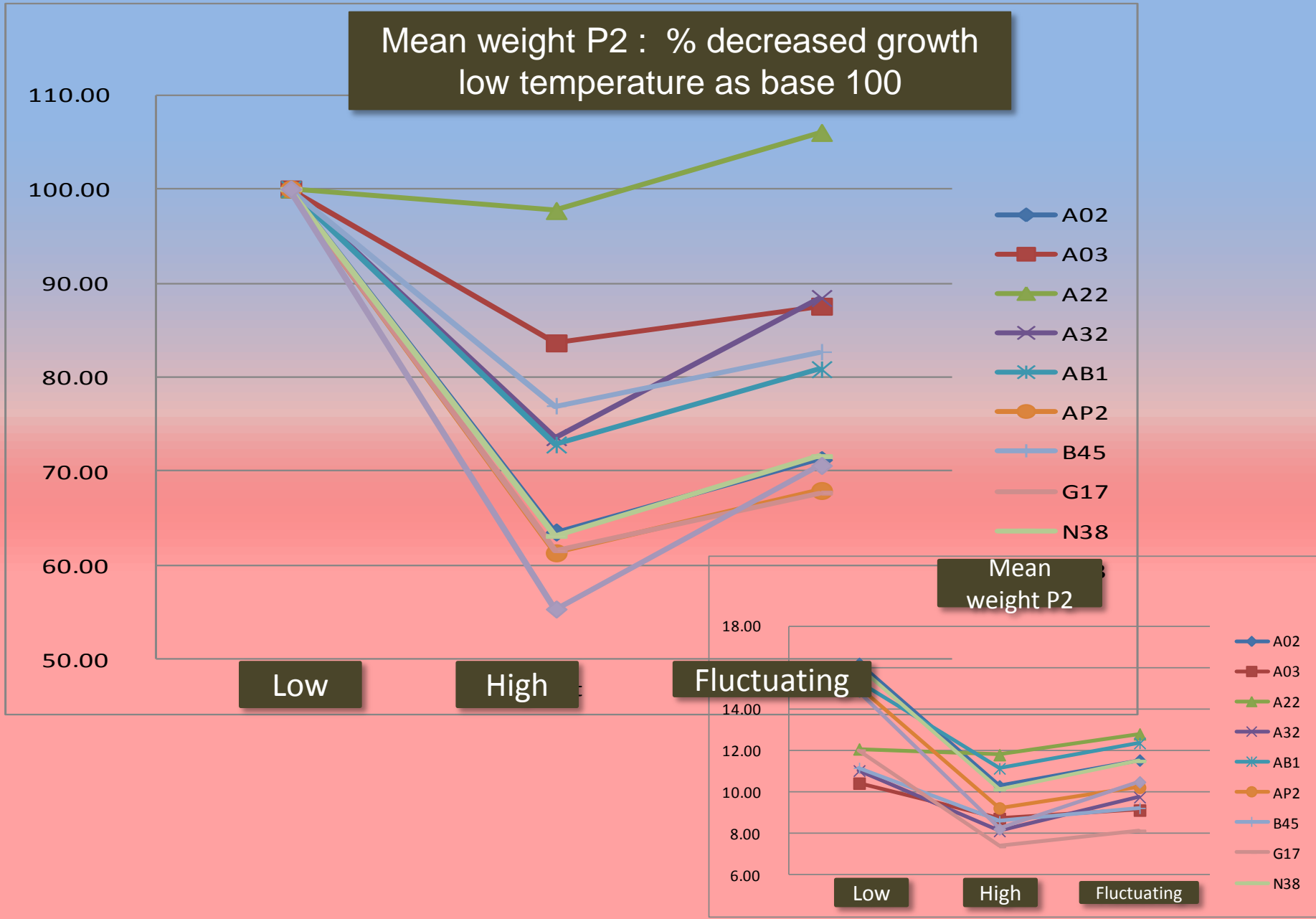
Mean weight

13.5 g

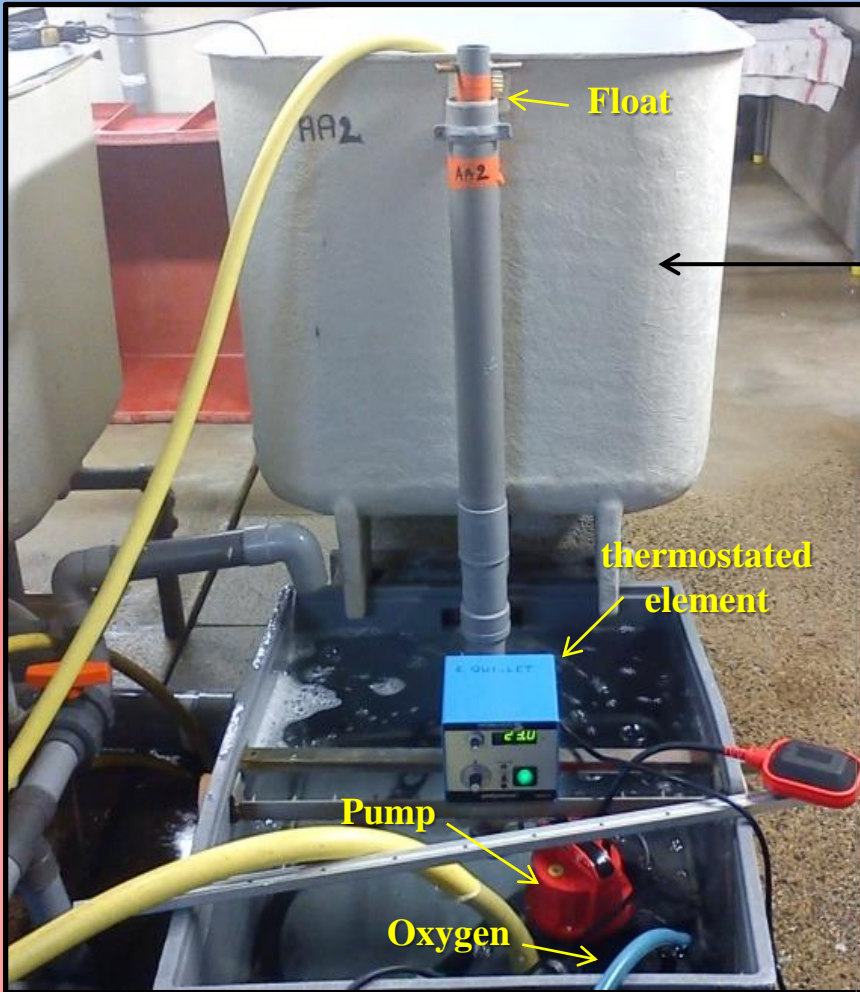
9 g

10.5 g

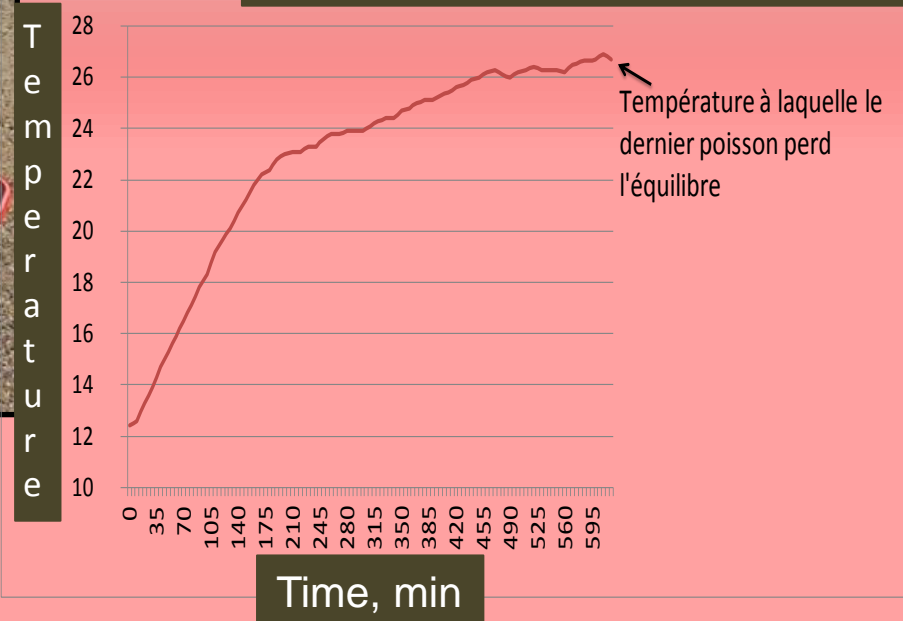
Significant genetic * temperature interactions for growth:
Genetic variability of response to temperature



Acute temperature stress

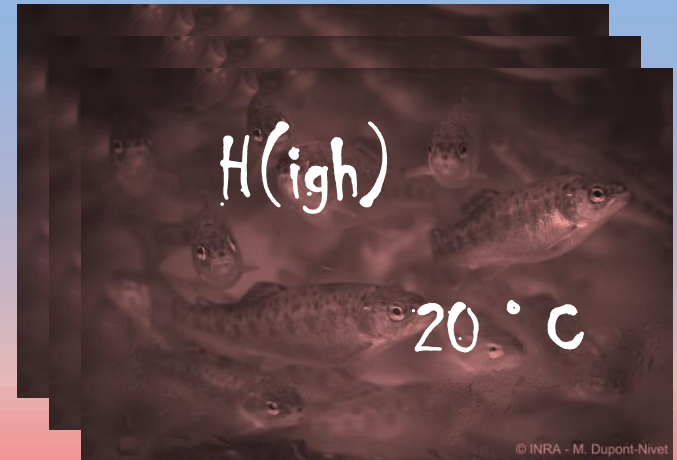
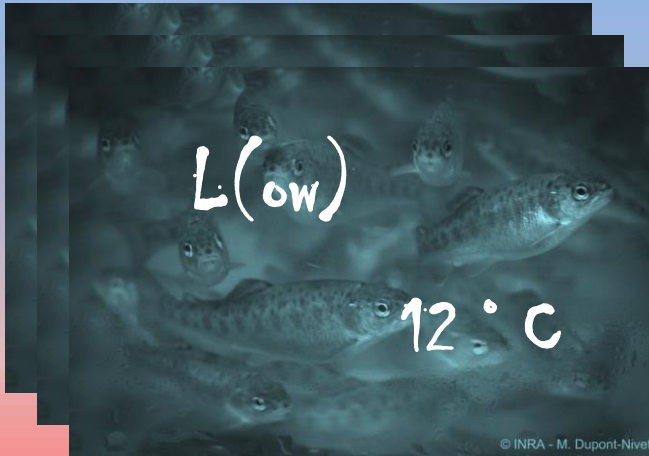


Temperature kinetics



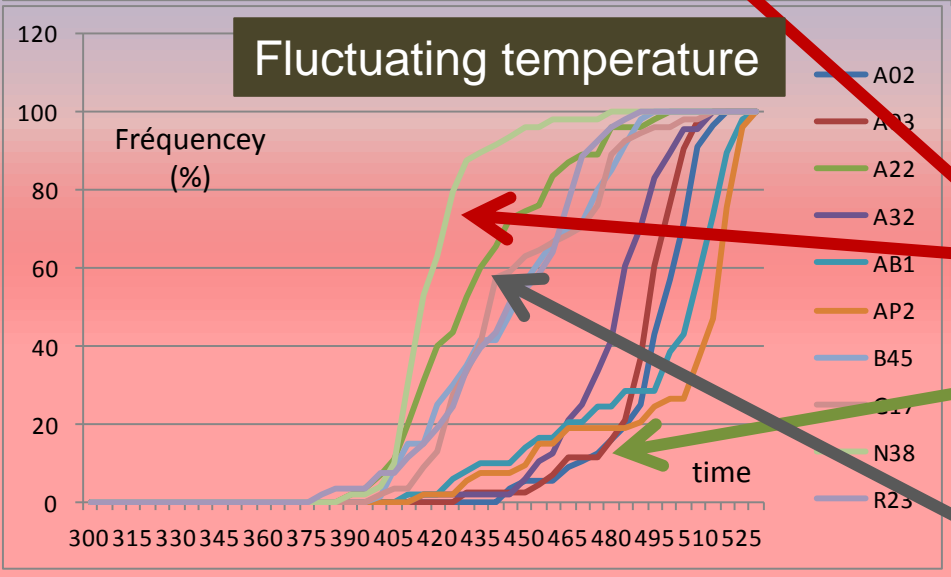
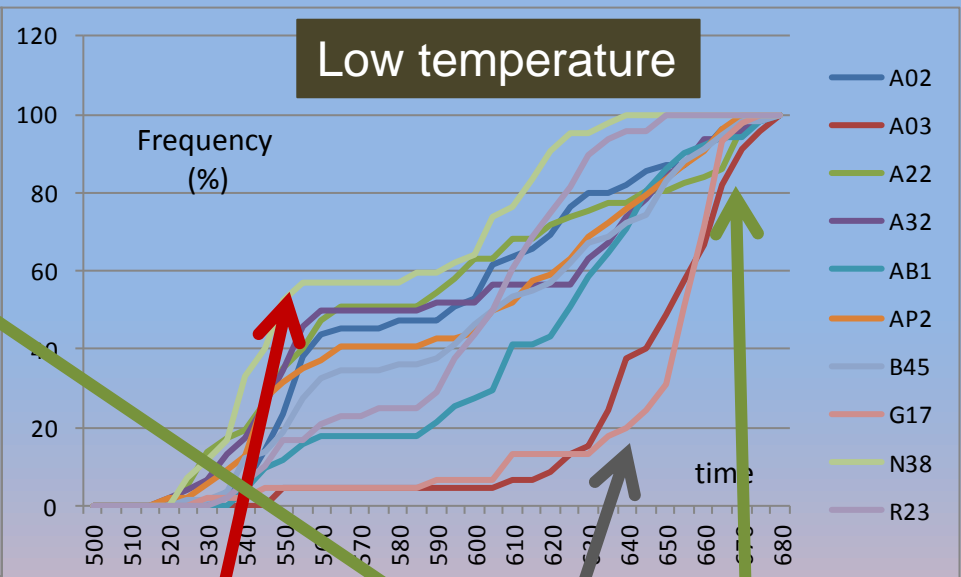
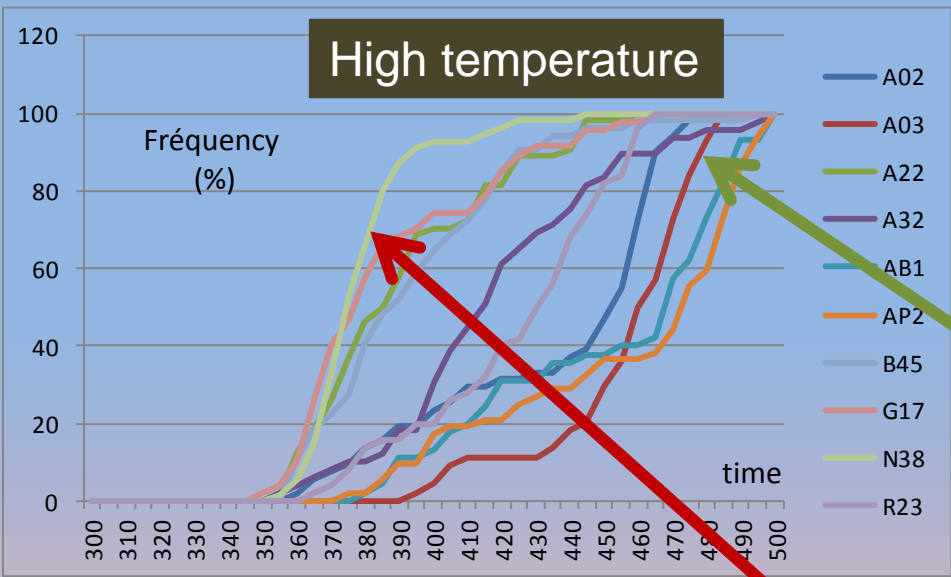
Photos © Marion Cousin

Acute temperature stress



Sum of cumulative exposure (degree.minutes) by summing all differences between the initial temperature and the experimental temperature at each minute until the loss of equilibrium, considered here as **upper thermal tolerance (UTT)** (Perry et al., 2001)

| Lignées | Moyenne de la somme de degrés subie bas | signification | | | | | Lignées | Moyenne de la somme de degrés subie haut | signification | | | | | Lignées | Moyenne de la somme de degrés subie Var | signification | | | | |
|---------|---|---------------|---|---|---|---|---------|--|---------------|---|---|---|---|---------|---|---------------|--|--|---|---|
| N38 | 5468 | a | | | | | N38 | 2447 | a | | | | | N38 | 2365 | a | | | | |
| R23 | 5635 | a | b | | | | G17 | 2458 | a | | | | | A22 | 2416 | a | | | | |
| AP2 | 5894 | | b | c | | | A22 | 2494 | a | b | | | | B45 | 2522 | | | | b | |
| A32 | 5921 | | | c | | | B45 | 2561 | | | b | | | G17 | 2551 | | | | b | |
| B45 | 5969 | | | c | d | | R23 | 2660 | | | | c | | R23 | 2587 | | | | b | |
| A22 | 6073 | | | c | d | | A02 | 2727 | | | | c | | A32 | 2789 | | | | | c |
| A02 | 6124 | | | c | d | | A03 | 2832 | | | | | d | A02 | 2806 | | | | | c |
| AB1 | 6207 | | | | d | | A32 | 2838 | | | | | d | A03 | 2857 | | | | | c |
| A03 | 6503 | | | | | e | AP2 | 2920 | | | | | | AB1 | 2883 | | | | | c |
| G17 | 6549 | | | | | e | AB1 | 2940 | | | | | | AP2 | 2923 | | | | | |



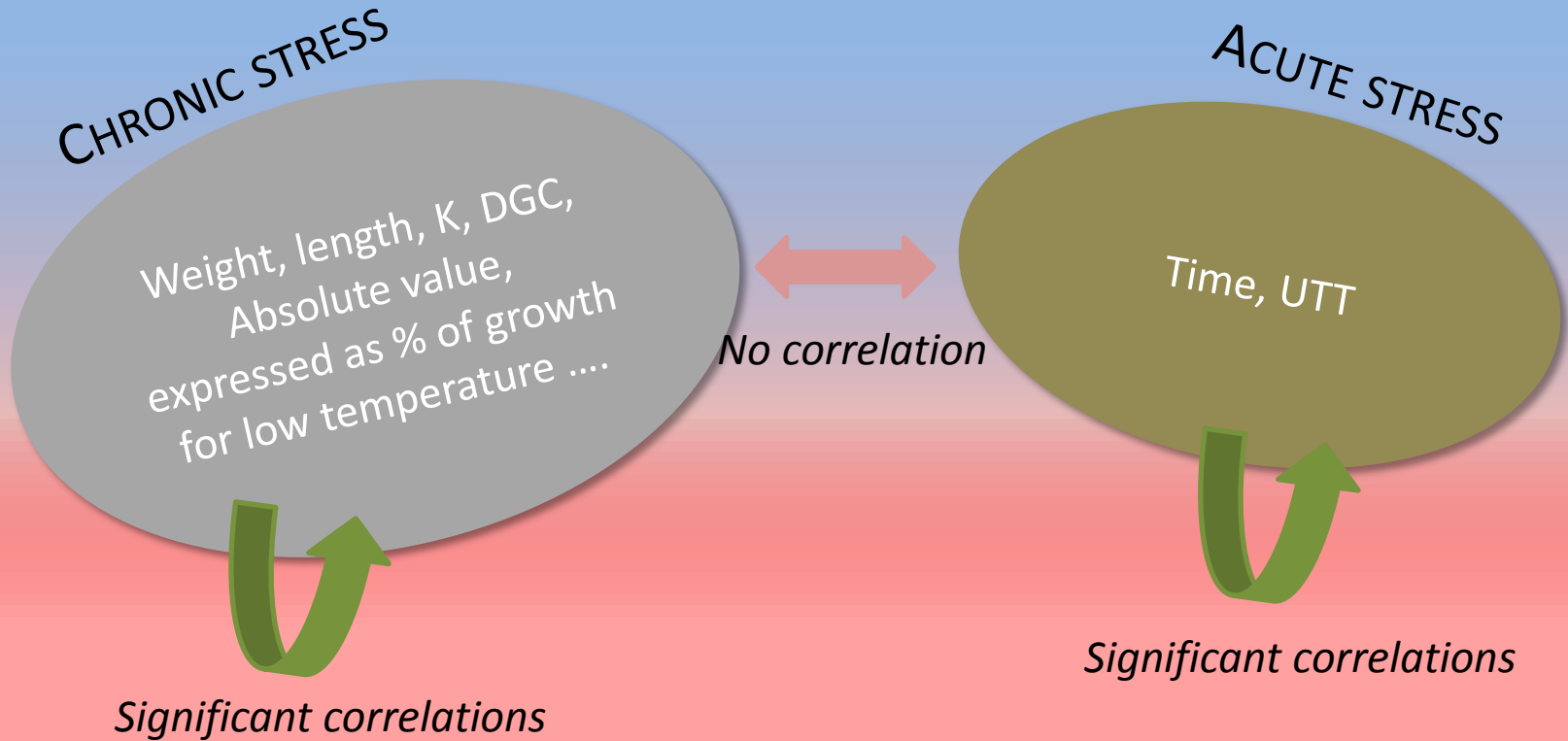
Sensitive line

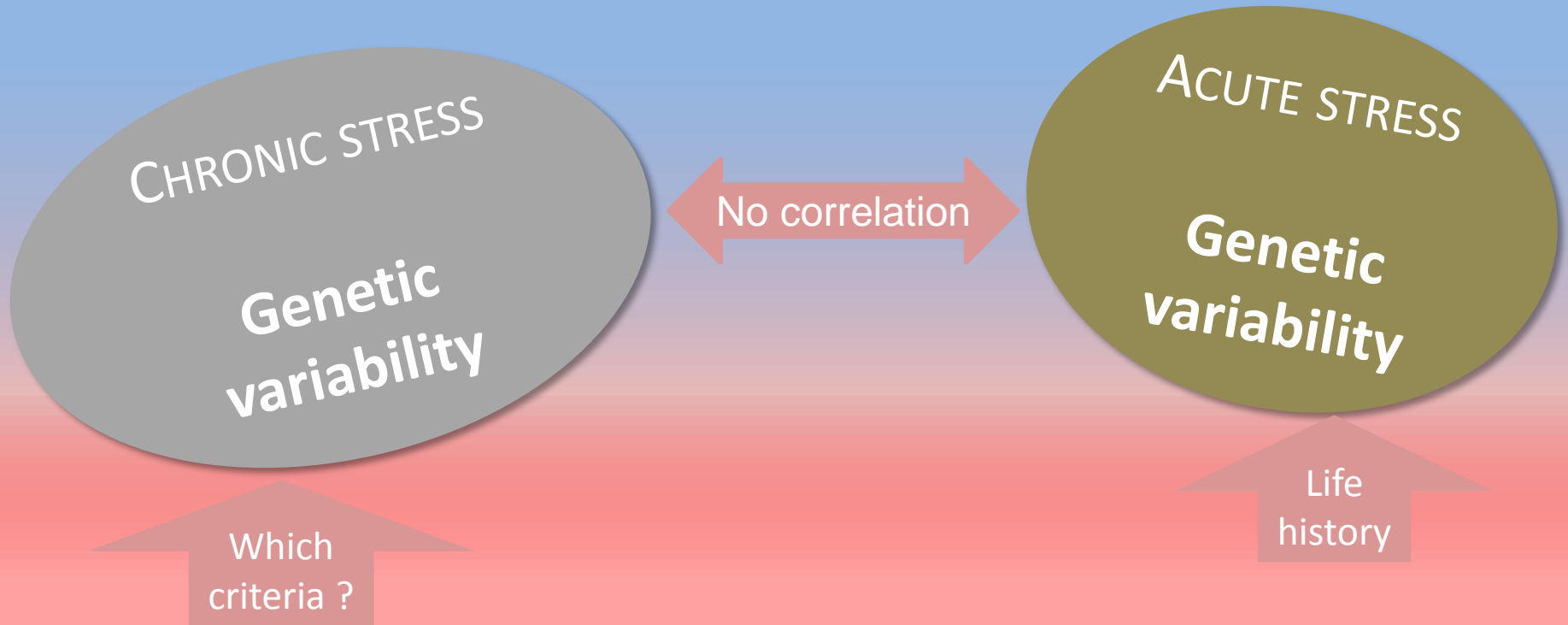
Resistant line

Genetic variability of resistance to acute and sudden temperature increases

Interactions
Rearing temperature
* résistance

Correlations chronic stress– acute stress

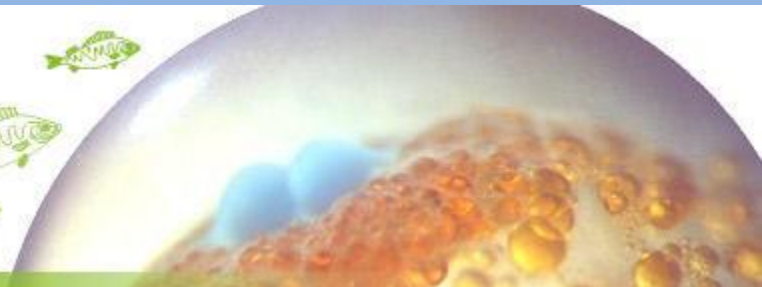




**Selection possible
but should be optimised**

Laboratoire
de Physiologie
et Génomique
des Poissons

LPGP



Study of extreme lines : physiology, behaviour

WANTED

Anyone interested
for collaboration

DEAD OR ALIVE



KONO SAKOHIN NA FICTION DETHRINODE JITSUZAISURI JINBUZSU DANIN
SONOJA NO SOSHIKI TO DOITSU NO MELSHOU GA GEKICHI NI TOUJYOU
SHITRTO SHITEMO JITSUZAI NA MONOTOHA ISSAI MUKANKEIDETH.

MARINE

Thanks



Metaprogramme ACCAF
Adaptation to climate change
for agriculture and forestry

<http://www.accaf.inra.fr/>



**Margaux
Crusot**