



Heritability of coping styles in farmed European sea bass

François Allal, Sebastien Ferrari, Khaled Horri, Marie-Odile Vidal, François Ruelle, Marc Vandeputte, Marie-Laure Bégout, Béatrice Chatain

► To cite this version:

François Allal, Sebastien Ferrari, Khaled Horri, Marie-Odile Vidal, François Ruelle, et al.. Heritability of coping styles in farmed European sea bass. 12. International Symposium on Genetics in Aquaculture, Jun 2015, Santiago de Compostela, Spain. pp.1. hal-02736002

HAL Id: hal-02736002

<https://hal.inrae.fr/hal-02736002>

Submitted on 2 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

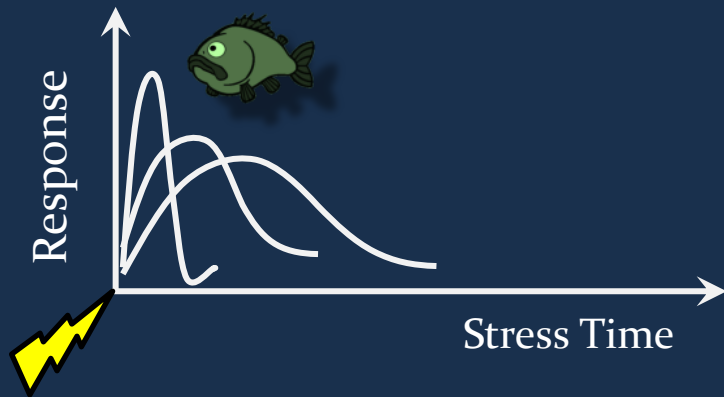
L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

HERITABILITY OF COPING STYLES IN FARMED EUROPEAN SEABASS

ISGA XII, 2015

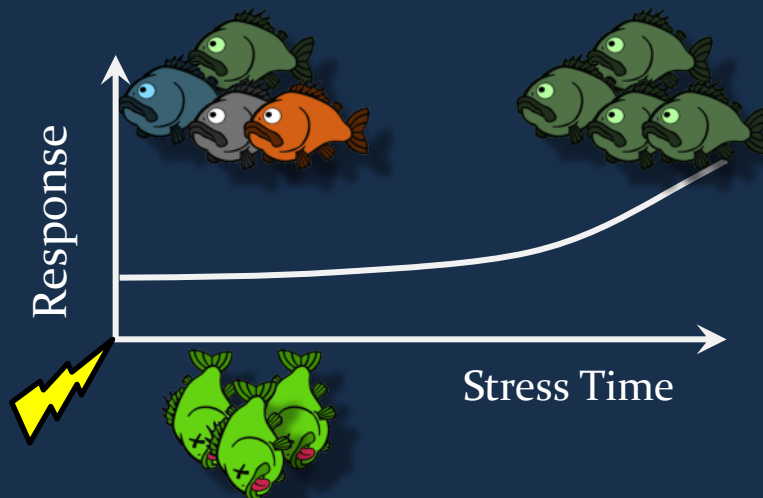
Allal F., Ferrari S., Horri K., Vidal M.-O., Ruelle
F., Vandeputte M., Chatain B., Bégout M.-L.

"Coping" with changes



Individual response

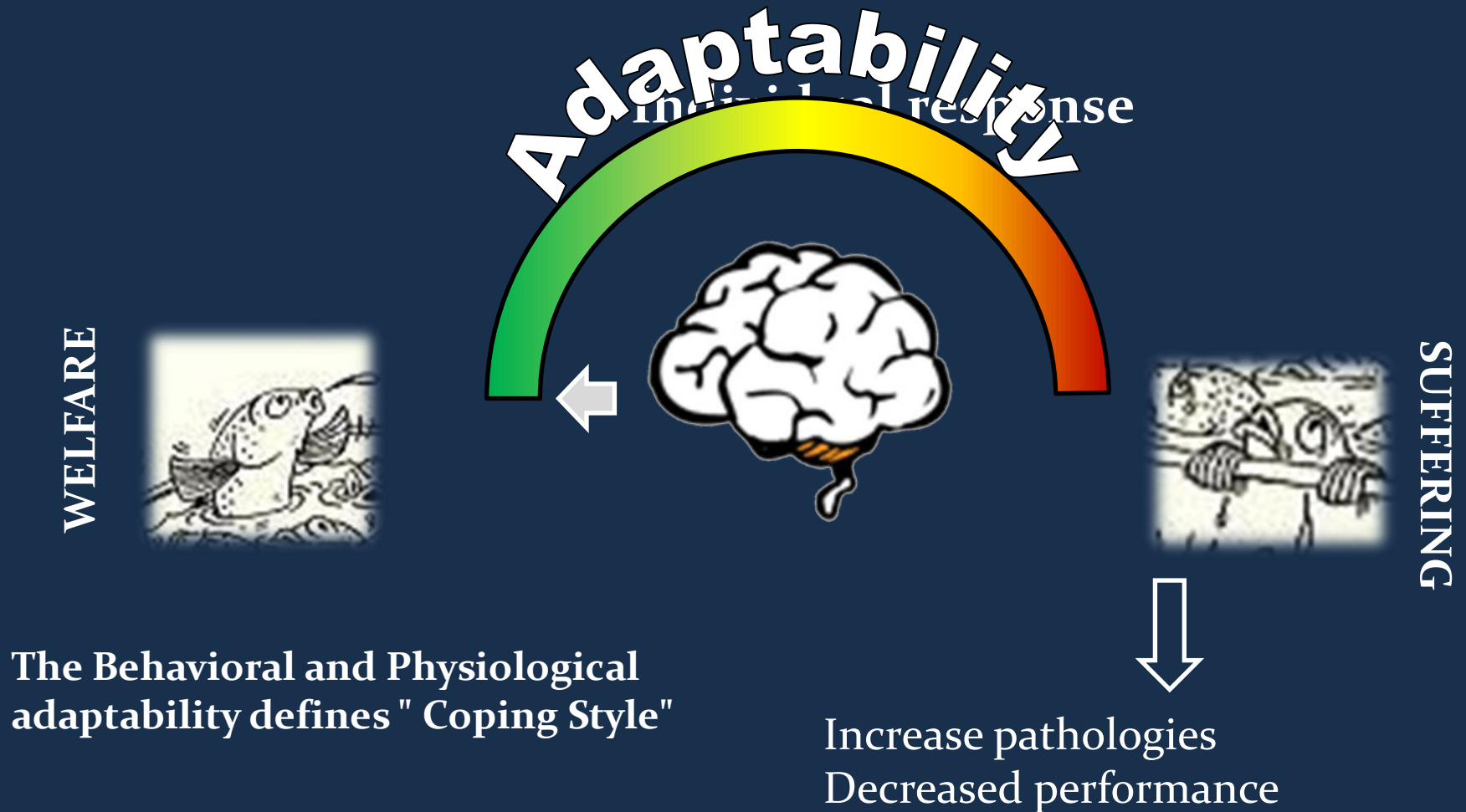
Behavioral
Physiological
Acclimatization



Populational response

Mortality
Fecundity shift
→ Modification of allele frequencies
Changes occur at a genetic level

"Coping" with changes



"Coping" with changes

The Coping Style distinguishes animals into two groups

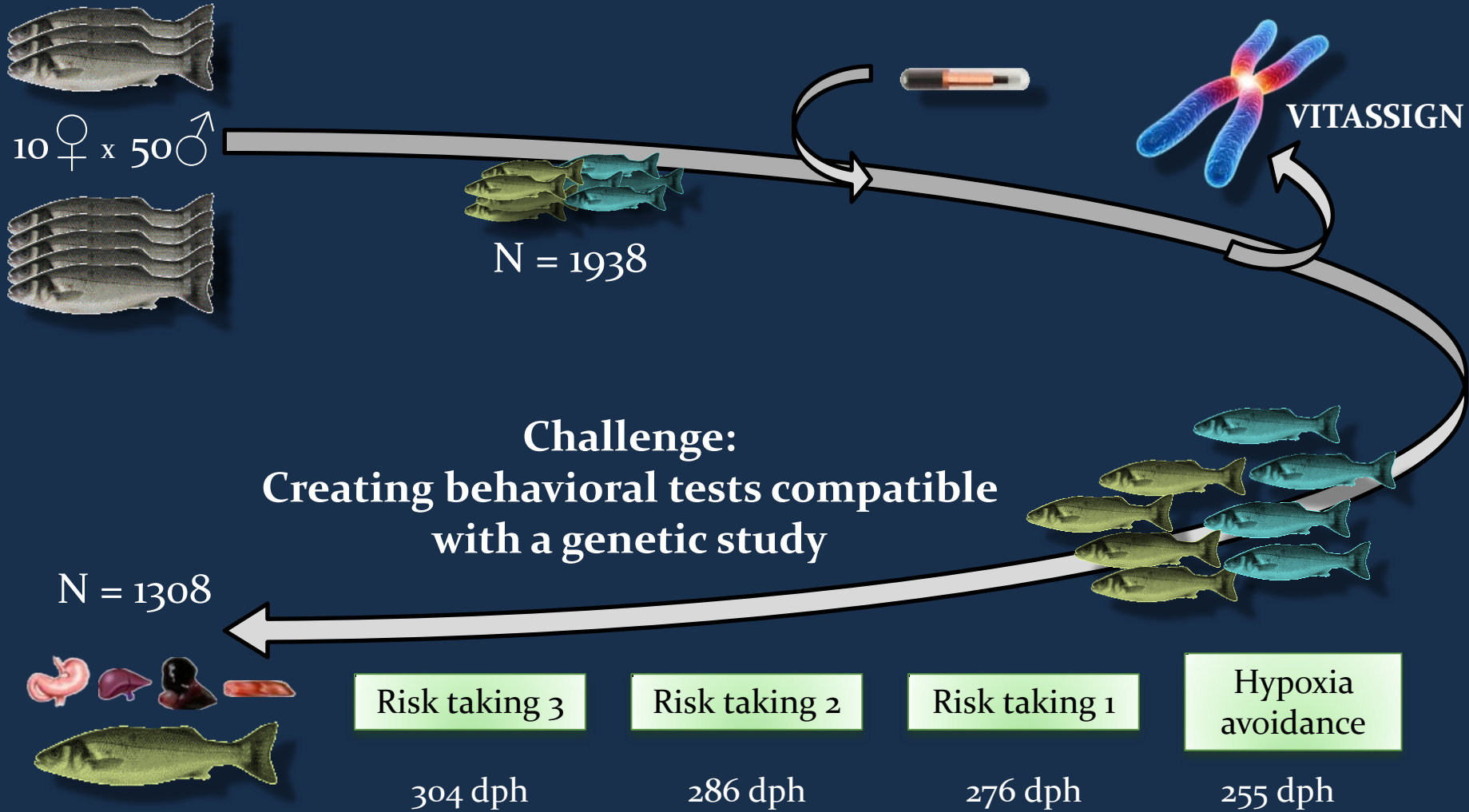


	Aggressiveness	
	Exploration	
	Boldness	
	Sociability	
	Activity	



Is there a genetic component to these personality traits ?

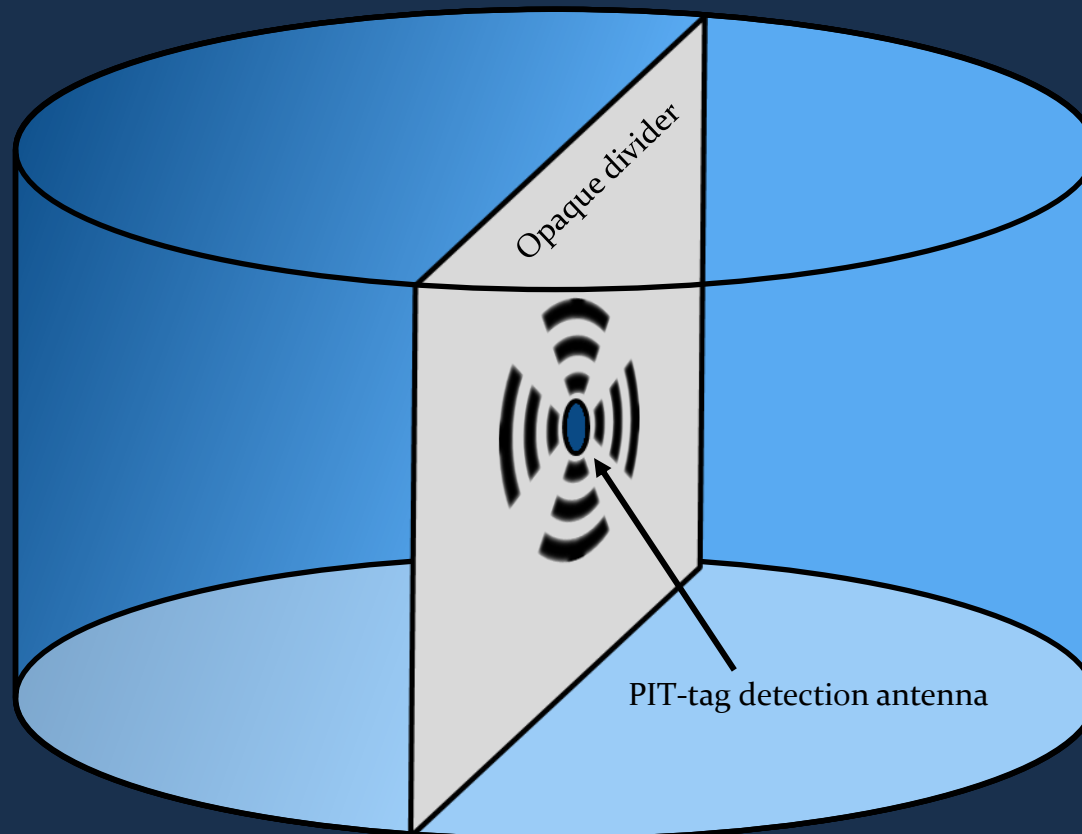
Material & Methods



Material & Methods

“Safe” shadow zone

“Stressing” lighted zone



$V = 5 \text{ m}^3$
 $H = 1.5\text{m}$
 $\varnothing = 2.5\text{m}$

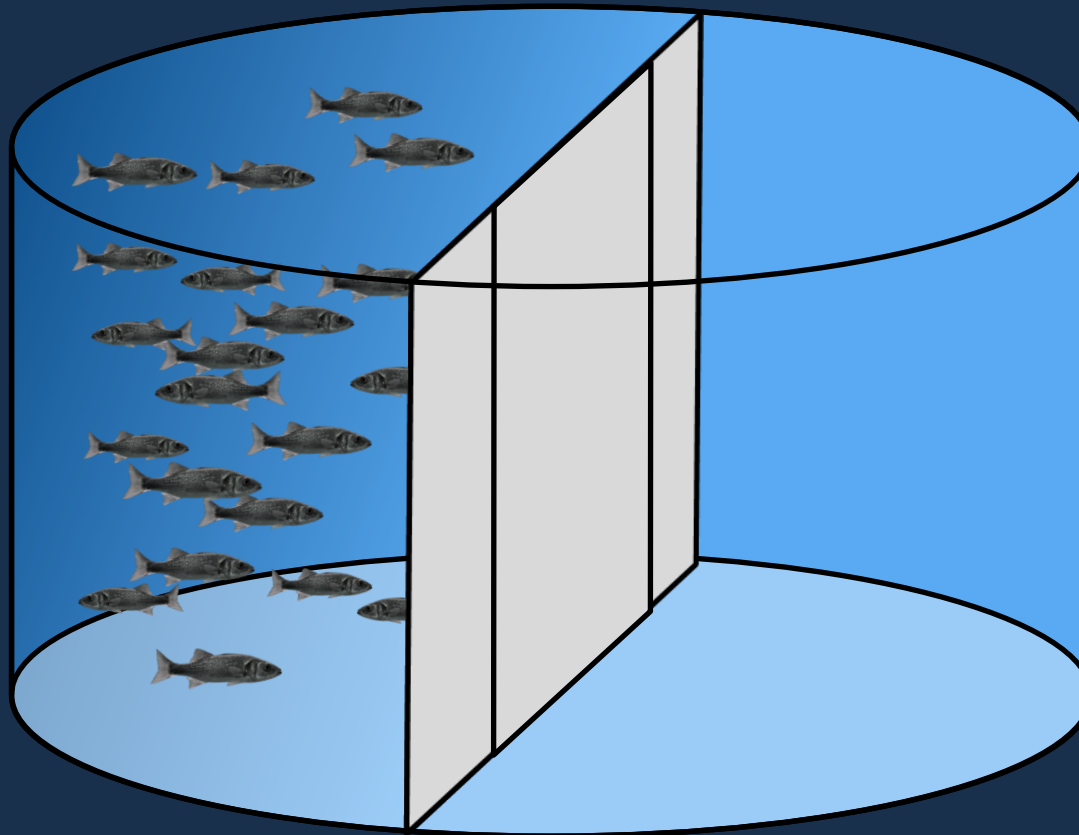
Material & Methods

Risk taking test



Shadow “safe” zone

Lighted “stressing” zone



After 30
minutes of
acclimatization

24 hours

PIT-tag	1 st passage
#3830604	00:14:37
#3854641	00:38:45
#3795461	01:21:16
#3863145	01:37:24
#3897844	02:54:46

Material & Methods

Hypoxia avoidance test



Nitrogen
Shadow “safe” zone

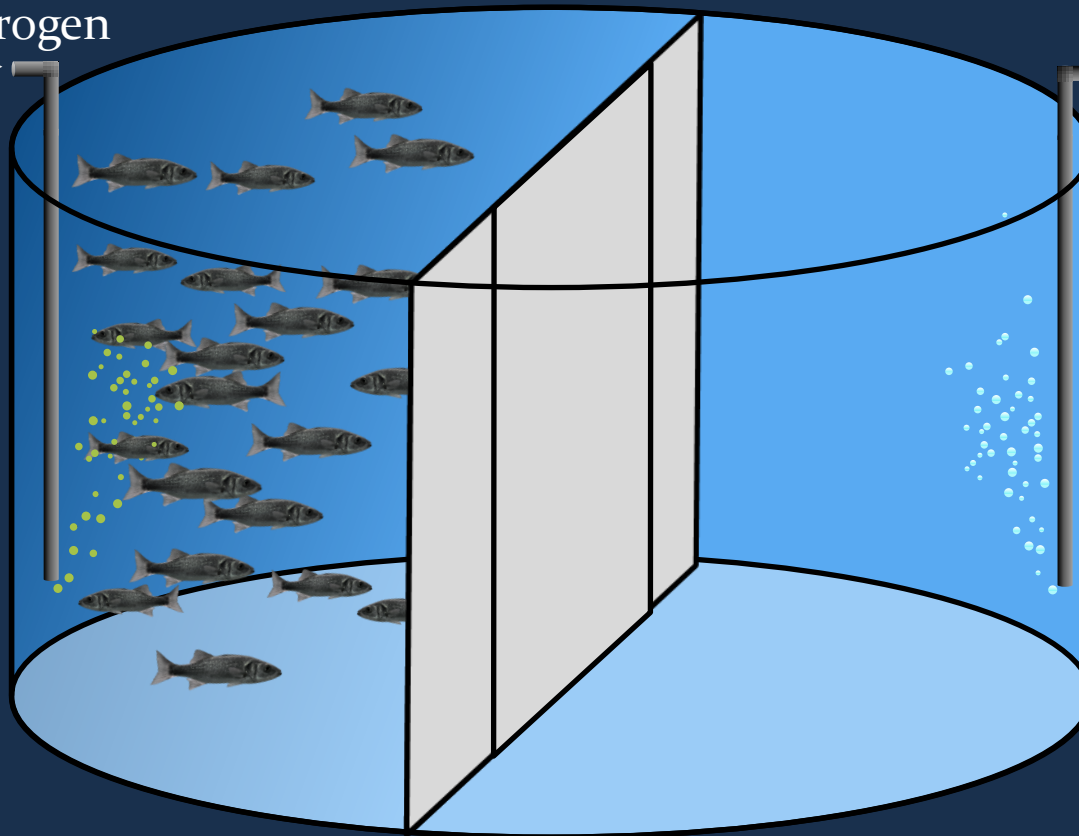
Lighted “stressing” zone

Oxygen

After 30
minutes of
acclimatization

2 hours
~10% O₂ sat.

PIT-tag	Passage	O ₂ sat.
#3852041	00:04:22	95%
#3830645	00:04:48	93%
#3496561	00:06:16	84%
#3863145	00:11:17	83%



Results & Discussion

Group testing validation

	Hypoxia avoidance		Risk taking 1		Risk taking 2		Risk taking 3	
Sex	♂	♀	♂	♀	♂	♀	♂	♀
Proactive %	19	15	16	14	17	16	20	18
Reactive %	81	85	84	86	83	84	80	82

$r_p = 0.69$ but

$r_A = 0.99(\pm 0.05) - 1(\pm 0.01)$

← Risk taking vs Hypoxia avoidance: $r_p = 0.10$; $r_A = 0.43(\pm 0.21)$ →

~20 % of fish are proactive

No sex effect!

Over time consistency of risk-taking behavior! $r_A \approx 1$

Hypoxia $\neq$ Risk taking

Results & Discussion

Heritability of behavior

Trait addressed	h^2 (SE)
Hypoxia avoidance	0.23 (0.10)
Boldness (mean of the 3 risk taking tests)	0.42 (0.12)



- Low but usable hypoxia avoidance heritability
- High boldness heritability
- Boldness h^2 = weight h^2
 - we can expect similar selection response!

Results & Discussion

Genetic correlations between coping styles and phenotypic traits

	Weight (SE)	TGC (SE)	Gonads (SE)
Hypoxia avoidance	-0.56 (0.18)	-0.45 (0.15) ; -0.55 (0.11)	0.32 (0.24)
Boldness (mean of the 3 risk taking tests)	-0.24 (0.15)	-0.12 (0.27); -0.23 (0.11)	-0.73 (0.16)

There is a genetic link between personality and growth traits in sea bass

- Hypoxia intolerant fish are significantly smaller
- Bolder fish invest less energy in gonadal production

Conclusions

- Low hypoxia avoidance heritability ($h^2 = 0.23 \pm 0.10$)
- High boldness heritability ($h^2 = 0.42 \pm 0.12$)
- Hypoxia avoidance and Risk taking tests do not address the same personality trait in sea bass
- Link between growth and personality
 - proactive < reactive

Looking for a boldness related QTL in sea bass!

*Laboratoire **Adaptation & Adaptabilité des Animaux et des Systèmes***



**Thanks for
your attention!**

