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Heritability of coping styles in farmed European sea bass

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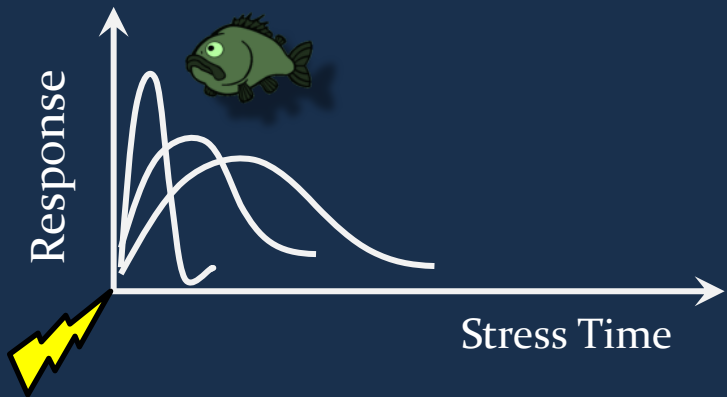
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HERITABILITY OF COPING STYLES IN FARMED EUROPEAN SEABASS

ISGA XII, 2015

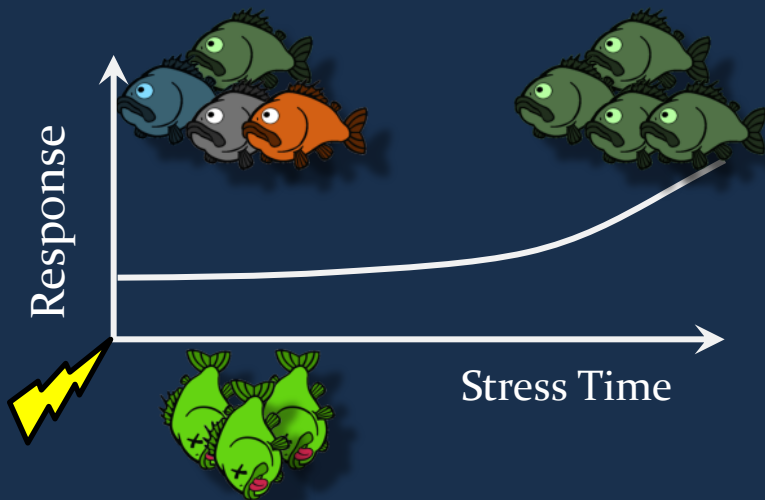
Allal F., Ferrari S., Horri K., Vidal M.-O., Ruelle
F., Vandeputte M., Chatain B., Bégout M.-L.

"Coping" with changes



Individual response

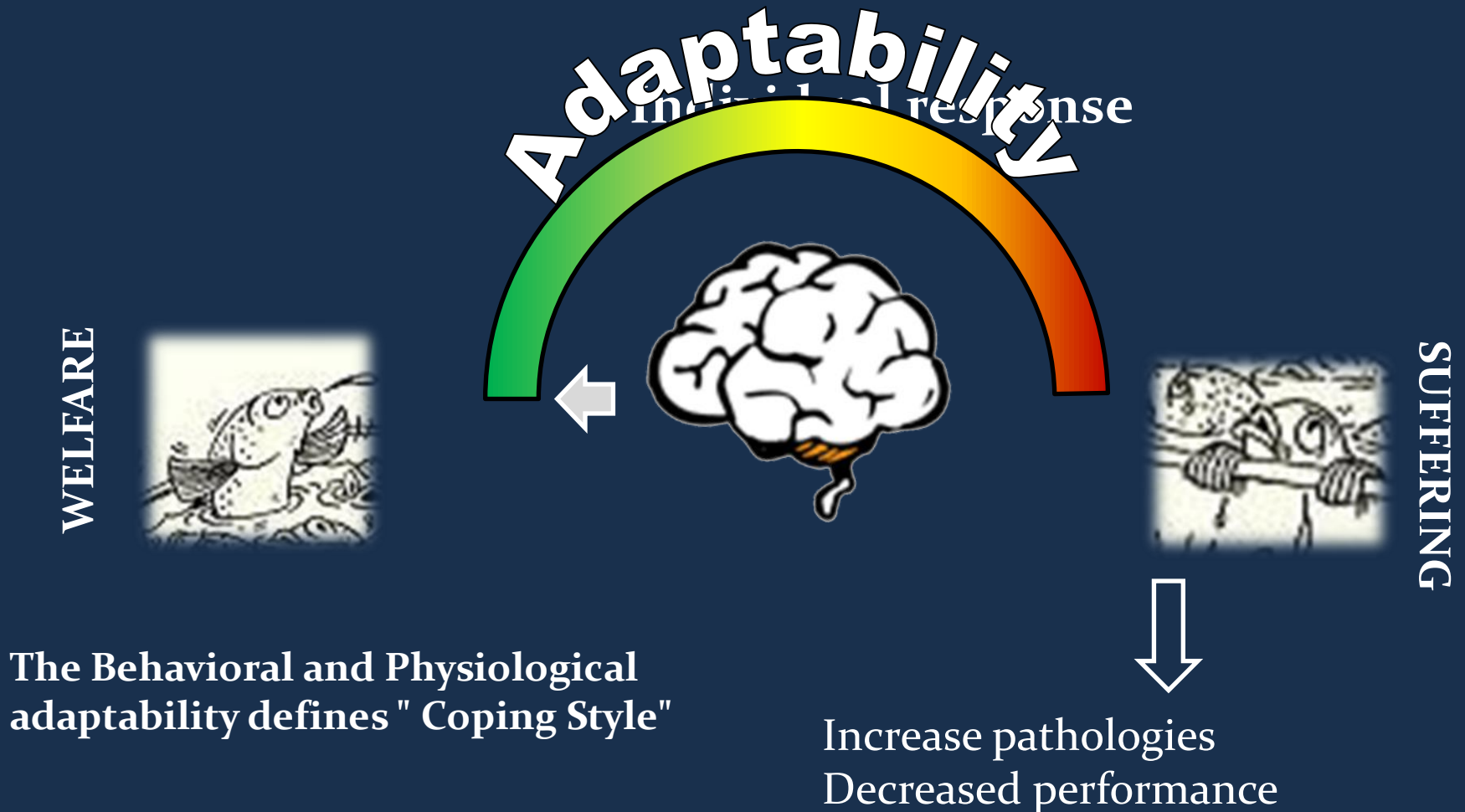
Behavioral
Physiological
Acclimatization



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



Fevold



et al., 2003

	Aggressiveness	
	Exploration	
	Boldness	
	Sociability	
	Activity	

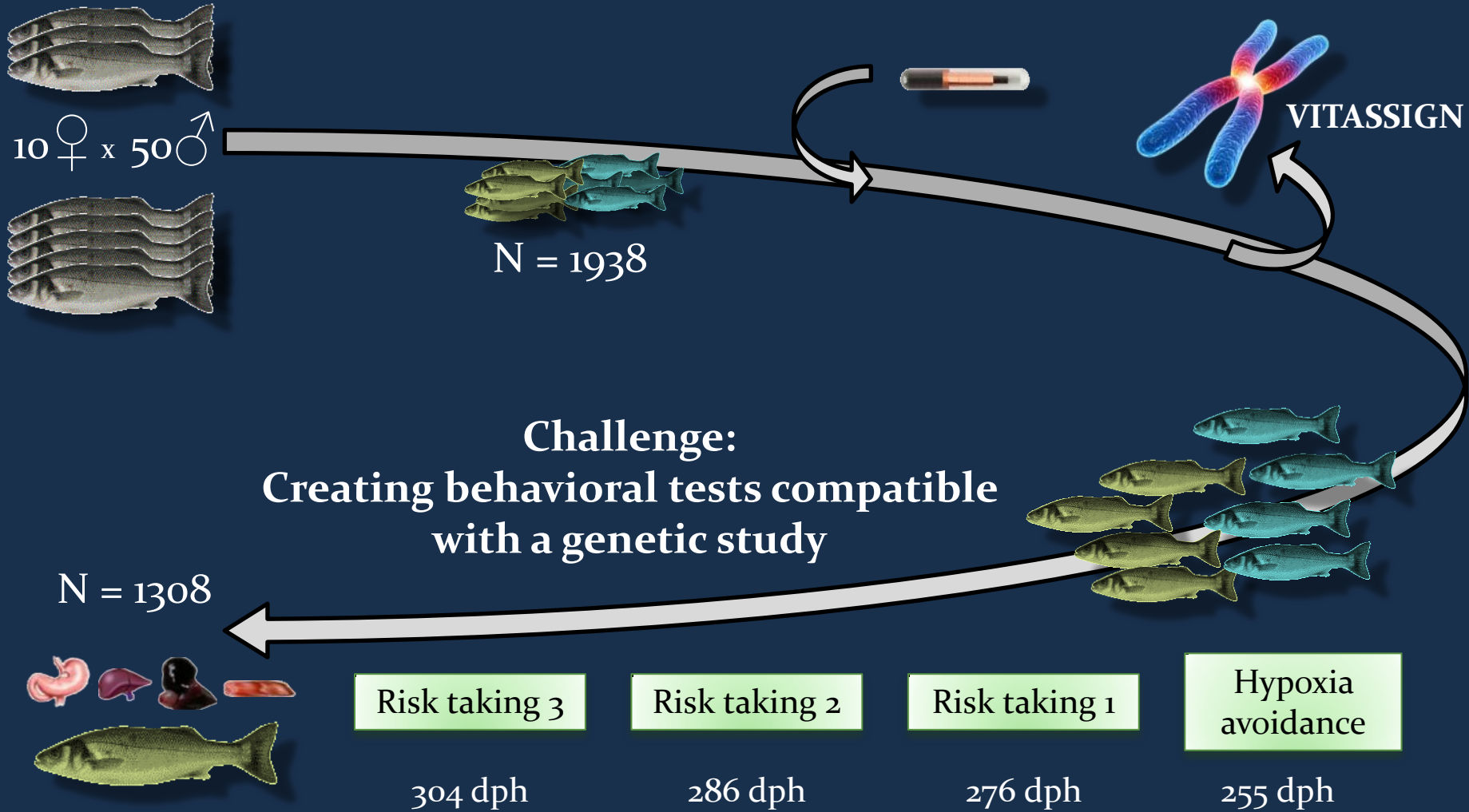
Is there a genetic component to these personality traits ?



Wright et al., 2005



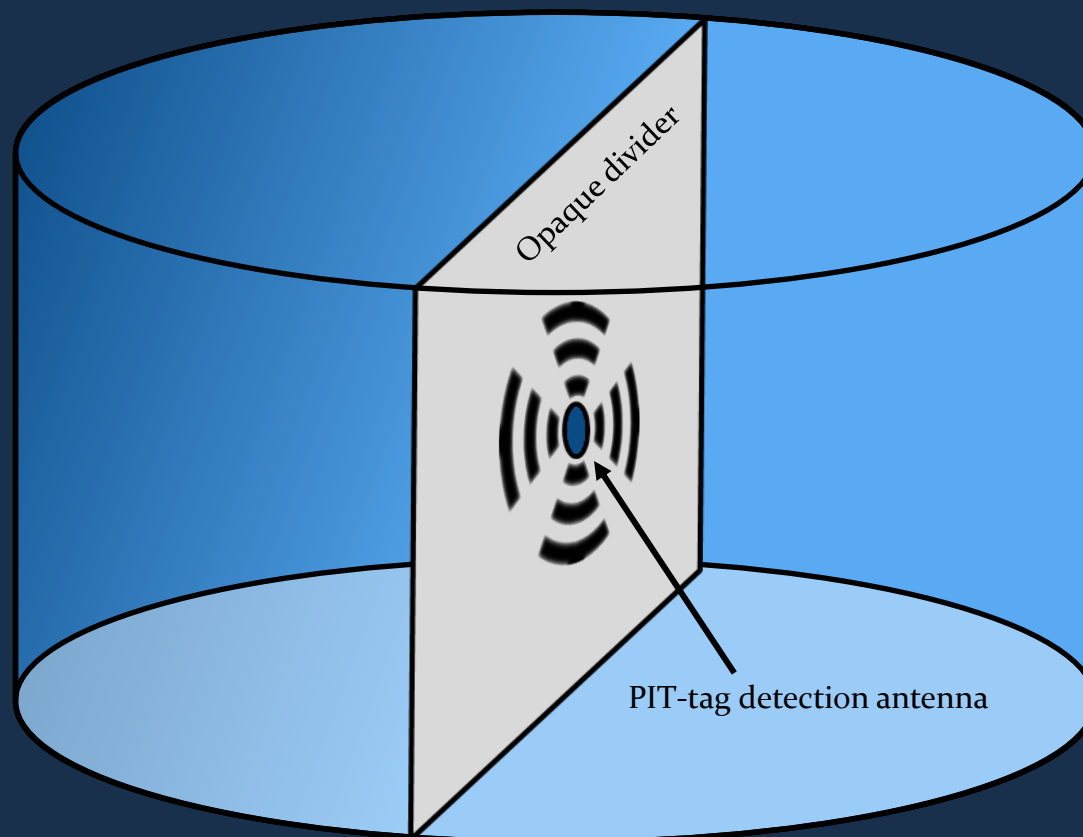
Material & Methods



Material & Methods

“Safe” shadow zone

“Stressing” lighted zone



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

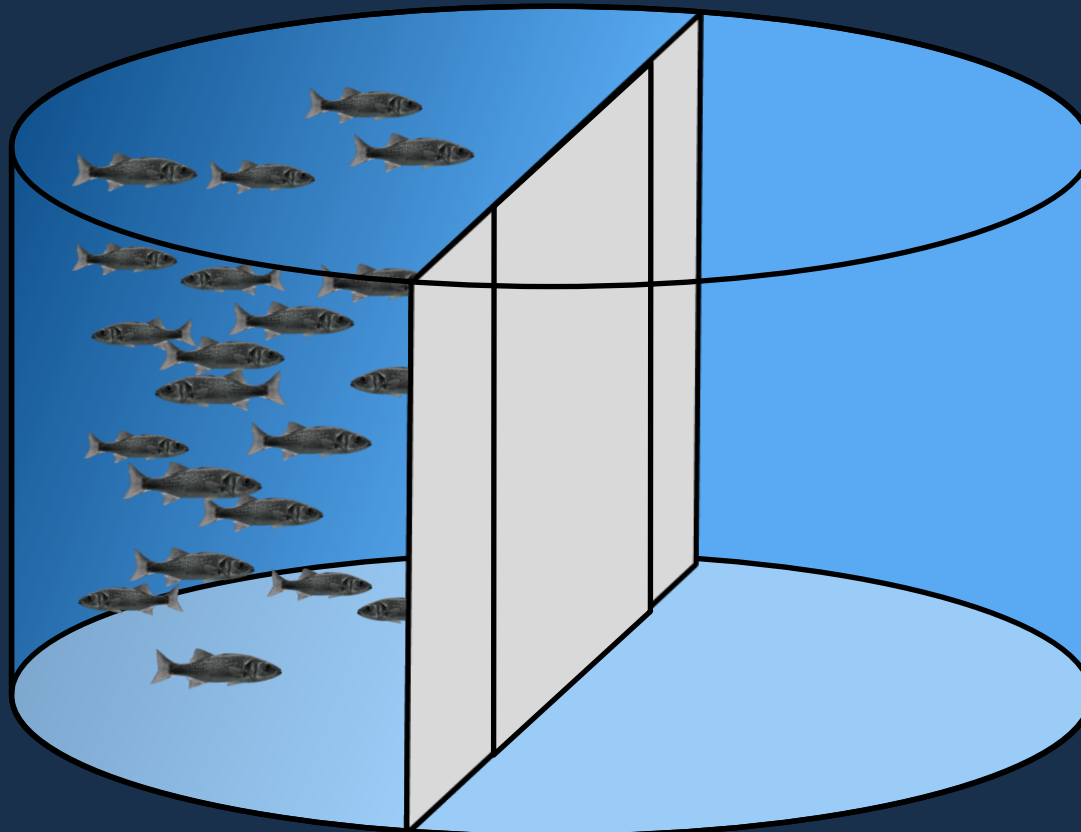
Material & Methods

Risk taking test



Shadow “safe” zone

Lighted “stressing” zone



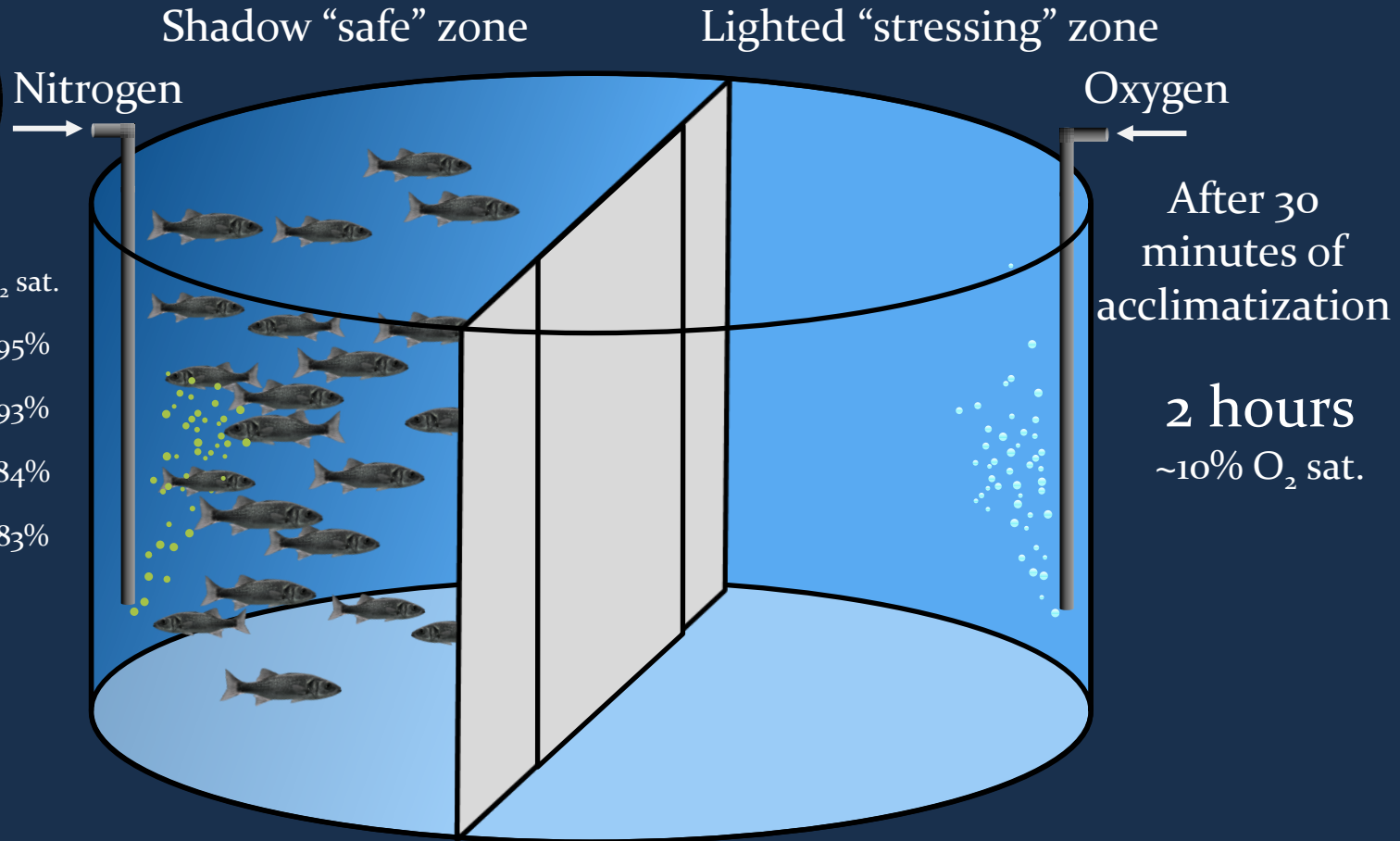
After 30
minutes of
acclimatization

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



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	
	♂	♀	♂	♀	♂	♀	♂	♀
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!**

