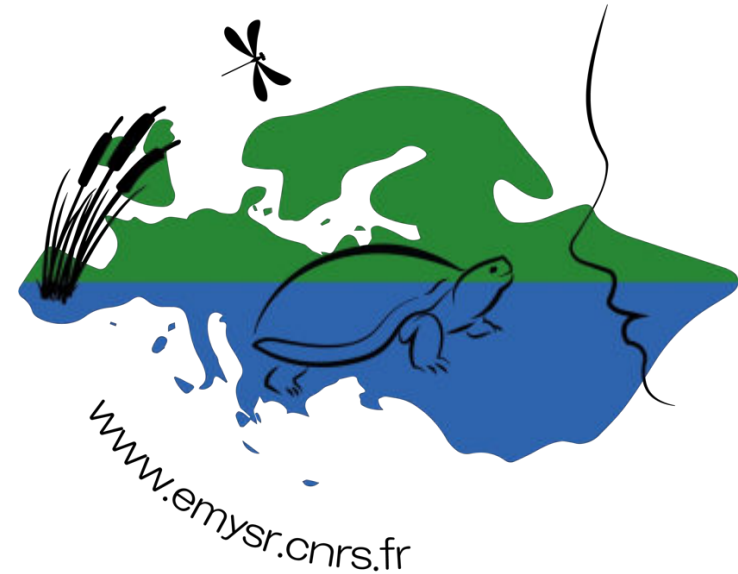


Survival and behaviour of captive-bred European pond turtles *Emys orbicularis* during the first winter after release in Alsace, NE France

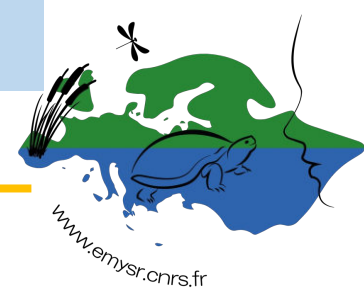
Jean-Yves Georges^{1,2}

jean-yves.georges@iphc.cnrs.fr



¹ Université de Strasbourg, CNRS, IPHC, UMR 7178, Strasbourg, France

² Long term Survey in Ecology and Evolution (SEE-Life) program of CNRS – Neu Woerr, France



Why am I attending the RT Metabolica...

- ... while I am a behavioural ecologist?... just capable of
 - capturing animals
 - measuring animals
 - deploying animal-borne dataloggers



Subantarctic fur seal ~50 Kg
1994-2000



Leatherback turtle ~500 Kg
2002-2011



European pond turtle ~0.5 Kg
2011-present time



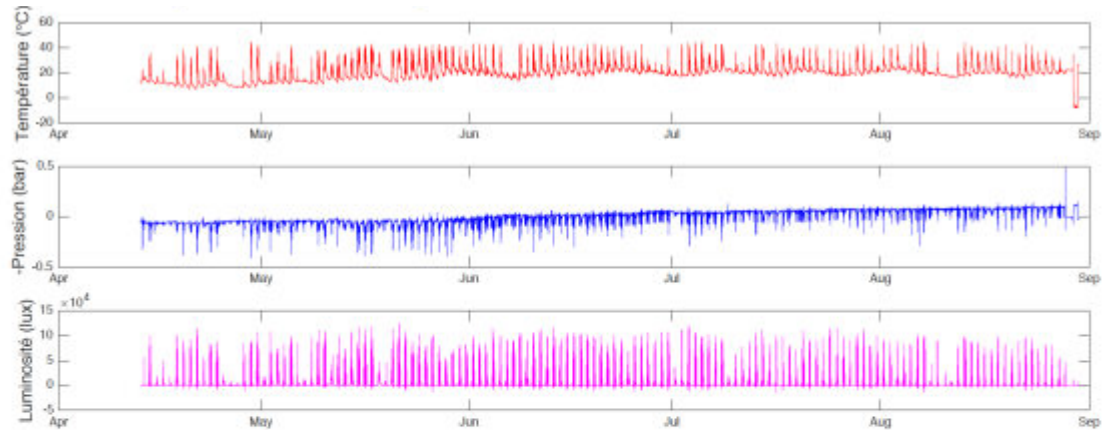
I am attending for...

- ... discussing about animals equipped with dataloggers



Temperature
Pressure
Light

1Hz → 12 months
LUL-logger (3 g)

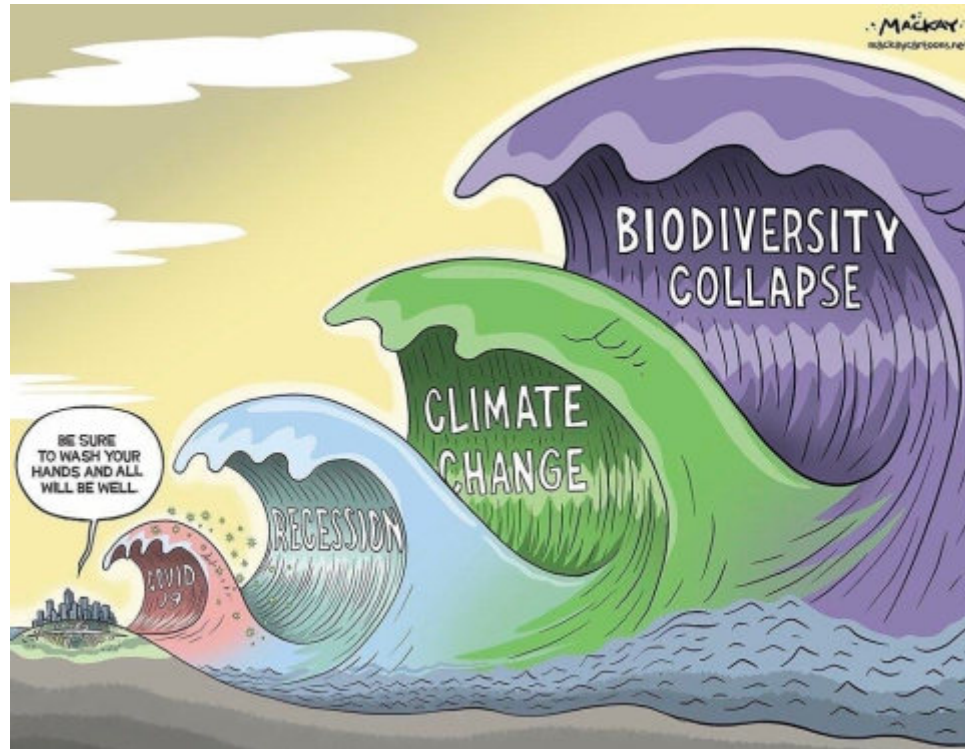


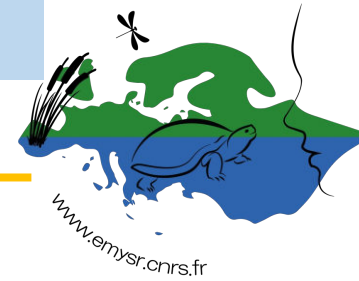
From Marchand et al. (2019) PloSOne

- inferring animal behaviours from physical parameters records
- assessing organism's responses to environmental conditions
- ... networking with RT-Metabolica nice people

Assessing organism's responses to environmental conditions

- Global change, climate change, biodiversity loss





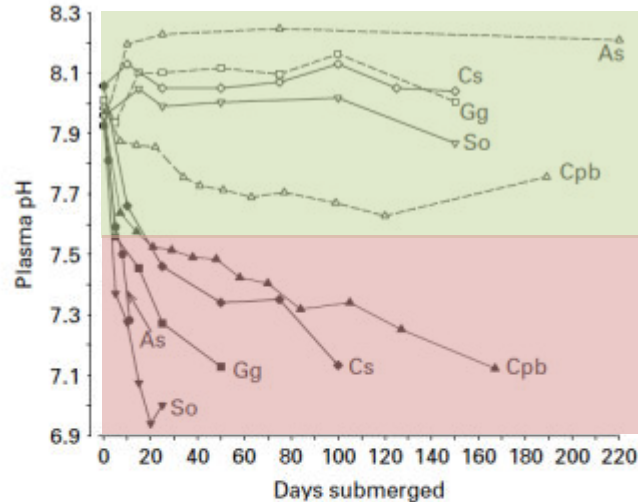
Physiology of hibernation in turtles

- General adaptations to cold in ectotherms
 - metabolic depression (MD)

Submersion (time)
in 3°C water
with ≠ dissolved O₂

Ultsch (2006) Biol. Rev.

- Specific adaptations
 - [bones+shell] buffering lactic acid
 - aquatic respiration



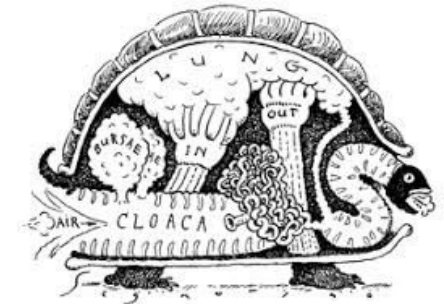
Normoxic

MD: up to - 95%

Anoxic MD - 99%

- *Che. serpentina*

- *Chr. picta bellii*





Physiology of hibernation in turtles

- Anoxia tolerance



- Anoxia intolerance

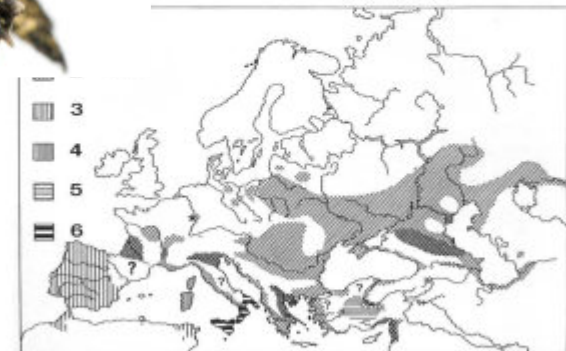
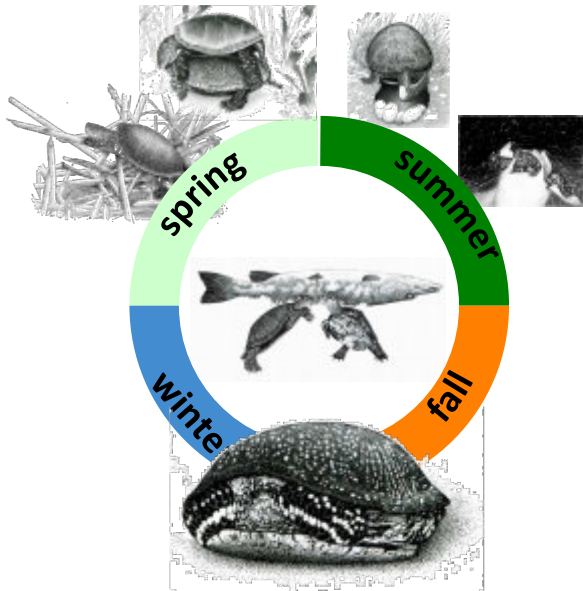


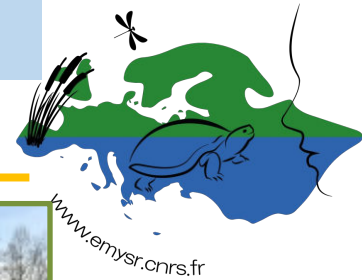
- Unknown for the European pond turtle



The European pond turtle *Emys orbicularis*

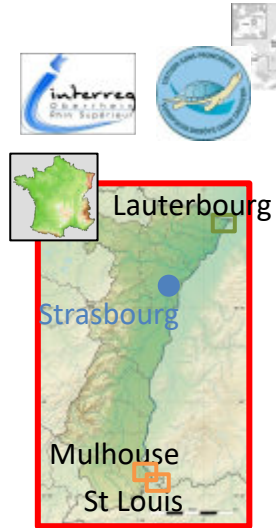
- Small freshwater turtle
 - 20 cm, 1 kg
 - annual cycle
 - extended range of winter conditions





www.emysr.cnrs.fr

The European pond turtle reintroduction in Alsace



Release site



Acclimation pond



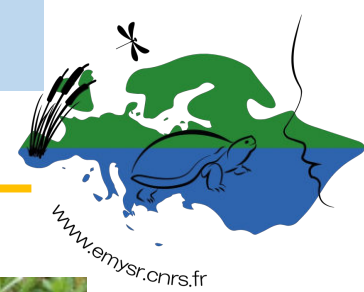
Natural wintering

How do captive-bred *Emys* cope with first winter after translocation in NE of France?

Captive facilities



Soft artificial wintering



Individual monitoring

- Behaviour

- WACU logger (IPHC)

- temperature
 - pressure
 - (light)
 - (3D accelero)
- } 1 Hz
 } 6 mo.
 } [7 grams]
 } 10 Hz

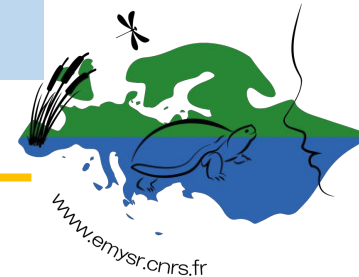
- Deployments

- from Oct 2013 to May 2014
 - N=9 ind. equipped
- n=9 ind. recaptured but only 4 WACU readable



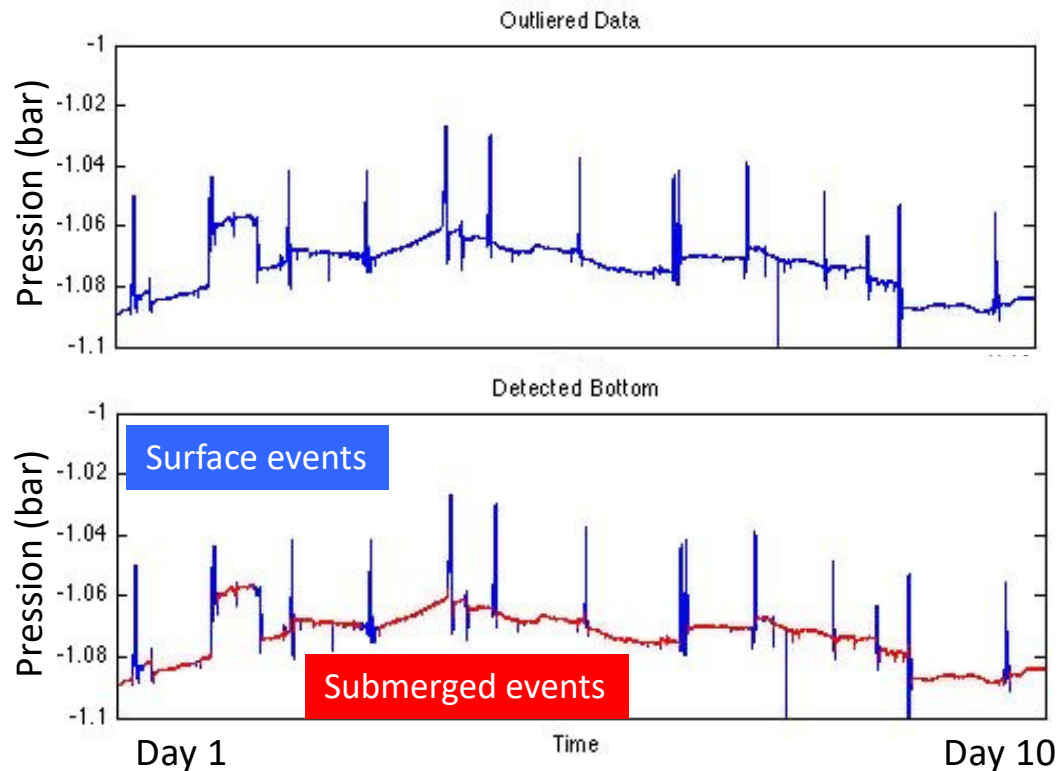
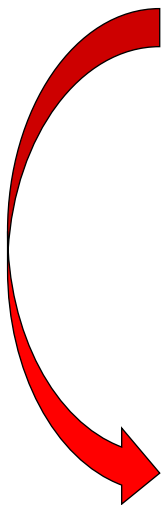
- Biometry

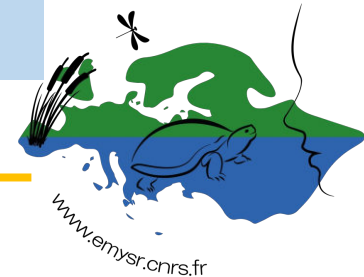
- Body mass (at deployment vs. at recapture)



Data processing

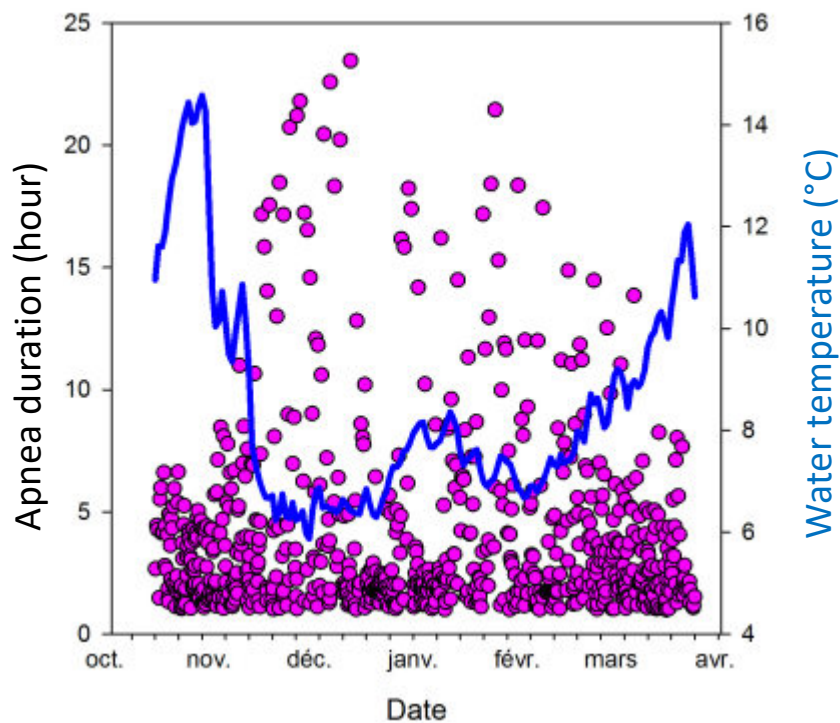
Diff(P)





Overwintering behaviour

- Global apnea and water temperature

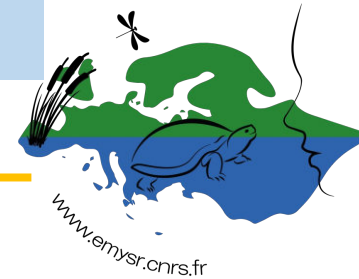


Individual

W51

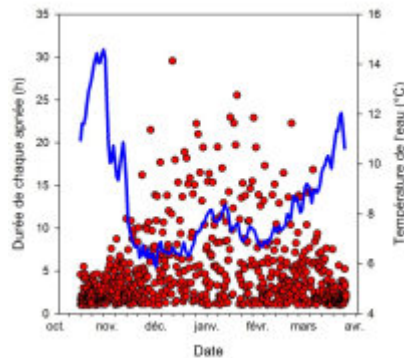
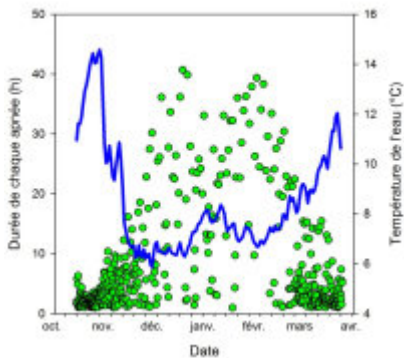
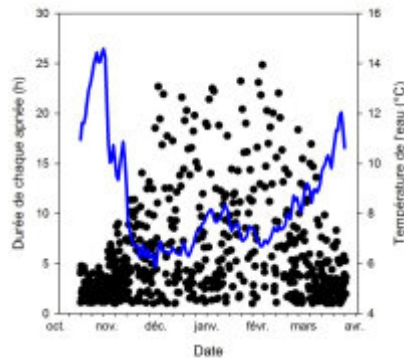
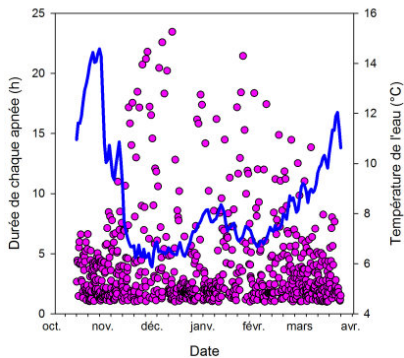
Apnea duration

$3,9 \pm 3,8$ h (754)

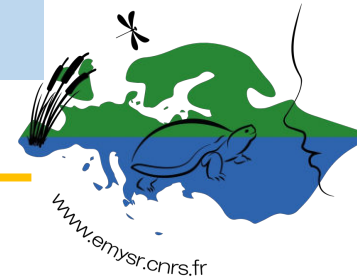


Overwintering behaviour

- Global apnea and water temperature

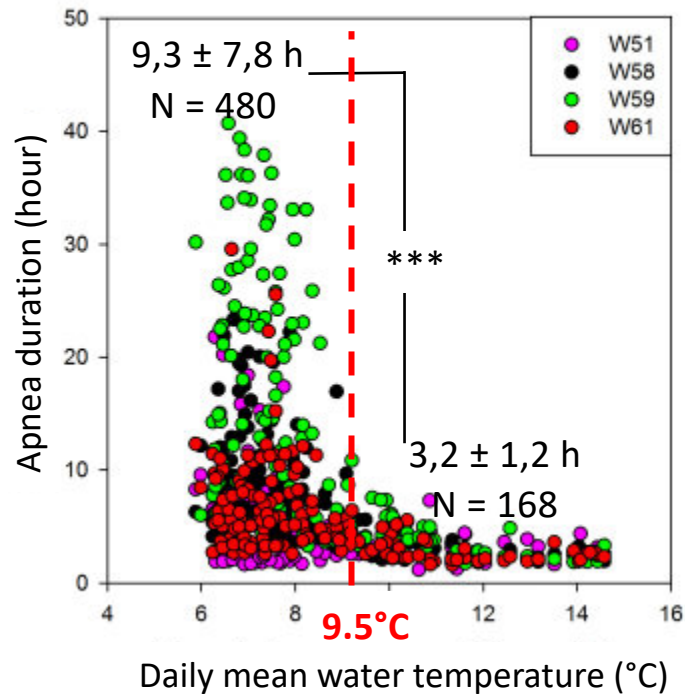


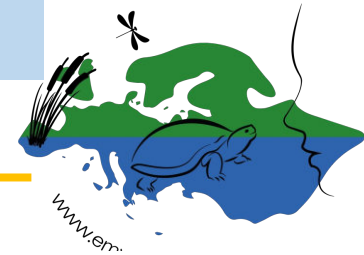
Individual	Apnea duration
W51	3,9 ± 3,8 h (754)
W58	5,4 ± 4,9 h (661)
W59	7,5 ± 8,8 h (471)
W61	4,6 ± 4,3 h (709)



Overwintering behaviour

- Individual apnea and daily water temperature



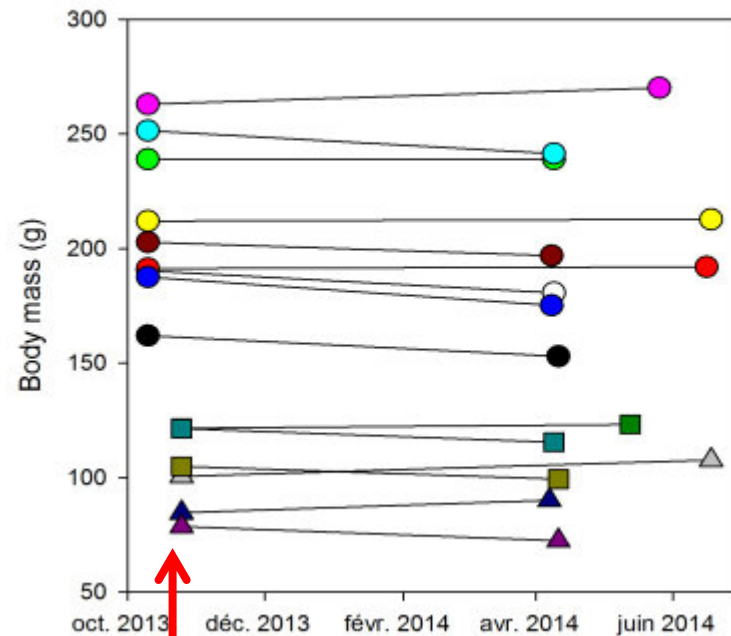


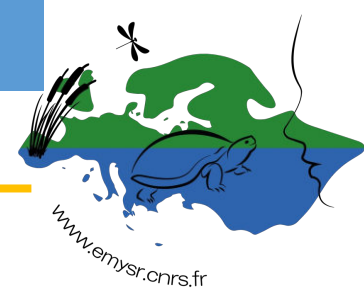
Overwintering survival and growth

- Winter survival
 - 100%
 - Not body mass dependent

- Growth

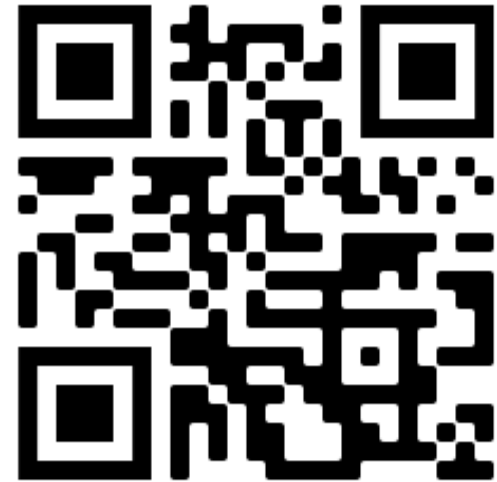
Recapture	Masse change (g)
< 190 j (n=10)	$-5,9 \pm 5,0$
> 190 j (n=5)	$3,5 \pm 3,0$
	$U = 3, p < 0,005$





Summary

- *Emys orbicularis* makes relatively short apneas
 - normoxia-like conditions (cf mild temperatures?)
 - temperature-dependant activity threshold $\sim 9.5^{\circ}\text{C}$
 - Comparative study throughout the latitudinal gradient, e.g. FR vs. LV (cf Emys-R Consortium)
- Survival throughout successive releases
 - after first winter 100% (n=15 ind.)
 - after 4 years $\sim 100\%$ (n=150 ind.)
 - after 10 years $\sim 37\%$ (n=550 ind.)
Georges et al. in prep



More on our website!

Emys-R (<https://emysr.cnrs.fr/>) was funded through the 2020-2021 Biodiversa+ and Water JPI joint call for research projects, under the BiodivRestore ERA-NET Cofund (GA N°101003777), with the EU and the funding organisations Agence Nationale de la Recherche (ANR, France, grant ANR-21-BIRE-0005), Bundesministerium für Bildung und Forschung (BMBF, Germany, grant BMBF project number 16LW015), State Education Development Agency (VIAA, Latvia, grant ES RTD/2022/2), and National Science Center (NSC, Poland, grant 2021/03/Y/NZ8/00101).