



## WP20

# The effect of cage depth on the performance of meagre

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# Introduction



- Technologies and practices used for grow out, similar to those for G. sea bream and E. sea bass

**But Meagre is different!!**

- Species-specific husbandry practices are needed
- The objectives of this work is **to develop / modify applied methods for ongrowing in cages to maximize performance**

Year	Production (t)
2013	788
2014	5888
2015	5258

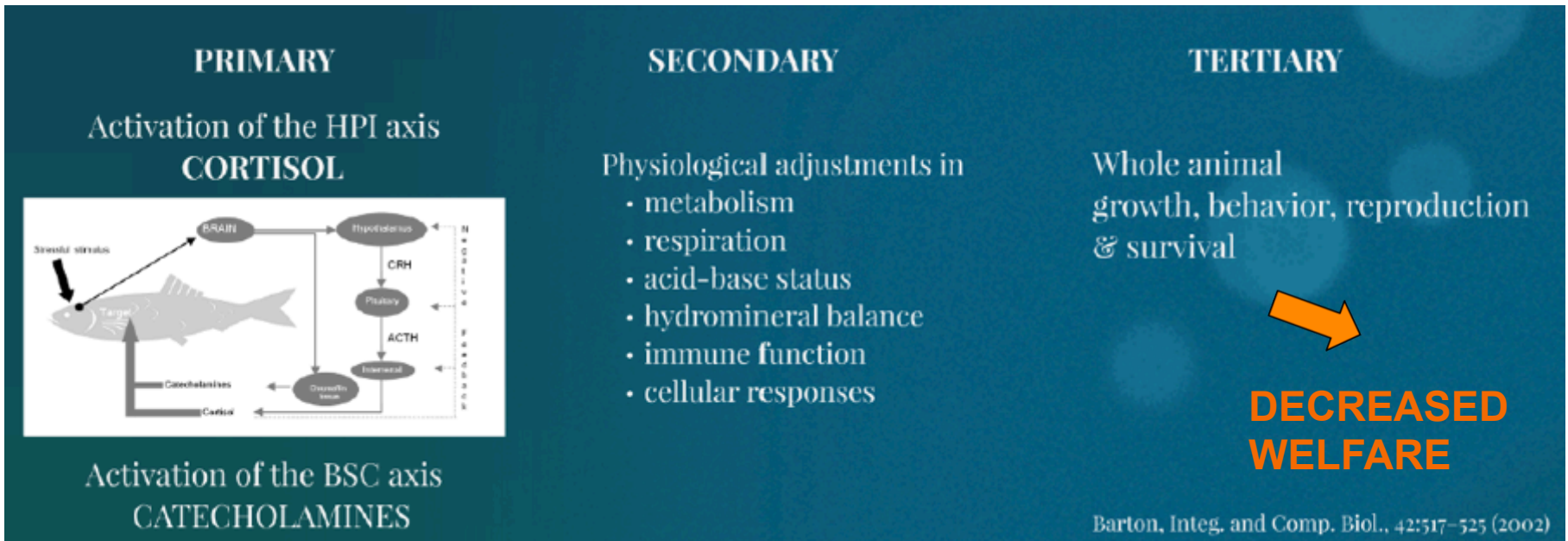
Which is proper environment for meagre rearing?

- Effect of cage depth



# Introduction: Stress in aquaculture

Intensive rearing practices → stress → inhibited performance and/or diseases



# Methodology

Test performance of meagre  
In cages of different **depth**  
(May 2014 – January 2016)



## ■ Methodology

- Cages of 180 (6x6x5-**Shallow**) and 290 (6x6x8-**Deep**) m<sup>3</sup> at the HCMR pilot farm in duplicates
- Fish origin from HCMR.
  - Eggs from a single spawning, larval rearing performed at the Mesocosm hatchery.
  - Juveniles of 2 gr were transferred at the cage facility and reared until **200 (±20) g**
  - 1<sup>st</sup> phase: 4 groups 2x~5,150 for the **180 m<sup>3</sup>** cages and 2x~8,240 for the **290 m<sup>3</sup>** ones.
  - 2<sup>nd</sup> phase: 4 groups, 2x~2,000 for the 180 m<sup>3</sup> cages and 2x~3,200 for the 290 m<sup>3</sup> ones
- Duration of each trial 8 months

1<sup>st</sup> phase BW = 200-800 g

2<sup>nd</sup> phase BW = 1-2 kg

# Monitoring

- Growth performance
  - monthly sampling
- Behavior
  - monthly monitoring using echo integrators
- Physiological status
  - hematological (hematocrite, hemoglobin),
  - biochemical (glucose, lactate, osmotic pressure)
  - hormonal (cortisol,  $T_3$ ,  $T_4$ )
- Humoral immune status
  - myeloperoxidase activity, antibacterial activity (lysozyme and complement) and anti-protease activity

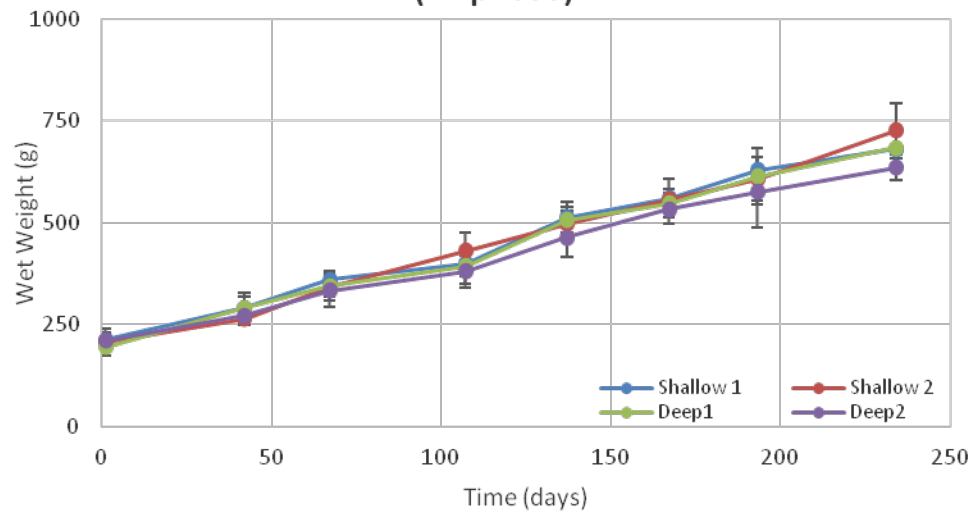
# Results

- Growth performance



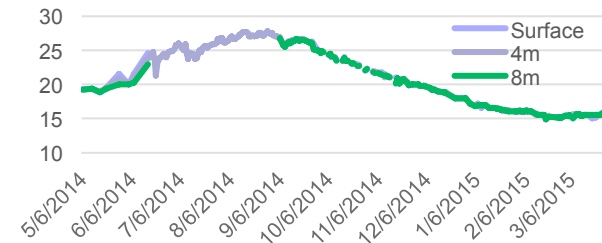
# Results

**Growth Performance  
(1<sup>st</sup> phase)**



SGR:  $\sim 2\text{g d}^{-1}$   
No significant difference

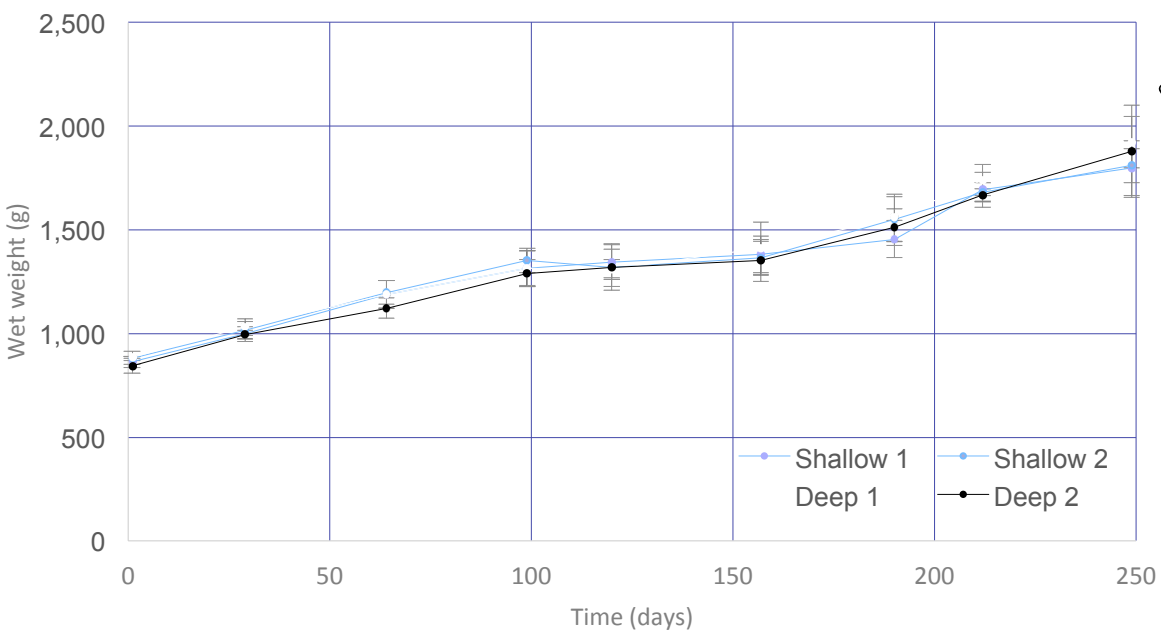
**Temperature 1st phase**



	S1	S2	D1	D2
<b>Mortality(%)</b>	23,5	24,2	12,1	13,9
<b>FCR</b>	1,92	1,92	1,58	1,60

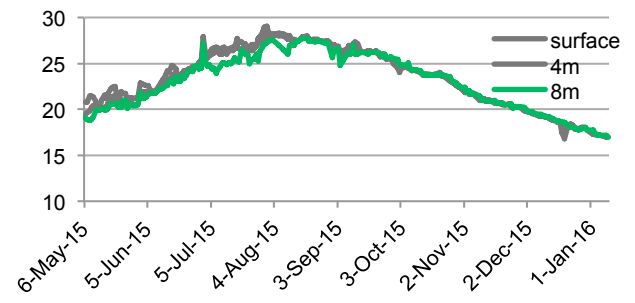
# Results

Growth performance  
(2nd phase)



SGR:  $\sim 3.5 \text{ g d}^{-1}$   
No significant difference

Temperature 2nd phase



	S1	S2	D1	D2
Mortality(%)	10.8	9.7	7.9	8.1
FCR	1.67	1.70	1.50	1.47



- Significant better performance during the 1<sup>st</sup> phase in the deep nets
- No difference during the 2<sup>nd</sup> phase

# Results

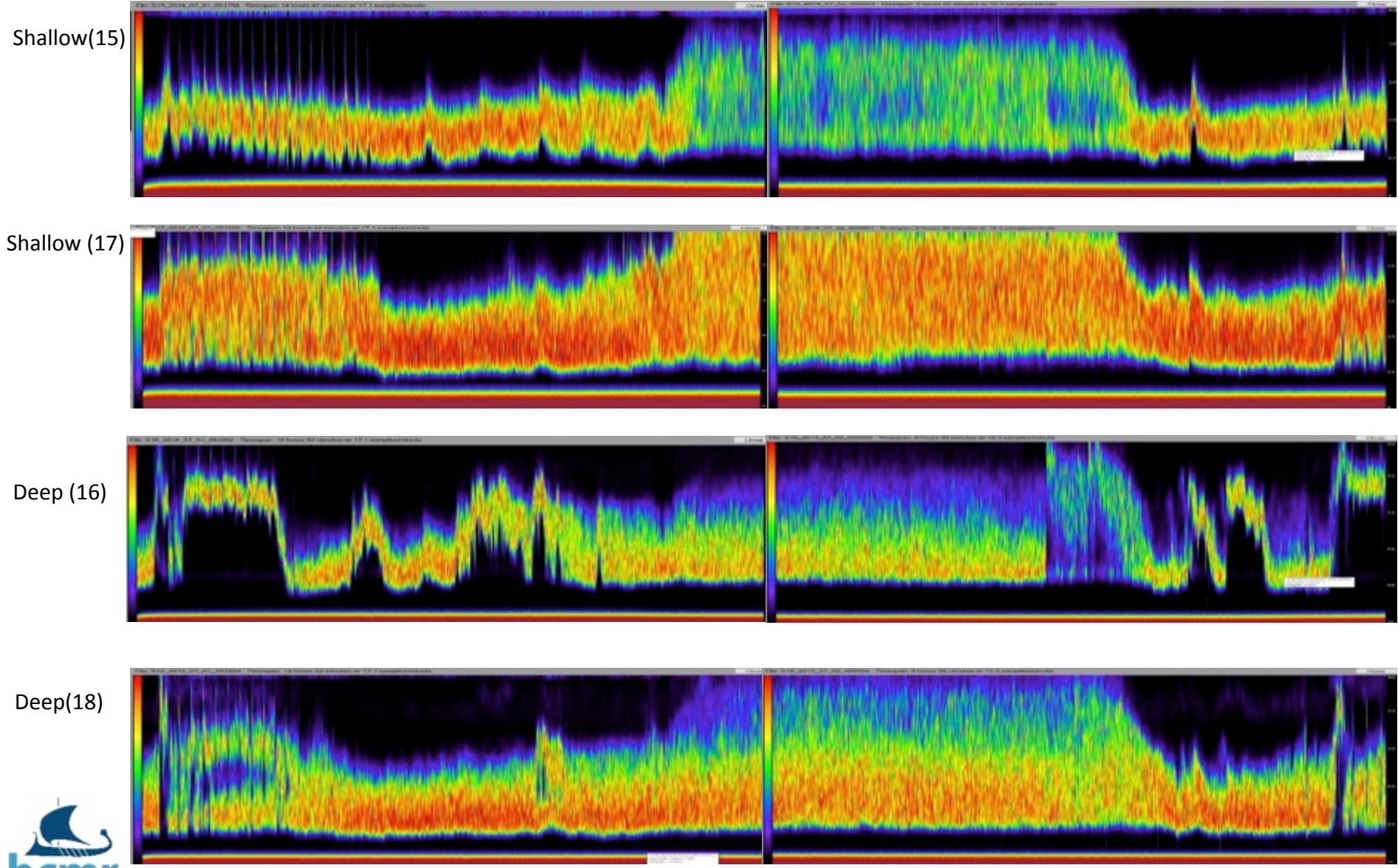
- Behavior
- Monitor the vertical distribution of the populations in cages with an echo integrator (CageEye 1.3, Lindem Data Acquisition AS, Norway)



## ■ 1<sup>st</sup> phase



01-02 Jul 14

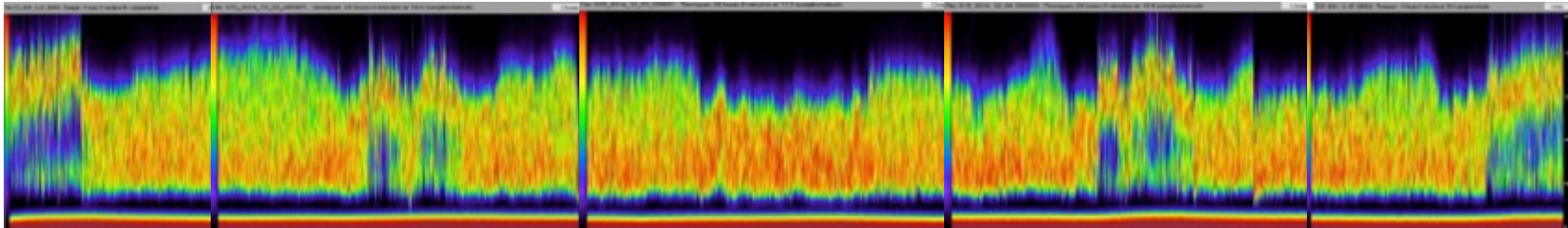




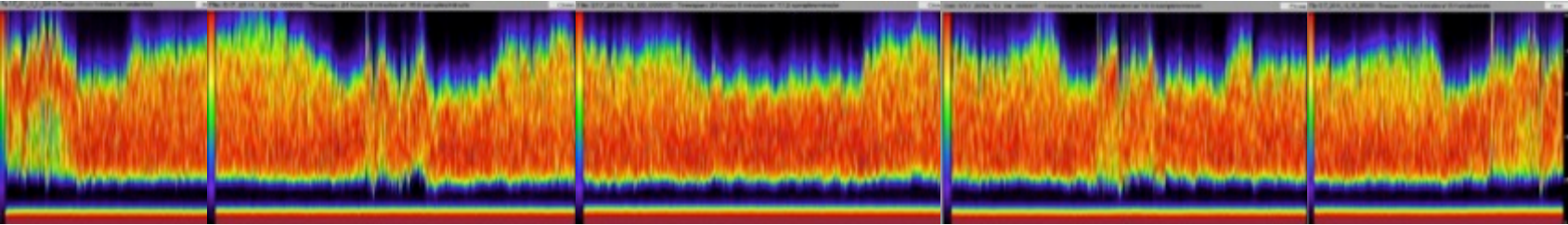
1-2-3-4-5 Dec 2014

No feeding day  
(bad weather)

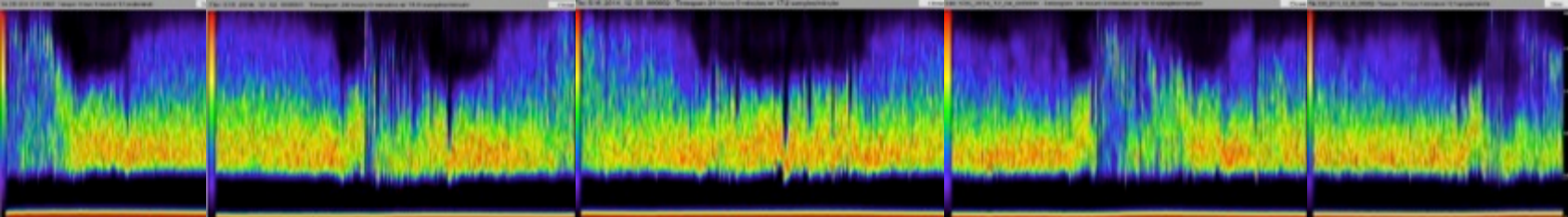
Shallow (15)



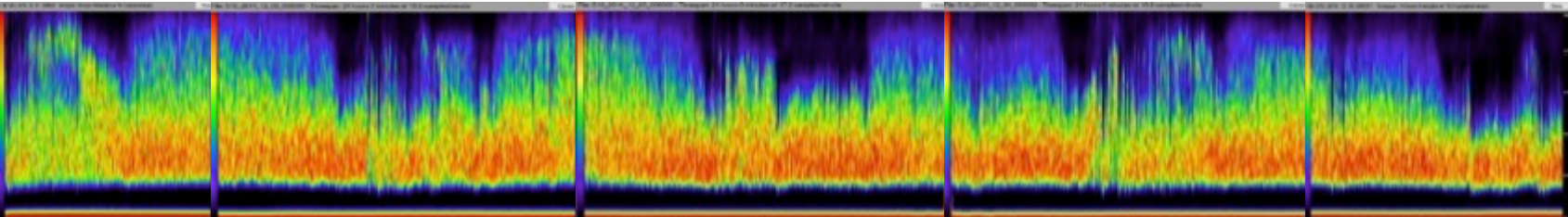
Shallow (17)



Deep (16)



Deep (18)

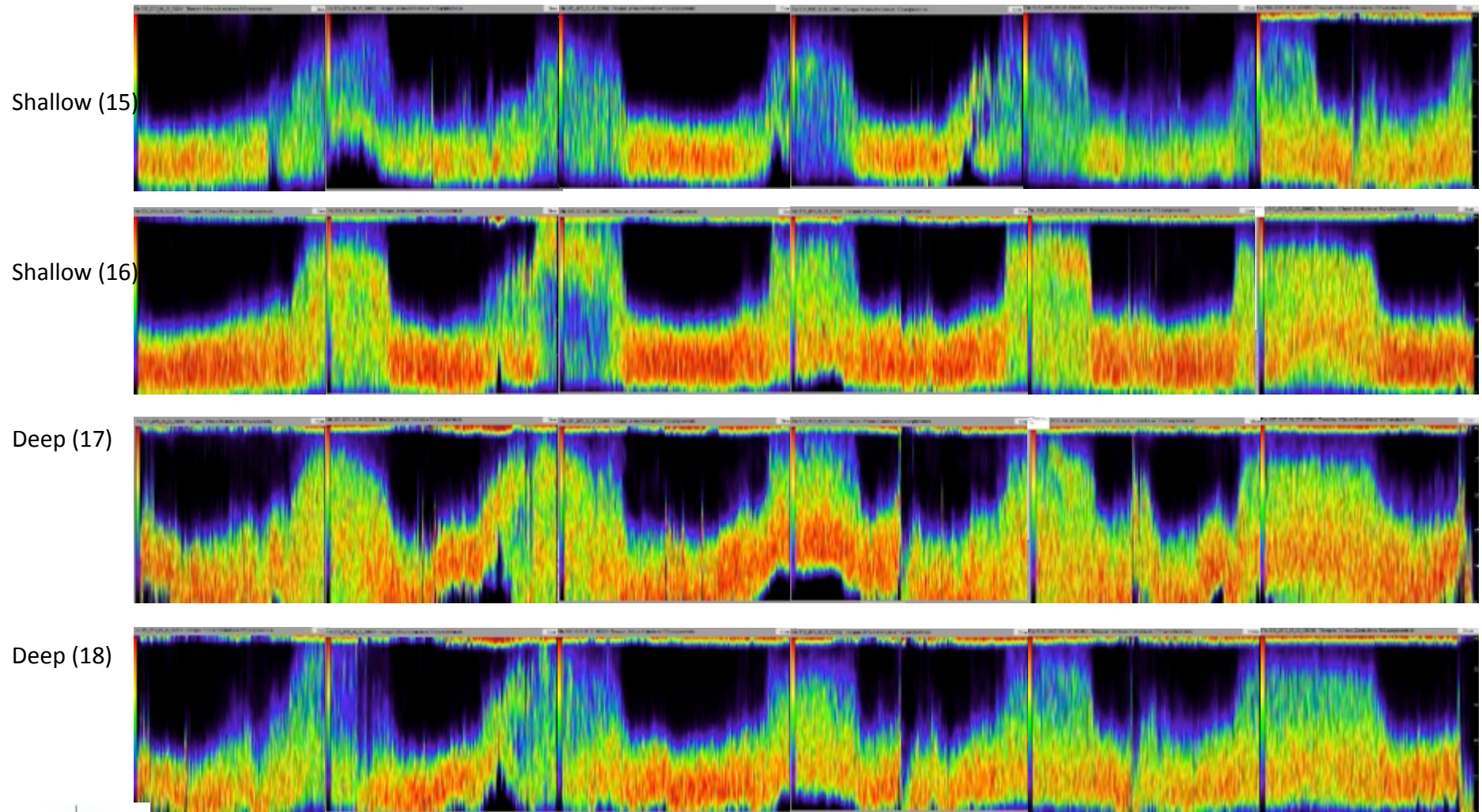




## ■ 2<sup>nd</sup> phase



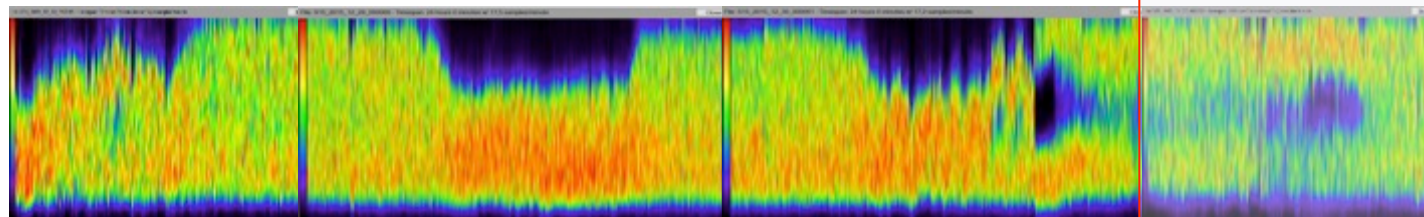
29-30-31 MAY and 01-02-03 June 2015



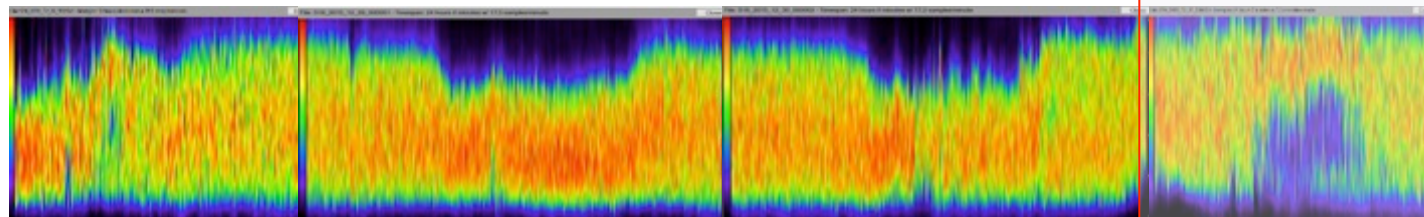
28-29-30-31 December 2015

31/12 strong currents

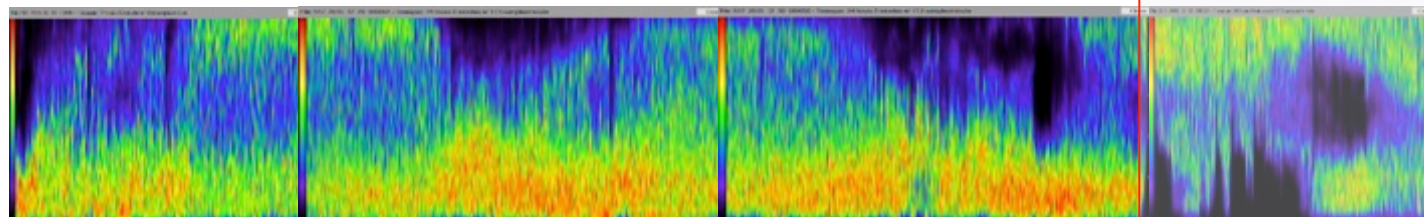
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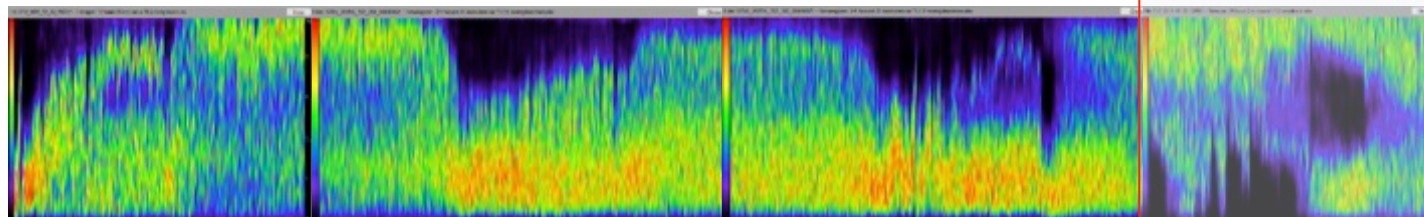
Shallow (16)



Deep (17)



Deep (18)

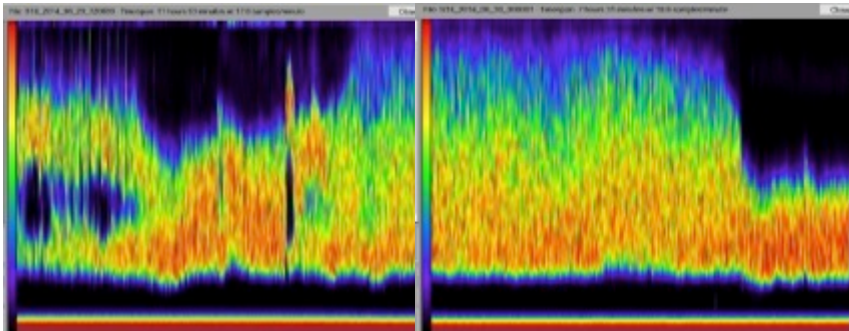




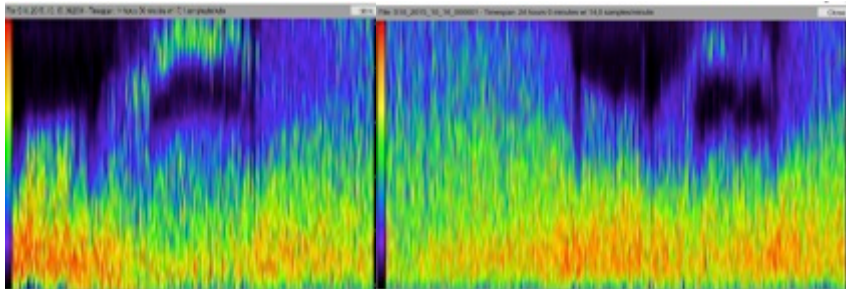
# Particular behaviors

(Split of the populations in 2 groups)

1<sup>st</sup> Phase - June 14 (deep cages)



2<sup>nd</sup> phase - October 15 (deep cages)



Further study  
Possible correlation with size variability



- The vertical distribution of meagre was mostly in the lower half of the cage during light-hours and almost homogeneous in the whole available volume of the cage during night
- The observation is independent of net depth, size of fish or season of rearing. To our knowledge this is the first time that such a behavior has been observed
- The night behavior is further studied for feeding management

# Results

- Physiological status

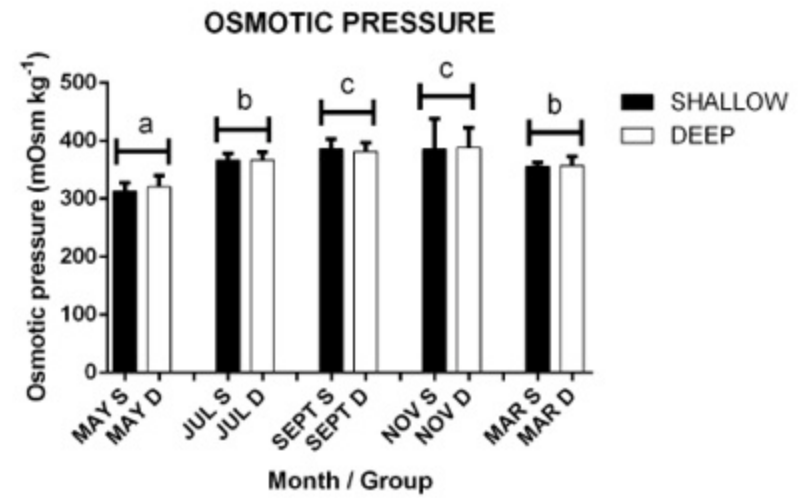
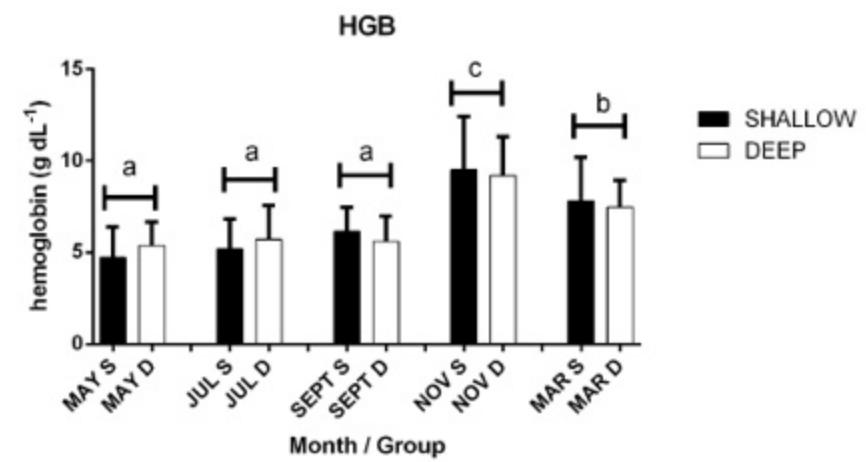
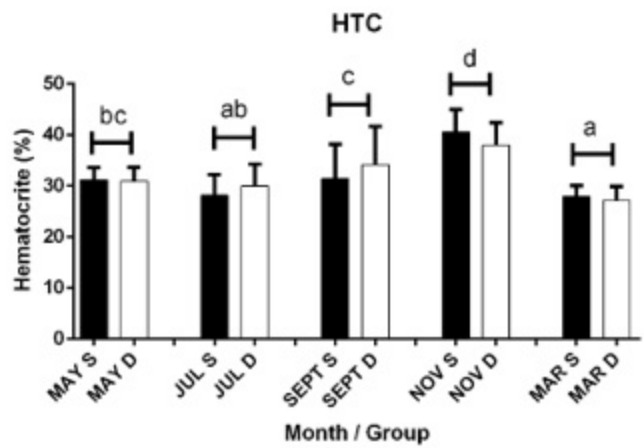
- *Blood sampling (10 fish per group)*



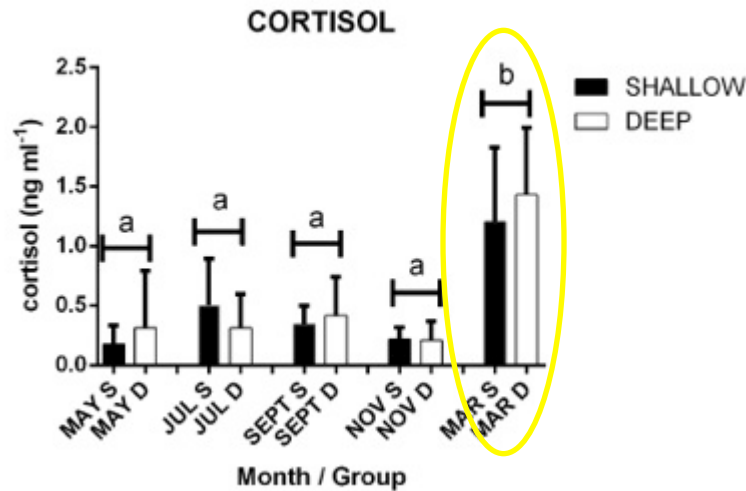
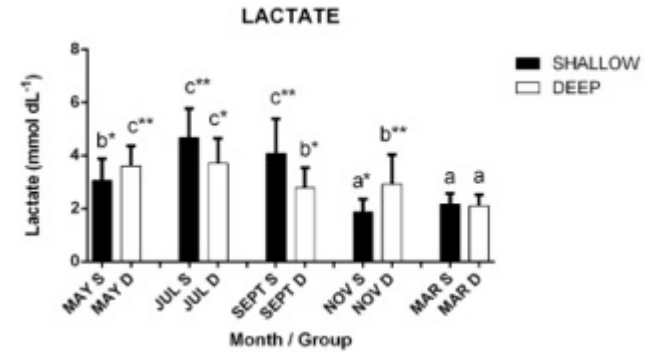
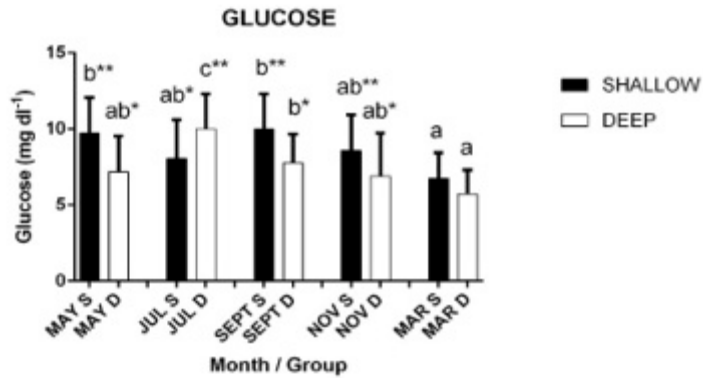


## ■ 1<sup>st</sup> phase

# Results: Haematocrite, Haemoglobin, Osmotic pressure



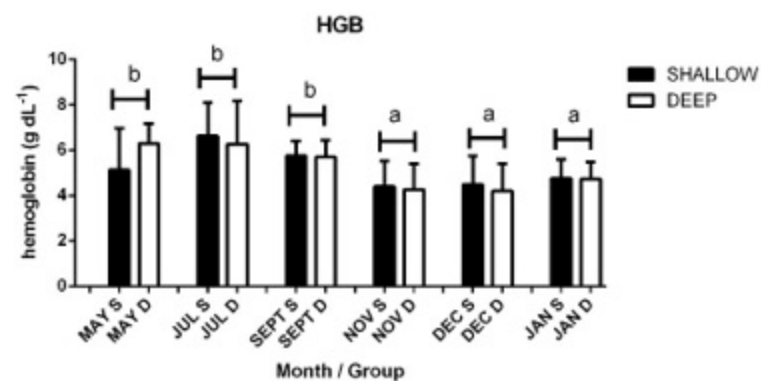
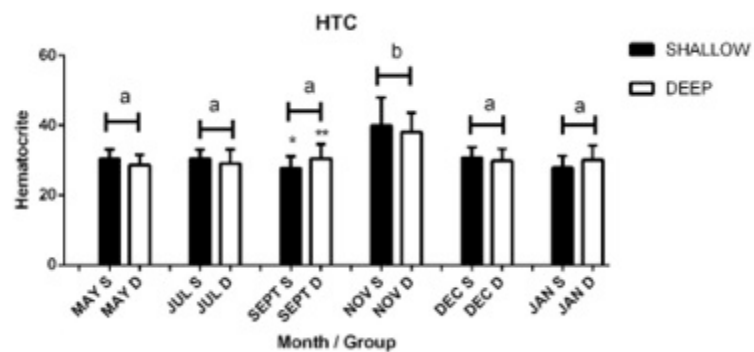
# Results: Glucose, Lactate, Cortisol





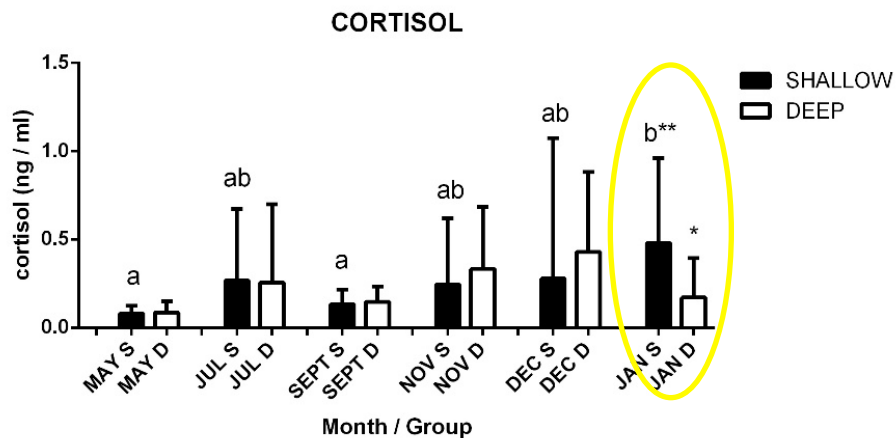
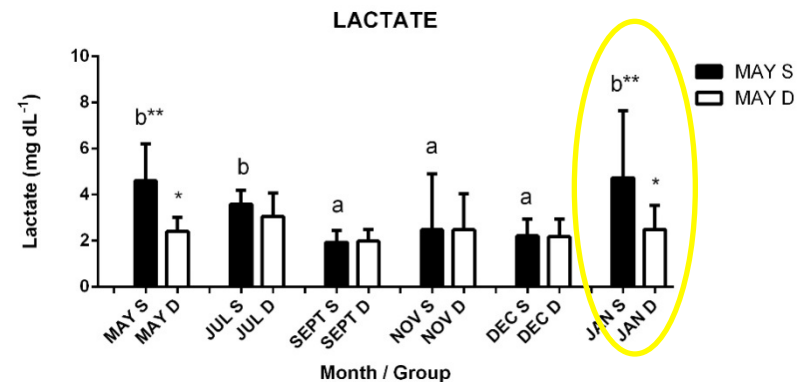
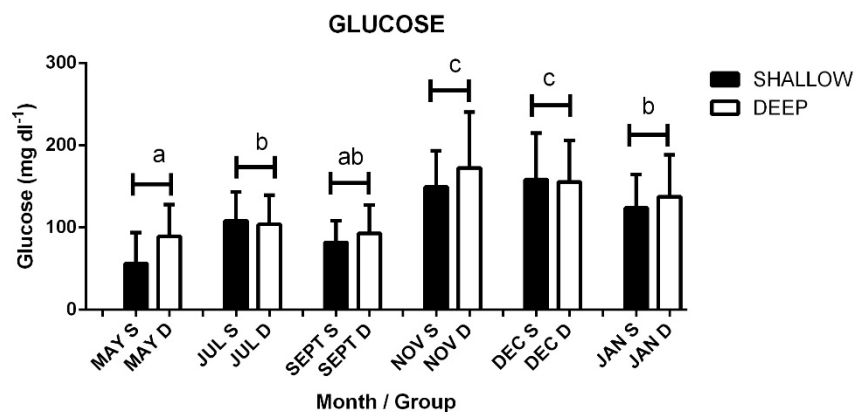
## ■ 2<sup>nd</sup> phase

# Results: Haematocrite and Haemoglobin





# Results: Glucose, Lactate and Cortisol



# Conclusions

## ■ 1<sup>st</sup> Phase

- ❑ Hematocrite, Hemoglobin, osmotic pressure, cholesterol, Total proteins, T3, T4 and NEFA: ONLY SEASONAL FLUCTUATIONS
- ❑ Glucose and Lactate: showed differences between the two net depths but statistical interactions make interpretation difficult
- ❑ Cortisol: only season fluctuation but higher levels in March may reflect stress due to crowding

# Conclusions

## ■ 2<sup>nd</sup> Phase

- Hematocrite, Hemoglobin and Glucose: ONLY SEASONAL FLUCTUATIONS
- Cortisol and Lactate: Statistically significant higher values in fish reared in the SHALLOW net than in the DEEP net  
(ONLY IN JANUARY)

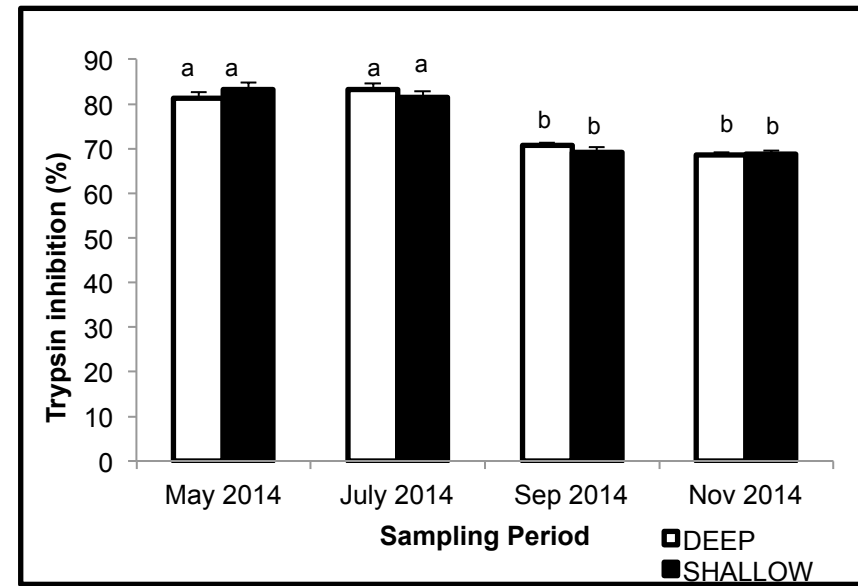
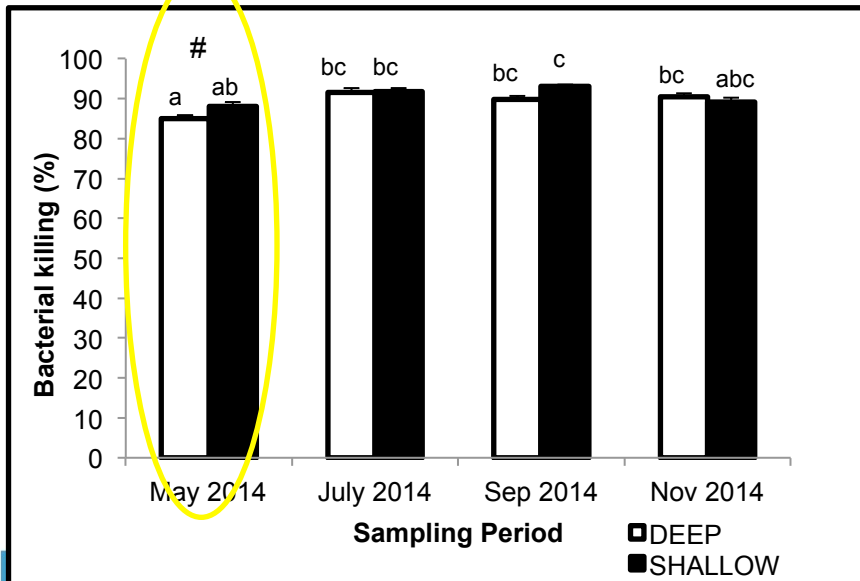
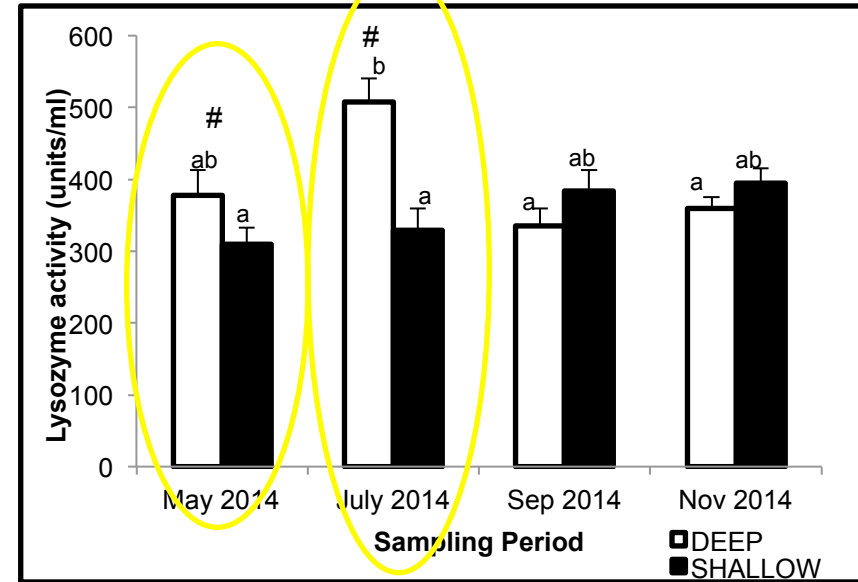
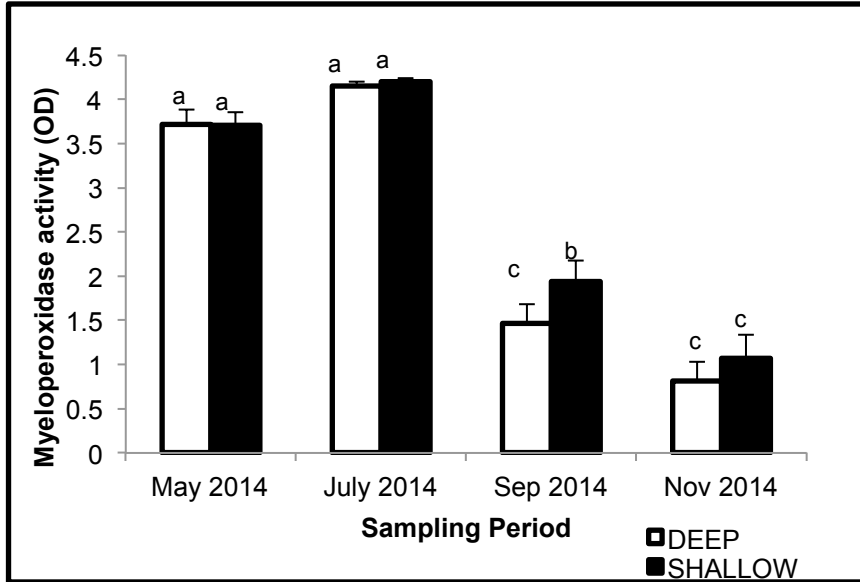
# Results

- Humoral immune status
  - *Blood sampling (10 fish per group)*



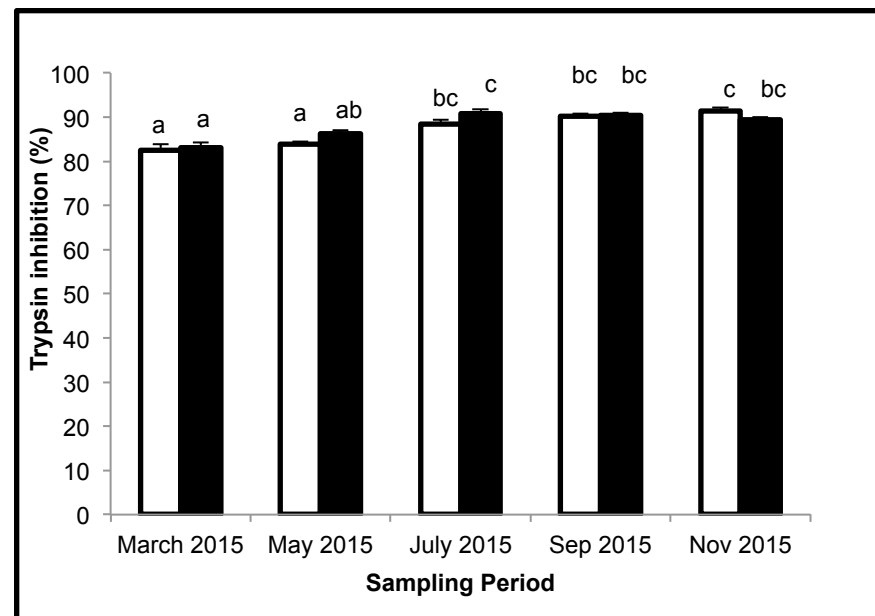
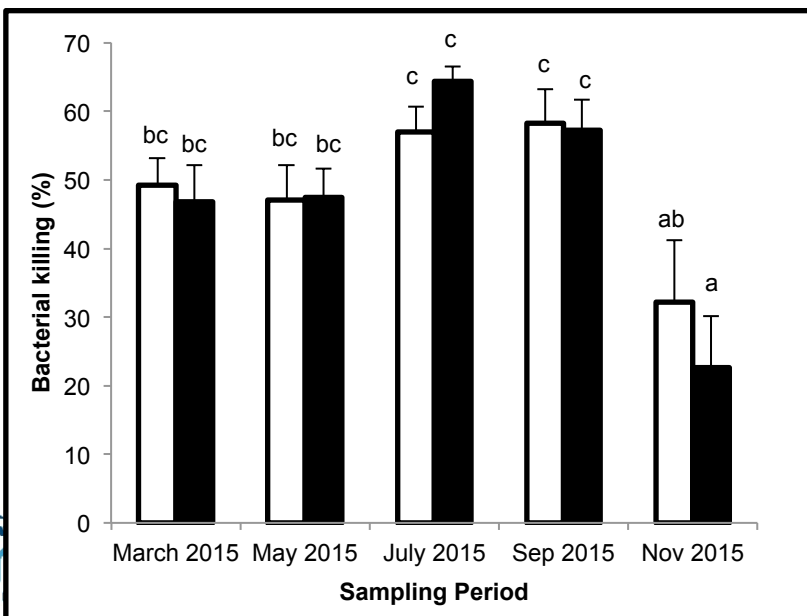
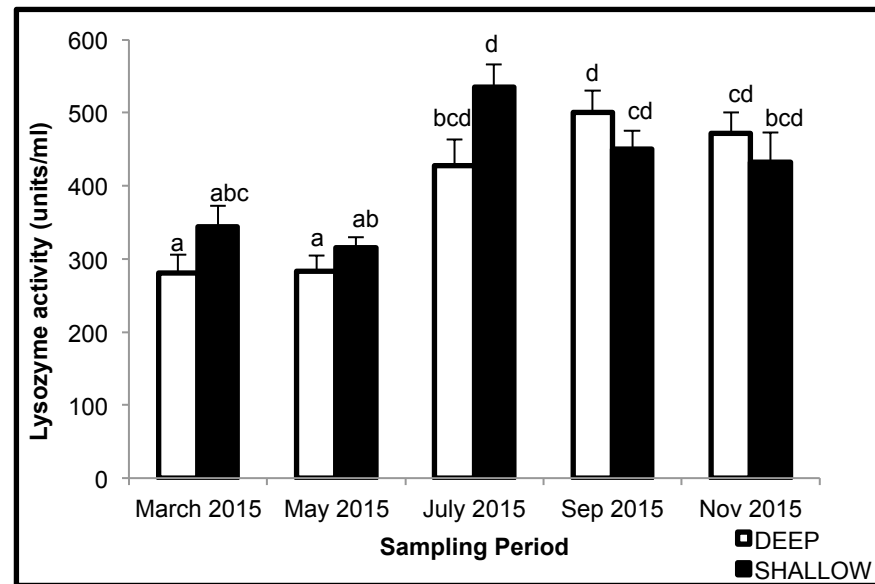
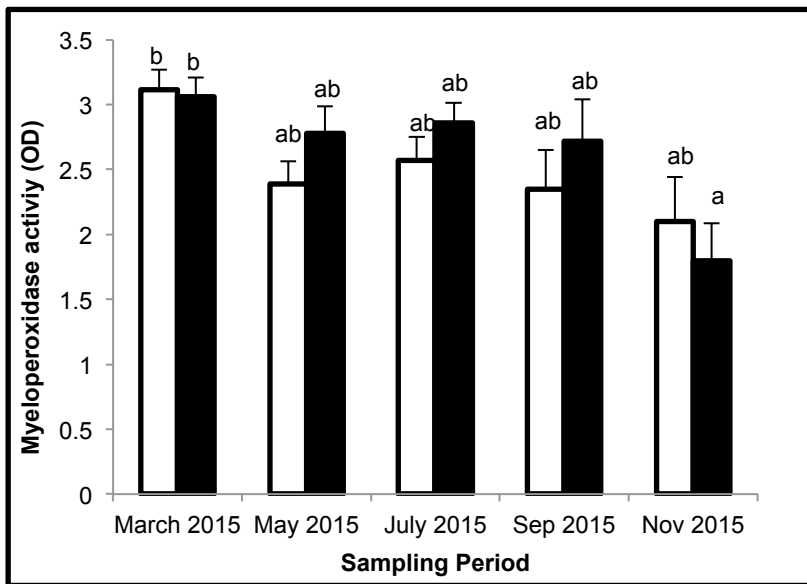


## ■ 1<sup>st</sup> phase





## ■ 2nd phase







# Results: A first estimation of the innate immune status of meagre

## ■ Compared to other Mediterranean species

- Lysozyme activity was double in meagre than in European sea bass and 6 times stronger than in Gilthead seabream but 5 times lower than in shi drum
- Myeloperoxidase activity was also very strong in meagre

## ■ Compare small and big

- small fish have a strong arsenal against bacterial infections (both Gram positive and negative)
- during fish growth it is evolved for additional protection against parasitical infections known to affect large fish, assessed here through the anti-protease activity.



# Results: A first estimation of the innate immune status of meagre

- The depth of the cages affected significantly the lysozyme and complement antibacterial activity of small fish in an opposite manner
- impossible to give a recommendation about optimal cage depth for the health of small meager
- Seasonal variations (water temperature and photoperiod) had a stronger effect on the fish immune parameters tested than the depth of the cages

# Conclusions

- Significant better performance during the 1<sup>st</sup> phase in the deep nets
- No difference during the 2<sup>nd</sup> phase

**Thank you for your attention!**

Prof. Pavlidis Michalis  
Marilena Kostari, Msc

