TEMPERATURE EFFECTS ON THE TRANSCRIPTOME OF YELLOW PERCH (*Perca flavescens*)

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Introduction

Freshwater ecosystems are vulnerable to meteorological changes. and have the potential to be greatly affected by these variables[1]. Namely, temperature variations in aquatic ecosystems affect biological processes[2] in fish, and effects of these changes have been reported in yellow perch (*Perca flavescens*) at different biological levels like condition factor or gene expression.

In ecotoxicological studies, it is important to be able to distinguish between stress responses to environmental variations and biological responses due to metal contamination.

The objective of this study is to identify the effects of temperature variations on the physiology and gene transcription of yellow perch.

Material and methods

Lab exposure

- 3 different conditions of temperature : 10°C, 20°C and 28°C
- 3 aquaria/condition and 25 fish/aquarium
- 1 month of exposure

Analyses

- Fulton index (condition factor)

$$FCF=\left(\frac{M}{L^a}\right)\times C$$

- Pyloric cæca index (condition factor measuring the relation between weight of pyloric cæca and yellow perch)

$$W_{corr}=\left(\frac{W_m}{W_f}\right)^b * W_c$$

- Gene expression (24 microarrays)

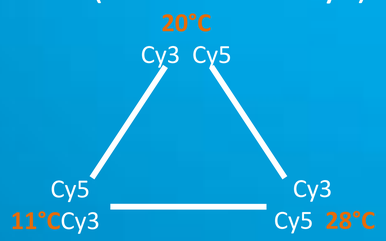

Figure 1 : Loopexperimental design withdye-swap (8 biological replicatesby conditions)

Results

- Biometric indicators

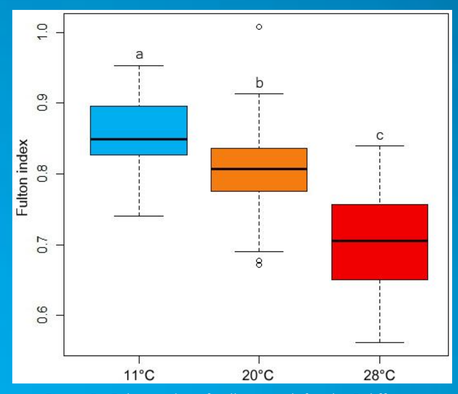

Figure 2 : Fulton index of yellow perch for the 3 different temperatures (11°C, 20°C and 28°C ; p-value < 0.05)

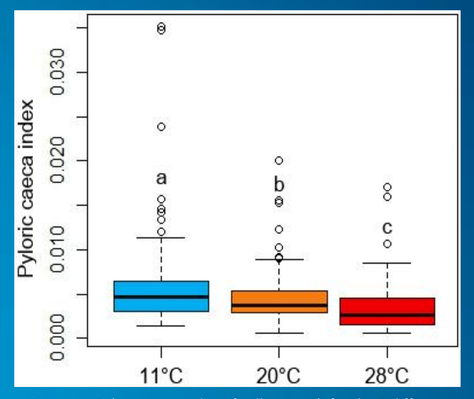

Figure 3 : Pyloric cæca index of yellow perch for the 3 different temperatures (11°C, 20°C and 28°C ; p-value < 0.05)

Both biometric indicators significantly decrease with the increase in temperature

- Gene expression

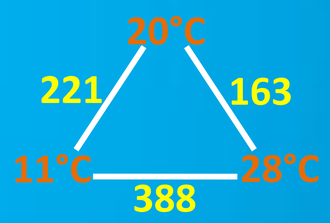

Figure 4 : Number of genes showing a significant difference of expression among the different temperatures

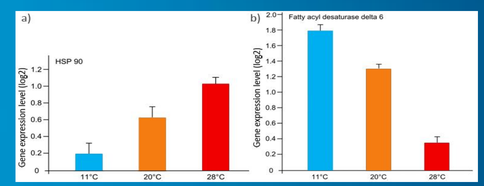

Figure 5 : Examples of genes a) overexpressed or b) underexpressedwith an increase in temperature

When temperature increases **119** genes are overexpressed and **143** are underexpressed.

Biological functions represented by underexpressed genes : lipid metabolism, ion transport, vitamin metabolism, and sexual differentiation.

Biological functions represented by overexpressed genes : regulation of cell death and apoptosis, and cell biosynthetic processes.

Conclusion

An increase in temperature affects the physiological condition of yellow perch. The decrease of Fulton and pyloric cæca indices can be explained by the underexpression of genes involved in lipid and vitamin metabolism.

Following an increase in temperature, we observed variation in expression levels of ion transport genes that are also involved in cadmium response. Therefore, it is important to consider environmental variations such as temperature in ecotoxicological studies.

References

[1] Bates et al. 2008

[2] Cochrane et al. 2009

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