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mRNA Expression in European Eel Eggs and Embryos and its Relationship to Hatching Success

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1. Introduction

Aquaculture production of viable European eel larvae has proven feasible[1], however with highly variable embryonic development and hatching success. Early embryonic development in fishes is catalysed by proteins translated from maternal mRNA incorporated in the oocytes during oogenesis[2]. Variation in quantity of this mRNA may explain this high variation in embryonic development and hatching success.

Farmed European eel

Stripping of European eel

Incubation flasks

Unfertilized eggs

40 HPF embryos

Fume hood

2. Objectives

We analyzed the relative expression of Tubulin β, Insulin-like growth factor 2 (IGF2), Nucleoplasmin (npm2), Prohibitin 2 (PHB2), Phosphatidylinositol glycan biosynthesis class F protein 5 (PIGF5), and carnitine O-palmitoyltransferase liver isoform-like 1 (CPT1), maternal mRNA of these genes have been associated to embryonic development in fishes[3,4,5]. Relative expression of these genes was analyzed at different embryonic developmental stages and compared with hatching success.

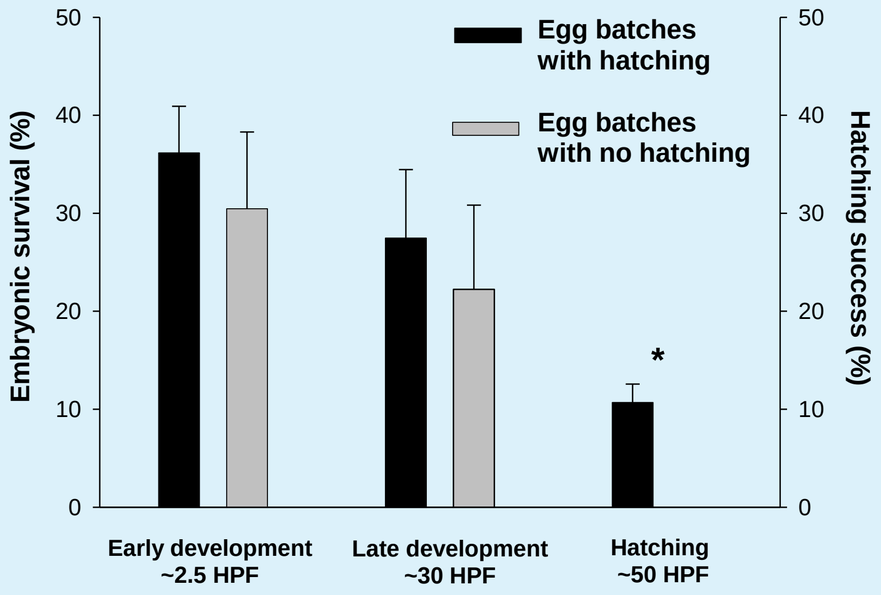
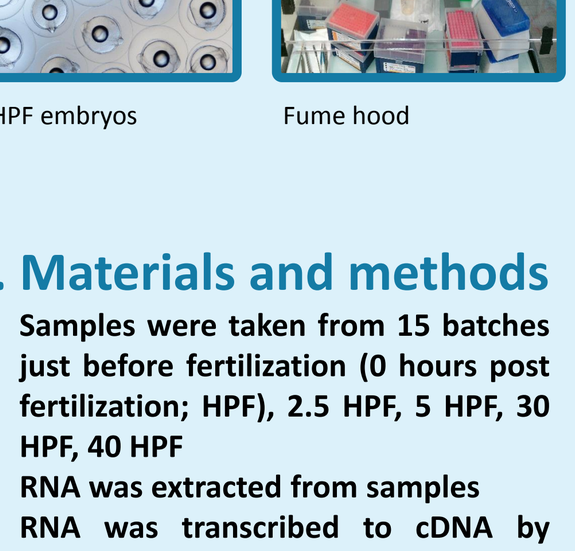


Fig. 1. Embryonic survival/ hatching success over time. Bars represent means ± SEM. The left y-axis shows embryonic survival, and the right y-axis shows hatching success. The HPF × egg quality interaction term was significant, therefore the model was decomposed at each HPF and analyzed using a series of t-tests.

3. Materials and methods

- ❑ **Samples were taken from 15 batches just before fertilization (0 hours post fertilization; HPF), 2.5 HPF, 5 HPF, 30 HPF, 40 HPF**
- ❑ **RNA was extracted from samples**
- ❑ **RNA was transcribed to cDNA by reverse-transcription**
- ❑ **Relative qPCR was performed**
- ❑ **Batches were organized into two groups: (i) with hatching larvae (ii) with no hatching (Fig. 1)**
- ❑ **Expressions data were analyzed by two-way repeated measures ANOVA**



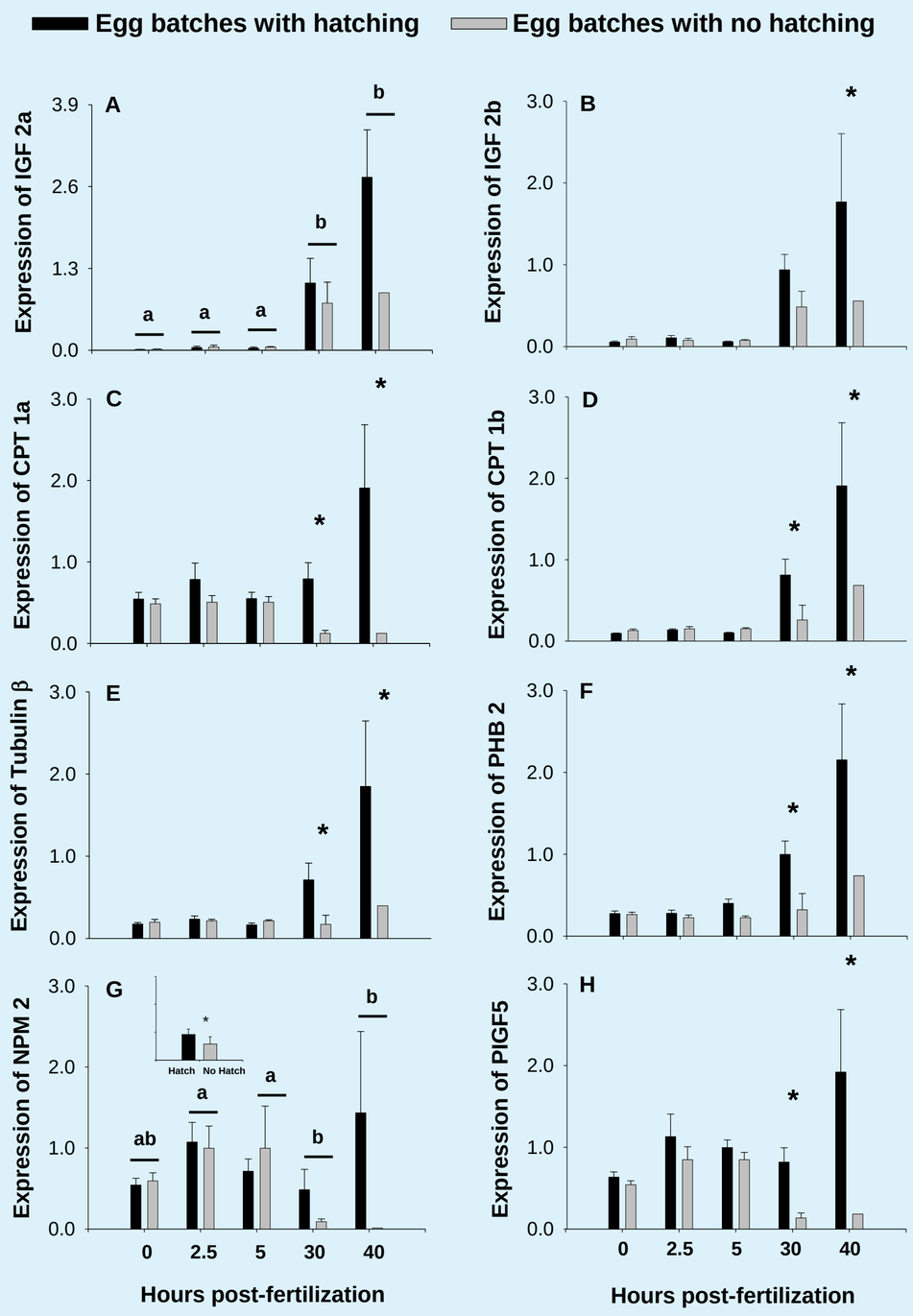


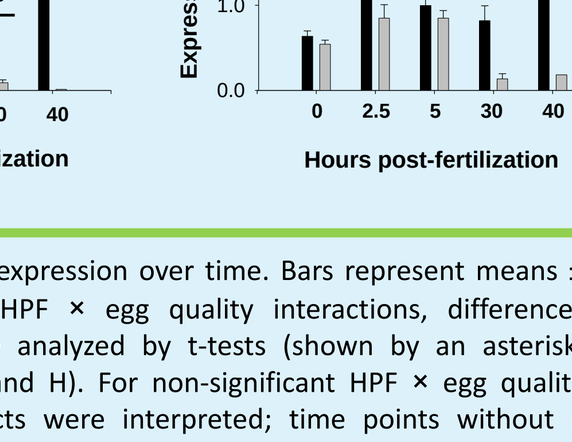
Fig. 2. Relative gene expression over time. Bars represent means ± SEM. For significant HPF × egg quality interactions, differences between groups were analyzed by t-tests (shown by an asterisk, panels B, C, D, E, F, and H). For non-significant HPF × egg quality interaction main effects were interpreted; time points without a common letter superscript differed (panels A and G). For NPM2 differences in average expression between groups is indicated by an asterisk (panel G).

4. Results

- ❑ **The HPF × egg quality interaction term was significant for IGF2b, CPT1a, CPT1b, Tubulin β, PIGF5, and PHB2 (Fig. 2B, C, D, E, F, and H)**
- ❑ **No significant differences were found, between the two groups, in expression of any of the genes at 0 HPF, 2.5 HPF, and 5 HPF (Fig. 2)**
- ❑ **Significant differences were found between the two groups for expression of CPT1a, CPT1b, Tubulin β, PIGF5, and PHB2 at 30 HPF (Fig. 2C, D, E, F, and H)**
- ❑ **At 40 HPF expression of all genes showed significant differences (Fig. 2)**

5. Conclusion

This study indicates that maternally incorporated mRNA transcripts, of the analyzed genes, does not govern embryonic development in European eel. However, later in development (30 & 40 HPF) differences in expression, between groups, can be seen for most genes, which points to up-regulation of expression in embryos from batches, which generated hatched larvae.



Mating eels

6. Acknowledgements

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PRO-EEL