

Table of contents

1	Introduction.....	1
1.1	Cod fisheries and farming	4
1.2	Photoperiod manipulation	6
1.2.1	<i>Effect of photoperiod on sexual maturation</i>	8
1.2.2	<i>The effects of light wavelength</i>	9
1.2.3	<i>Cold-cathode light</i>	10
1.3	The endocrine growth axis in fish	11
1.3.1	<i>Insulin-like growth factor I</i>	12
1.3.2	<i>Growth hormone and melatonin</i>	14
1.4	Measuring hormone levels in fish	15
1.5	Statistics	18
1.6	Objective	20
2	Materials and methods	21
2.1	Experimental conditions.....	21
2.2	Sampling and sample analysis	24
2.2.1	<i>Measuring IGF-I by the RIA method</i>	27
2.2.2	<i>ELISA method for measuring IGF-I</i>	31
2.3	Statistical calculations.....	37
3	Results	39
3.1	Growth.....	39
3.2	Plasma extraction	43
3.3	IGF-I measured by the RIA method	44
3.4	ELISA for measuring IGF-I	47
4	Discussion	48
4.1	Conclusions	54
4.2	Closing words	55

5	References	56
5.1	Reference from WebPages	68
5.2	Figures	68
6	Appendixes.....	a
6.1	ELISA buffers and materials	a
6.2	Dilution of antibodies	c
6.3	Overview: IGF-I analysis using the ELISA method.....	iv
6.4	ELISA results.....	v
6.5	Regression	vii
6.6	Regression table.....	x
6.7	Extraction of plasma	xiv
6.8	IGF-I values (ng/ml) in Atlantic cod plasma samples.	xviii
6.9	Poster presented at Aquaculture Europe held in Istanbul, Turkey in 24-27. October 2007.	u

Figures

<i>Figure 1. An evolutionary phylogenetic tree.....</i>	2
<i>Figure 2. Atlantic cod (<i>Gadus morhua</i> L.)</i>	3
<i>Figure 3. Atlantic cod. Total landings.....</i>	4
<i>Figure 4. The light spectrum in the sea.....</i>	9
<i>Figure 5. A cold-cathode light unit in cod juvenile tank</i>	10
<i>Figure 6. The GH-IGF-I system.</i>	11
<i>Figure 7. RIA diagram.....</i>	16
<i>Figure 8. Experimental facilities at Staður, Grindavík.</i>	21
<i>Figure 9. Smaller tanks (3m³)</i>	21
<i>Figure 10. Larger tank (30m³).....</i>	22
<i>Figure 11. Experimental design.</i>	23
<i>Figure 12. Small storage tanks (1m³)</i>	24
<i>Figure 13. Sleepy fishes</i>	24
<i>Figure 14. The sampling table</i>	25
<i>Figure 15. Blood sampling</i>	25
<i>Figure 16. Liver and muscle sampling</i>	26
<i>Figure 17. Individually tagged fish.</i>	26
<i>Figure 18. From the RIA lab at the Zoology institute in Gothenburg.</i>	27
<i>Figure 19. An Eppendorf centrifuge,</i>	27
<i>Figure 20. A Wizard 1470 Automatic, Wallac Gamma counter.....</i>	29
<i>Figure 21. A sandwich ELISA diagram and ELISA standard curve</i>	32
<i>Figure 22. A schematic drawing of an ELISA plate, 96 wells.....</i>	33
<i>Figure 23. The microplate reader.</i>	35
<i>Figure 24. The mean weight of fish.....</i>	39
<i>Figure 25. The mean length of 20 fish (± S.D) from each treatment.....</i>	40
<i>Figure 26. The mean weight (ln weight) plotted against the mean length.....</i>	40
<i>Figure 27. Specific growth rate (% SGR)</i>	41
<i>Figure 28. Condition factor (CF) of the experimental fish</i>	42
<i>Figure 29. A comparison of IGF-I levels in plasma and extracted plasma.</i>	43
<i>Figure 30. Plasma IGF-I levels in experimental fish.</i>	44

<i>Figure 31. Plasma IGF-I levels in relation to the weight of experimental fish...</i>	45
<i>Figure 32 Plasma IGF-I levels (ng ml^{-1}) and specific growth rate (SGR).</i>	46
<i>Figure 33. Specific growth rate (SGR).....</i>	46

Tables

<i>Table 1 Systematic classification of Atlantic cod</i>	3
<i>Table 2 Dilution of assay standard</i>	35
<i>Table 3 Dummy variables</i>	38