

# The nutrient profile of *Artemia* is greatly improved by ongrowing nauplii for 3 days with Origreen

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NIFES, IMR, SWH



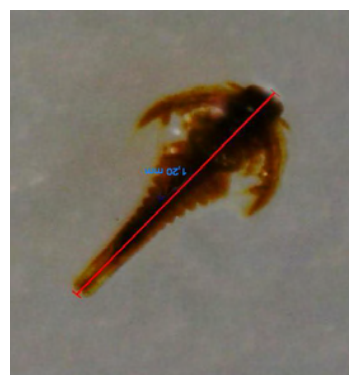
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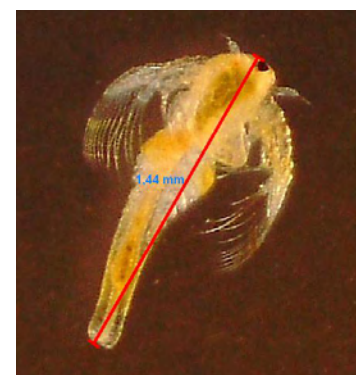
nauplie



Day 2



Day 3



Day 4

## Background: Halibut juvenile quality



Malpigmented



No eye migration



Normal



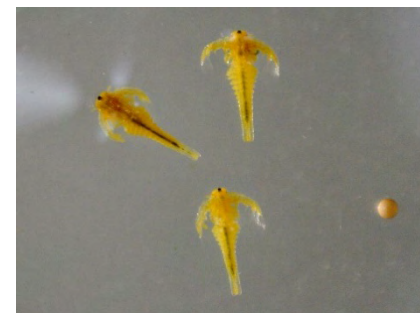
- Juvenile quality has improved in recent years but is still a challenge in the industry
- Feeding on-grown Artemia improves juvenile quality

## Task 11.2 Nutrient profile of ongrown Artemia

(Delivered in 2015)

1. Development of macronutrients, fatty acids and amino acids over a four days culture period
2. Nutrient profile of Artemia grown for three days compared to Artemia nauplii at IMR and SWH

### Artemia grown on OriCulture from Skretting



*Artemia* grown for 3 days from nauplii compared to an *Artemia* cyst.

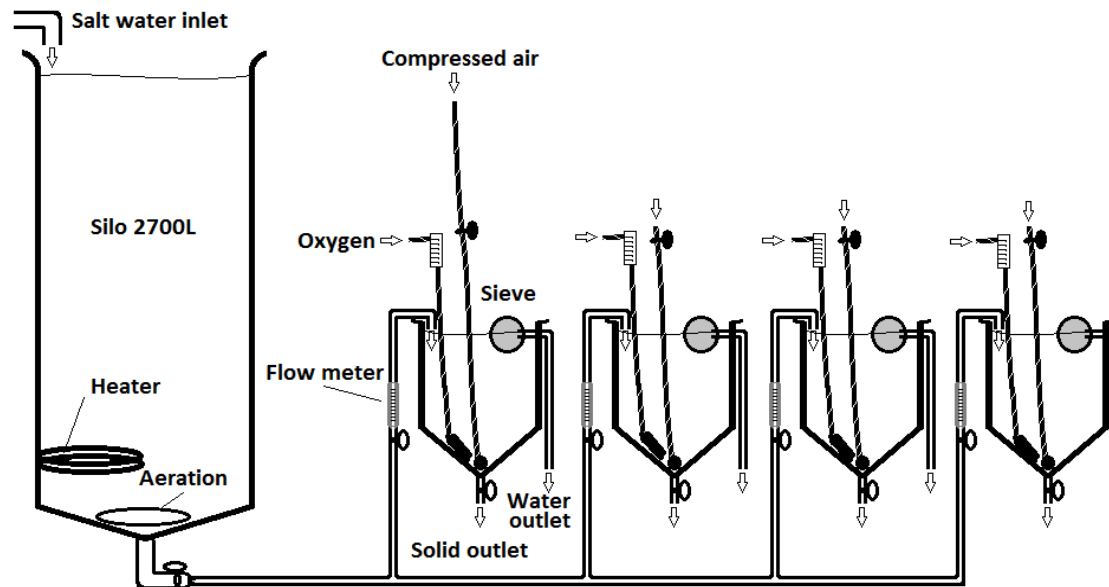
## IMR: Experimental setup



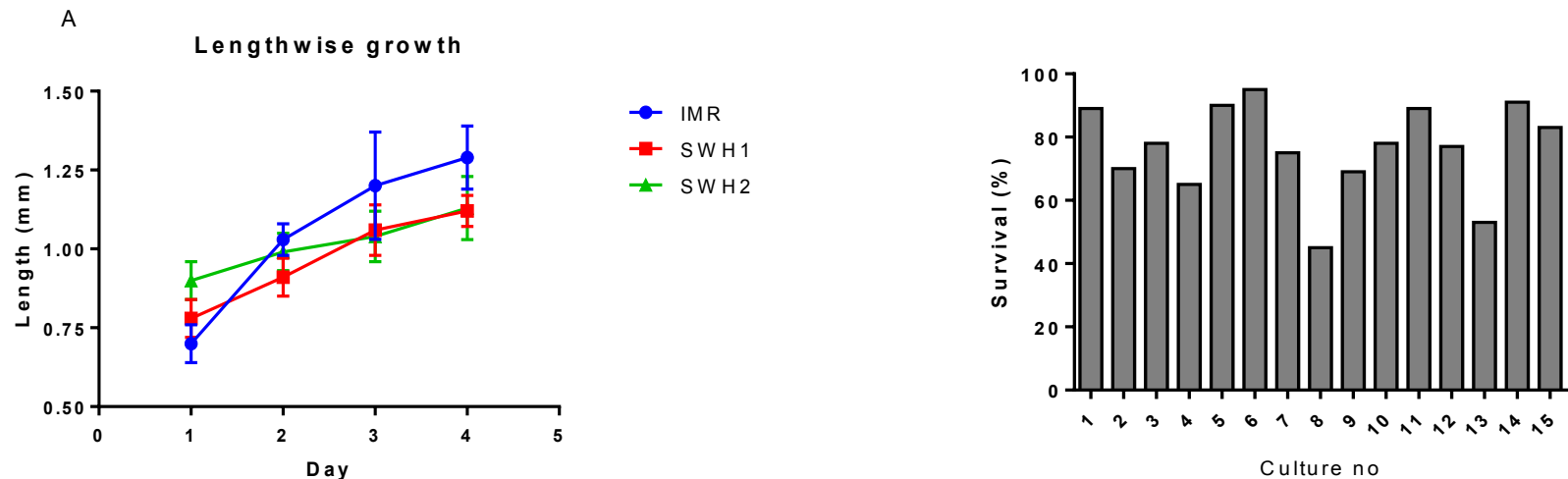
- EG cysts, OriGreen for culture and enrichment with Multigain
- Density: 100 ind/mL
- Waterflow: 15L/h, 21°C

## SWH: Experimental setup

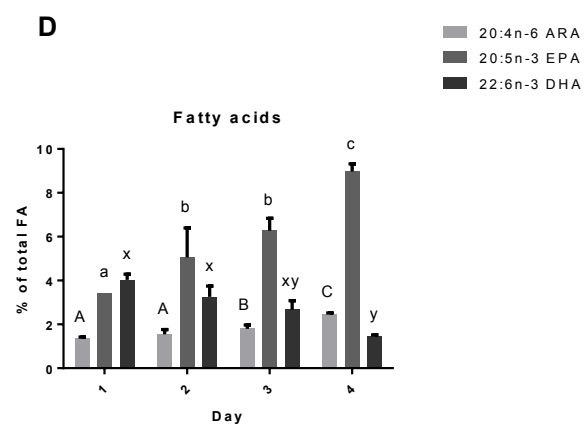
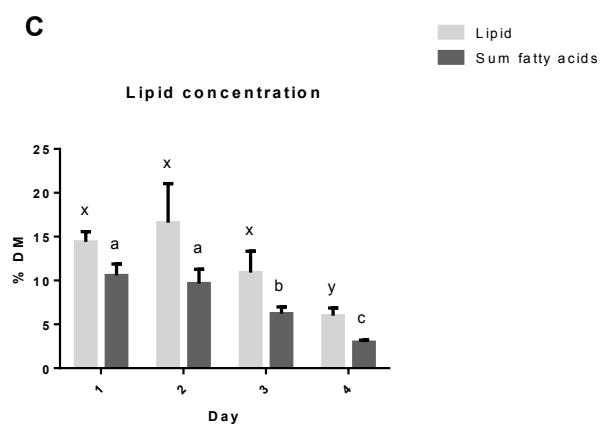
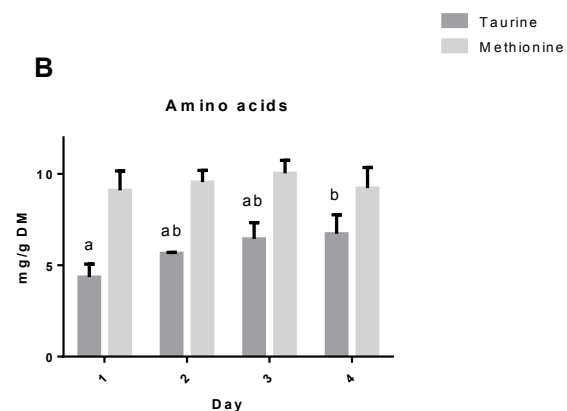
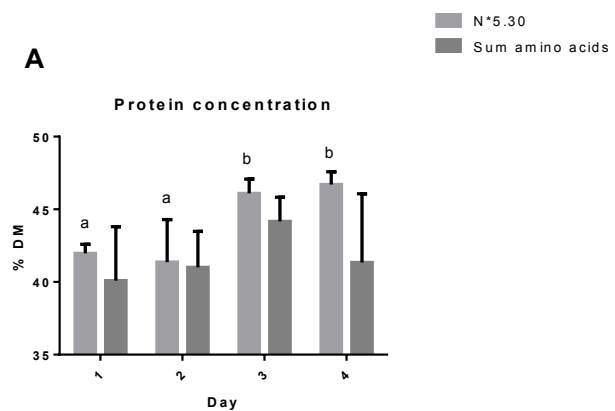
- SepArt EG cysts > 240000 npl/g, OriOne, enrichment with Multigain
- Density: 200 ind/mL
- Waterflow: 20L/h, 22.5°C



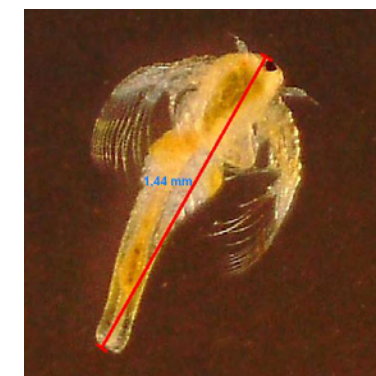
## Growth and survival in *Artemia* grown for 4 days



**Figure 5.** A. Growth of *Artemia* cultured for four days at IMR and SWH (mean±SD). B. Survival in 15 batches of on-grown *Artemia* cultured for three days at IMR. Numbers are based on numbers of *Artemia* ml<sup>-1</sup> at start and end of the 3-day culture period.



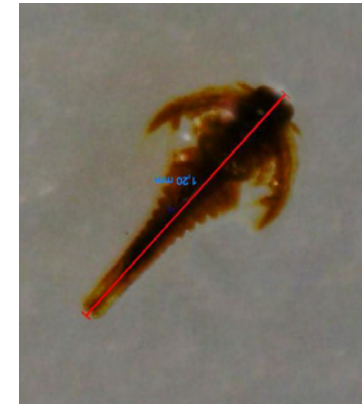
nauplie



Day 4



On dry wt	Unit	Nauplii enriched	On-grown enriched	<i>P</i> Day 1-3
Protein Nx5.30	g 100g <sup>-1</sup>	46±1	51±2	0.026
Free AA	g kg <sup>-1</sup>	70±4	92±13	0.044
Taurine	g kg <sup>-1</sup>	4.4±0.2	5.5±0.6	0.040
Glycogen	g kg <sup>-1</sup>	25±3	7.1±3.2	0.002
Lipid	g 100g <sup>-1</sup>	17±1	11±1	0.004
PL	% TL	24±3	34±3	0.013
ARA	% TFA	2.4±0.1	2.1±0.1	0.016
EPA	% TFA	4.1±0.2	6.0±0.7	0.010
DHA	% TFA	5.9±0.6	17±2	0.001
Thiamine	mg kg <sup>-1</sup>	10.8±0.8	12.5±1.1	0.096
Vitamin C	mg kg <sup>-1</sup>	1037±336	1401±166	0.168
Vitamin D3	mg kg <sup>-1</sup>	0.12±0.01	0.24±0.01	0.000
Vitamin E	mg kg <sup>-1</sup>	580±27	890±224	0.076
MK4	µg kg <sup>-1</sup>	1040±137	102±37	0.000
Phylloquinone	µg kg <sup>-1</sup>	13±1	281±131	0.024
MK6	µg kg <sup>-1</sup>	nd	15±7	0.024
MK7	µg kg <sup>-1</sup>	6.7±0.7	75±37	0.033
MK8	µg kg <sup>-1</sup>	nd	242±111	0.020
MK9	µg kg <sup>-1</sup>	nd	22±11	0.026
MK10	µg kg <sup>-1</sup>	nd	41±22	0.031
Total vitamin K	µg kg <sup>-1</sup>	1073±124	778±340	0.231
Iodine	mg kg <sup>-1</sup>	5.2±0.5	8.2±0.5	0.002
Ca	g kg <sup>-1</sup>	3.4±0.5	3.1±0.5	0.460
K	g kg <sup>-1</sup>	15±1	14±0.1	0.152
Mg	g kg <sup>-1</sup>	8.2±0.8	7.1±0.9	0.165
P	g kg <sup>-1</sup>	11.1±0.9	10.9±0.4	0.420

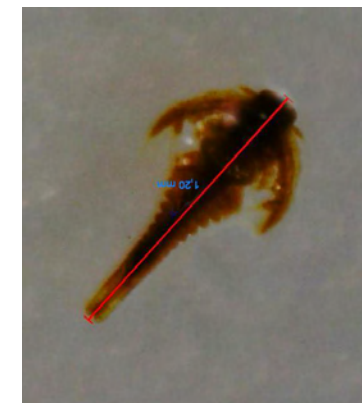


Day 3



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On dry wt	Unit	Nauplii enriched	On-grown enriched	<i>P</i> Day 1-3
Protein N*5.30	g 100g <sup>-1</sup>	49±2	55±4	0.006
Free AA	g kg <sup>-1</sup>	79±3	121±12	0.000
Taurine	g kg <sup>-1</sup>	4.7±0.0	5.3±0.3	0.022
Glycogen	g kg <sup>-1</sup>	24±5	10.3±2.1	0.000
Lipid	g 100g <sup>-1</sup>	27±3	17±1	0.000
PL	% TFA	25±1	33±1	0.000
ARA	% TFA	2.8±0.2	3.2±0.2	0.015
EPA	% TFA	5.9±0.4	6.9±0.3	0.005
DHA	% TFA	18±2	9.4±0.9	0.000
Thiamine	mg kg <sup>-1</sup>	22±1	20±2	0.009
Vitamin C	mg kg <sup>-1</sup>	920±127	786±254	0.098
Vitamin D3	mg kg <sup>-1</sup>	0.28±0.08	0.25±0.01	0.544
Sum vitamin K	µg kg <sup>-1</sup>	2790±215	1137±209	0.000
Vitamin E	mg kg <sup>-1</sup>	743±18	869±81	0.072
Iodine	mg kg <sup>-1</sup>	5.8±1.9	7.5±1.1	0.388
Mn	mg kg <sup>-1</sup>	3.7±0.1	4.1±0.3	0.321
Fe	mg kg <sup>-1</sup>	123±33	187±13	0.399
Co	mg kg <sup>-1</sup>	0.25±0.02	0.37±0.03	0.001
Cu	mg kg <sup>-1</sup>	10.6±2.3	21±8	0.071
Zn	mg kg <sup>-1</sup>	184±22	177±11	0.641
Se	mg kg <sup>-1</sup>	1.7±0.1	1.06±0.17	0.000



Day 3

## Summary

- Ongrowing of Artemia for three days gave increased concentrations of
  - Protein, free amino acids, taurine, phospholipids
- Decreased concentrations of
  - Glycogen and lipid
- Different results for fatty acids at IMR and SWH
  - IMR: Large increase in DHA, increase in EPA and stable ARA. (EG cysts, OriGreen)
  - SWH: Slight increase in ARA and EPA and large decrease in DHA (SepArt EG cysts > 240000 npl/g, OriOne)
- Vitamins and minerals were OK
- Ongrowing of Artemia is work intensive and significant gains in halibut juvenile quality is needed for it to be implemented.

# Thank you for your attention



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Malpigmented



No eye migration



Normal