

# Larval Husbandry 1<sup>st</sup> Year Progress

WP14-Meagre

WP15-Amberjack

WP16-Pike perch

WP17-Halibut

WP18-Wreckfish

WP19-Grey mullet



## **WP14 Meagre larval husbandry**

**INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES  
(IRTA) Spain**

**Task 14.1 Determining the earliest and most cost effective weaning period**

## Experimental design Early weaning of meagre

Tanks = 100 L (x3)

Larval density 100 larvae L<sup>-1</sup>

Photoperiod= 16hL:8hO

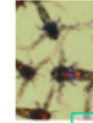
Temperature =23 °C

Light Intensity= ~ 500 lux.

### Feeding schedule



rotifers (10 rot/ml)



artemia metanuplii (0.5-6 art/ml)



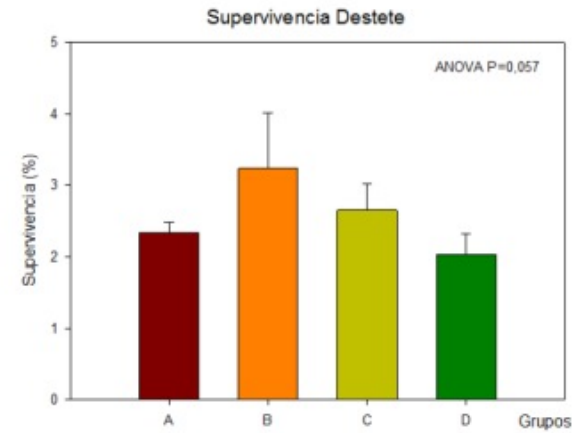
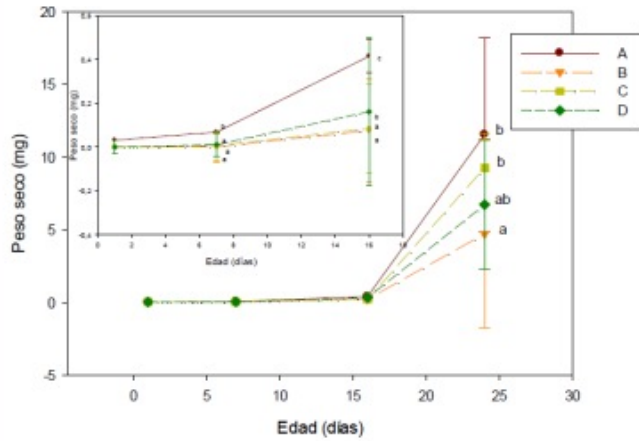
*Ad libitum* Gemma  
Micro 150,  
(Skretting)

### Feeding design

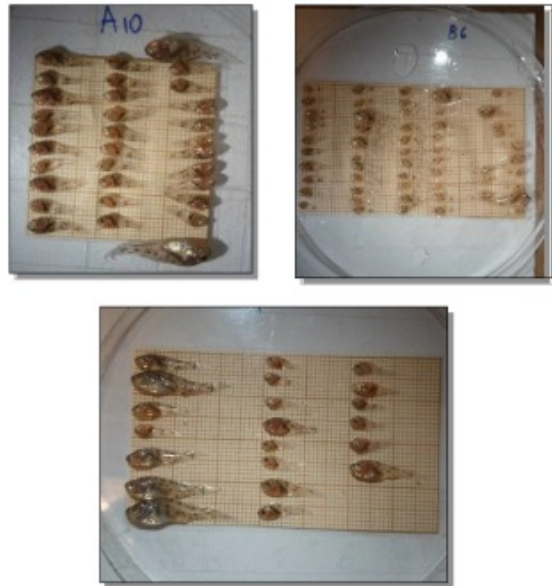
Group	Food			
	Rotifers days	Artemia days	Artemia %	Microdiet days
A	2-14.	8-30.	100%	20
B	2-14.	8-30.	50%	20
C	2-14.	8-30.	50%	15
D	2-14.	8-30.	50%	12

Larval samples: 8-12-15-16-19-20 dph  
Biometry (DW- LT), Proximal composition and FAs  
Digestive enzymes, Skeletal deformities.

# Results



No significant differences were observed in % survival although the growth was significantly higher in the larvae fed using the standard feeding scheme: rotifers from 2 to 14 days, artemia metanauplii from days 8 to 30 and microdiet from day 20 onwards, early weaning produced very high differences in the size of the larvae and a high incidence of cannibalism





## **WP15 Amberjack larval husbandry**

Fundacion Canaria Parque Cientifico Tecnologico de  
la Universidad de Las Palmas de Gran Canaria  
(FCPCT), Spain



## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

### Objectives:

1. Effect of different feeding strategies on larval performance in intensive systems
2. Development of feeding protocol and rearing system in mesocosm semi-intensive systems
3. Development of industrial protocol for larval rearing

**Participants: HCMR, FCPTC, IEO, ULL, FORKYS**



## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

### Task 15.1 Effect of feeding regime and probiotics

**Leader: IEO. Participants: ULL**



## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

### Task 15.1 Effect of feeding regime and probiotics IEO.

#### Y1 actions (2014)

Different proportions of *Echium* oil (four experimental treatments by triplicate) were used to enrich the rotifers considering 4 different enrichment periods (3, 6, 10 and 24 hours). The *Echium* oil was combined with either a commercial emulsion or a marine lecithin rich in LC-PUFA.

Biochemical analysis of enriched rotifers are currently being carried out at ULL to establish the best combination (time and concentration) to feed the larvae.

#### Deviation of initial plan

The lack of spawning of F1 broodstock forced to postpone the beginning of the trial with larvae to the next spawning season.





## **WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK**

### **Task 15.1**

**D15.2 Efficient prey density and protocol of using immune modulators  
In Greater amberjack larval rearing. M27**

### **Y2 actions (2015)**

**With the best results obtained in Y1, density and frequency supply of  
Enriched prey will be assayed.**

### **Determinations:**

**Larval performance (IEO)**

**Development of skeletal deformities and larval nutritional status,  
Oxidative Stress and humoral parameters (O)**

**Digestive tract ontogeny: proteases, lipases, amylases and ATPase  
activities (ULL)**

### **Exchange of samples:**

**IEO will provide samples to ULL to be analysed**



## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

# Task 15.2 Comparison of semi-intensive and intensive rearing

**Leader: HCMR. Participants: FCPCT, ULL**



## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

### Sub-task 15.2.1 Comparison between intensive and semi-intensive HCMR

#### Semi-intensive Culture

Tanks = 40 m<sup>3</sup> (x3)

Larval density 40

Photoperiod= 18L:06D

Temperature =24 °C

Light Intensity= ~ about 25  $\mu\text{mol m}^{-2} \text{s}^{-1}$ .

#### Feeding schedule:

enriched rotifers (3 to 18 dph)

Instar II Artemia nauplii (from 15 to 30 dph)

occasionally eggs and prelarvae since 16dph

Artificial diet delivery was initiated on 22dph

Phytoplankton was added daily until 20 dph.

Biometry (DW- LT),





## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

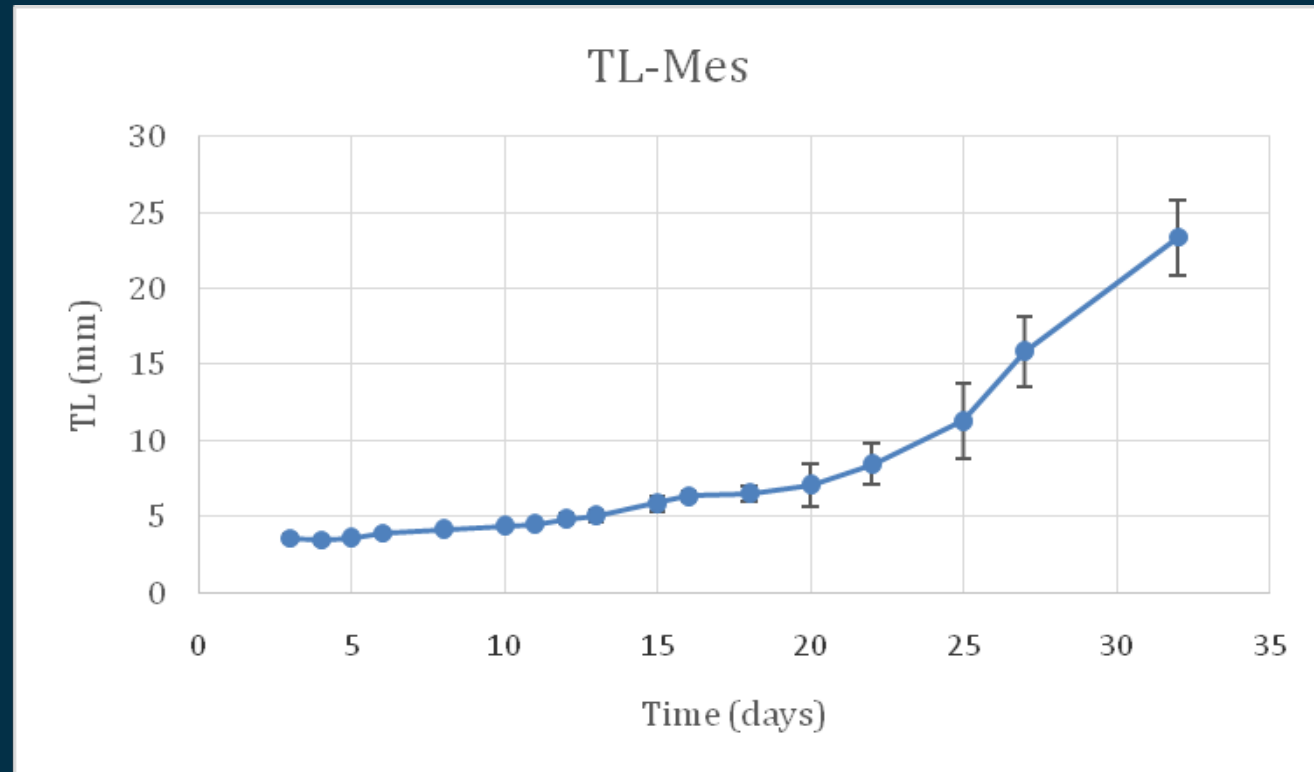
Sub-task 15.2.1

RESULTS:

Semiintensive

On day 30:

950 individuals  
transferred for  
pre-growing.



Evolution of total Length during the rearing in Mesocosm (error bars is the standard deviation of the mean, n=10)



## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

### Sub-task 15.2.1 Comparison between intensive and semi-intensive **HCMR**

#### Intensive culture

Tanks = 500 l

Larval density 40

Photoperiod= 18L:06D

Temperature =22 °C

Light Intensity= ~ about 25  $\mu\text{mol m}^{-2} \text{s}^{-1}$ .

#### Feeding schedule:

enriched rotifers (3 to 21 dph)

Instar II Artemia nauplii (from 12)

**Artificial diet delivery was initiated on 21dph**

**Phytoplankton was added daily until 22 dph.**

**Biometry (DW- LT),**





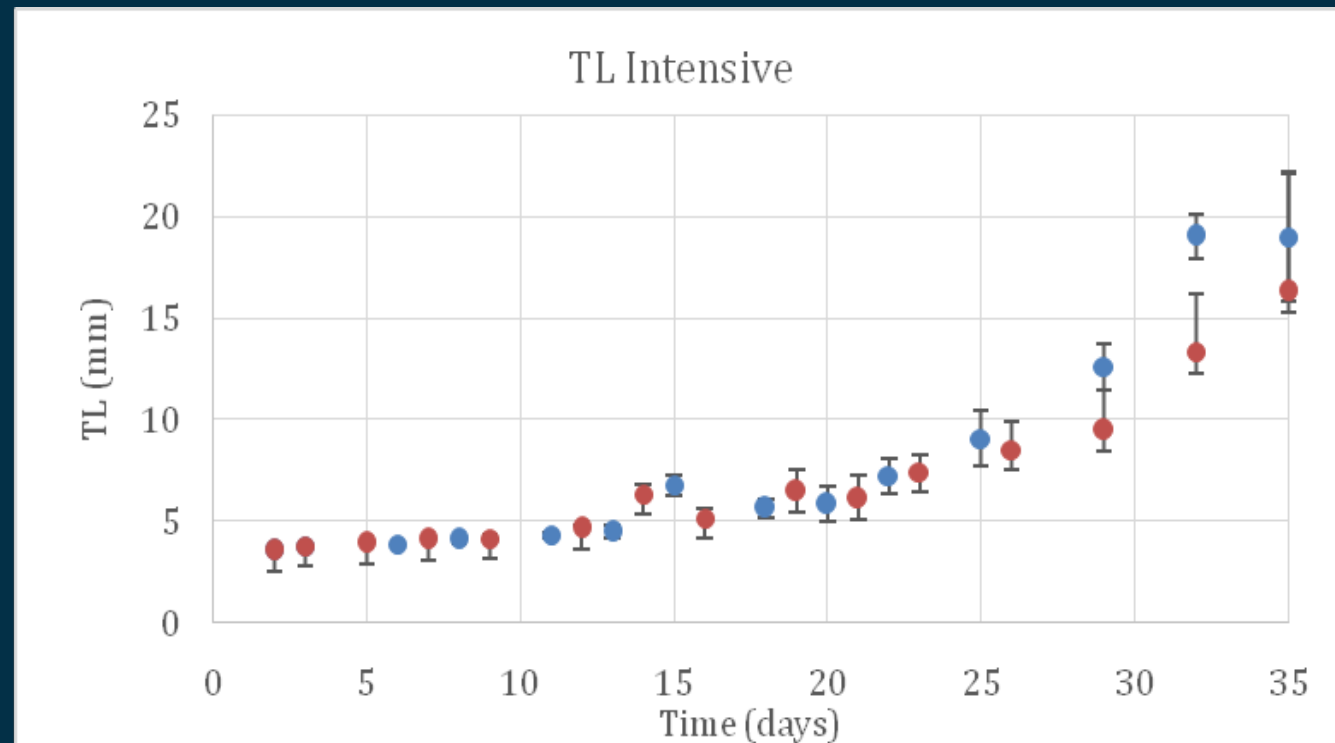
## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

Sub-task 15.2.1

Results: Intensive

On day 30:

**2500 individuals**  
transferred for  
pre-growing.



Evolution of TL during intensive rearing (error bars is the standard deviation of the mean, n=10)



## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

### Sub-task 15.2.2 The effect of stocking density **FCPCT**

Tanks: 2000 l (x3)

Eggs density: 25, 50, 75

Photoperiod: natural

Temperature: 23-25°C

Feeding schedule:

enriched rotifers

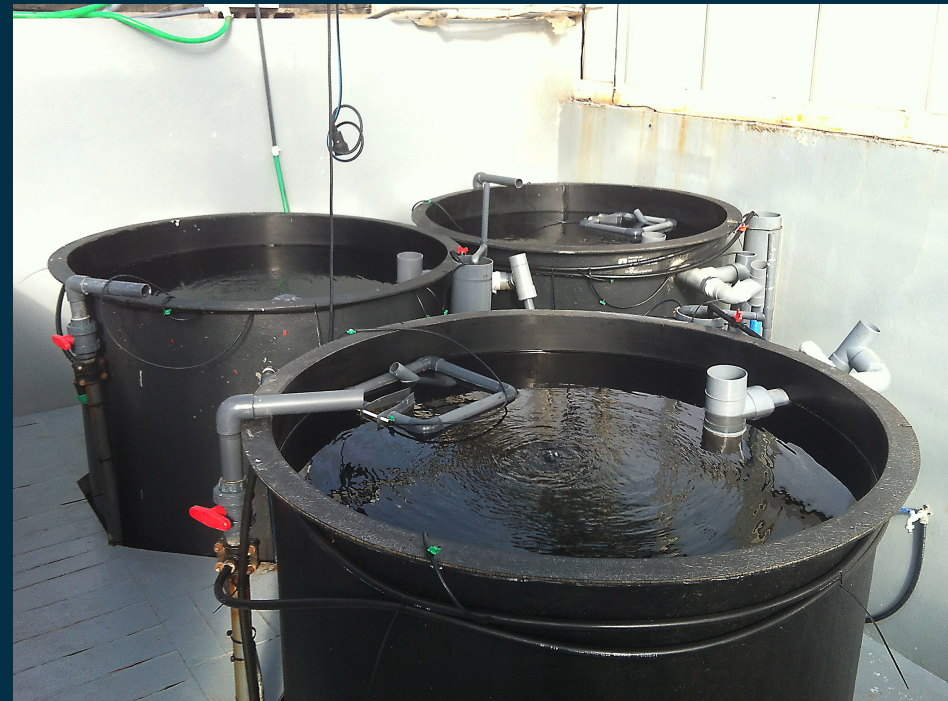
Artemia nauplii

Artificial diet

Phytoplankton

Larval samples: 0-5-10-15 dph

Biometry (DW- LT), Histology.

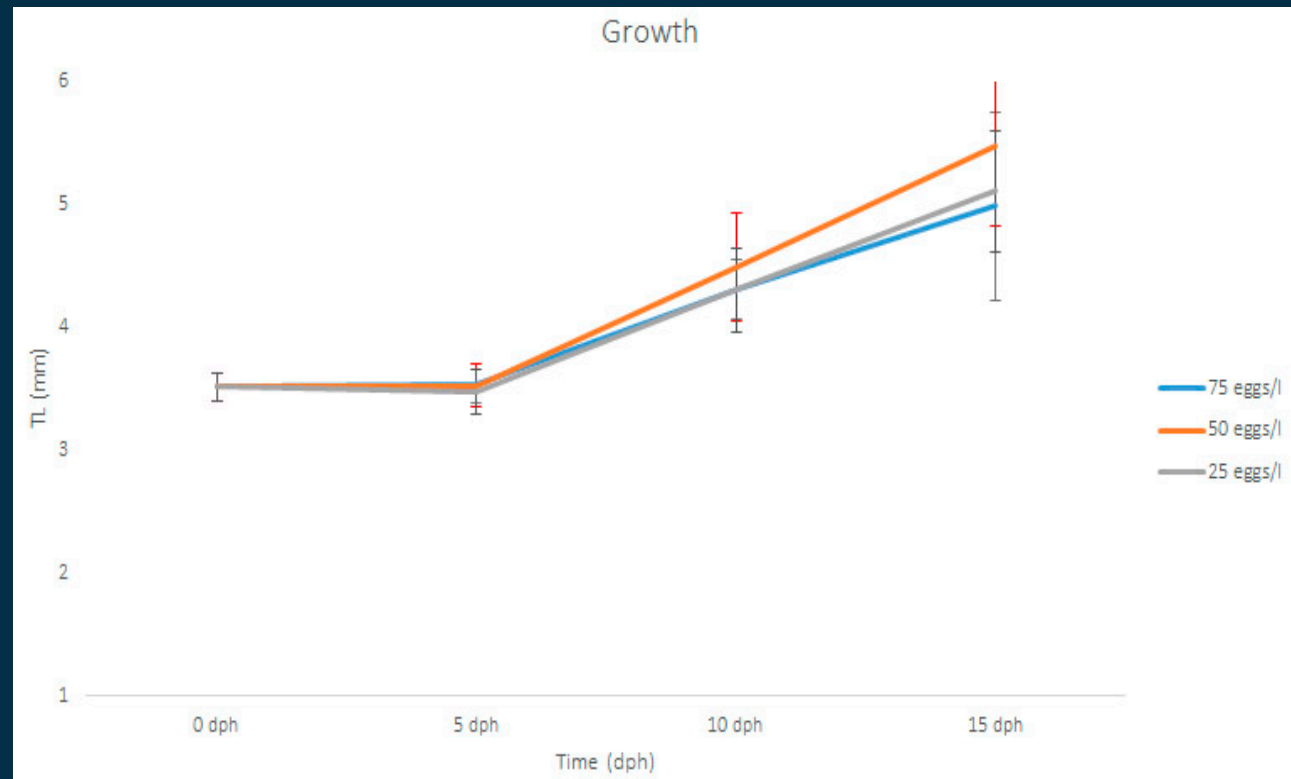


Larval rearing tanks



## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

Larvae 15 dph  
were given to  
ULL  
analyzing  
enzymes



Total length evolution during the 15 days of experiment





## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

### Task 15.3 Effect of enviromental parameters during rearing

**Leader:** FCPCT. **Participants:** HCMR

- Sub-task 15.3.1 The effect of tanks hydrodynamics (FCPCT)
- **Sub-task 15.3.2 Effect of light on larval rearing (HCMR)**

No work done during this period



## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

### Task 15.3 Effect of enviromental parameters during rearing

Leader: **FCPCT**. Participants: HCMR

#### Sub-task 15.3.1

- Sub-task 15.3.2 Effect of light on larval rearing (HCMR)

No work done during this period



## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

### Task 15.4 Development of industrial protocol

**Leader: IEO. Participants: FCPCT, FORKYS**

Sub-task 15.4.1

Sub-task 15.4.2

Sub-task 15.4.3

**No work done during this period**



## WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

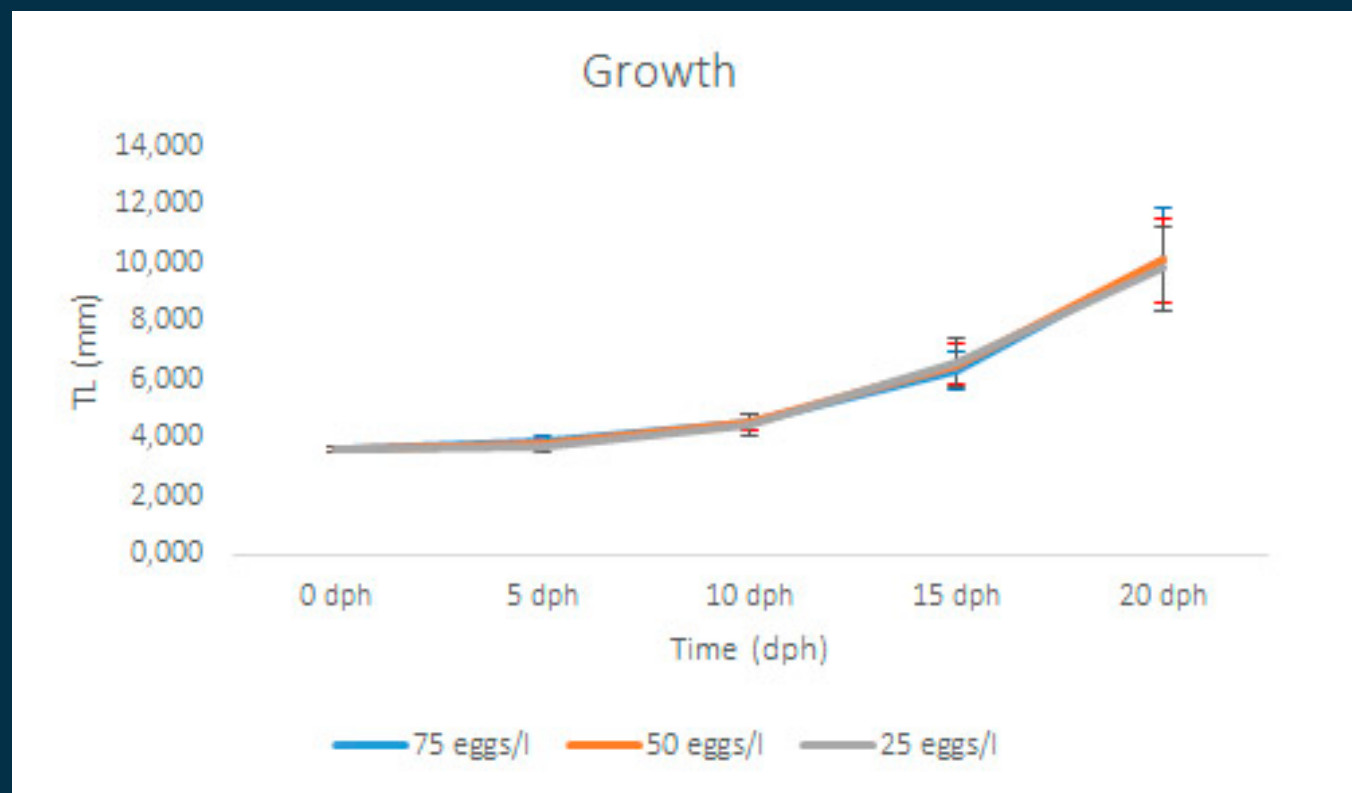
In order to produce fry for ongrowing test to be performed in WP.....:

- Two 40 m<sup>3</sup> mesocosm tanks where stocked at 10 eggs/ L with eggs from a naturally occurring spawning event.
- Another set of nine 2000 L tanks were also stocked at 80 eggs/ L (according to the traditional method) with eggs from the same natural spawning.



### WP 15 LARVAL HUSBANDRY-GREATER AMBERJACK

In order to produce fry for ongrowing test to be performed in WP.....:



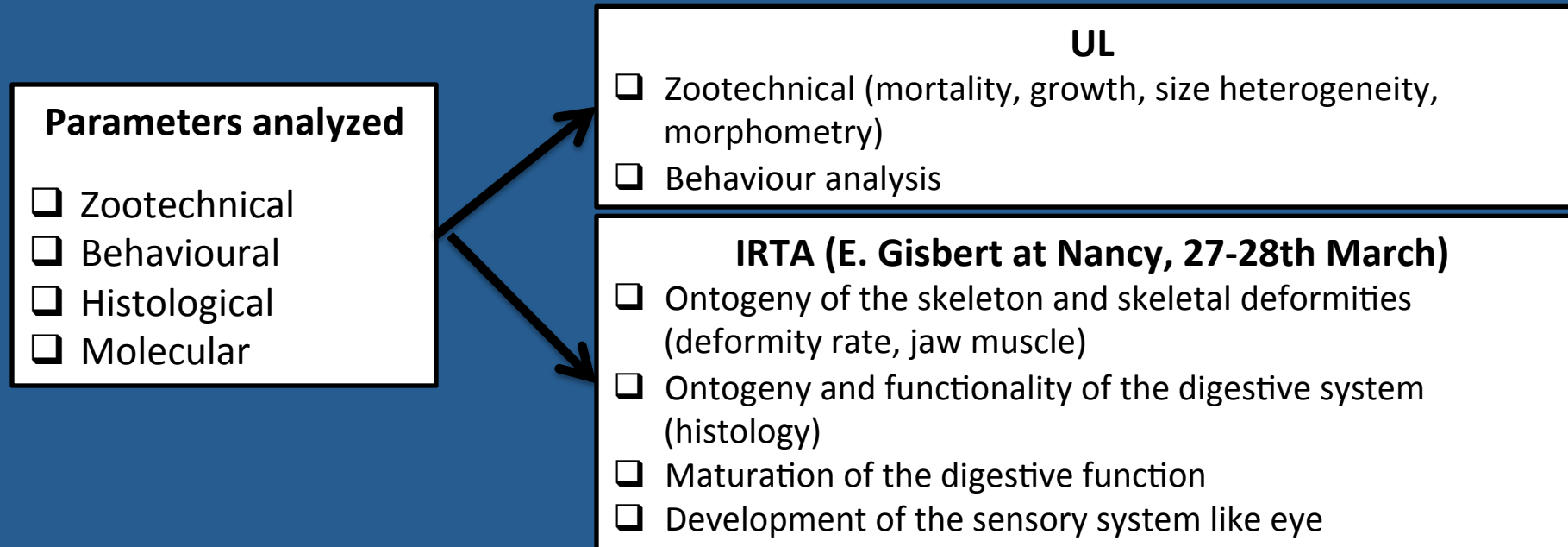
Growth larvae of experiment one



# **WP16 Pike perch larval husbandry**

## **Université de Lorraine UL France**

## D 16.1 Determine the effect of environmental factors on pikeperch larval rearing (led by UL)



**500 000 larvae received in May** , but all larve died in 2 days!!! (pb with water quality)

The experiment is postponed in November 2014 – January 2015 (out-of-season spawning in Asialor)



# **WP17 Halibut larval Husbandry**

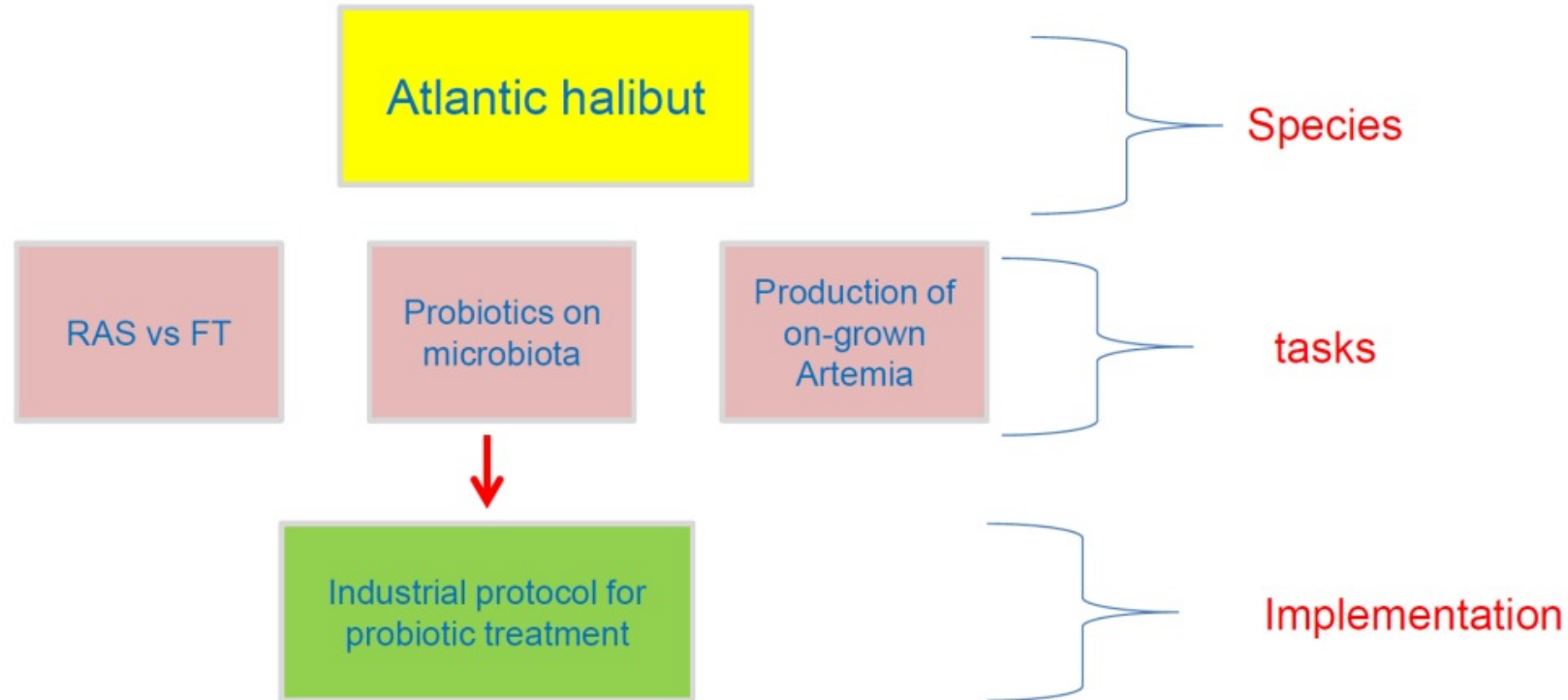
## **Havforskningsinstituttet (IMR), Norway**



(from Bill Koven's presentation)



# Atlantic halibut strategy





## Objective:

Improve larval survival and quality during early development of Atlantic halibut.

## Tasks :

- Compare recirculation aquaculture (RAS) and flow through (FT) systems during yolk sac and **first-feeding** larval stages
- Evaluate the effectiveness of probiotics during early larval development and develop a protocol for industrial use in larval rearing
- Develop an optimal production protocol for on-grown Artemia compared with use of Artemia nauplii.

Yolk sac stage



Silos





2014:

RAS vs FT, yolk sac stage

On-grown Artemia, production protocol

Formulated feed



Recently, (after the 6 month report) we have examined larvae survival in the two systems.

- Larval mortality was higher in the RAS system the first week after hatching. Thereafter there were no differences in mortality or larval size at the end of yolk sac stage.
- There was, however, a higher proportion of jaw deformed larvae in the RAS system



# WP 18: Wreckfish larval husbandry

## Instituto Espanol de Oceanografia (IEO), Spain

# Work package **WP18**

## **Type of activity 54 RTD**



Co-funded by the Seventh  
Framework Programme  
of the European Union



**Work package title: Larval husbandry - wreckfish**

**Start month 1.....End month 48**

**Lead beneficiary number 8 IEO**



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**DE OCEANOGRAFÍA**

# Larval husbandry Wreckfish

## Objectives:

1. Development of a larval rearing protocol based on the most effective prey density, succession of prey type, light regime (intensity and duration), temperature and culture system.
2. Description of the ontogeny of the digestive system, vision, taste and smell organs in response to larval rearing methods.



## Incubation:



**Broodstock:** Acuarium Finisterrae (Partner 32MC2)

**Viable Spawn date:** 04/06/2014

**Volume:** 1000 ml

**Number of eggs:** 270.000

**Fecundity:** 70%

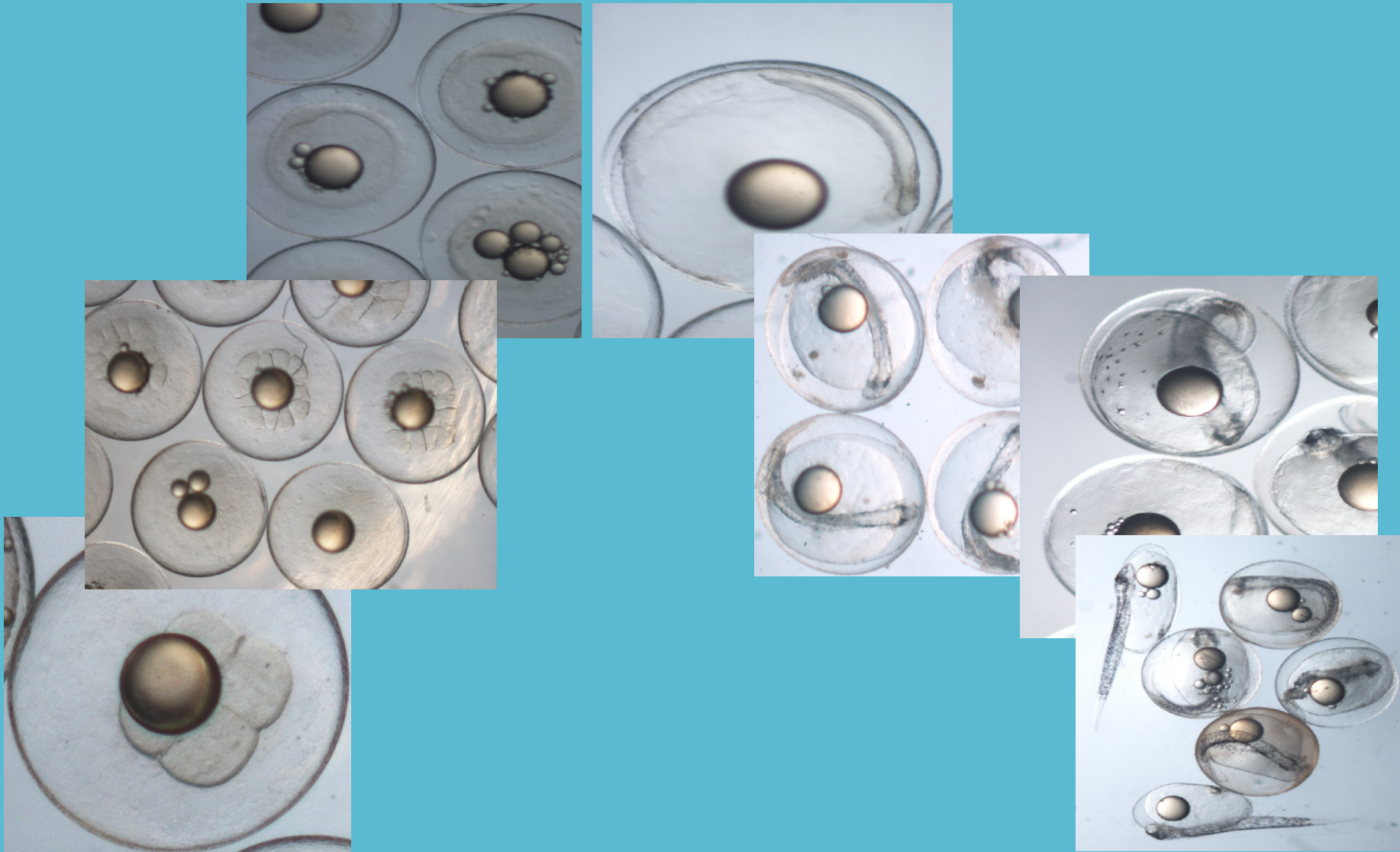
**Egg diameter:** 2.400  $\mu\text{m}$

**Number of eggs/ml:** 270

**Incubation tank Volume:** 100 l

**Incubation :** 7 days at  $14,6 \pm 0,5^{\circ}\text{C}$

# Egg development (incubation time)



## Larval culture

**Hatching percentage: 14%**

**Larvae seeded: 11.340**

**Larvae size:  $3.8 \pm 0.3$  mm**

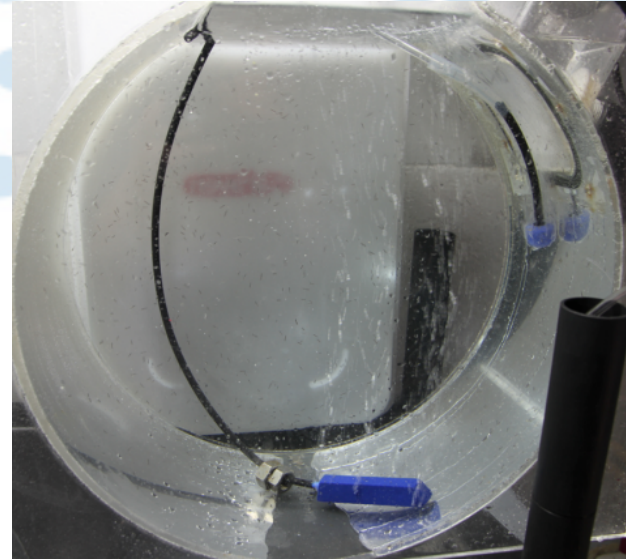
**Tank Volume: 85 l**

**Yolk Consumption Time: 6 DAH**

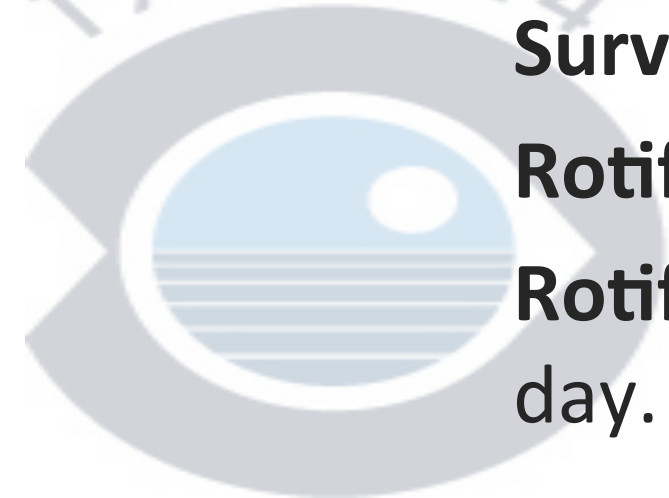
**Survival at day 20: 0%**

**Rotifer concentration: 8 rot/ml**

**Rotifer Ingestion: empty digestive tract at 20 day.**

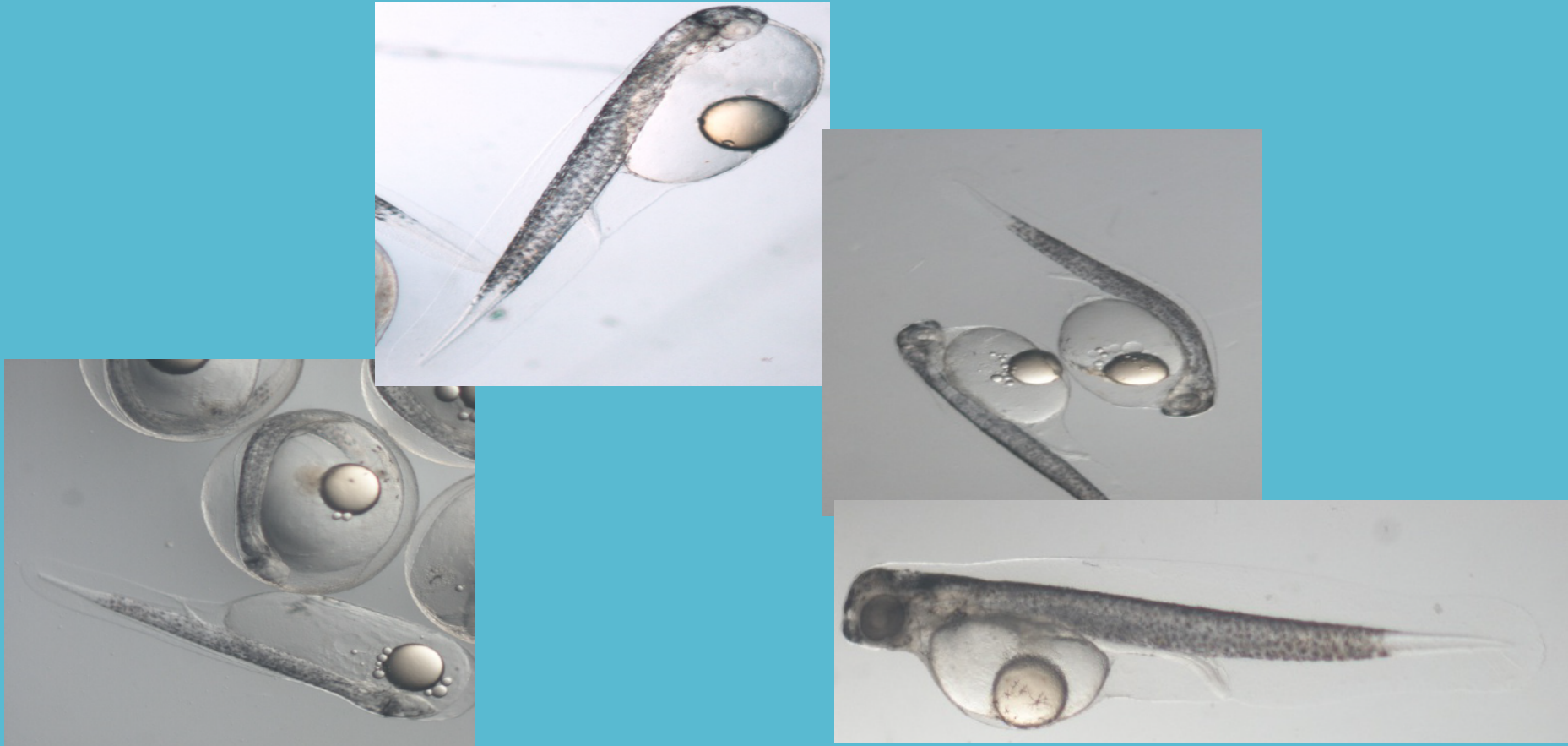


1914-2014



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# Larval development (time after hatching)



Newly  
hatched

24 h

48 h

120 h



## Results:

- **Poor egg quality.**
- **Poor larval quality.**
- **No survival at 20 days after hatching (DAH).**
- **Live food: enrichment rotifers with microalgae.**
- **No Survival: Mortality possibly due to starvation.**



# Larval Husbandry WP19-Grey mullet

## Lead beneficiary: IOLR

### Work summary: 2014

**Task 19.1** Effect of algal type and concentration on larval performance (led by IOLR). M24

✓ **On-going-stocked Nov1 2014**

**D19.1** Determine most effective type and concentration of algae used in grey mullet larval rearing (M24)

Treatment	Concentration	Turbidity
1-Control	Without algae	Clear
2- <i>Nannochloropsis</i> spp.	0.2x10 <sup>6</sup> cells/ml	Identical turbidity
3- <i>Isochrysis galbana</i>	0.0144x10 <sup>6</sup> cells/ml	
4- <i>Nannochloropsis</i> spp.	0.5x10 <sup>6</sup> cells/ml	Identical turbidity
5- <i>Isochrysis galbana</i>	0.0228x10 <sup>6</sup> f cells/mo	

- Twenty 1500 l tanks testing each treatment in replicates of 4 replicates/treatment
- Feeding 10 rots/ml enriched for 8 h on Red pepper and 21 h on 600 mg taurine/l



# Sampling schedule

DPH	Mastaxes	FA/AA	Wt	Length	Dig. Tr.*	Comments
Eggs	-	V	-	-		
0	-	V	V	V		
1-5	V	-	-	-		
5	-	-	-	V		
10	-	V	V	V		Unenriched Artemia
14	-	-	-	V		Enriched Artemia
18	-	V	V	V		Weaning feed+Artemia
25	-	V	V	V		Starter feed only
35	-	V	V	V		Transfer to Nursery

\*Decide with IRTA when to take samples for enzyme analysis

**Action 19.1.2** Determine if the benefit of algal addition to rearing tanks due to background lighting or other factors that contribute to larval performance (led by IOLR)



## Summary of work done so far

- Problem of larval rearing-total dependence on brood stock production.
- Technological problems- repeat of experiments (wreckfish, pike perch)
- Experiments are on-going (mullet)
- Analytical results still pending.
- Lot of work was carried out and a clearer picture of results will emerge in the next few months.