



# FEEDING PATTERN FOR GREATER AMBERJACK *Seriola dumerili*: EFFECTS ON GROWTH, FEED UTILIZATION AND WELFARE INDICATORS

Barcelona, 17-19 January 2017



## Task 21.2 Development of feeding methods. Test of different feeding methods including estimation of daily rhythm and frequency.

**Action 21.2.1** (FCPCT) Definition of feeding pattern for 5 g fish reared in 500 l-tanks for 4 months. Monitoring include:

- Growth performance
- Feed efficiency
- k index
- Juvenile quality
- Haematological analysis
- Histological analysis
- Biochemical analysis
- Immunological analysis.



*This Action will contribute to deliverable D21.1 Definition of optimum feeding methods for greater amberjack grow out.*



Not so much references available for the species

Feeding rate (% B.W./day)	Feeding frequency (meals per day)	Initial B.W.	species	
Satiation	8	4.11	<i>S. lalandi</i>	Abbink 2011
3%	2	30	<i>S. dumerili</i>	Hirazawa et al., 2010
3%	3	2	<i>S. dumerili</i>	Sato et al. 2008
3.5%	2	50	<i>S. dumerili</i>	Takakuwa eyt al., 2006
7%	3	8	<i>S. lalandi</i>	Palstra et al., 2015
Satiation	-	100g	<i>S. dumerili</i>	Yilmaz et al. 2011
Satiation (around 3.5)	3	20g	<i>S. dumerili</i>	Fernandez-Montero (submitted)



**The objective of the present study was to determine the optimum feeding regime for greater amberjack to optimize growth, feed utilization and welfare status.**

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## TREATMENTS

Feeding rate (% B.W./day)	Feeding frequency (meals per day)	treatment
Apparent satiety	3	T1- S3
Apparent satiety	1	T2- S1
3.5	3	T3- 3.5/3
3.5	4	T4- 3.5/4
3.5	1	T5 – 3.5/1
2.5	3	T6 – 2.5/3
2.5	4	T7 – 2.5/4
2.5	1	T8 – 2.5/1





**EXPERIMENTAL CONDITIONS**

**Initial weight**

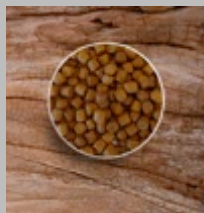
$20.1 \pm 1.8g$

**Number fish /tank**

**25 fish/tank**

**Tanks**

**500 l X 24  
(3 tanks/treatment)**



SKRETTING  
a Nutreco company

Europa 22  
52/20

**Dissolved oxygen**

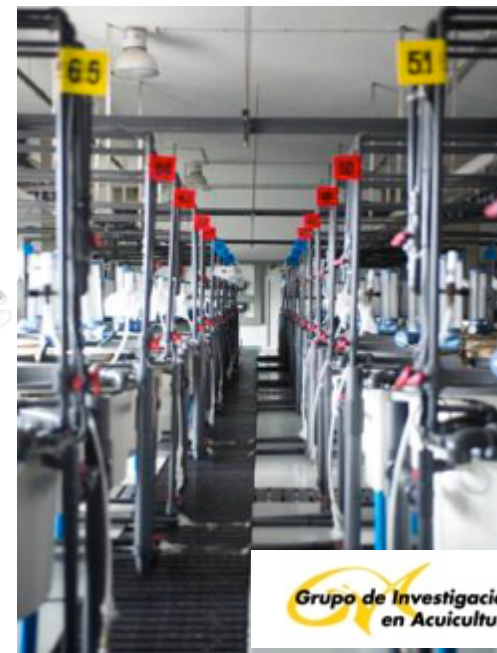
$7.2 \pm 1 \text{ mg/l}$

**Temperature**

$21.1 \pm 1.44^{\circ}C$

**Experimental period**

**120 days**



## Samplings

### Monthly

#### Biological parameters

Weight gain  
FCR

### Final sampling (120 days)

#### Biological Parameters

Weight gain  
FCR

#### Immunology

Serum lysozyme activity  
Serum peroxidase activity

#### Blood biochemistry

ALP, Lipase, Cholesterol,  
Glucose, Triglycerides

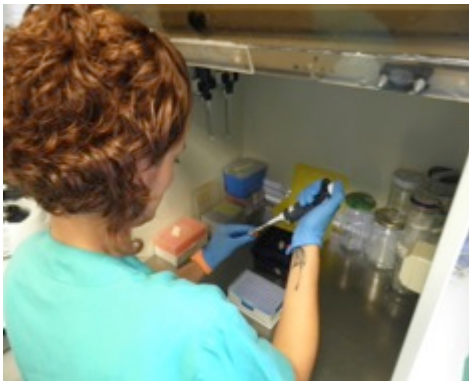




## Biochemistry

### Proximal composition

- Crude protein
- Crude Lipids
  
- Whole fish
- Feeds
  
- Nutrient retention



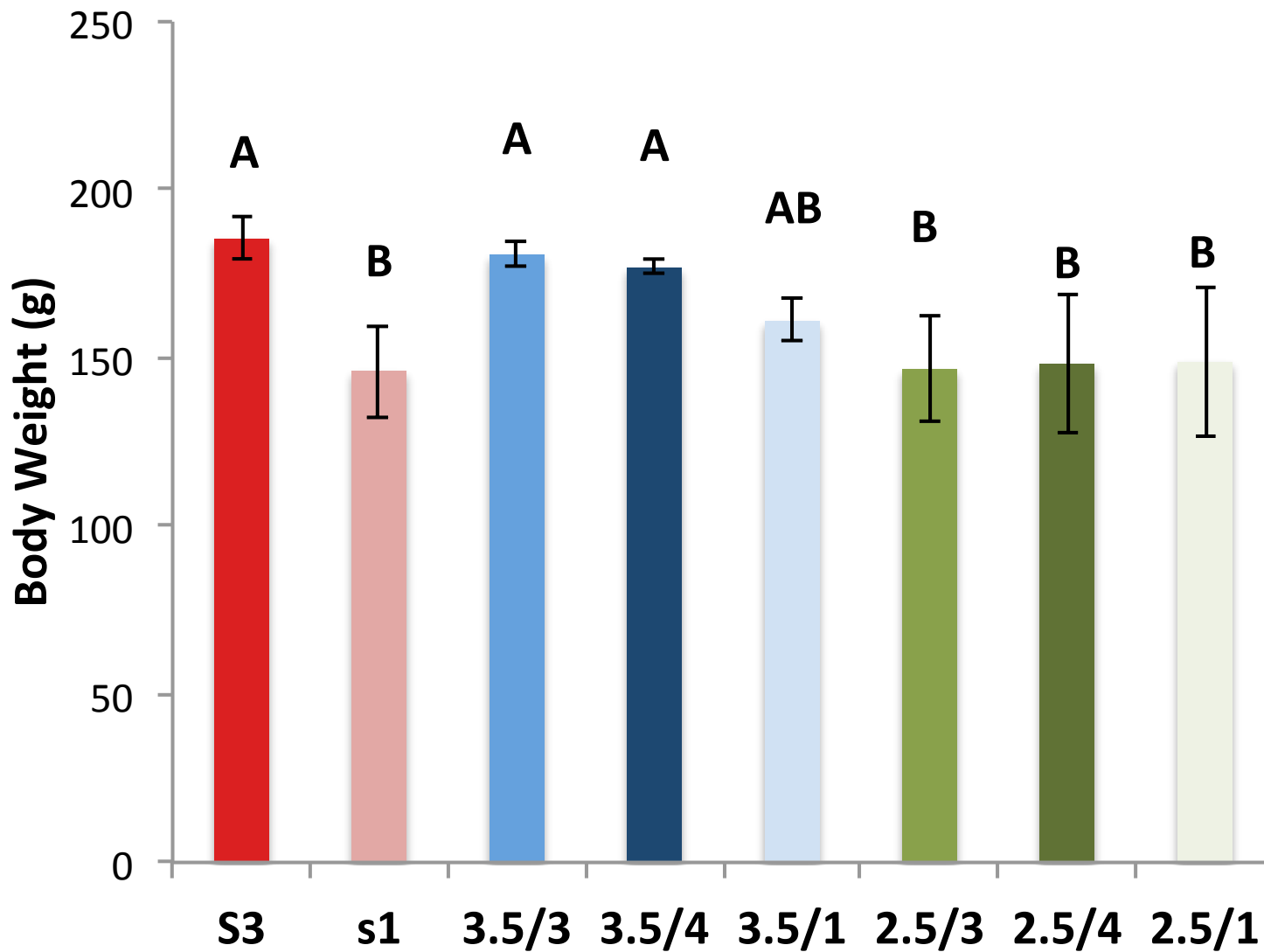
## Histology

Liver

intestine



# Results



Different letters denote significant P<0.05) differences

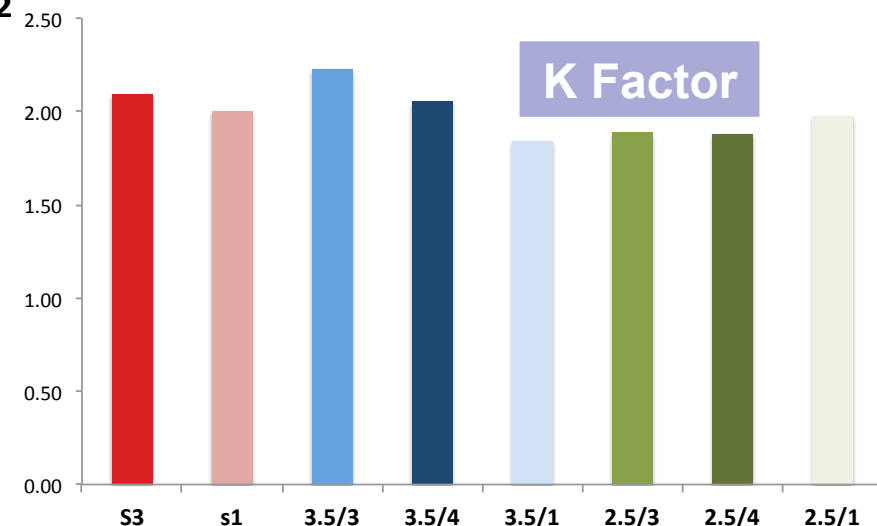
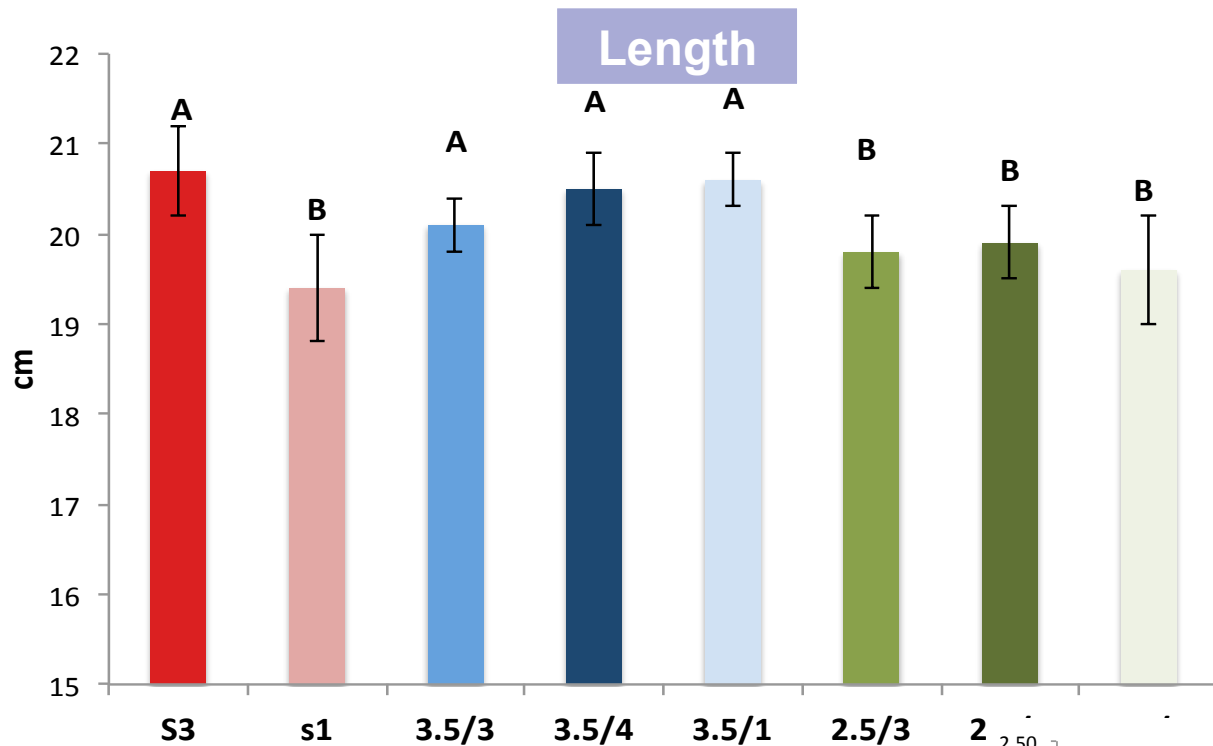
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Two – way ANOVA	P- value
Feeding Rate	0.014
Feeding frequency	0.096
Rate x Frequency	0.000



Two-way ANOVA analyses showed that fish final weight was affected ( $P < 0.05$ ) by the amount of fish provided and not by the number of meals. Besides, there was a significant ( $P < 0.05$ ) interaction between both factors.

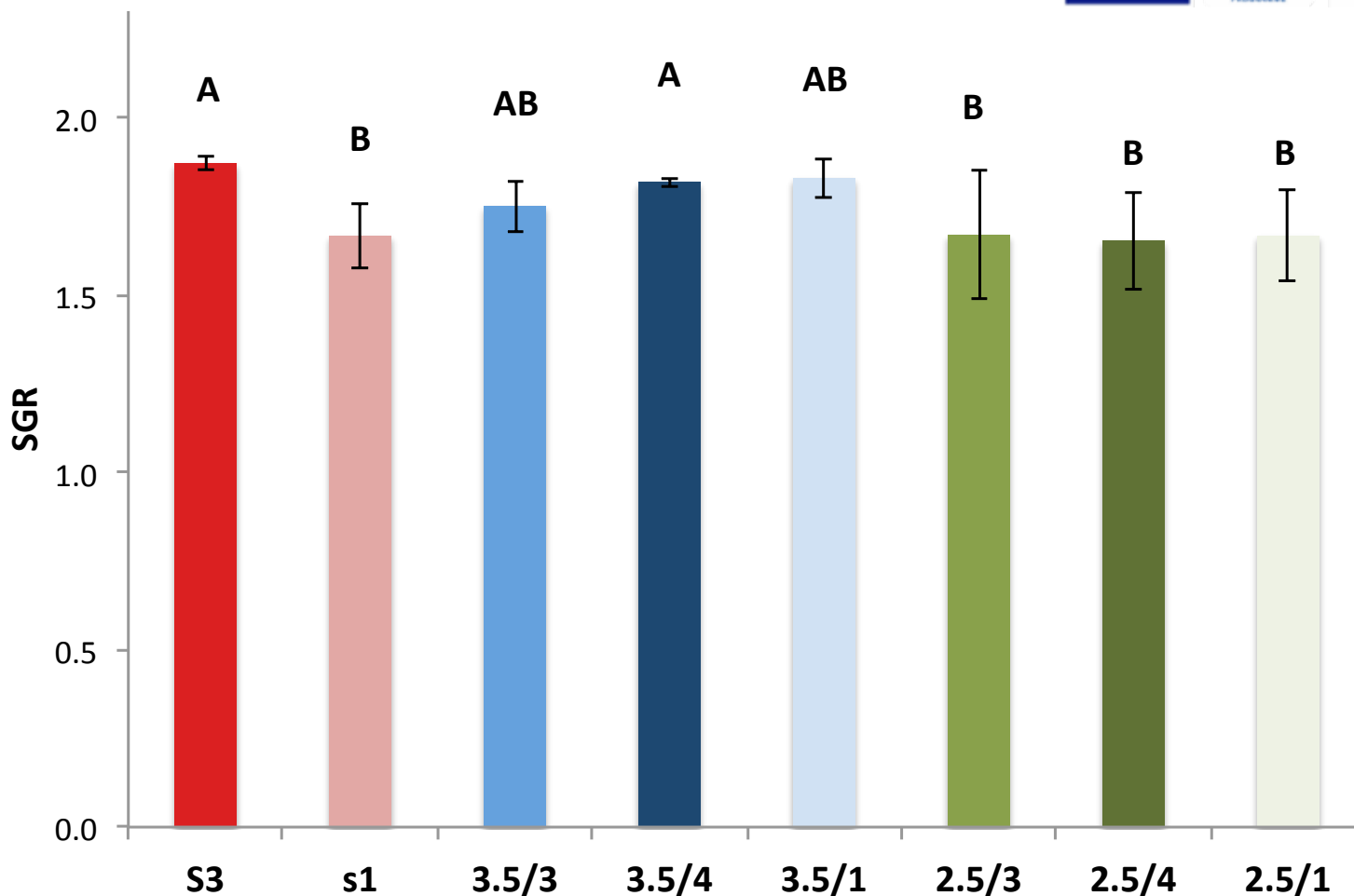
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Different letters denote significant  $P < 0.05$ ) differences

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SGR



Two – way ANOVA

P- value

Feeding Rate

0.023

Feeding frequency

0.103

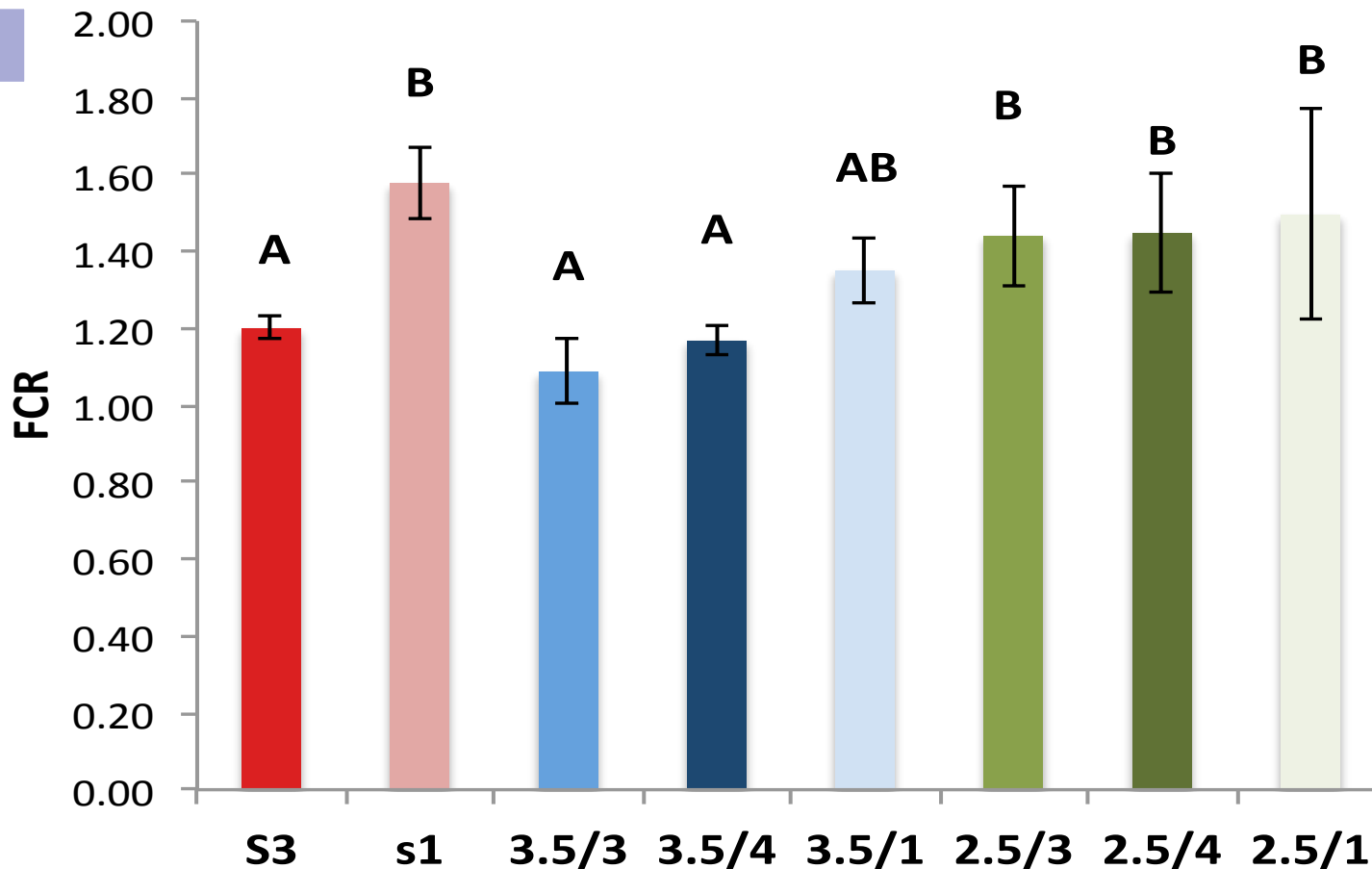
Rate x Frequency

0.000

Different letters denote significant P<0.05) differences

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FCR



Two – way ANOVA

P- value

Feeding Rate

0.012

Feeding frequency

0.042

Rate x Frequency

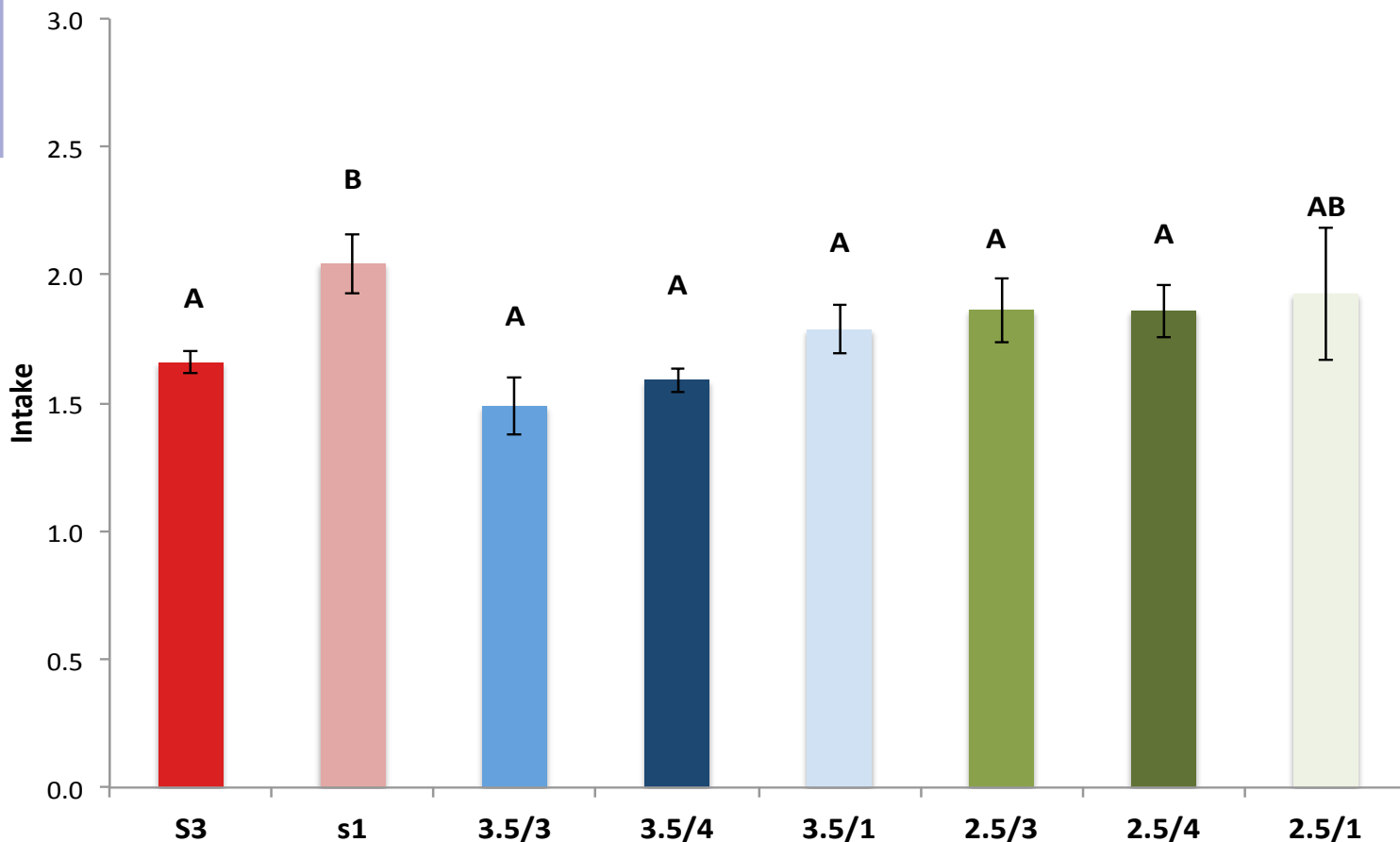
0.000

Different letters denote significant P<0.05) differences

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Feed intake (g dm/fish)



Two – way ANOVA

P- value

Feeding Rate

0.193

Feeding frequency

0.210

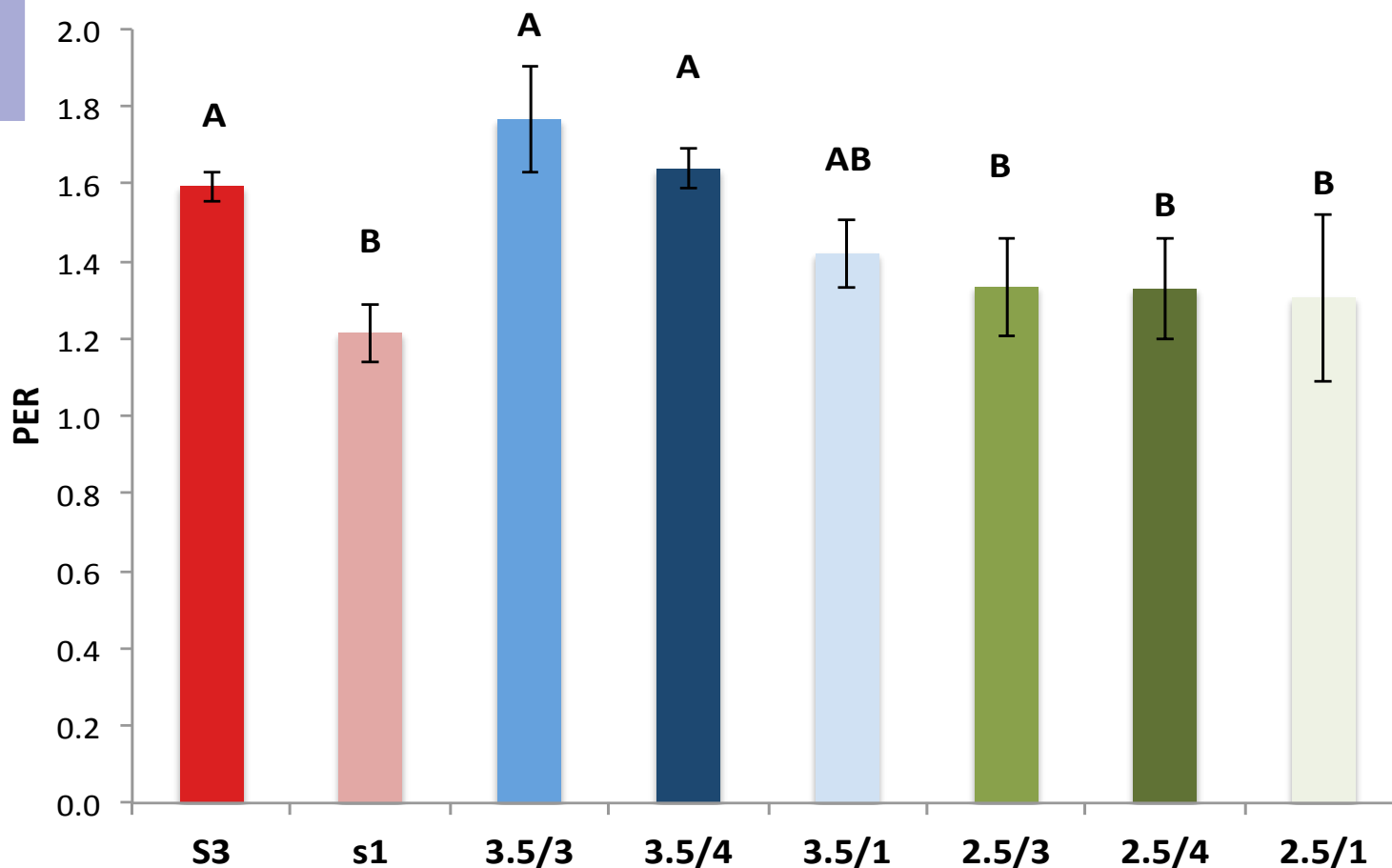
Rate x Frequency

0.132

Different letters denote significant P<0.05) differences

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**Protein Efficiency Ratio**



**Two – way ANOVA**

**P- value**

**Feeding Rate**

**0.021**

**Feeding frequency**

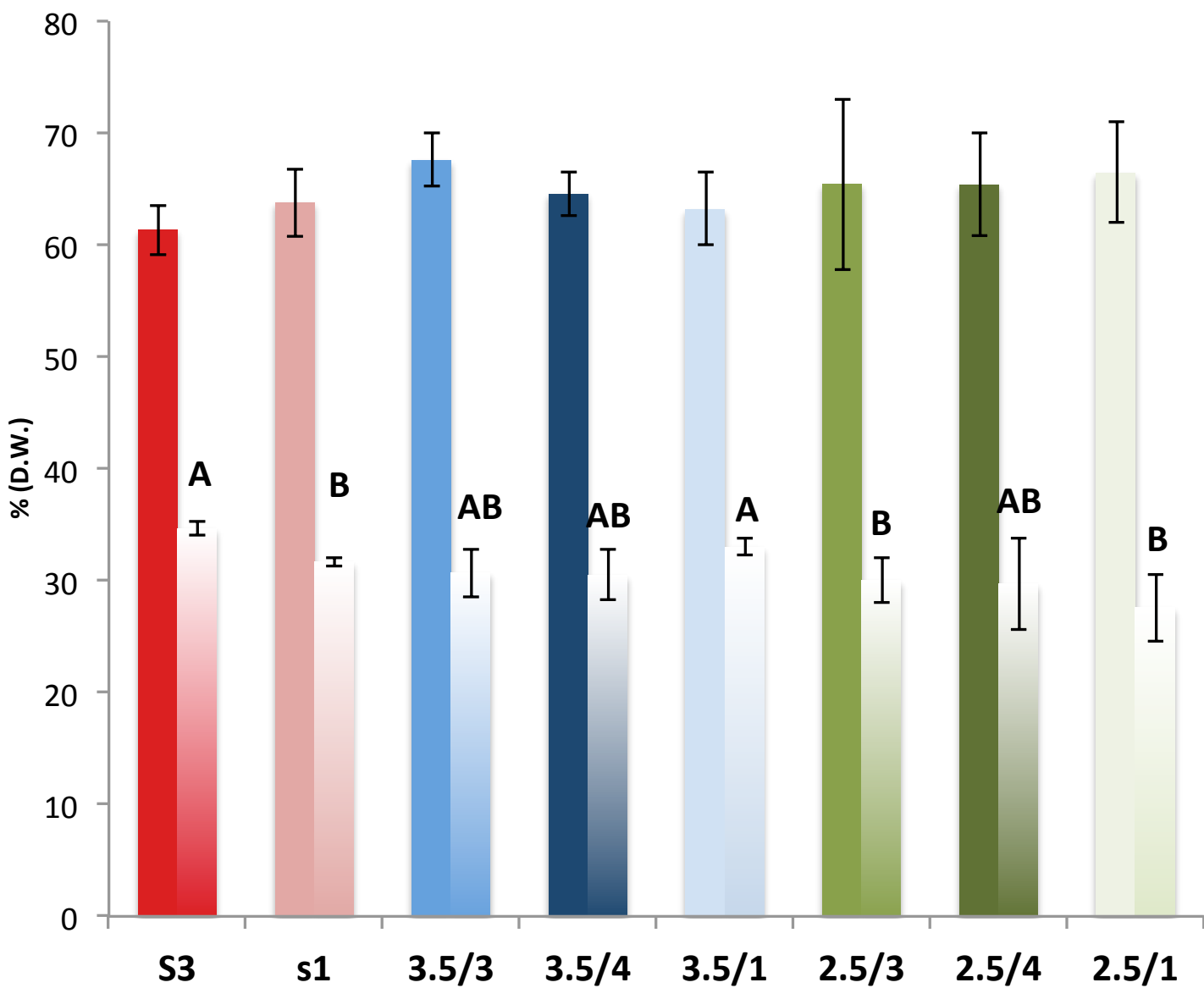
**0.019**

**Rate x Frequency**

**0.008**

Different letters denote significant P<0.05) differences

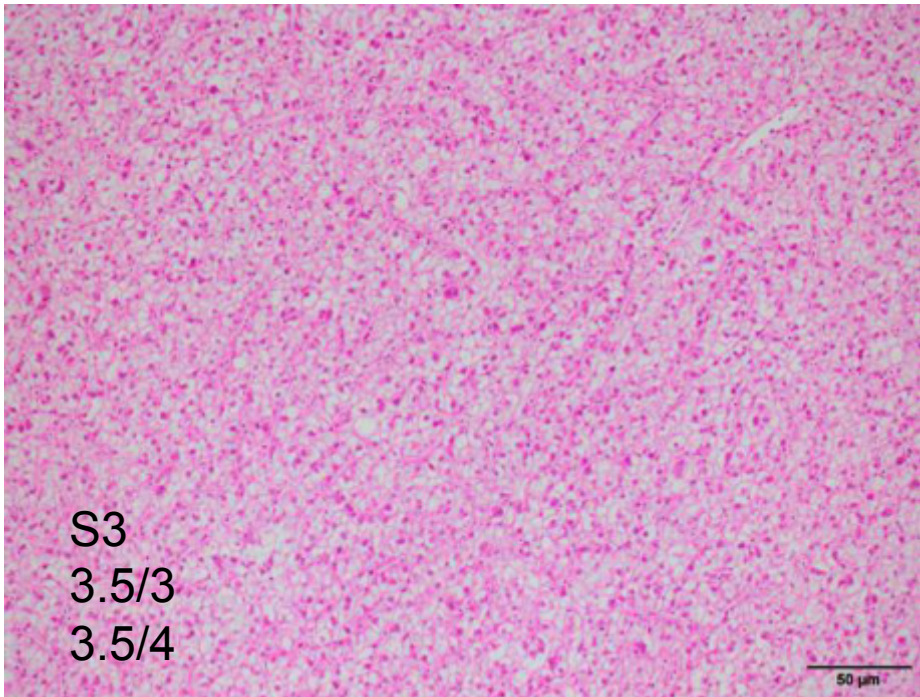
Proximal composition



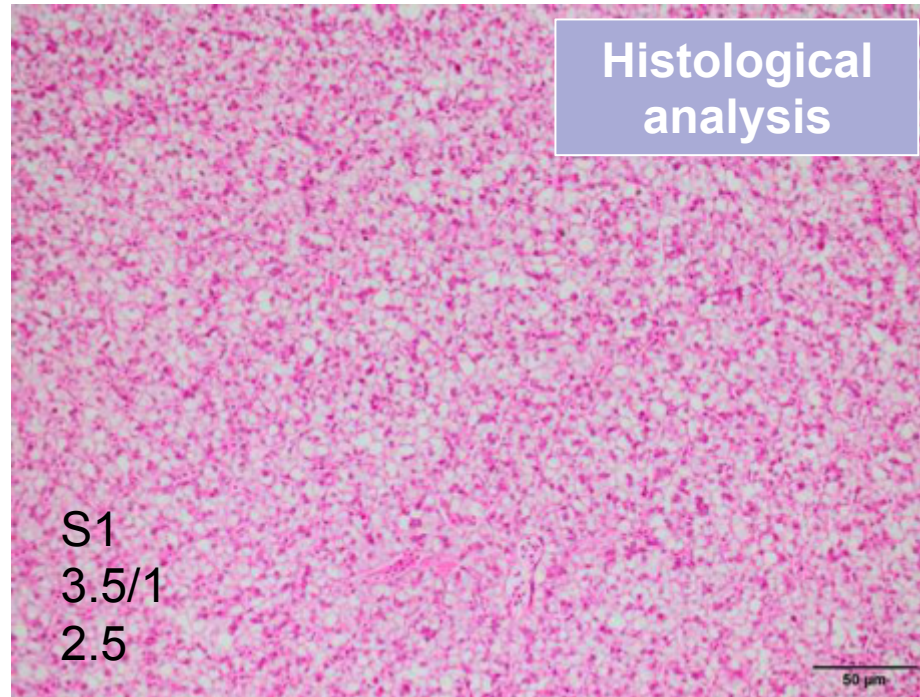
■ Protein  
 ■ Lipids



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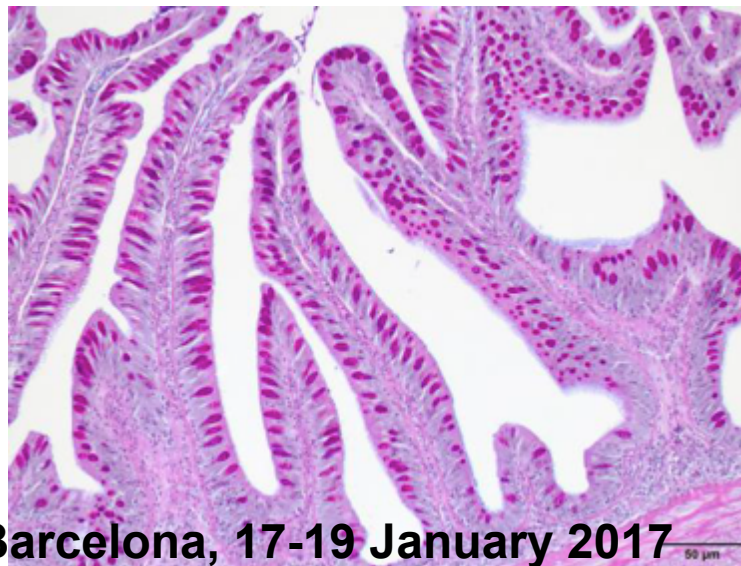
S3  
3.5/3  
3.5/4



Histological analysis

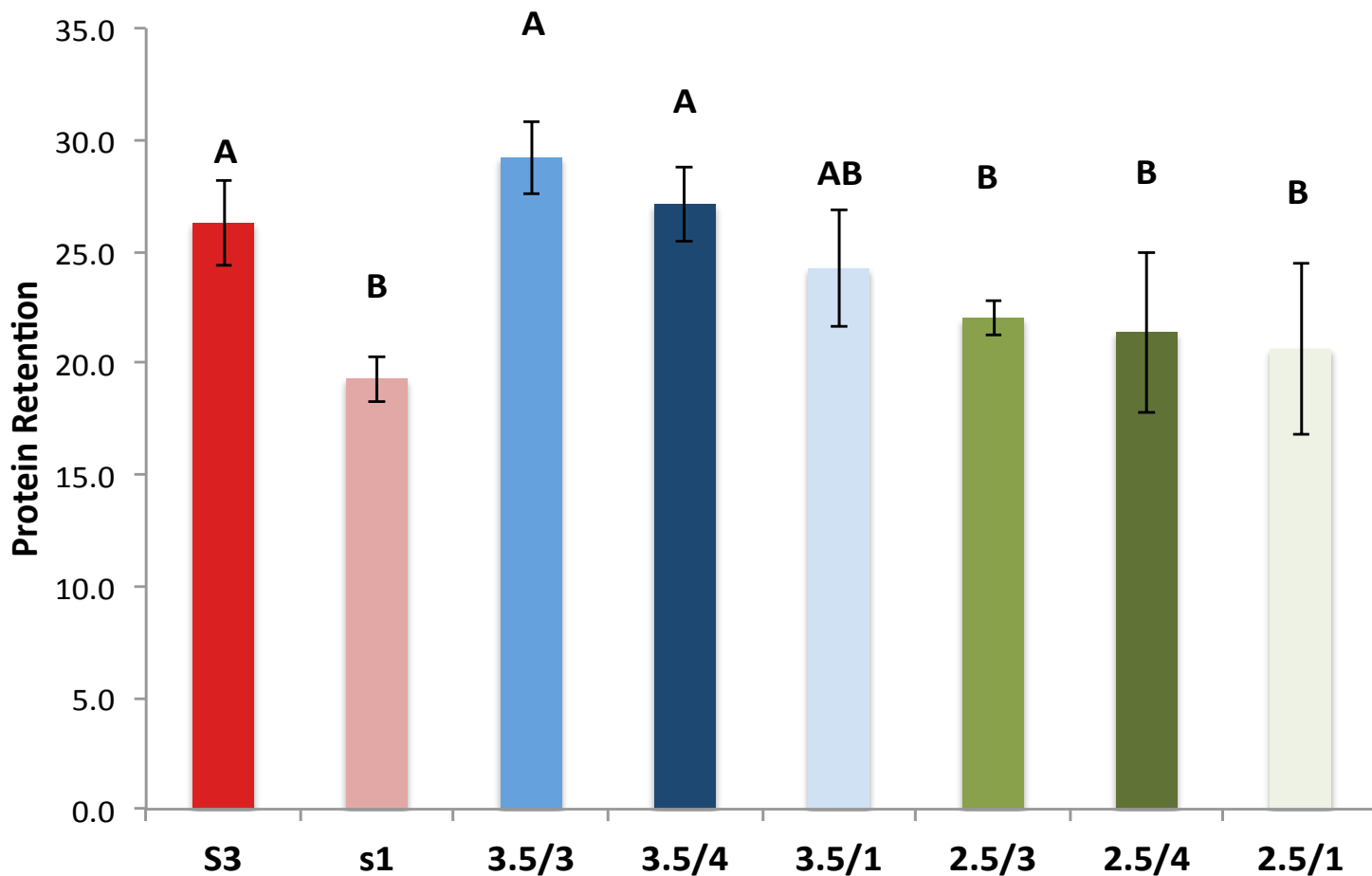
S1  
3.5/1  
2.5

Currently in progress



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**Protein Retention**



**Two – way ANOVA**

**P- value**

**Feeding Rate**

**0.031**

**Feeding frequency**

**0.002**

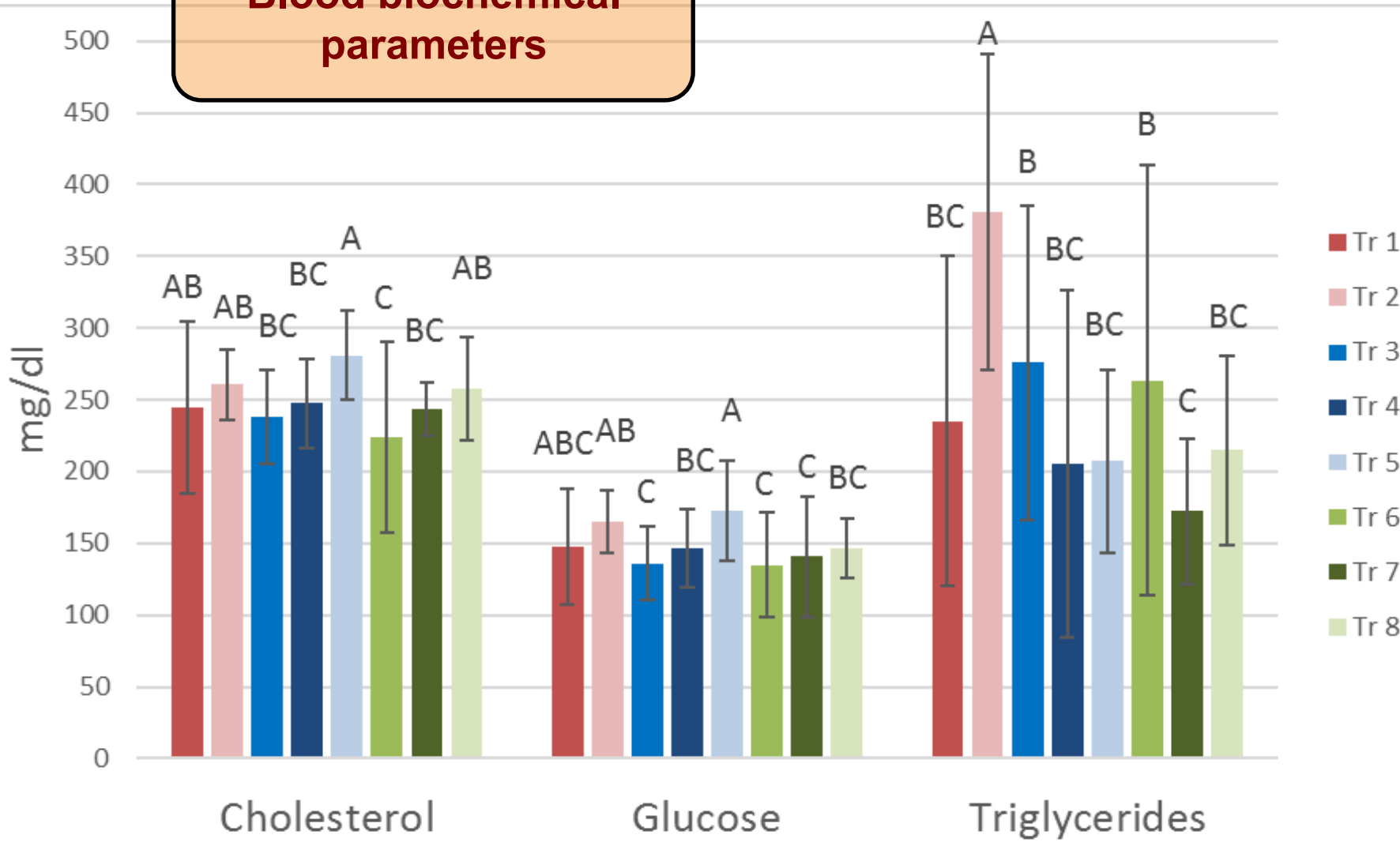
**Rate x Frequency**

**0.000**

Different letters denote significant P<0.05) differences

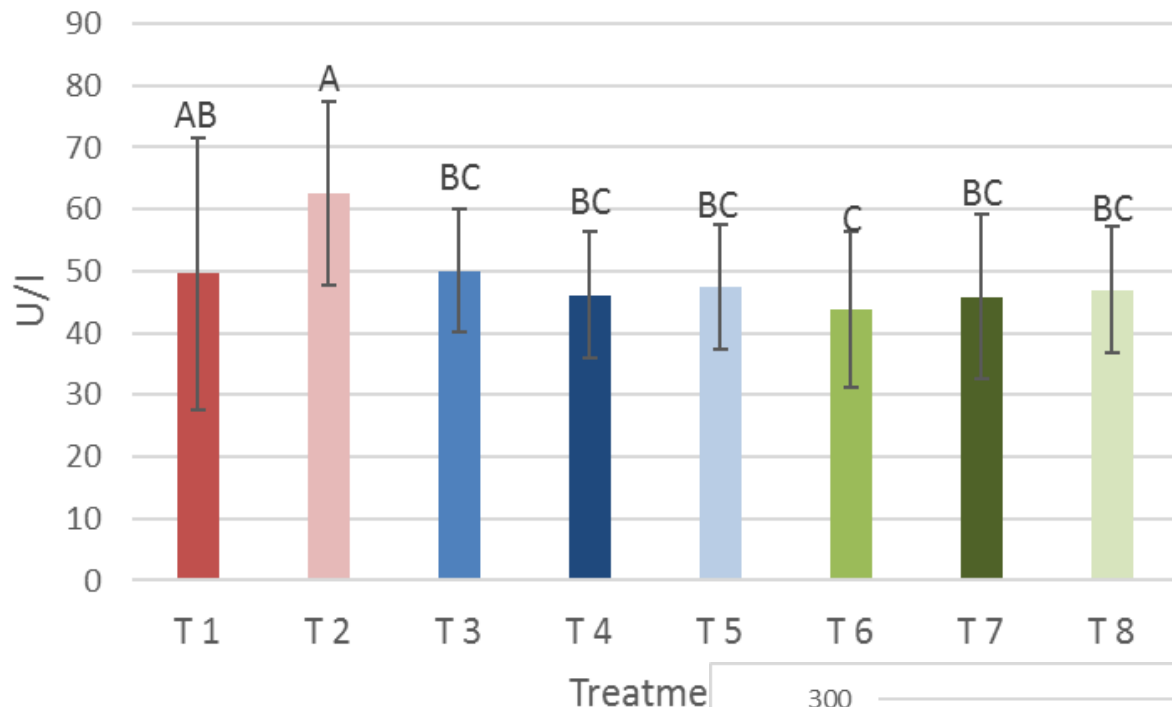
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**Blood biochemical parameters**



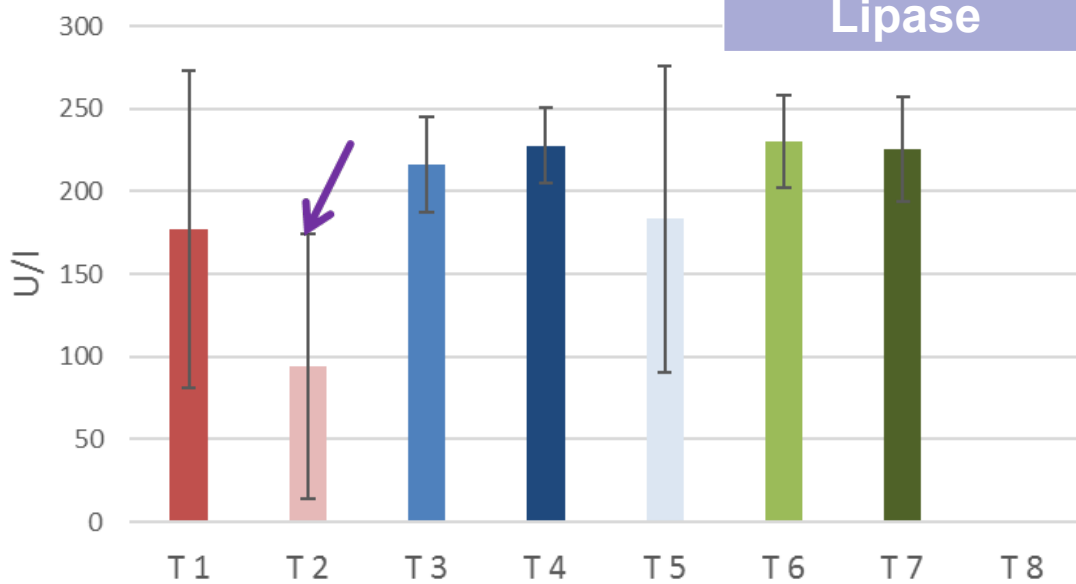


**Blood biochemical parameters**



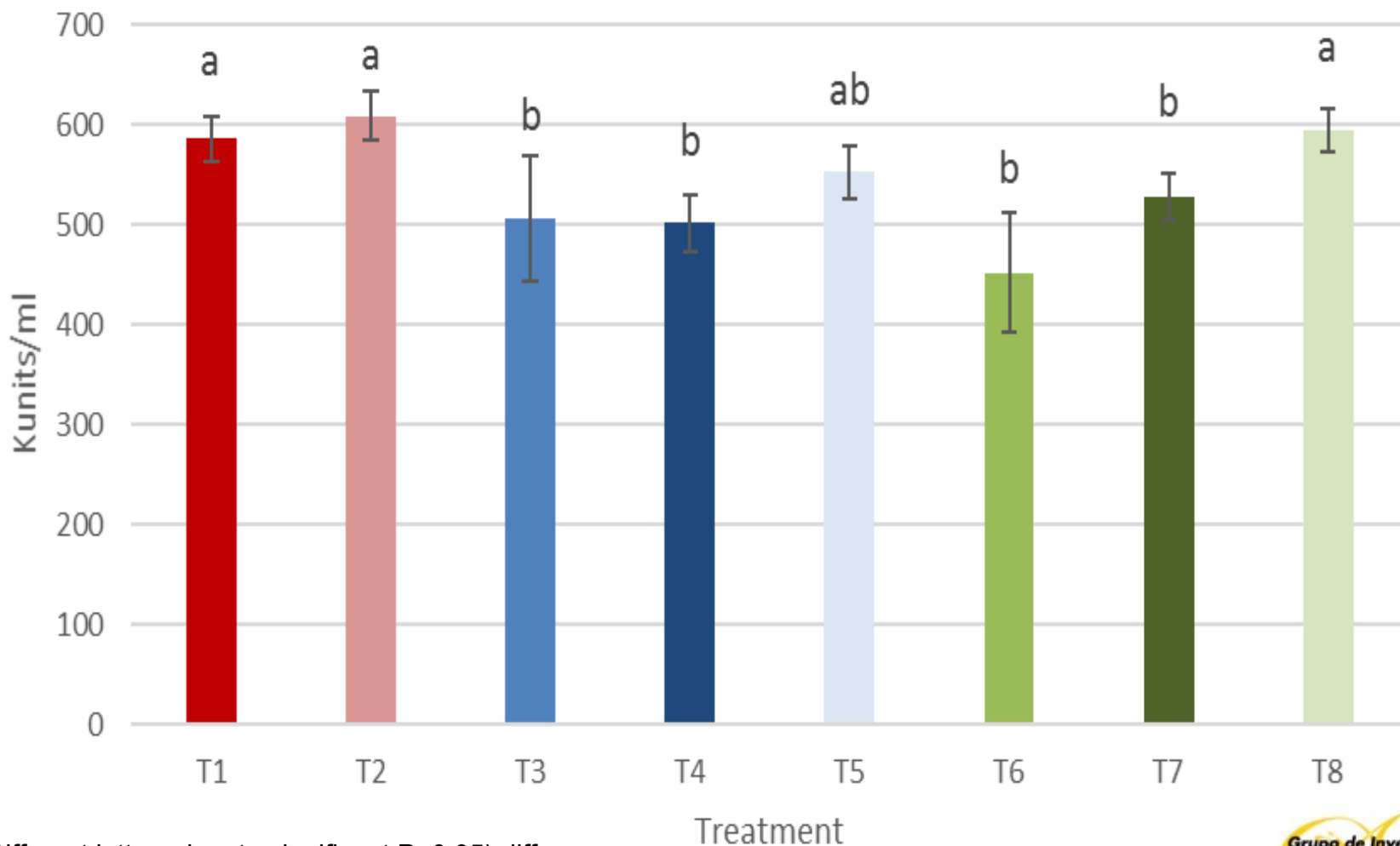
**Alkaline Phosphatase ALP**

**Lipase**



Different letters denote significant P<0.05) differences

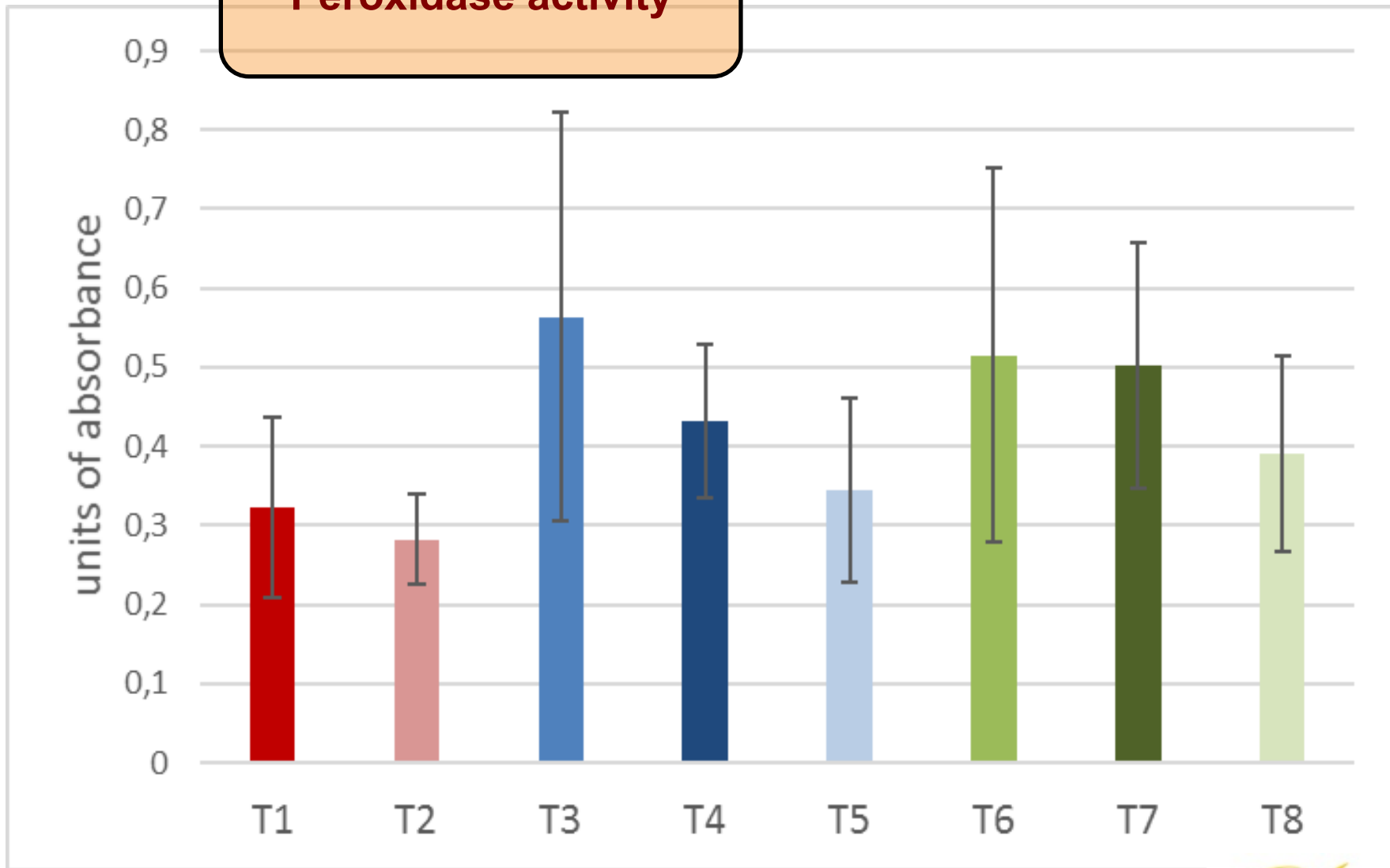
**Serum Lysozyme activity**



Different letters denote significant P<0.05) differences

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**Peroxidase activity**



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## Preliminary Conclusions

A feeding ratio of 3.5% body weight per day produced higher growth, best FCR, higher protein retention

Increasing meals per day up to 3 induced better growth, FCR and protein retention. No differences were found increasing meals per day up to 4.

A feeding ratio of 3.5% body weight per day, in 3 meals per day is the best protocol for Greater amberjack juveniles.

Offering only one meal per day increases some blood biochemical parameters that suggest lipidic metabolism imbalance.

# Thank you for your attention

International Symposium on  
Fish Nutrition and Feeding  
(ISFNF2018)  
June 2018



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