ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI SCIENZE MEDICHE VETERINARIE

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CURRICULUM: Produzioni animali e Sicurezza Alimentare
Anno di attività: 3°

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COMPLETE CV:

MEDITERRANEAN AQUACULTURE FEEDING STRATEGIES INSIGHTS

Background

- Despite the knowledge in aquafeed formulation, knowledge of FM and FO levels and animal welfare under certain rearing conditions is still scarce
- This research addresses current gaps of feeding strategies matching fish feeding, management practices and welfare in gilthead seabream and European seabass

Objectives

Match best dietary fish meal (FM) / fish oil (FO) or lipid (L) percentages with:

I. Seasonal **temperature change** on gilthead seabream fat deposition

II. Rearing **density** (D) on gilthead seabream performances

III. Daily **feeding frequency** (F) on gilthead seabream performances

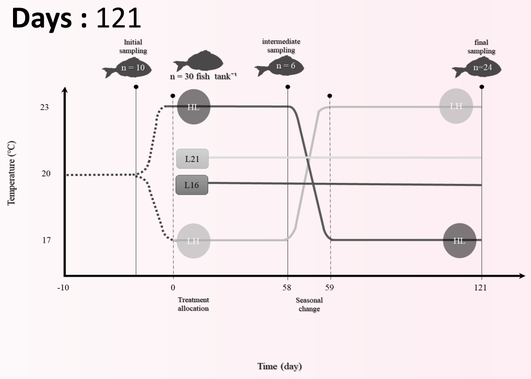
IV. **Health** and **stress tolerance** improvement on European seabass

Materials and methods

Experimental designs

Trial I

Diets : L16 and L21
Temperatures : 17 °C and 23 °C with a switch at half trial
Replicates : 3 groups of 30 fish/tank
Seasonal thermal Switch : 59th day
Days : 121



Statistics :
2-way ANOVA
Relative increment

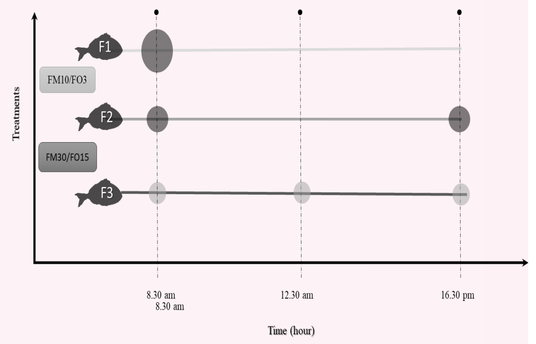
Trial II

Diets : FM30/FO15 and FM10/FO3
Rearing density : low (LD) 4.8 and high (HD) densities 14.4 kg / m³
Replicates : 3 groups of 40(LD), 120(HD) fish/tank
Days : 98

Statistics :
2-way ANOVA

Trial III

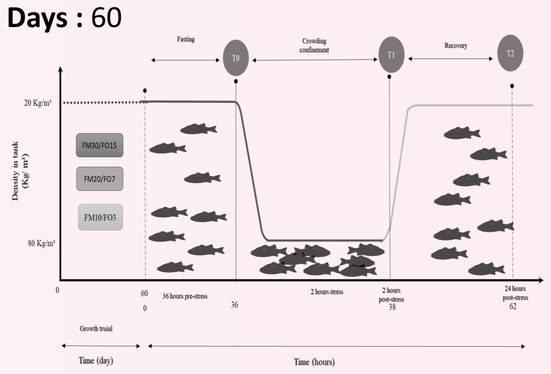
Diets : FM30/FO15 and FM10/FO3
Feeding frequency : 1 (F1), 2 (F2), 3 (F3) meals per day
Replicates : 3 groups of 60 fish/tank
Days : 109



Statistics :
Kruskall-Wallis test
1-way ANOVA
Student T-test

Trial IV

Diets : FM30/FO15, FM20/FO7 and FM10/FO3
Stress : 36h fasting, 2h crowding, 24h recovery after growth period
Replicates : 3 groups of 50 fish/tank
Days : 60



Statistics :
1-way ANOVA for growth period
2-way ANOVA for stress tolerance period

Analyses and outputs

Growth and feed utilization

No overall differences. After thermal switch, fish fed L21 had higher perivisceral fat content

Plasma biochemistry

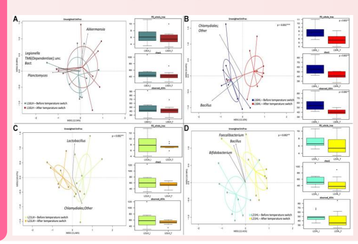
After thermal switch AST and ALP increased in L21 fish

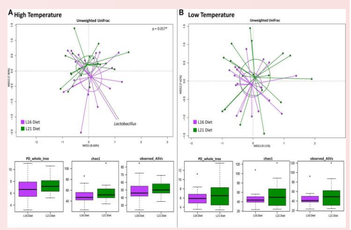
Digestive enzyme activities

L16 and 17 °C increased pepsin activity

Gut bacterial community

Diets had different layouts, at 23 °C fish fed L16 had a higher load of *Lactobacillus*. diet In the HL transition L16 favored an increase in *Weissella* and *Bradyrhizobium*, while in the final condition of LH transition, while L21 diet favored an increase in *Streptococcus* and *Bacillus*.



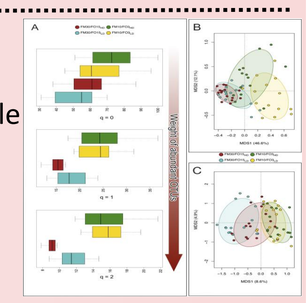


HD lowed fish fed FM30/FO15feed intake

Was not influenced by density

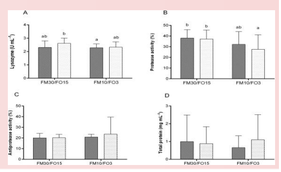
Brush borders enzymes were more influenced by density than gastric and pancreatic ones

FM10/FO3 kept steady the biodiversity, while HD reduced biodiversity of FM30/FO15



Skin mucosal immunity

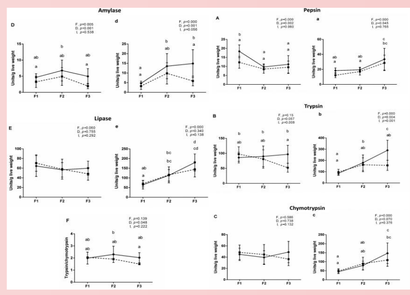
Lysozyme was slightly reduced at HD



No major effects were found

Higher creatinine was found in fish fed F1 with 30FM/15FO

Consecutive meals decreased trypsin activity in FM10/FO3 diet



Apparent digestibility

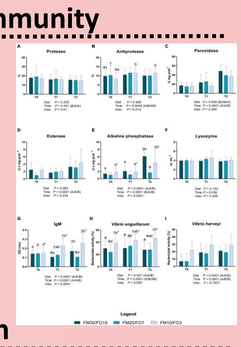
Was not affected by the number of meals

FM10/FO3 reduced slightly growth

Acute stress induced different responses, especially for lactate

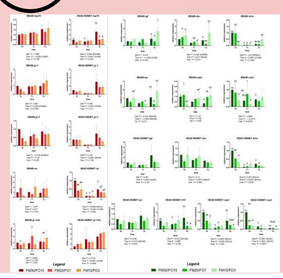
Skin mucosal immunity

Crowding boosted IgM in fish fed FM10/FO3



Gene expression

Stress upregulated hsp70 and gr2, and reduced inflammatory response (tnf-a amd il10) in fish fed FM30/FO15



Overall Results

I. In seabream the 16% lipid level should be preferred during seasonal temperature changes to optimize feed utilization and gut health

II. It is feasibile to reare seabream at a density up to 36-44 kg m^{-3} with both FM and FO levels without negative effects on considered parameters

III. Seabream can maximize feed utilization regardless the number of daily meals

IV. Low FM/FO dietary level employed could affect stress and immune response

Conclusion

These feeding strategies insights were used to design offshore farm case-studies in Spain and Greece in order to tailor practical guidelines for fish farmers

Funding

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References

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