

## EFFECTS OF DIFFERENT INCLUSION LEVELS OF HERMETIA ILLUCENS LARVAE MEAL ON GROWTH, PLASMA BIOCHEMISTRY, AND FILLET QUALITY OF GILTHEAD SEA BREAM (SPARUS AURATA)

### INTRODUCTION

The increasing global need to find alternative and sustainable protein sources has promoted research in the field for non-conventional feed ingredients, such as insects. There are many positive aspects of insect use as sustainable aquafeed ingredient especially for their high nutritional value and being a source of macronutrients and bioactive compounds. This study was performed in order to assess the effects of different inclusion levels of *Hermetia illucens* (HI) larvae meal on growth performances, plasma biochemistry, as well as technological and sensorial quality of gilthead sea bream.

### MATERIALS AND METHODS

- Four isoproteic and isolipidic diets** (50.6% protein, 13.8% fat)
- 50 fish tank<sup>-1</sup> (initial average weight: 98.6 ± 0.6g); 12 tanks in RAS
  - Fish fed to visual satiation for 113 days; Triplicate treatments



	Experimental diets			
Ingredients (%)	CTRL	HI 5	HI 10	HI 15
FM	22.0	18.1	14.1	10.1
IM	0.00	5.01	10.0	15.0
Wheat flour	9.82	8.47	7.12	5.79
Wheat gluten meal	3.07	3.08	3.08	3.09
SBM	11.4	11.5	11.5	11.5
Maize gluten meal	26.4	26.4	26.5	26.5
Soy protein Concentrate	13.2	13.2	13.2	13.3
Rapeseed oil	7.52	6.89	6.37	5.76
Fish oil	3.22	3.71	4.09	4.56
DL-Methionine	0.26	0.30	0.33	0.36
HCl Lysine	0.26	0.33	0.41	0.50
Mix Vitamins and Minerals	0.69	0.69	0.69	0.69
Composition (%)				
Moisture	6.16	6.11	6.76	6.41
Crude protein	49.8	50.3	51.0	51.3
Crude fat	13.88	14.02	13.81	13.61
Ash	6.62	6.37	6.28	6.17

CTRL, Controllo, HI 5, 5% insect meal, HI 10, 10% insect meal, HI 15, 15% insect meal.  
Ingredient's abbreviations: FM, Fish meal; IM, Insect meal, SBM soybean meal

#### Sensorial quality

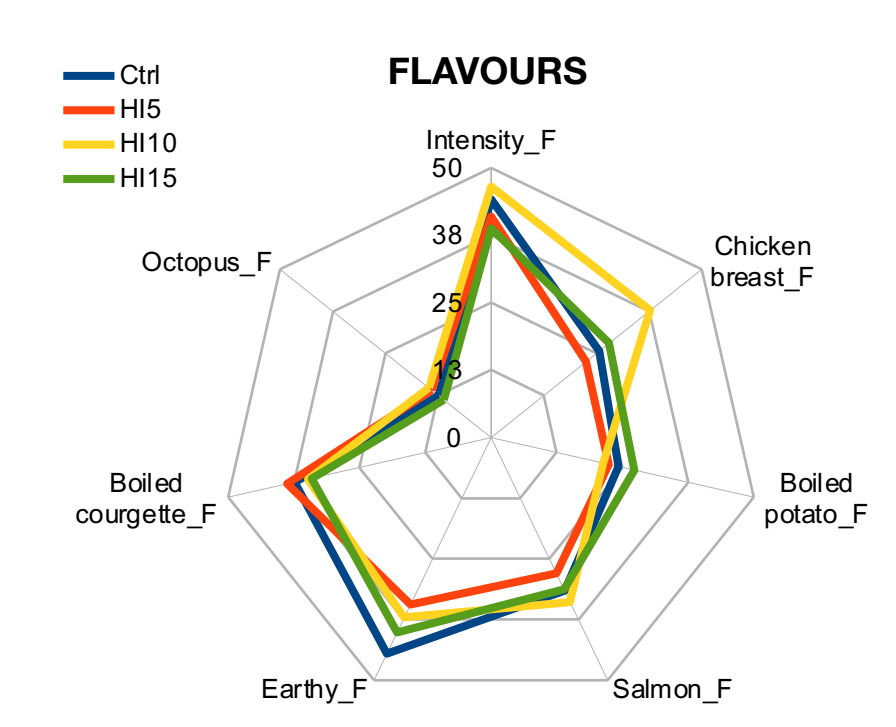
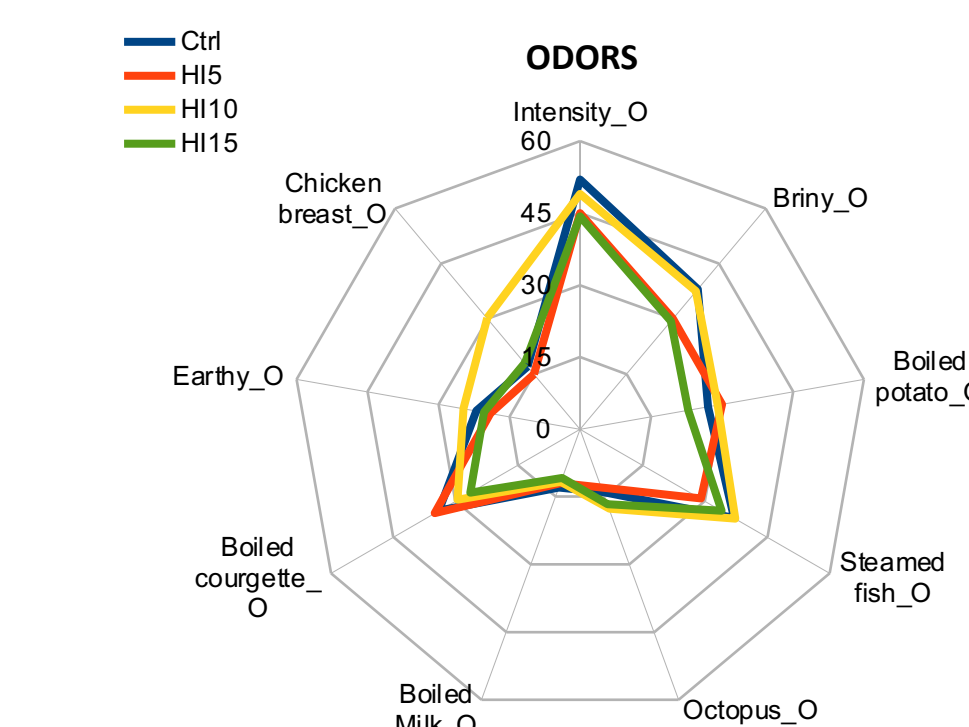
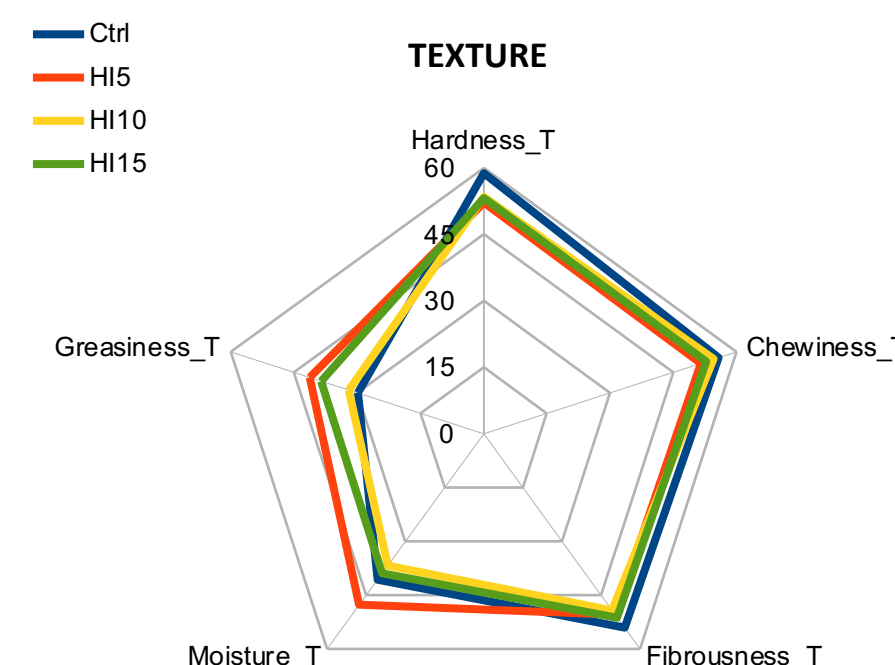
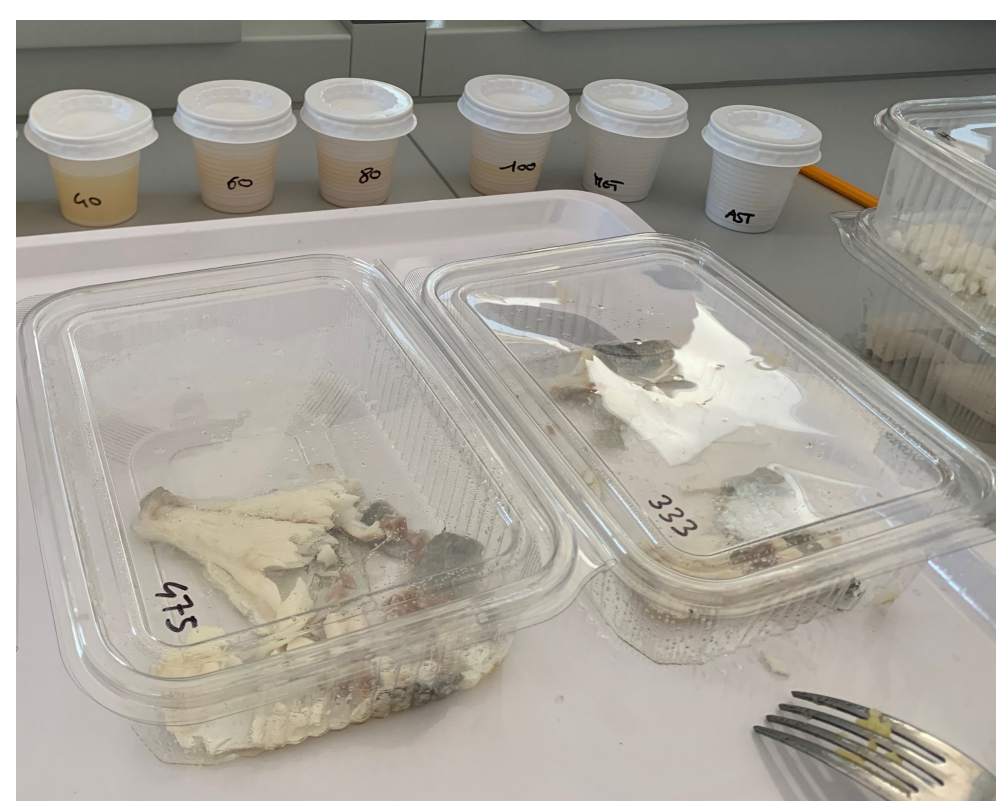
- A Panel group trained by tasting different sea bream fillets deriving from different rearing conditions and places in order to choose the most suitable characteristics for the sensory analysis of this trial.
- At the end of the trial the fishes were filleted and the fillets vacuum-packed at -80 ° C.
- Fillet preparation: defrosting in the fridge for 24h at 3 ° C, steaming for 5 minutes.

#### Technological quality

- The gutted sea bream were stored on ice and in a cold room at 0°C (until the resolution of rigor mortis).
- Subsequently the fishes were filleted. For each sea bream, one fillet was marinated (8% NaCl, 1% CH<sub>3</sub>COOH) and used for the determination of marinade uptake and purge loss, while the other one was subjected to the measurement of pH, proteins' functionality (i.e., protein solubility) and oxidative profile (i.e., TBARS and carbonyls).

#### Statistical analysis

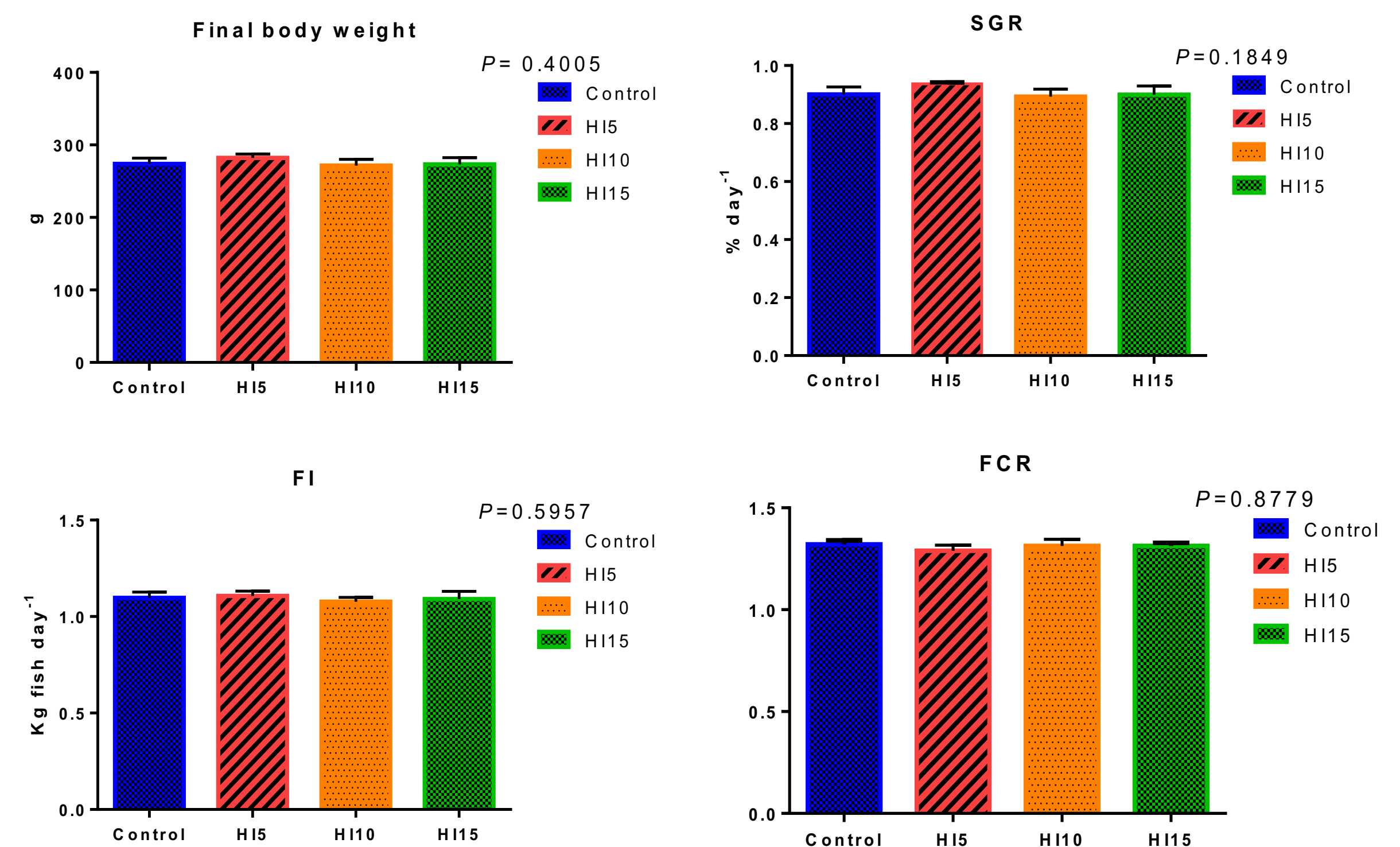
All data were analyzed by One-way ANOVA followed by Tukey's Multiple Comparison Test.



No significant difference are present among treatments (One-way Anova p > .05).  
O= Odors; A= Aspects; T= Texture; F=Flavours; Bt= Basic taste; Mf=Mouthfeels.

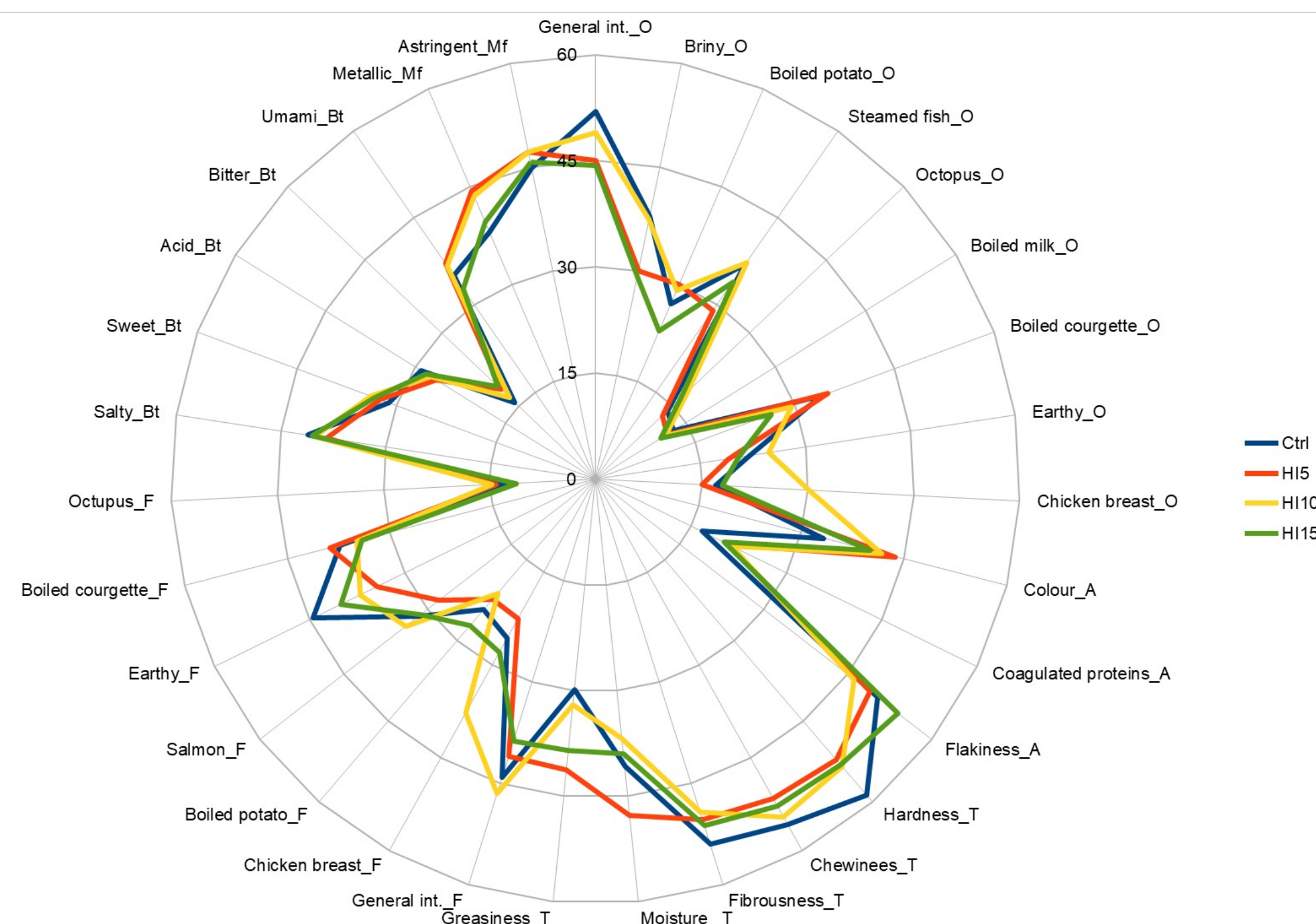
### RESULTS

#### GROWTH



FI = Feed Intake (% day<sup>-1</sup>) = 100 \* (crude feed intake / average body weight / 2 / days). FCR = Feed conversion rate = dry feed intake / weight gain.  
SGR = Specific growth rate (% day<sup>-1</sup>) = 100 \* (ln final weight - ln initial weight) / days. No significant differences among treatments (One-way Anova p > .05).

#### SENSORIAL QUALITY



### CONCLUSIONS

- ✓ *Hermetia illucens* larvae meal can replace 5%, 10% and 15% of FM without compromising the growth and feed utilization.
- ✓ No significant differences were found among treatments for the sensorial characteristics analyzed (Odors, Aspects, Texture, Flavours, Taste, Mouthfeels), indicating that an inclusion level of insect meal up to 15% does not involve a difference in the sensory evaluation of the fillet.
- ✓ Dietary inclusion of *Hermetia illucens* meal up to 15% shows similar technological fish quality compared to the control diet, thus they do not compromise the technological characteristics and the oxidative state of the fillet.

#### TECHNOLOGICAL QUALITY

	Experimental Diets				
	Ctrl	HI 5%	HI 10%	HI 15%	P-value
pH	6.26 ± 0.05	6.27 ± 0.08	6.26 ± 0.08	6.24 ± 0.05	0.796
Marinade uptake (%)	0.54 ± 1.32	-0.61 ± 0.93	0.53 ± 1.16	-0.25 ± 1.20	0.06
Purge loss (%)	1.73 ± 0.49	1.47 ± 0.56	1.58 ± 0.43	1.54 ± 0.38	0.706
TBARS (mg MDA/kg)	0.64 ± 0.04	0.66 ± 0.02	0.64 ± 0.06	0.66 ± 0.04	0.554
Carbonyls (nmol/mg)	1.78 ± 0.67	2.39 ± 0.65	1.98 ± 0.43	1.85 ± 0.33	0.078
Protein solubility (mg/g)	139.2 ± 22.8	125.1 ± 30.9	142.7 ± 22.4	137.6 ± 26.8	0.302

Data are given as the mean (N=12) ± SD. No significant difference are present among treatments (One-way Anova p > .05).  
CTRL, Controllo, HI 5, 5% insect meal, HI 10, 10% insect meal, HI 15, 15% insect meal.