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Effect of the rearing system on the nutritional physiological state of cultured fishes

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INTRODUCTION

Gilthead sea bream is one of the most important finfish species cultured in the Mediterranean region and its production is still in rapid expansion (Basurco and Abellán 1999). Albeit the production of this species has reached a high level of quality and efficiency, the knowledge of its nutritional requirements and digestive processes is very scarce compared to other fish species (Oliva-Teles 2000). In the present study the effects of three different rearing systems, on several parameters of the gastro-intestinal function, are investigated.

MATERIAL AND METHODS

The trial was conducted between May and November 2001, in Apulia Region (Italy) and three different sampling were carried out. Fish were all fed the same commercial extruded feed (Biomar-Treviso, Italy) at a feeding rate of 1-2% fish body weight per day, 7 days a week. Final fish rearing density was 4, 15 and 25 kg/m³ for semi-intensive, sea cages and land-based intensive system, respectively. Enzyme activities were measured in the intestine and liver homogenate, according to Storelli et al. (1986) using photometric techniques

Riassunto

Gli effetti di tre differenti sistemi di allevamento (semintensivo in una laguna costiera, intensivo in vasche in cemento e in gabbie a mare), su alcuni indicatori dello stato nutrizionale fisiologico dei pesci, sono stati studiati su orate (*Sparus aurata*) di taglia commerciale. La prova è stata condotta fra maggio e novembre del 2001, in 3 impianti situati nella Regione Puglia (Italia). Durante il periodo sono stati effettuati 3 campionamenti. Lo stato nutrizionale fisiologico è stato valutato attraverso la misurazione dell'attività di 3 differenti enzimi digestivi del tratto gastro-intestinale: la fosfatasi alcalina (ALP), la leucino-aminopeptidasi (LAP) e la maltasi; e dell'attività della fosfatasi alcalina epatica. Inoltre, sono stati misurati i contenuti epatici in proteine, colesterolo e lipidi totali. I risultati sono stati comparati con quelli ottenuti per orate selvatiche (controllo), pescate in una vicina area costiera. I risultati ottenuti suggeriscono che orate allevate con differenti sistemi, presentano uno stato nutrizionale fisiologico paragonabile a quello di esemplari selvatici

Summary

The effects of three different rearing conditions (semi-intensive in a coastal lagoon, intensive in land-based concrete ponds and sea-cages) on several indicators of the nutritional physiological state were studied during the rearing of gilthead sea bream (*Sparus aurata*). The nutritional physiological state has been evaluated by measuring the activity of three different intestinal digestive enzymes: alkaline phosphatase (ALP), leucine aminopeptidase (LAP) and maltase; and the activity of the hepatic ALP. In addition the hepatic content in protein, cholesterol and lipid were evaluated. The results were compared with those obtained for wild sea breams captured in a coastal area (control). Results obtained suggest that the reared fishes showed (at the end of the trial) a nutritional physiological state comparable to that of wild sea breams.

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RESULTS

The fish reared in the semi-intensive and in the sea-cages conditions showed a significantly higher intestinal ALP and maltase activities with respect to those measured in fish reared in land based intensive condition (Fig. 1 and Fig.2). Both these two activities were kept constant during the trial. It must be underlined that the observed differences in the enzymatic activities disappeared at the end of the trial. No differences between groups were observed concerning the activity of LAP (Fig. 3). Hepatic ALP activity (Fig. 4) did not show significant differences between groups with exception of the initial value measured in the semi-intensive reared fish. Finally the enzymatic activities measured in reared fish at the end of the trial were not different from those measured in wild sea breams.

Figure 1

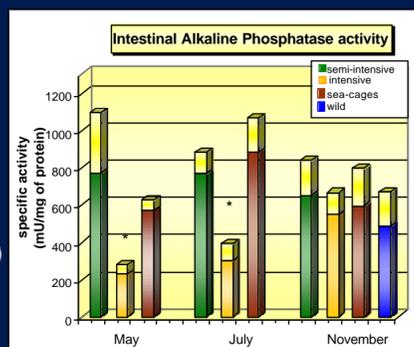


Figure 2

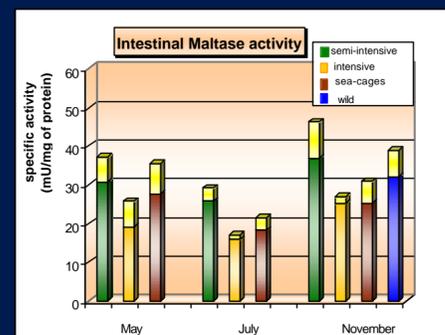


Figure 3

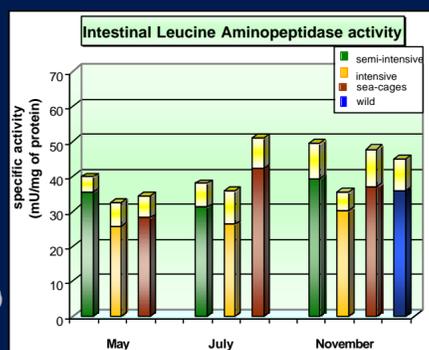


Figure 4

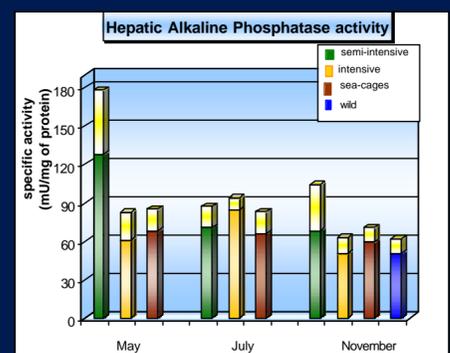


Table 1

(mg/g dry tissue)	Semi-intensive	Land based intensive	Sea cages	Wild sea breams
Protein	377,73 ± 4,15	585,88 ± 32,82	488,57 ± 15,89	486,45 ± 15,31
Lipids	626,00 ± 62,39	358,92 ± 30,05	414,68 ± 56,52	506,27 ± 75,44
Cholesterol	6,31 ± 0,76	9,1 ± 0,11	6,05 ± 0,01	11,07 ± 0,57

Concerning the hepatic protein content results (Table 1) indicate that only the protein concentration measured in the semi-intensive reared fish changes during the trial, being higher (803,17 ± 38,63 mg protein/g dry tissue) at the beginning of the trial and lower at the end, while it remains unchanged in the intensive and sea-cages animals. With respect to control, the hepatic protein content of intensive reared fish is higher. Lipids were significantly lower in intensive reared fish with respect to the other groups, while the cholesterol content seems to be similar in all conditions but lower with respect to the control.

CONCLUSIONS

The results obtained suggest that sea breams cultured both in a semi-intensive and intensive system, present a nutritional physiological state comparable to that of wild individuals.

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