

## **EFFECT OF DUO CULTURE ON GROWTH PERFORMANCE OF BROWN TROUT (*SALMO TRUTTA FARIO*) AND BLACK SEA TURBOT (*PSETTA MAXIMA*) IN TANK REARED CONDITION**

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### **DELOVANJE DUO CULTURE NA PERFORMANCE RASTA POTOČNE PASTRMKE (*SALMO TRUTTA FARIO*) I CRNOMORSKE RIBE LIST (*PSETTA MAXIMA*) U USLOVIMA UZGOJA U TANKOVIMA**

#### ***Abstrakt***

Cilj ove studije je bilo poređenje performansi rasta i koeficijenta konverzije hrane potočne pastrmke i crnomorske ribe list u monokulturi i duo-kulturi u uslovima gajenja u tankovima u region Crnog mora, Turska. Eksperiment je trajao 84 dana od 3.marta do 26 maja 2009. na Karadeniz Tehničkom Univerzitetu. RIBE su bile 14 meseci stare potočne pastrmke, odgajene u mrestilištu, početne težine  $54.81 \pm 6.53$  g (n=72) i 9 meseci stare crnomorske ribe list, odgajene u mrestilištu, početne težine  $50.80 \pm 3.14$  (n=72) g. RIBE su držane u tankovima od fiberglasa zapremine  $0.2 \text{ m}^3$ , snabdevene bočatom vodom (17‰). Na kraju studije prosečna težina potočne pastrmke je uvećana za  $104.46 \pm 1.69$  g, a crnomorske ribe list za  $100.15 \pm 6.71$  g, u monokulturi, dok je uvećanje iznosilo  $91.46 \pm 5.68$  g za pastrmku i  $91.71 \pm 3.77$  g za ribu list u duo-kulturi, razlike su bile sttistički značajne između monokulture i duo-kulture za svaku vrstu ( $P < 0.05$ ). Specifične stope rasta u monokulturi su bile više nego u duo-kulturi ( $P < 0.05$ ). Finalni faktori kondicije za svaku vrstu su bili slični u monokulturi i duo kulturi. Koeficijent konverzije hrane crnomorske ribe list u monokulturi bio je bolji of potočne pastrmke u monokulturi nego u duokulturi ( $P < 0.01$ ). Ova studija je pokazala da je duokultura potočne pastrmke i crnomorske ribe list nepovoljna za ove vrste.

***Ključne reči:*** potočna pastrmka, crnomorska riba list, duokultura, parametri rasta, koeficijent konverzije hrane

## INTRODUCTION

Polyculture is the way of simultaneously producing more than one fish species in the same rearing space (Papoutsoglou et al., 1992; Papoutsoglou et al., 2001). The principle of polyculture is based on the fact that cultured fish species feed on different levels of food chain and environment (Milstein et al., 2002), but wild species can be stocked with domesticated species to get them used to artificial feed. In this case, increasing food intake due to competition and social hierarchy can affect fish growth positively. At the same time, uneaten feed by wild species consumed by domesticated fish, and feed efficiency is maintained (Okumuş, et al., 1999).

Culture possibilities of brown trout (*Salmo trutta fario*; *S.t.f.*) were evaluated by the Department of Fisheries Technology at the Faculty of Marine Sciences at Karadeniz Technical University, and Black Sea turbot (*Psetta maxima*; *P.m.*) by Ministry of Agriculture and Rural Affairs and the Central Fisheries Research Institute. The objectives of the present study are to compare growth performance and feed conversion ratios of brown trout and Black Sea turbot in monoculture and duo-culture tank reared conditions in the Black Sea Region, Turkey.

## MATERIALS AND METHODS

The growth trial, which lasted 84 days, was carried out March 3<sup>rd</sup> – May 26<sup>th</sup> 2009 at the Prof.Dr. İbrahim OKUMUŞ Aquaculture Research and Production Unit at Karadeniz Technical University. The fish were about 14-month-old hatchery reared brown trout and 9-month-old hatchery reared Black Sea turbot with initial weights of  $54.81 \pm 6.53$  (n=72) and  $50.80 \pm 3.14$  (n=72) g, respectively. Fish were kept in 0.2 m<sup>3</sup> fiberglass tanks, and brackish water (17‰) supplied. Nine tanks were used and the fish were equally allotted to 3 groups with three replicates. Each tank contained 16 fish from each species for monoculture, and 8+8 fish from each species for duo-culture.

Fish were fed to apparent satiation with commercial dry extruded pellets of 3 mm containing 48% crude protein and 18.0% crude lipid. Feed was manually given two times a day (at 8:30 and 16:30 h). Growth was followed by bulk-weighing the fish in each tank (within 0.1 g accuracy limit), and total lengths ( $\pm 1$  mm) and individual live weights ( $\pm 0.1$  g) were noted down to determine condition factors.

The following parameters were calculated from the data collected: specific growth rate (SGR, %/day) =  $[(\ln W_t - \ln W_0)/t] \times 100$ ; condition factor (CF) =  $(W/L^3) \times 100$ ; feed conversion ratio (FCR) = Feed consumed/biomass increment; where  $W_0$  and  $W_t$  are live weights (g) of the fish at the beginning and a successive weighing, respectively; t is number of days and L is total length of the fish (cm). The mean and standard deviation ( $\pm$ sd) were calculated for all parameters in each group and one-way analysis of variance (ANOVA) and Tukey were used to test for differences among the groups.

## RESULTS

At the end of the study, mean live weights of brown trout and Black Sea turbot increased to  $104.46 \pm 1.69$  g and  $100.15 \pm 6.71$  g in monoculture,  $91.46 \pm 5.68$  g and  $91.71 \pm 3.77$  g in duo-culture, respectively, and significant differences were found between the monoculture and duo-culture groups for each species ( $P < 0.05$ ). The specific growth rates in monoculture were found higher than duo-culture ( $P < 0.05$ ). The final condition factors of species were similar for each species in monoculture and duo-culture. The feed con-

version ratio (FCR) of Black Sea turbot in monoculture was the best than brown trout in monoculture, and duo-culture group ( $P < 0.01$ ) (Table 1).

**Table 1.** Mean growth ( $W_f$ : final weights; SGR: specific growth rate; CF: condition factor; and, feed conversion ratio (FCR) parameters (m: monoculture; d: duo-culture; \*: duo-culture value of *S.t.f.* and *P.m.*).

	<i>S.t.f.</i> m	<i>P.m.</i> m	<i>S.t.f.</i> d	<i>P.m.</i> d	P
$W_f$ (g)	104.46±1.69 <sup>a</sup>	100.15±6.71 <sup>a</sup>	91.46±5.68 <sup>b</sup>	91.71±3.77 <sup>b</sup>	<0.05
SGR	0.80±0.02 <sup>a</sup>	0.81±0.02 <sup>a</sup>	0.66±0.16 <sup>b</sup>	0.70±0.11 <sup>b</sup>	<0.05
CF	1.26±0.02 <sup>a</sup>	1.82±0.01 <sup>b</sup>	1.31±0.20 <sup>a</sup>	1.72±0.05 <sup>b</sup>	<0.01
FCR	1.29±0.14 <sup>a</sup>	0.80±0.10 <sup>c</sup>	1.11±0.14 <sup>b</sup>		<0.01

## DISCUSSION

In this study, it was found out that both species had good FCR if the conditions are suitable. Feed conversion ratio, which fell below 1.3, in all three groups proves this. Since feed conversion ratio is affected by various such factors as biological value of feed, the ratio of main constituents of feed, stock density, genetic line of fish, fish size, basal metabolic rate, water temperature, feeding method and frequency (Jobling, 1995), comparing results of different trials may not have a practical value. The estimated feed use values during the study shows that there is no need to overfeed. As a result, this study has shown that duoculture of brown trout and Black Sea turbot is disadvantageous for each species.

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## REFERENCES

- Jobling, M., Arnesen, A.M., Baardvik, B.M., Christiansen, J.S., Jørgensen E.H. (1995): Monitoring feeding behavior and food intake: Methods and applications. *Aquaculture Nutrition*, 1, 131-143.
- Papoutsoglou, S.E., Petropoulos, G., Barbieri, R. (1992): Polyculture rearing of *Cyprinus carpio* (L.) and *Oreochromis aureus* (St.) using a closed circulated system. *Aquaculture*, 103, 311-320.
- Papoutsoglou, S.E., Miliou, H., Karakatsouli, N.P., Tzitzinakis, M., Chadio, S. (2001): Growth and physiological changes in scaled carp and blue tilapia under behavioural stress in mono- and polyculture rearing using a recirculated water system. *Aquaculture International*, 9, 509-518.
- Milstein, A., Wahab, M.A., Rahman, M.M. (2002): Environmental effects of common carp *Cyprinus carpio* (L.) and mrigal *Cirrhinus mrigala* (Hamilton) as bottom feeders in major Indian carp polycultures. *Aquaculture Research*, 33, 1103-1117.
- Okumuş, İ., Çelikkale, M.S., Kurtoğlu, İ.Z., Başçınar, N. (1999): Growth performance, food intake and feed conversion ratios in rainbow (*Onchorynchus mykiss*) and brook trout (*Salvelinus fontinalis*) reared as a single and mixed species. *Turkish Journal of Veterinary and Animal Sciences*, 23, Supl. 1, 123-130.