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A comparative study on body composition of Shyrbot (*Barbus grypus*) fish reared in different salinities

Maedeh Jalali[1], Reza Davoodi[1,*], Abdul Ali Movahedinia[2] and Seyed Abdolsaheb Mortazavi Zadeh[3]

[1]Department of Fisheries and Aquaculture. Agricultural and Natural Resources College, Persian Gulf University, Bushehr, Iran.

[2]Sea Hydrographic Department, Khorramshahr University of Marine Science and Technology, Iran.

[3]Research Institute of South Aquaculture, Iran.

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ABSTRACT

Effect of different salinity on body composition of shyrbot fish was investigated. Shyrbot fingerlings with an average weight of 3.96 grams were reared under different salinities (0, 3, 6, 9, 12 and 15g). Analysis of body composition showed a significant effect of different levels of salinity on protein, fat, moisture and ash ($p<0.01$) of the fishes. The highest level of protein, ash and moisture and lowest amount of fat were obtained in 15ppt salinity followed by 12 and 9ppt salinity. The highest amount of fat was obtained in freshwater followed by 3 and 6ppt. In higher salinities (9, 12 & 15ppt) low fat and energy stored. The results suggest that Shyrbot fingerlings until 6ppt salinity can be easily developed.

Introduction

The interest in the development of warm water fish culture in Iran has been increased in recent years. About 97,262 tonns of warm water fishes were cultured in the 1386 out of which 25,211 tonnes were produced in the Khuzestan province and shyrbot constitute a significant share of that (Iranian Fisheries Statistical Yearbook, 2007). Shyrbot, *Barbus grypus*, belong to the Cyprinidae family which lives in the Euphrates river basin, watershed of the Persian Gulf and catchment of Hormuz strait (Coad, 1993). It is an important member of fresh water fishes and it is commercially important due to its food value for indigenous people of Khozestan. But, despite of high economic value, not much information is available on optimal conditions for breeding and rearing of these fish.

Body composition" is the analysis of water, fat, protein, and ash contents of the fish (Love 1980). The live weight of majority of fish usually consists roughly of 70-80% water, 20-30% protein and 2-12% lipid (Love 1980, Weatherley and Gill 1987). But, in general, it has been observed that a number of physical, abiotic and biotic factors affect the body composition parameters. Various studies have been made on body composition of various fish species (Ali et al., 2005; Dempson, et al., 2004; Berg, et al., 2000; Jonsson and Jonsson, 1998; Grayton and Beamish, 1997; Salam and Davies, 1994; Salam and Mahmood, 1993; Salam et al., 1993).

With a rich source of brackish water Iran and in view of growth potential and popularity among fish consumers, present study was undertaken with an aim to compare the body composition of *Barbus grypus* cultured under different salinity to assess the condition of fishes in different environments.

Materials and Methods

A total of 500 shyrbot (*Barbus grypus*) fingerlings with an average weight of 3.69g were purchased and transferred to the Aquaculture Institute of South, Iran. They were acclimatized for one week in $1m^3$ fiberglass tanks containing freshwater with 29.2°C temperature and pH=7.4. In order to adapt the fishes to brackish water, fishes were divided into 5 different treatments and were introduced to 0, 3, 6, 9, and 15ppt for 3 weeks.

From each treatment 45 fishes were randomly selected and after biometry 15 fishes were introduced to one aquarium (3 repetitions) holding 30 liters of brackish water with different salinity. Five percent of the biomass was fed 5 times a day. A plastic filter was placed at the bottom of each aquarium to accumulate the remaining food. Water changing was done every 4days.

After 60 days of rearing all the fishes from each replicate were weighted individually and kept in the oven at 70°C for 48 hours and re-weighed to measure the amount of moisture from carcasses. Dried carcasses from each replicate were grinded for further analyses. Protein, fat and ash contents were measured using Kjeldahl, Soxhlet and furnace, respectively.

This study was conducted using a completely randomized design with 3 replications. Data were analyzed using ANOVA and Duncan test at a confidence level of 99% on SAS software. Graphs were plotted using Excel.

Results

Water quality parameters (Table 1) including temperature, dissolve oxygen and pH were within the acceptable levels for warm water aquaculture defined by Boyd (1990). Effect of different salinity on body composition of shyrbot fingerlings was compared between the treatments and is shown in table 2 which shows a significant difference ($P<0.01$) between the treatments.

The negative effects of increased salinity were found in fishes reared in 15, 12 and 9 ppt. respectively, where lower fat and as a result smaller diameters and elongated body were observed. Highest level of fat was recorded in freshwater followed by 3 and 6ppt salinity.

Tele:

E-mail addresses: da_afshin@yahoo.com

Table 1: Average water quality parameters during the experiment

pH	Temperature (° C)	Oxygen (ppm)	Salinity (ppt)
7.79	26.73	8.73	0
7.85	26.57	8.48	3
7.86	26.52	7.37	6
7.94	26.58	6.93	9
7.95	26.56	6.47	12
7.93	26.58	6.98	15

Table 2: Mean values for protein, fat, moisture and ash in the carcass of *Barbus grypus* fingerlings reared in different salinity

Salinity (ppt)	Crude protein	Crude fat	Total ash	Moisture
0	42.17^{d}	45.79^{a}	7.25^{cd}	63.28^{d}
3	41.44^{d}	43.72^{a}	6.83^{d}	62.69^{d}
6	44.5^{cd}	42.3^{a}	7.88^{cd}	65.54^{cd}
9	45.57^{c}	38.68^{b}	8.35^{c}	68.53^{c}
12	51.93^{b}	27.58^{c}	11.82^{b}	73.15^{b}
15	56.3^{a}	21.79^{d}	18.98^{a}	75.74^{a}

Different English letters represents significant differences at 99% confidential level

The percentage of protein, ash and moisture increased with increasing salinity and contrary fat level decreased as salinity increased. The highest percentage of protein (56.3), ash (18.98) and moisture (75.74) and lowest percentage of fat (21.79) was observed in 15ppt salinity.

Discussion

Due to arid condition in southern Iran, there is a shortage of fresh water with problem of increasing groundwater salinity which can be used for brackish water aquaculture. Many studies report on the effects of salinity change to fish physiology and ecology (Johnston and Saunders, 1981; Kelly and Woo, 1999; Nolan et al. 1999); however, little is known on how salinity change affects the shyrbot fish. The present study has demonstrated that the shyrbot in low-salinity water exhibited a better body composition and growth rate than when exposed to higher salinities. The result of this study showed that maximum water content was observed in fishes reared in 12 and 15ppt salinity while minimum was observed in freshwater followed by 3 and 6ppt salinity. The result was the same as for protein and ash content but it was reversed in case of lipid content. As evident, with increasing salinity percentage of fat declines. This result is in line with the findings of Lee and Putnam (1973), Gouveia (1992), Steffens (1994) and Ohata and Watanabe (1996).

The differences suggested that variable rearing conditions within different system might influence the body composition, which could be related to physiological adaptations of the species to salinity. Protein content, which is important component, tends to vary little in healthy fish (Weatherly and Gills, 1987). Dempson, et al., (2004) reported that the lower the percentage of water, greater the lipids and protein contents and higher the energy density of the fish.

As observed during this experiment, fishes reared in 12 and 15ppt, consumed less amount of food and therefore for their activities and osmotic adjustment must have used their stored energy. Decreased food consumption was also reported with increasing salinity in anadromous *Oncorhynchus kisutch* (Otto, 1971), in freshwater euryhaline hogchoker *Trinectes maculates* (Peters and Boyd, 1972), *Salmo gairdneri* (Nahhas et al., 1982) and *Acipenser baerii* (Rodrigues 2012), *Cyprinus carpio* (Wang et al., 1997). When salinity increases animal should deal with dehydration and for compensating water shortage and disposal of additional ions through chloride cells of the gills, more water should be taken and this cause increasing in body moisture (Kaushik and Oliva, 1989; Goueveia, 1992; Steffens, 1994; Ohata and Watanable 1996).

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