



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

Maedeh Jalali¹, Reza Davoodi^{1,*}, Abdul Ali Movahedinia² and Seyed Abdolsaheb Mortazavi Zadeh³

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

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

³Research Institute of South Aquaculture, Iran.

ARTICLE INFO

Article history:

Received: 29 May 2013;

Received in revised form:

24 June 2013;

Accepted: 9 July 2013;

Keywords

Shyrbot (*Barbus grypus*),
Salinity,
Body Composition.

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.

© 2013 Elixir All rights reserved.

Introduction

The interest in the development of warm water fish culture in Iran has been increased in recent years. About 97,262 tons 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 1m³ 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.

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 maculatus* (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; Gouveia, 1992; Steffens, 1994; Ohata and Watanabe 1996).

References

- Ali M., F. Iqbal, A. Salam, S. Iram, and M. Athar. Comparative study of body composition of different fish species from brackish water pond. Int. J. Environ. Sci. Tech. 2005; Vol. 2, No. 3, pp. 229-232.
- Boyd, C. E. Water Quality in ponds for Agriculture. Auburn University, Auburn, Alabama. 1990; Pp: 482.
- Berg O. K., Thronaes E. and Bremset G. Seasonal changes in body composition in young riverine Atlantic salmon and brown trout. J. Fish Biol. 2000; 52, 1272-1288.
- Coad, B. W. and Abdoli, A. Exotic fish species in the fresh waters of Iran. Zoology in the Middle East. 1993; 9: 65-80.
- Dempson I. B., Schwarz C. J., Shears M. and Furey G. Comparative proximate body composition of Atlantic salmon with emphasis on par from fluvial and lacustrine habitats. J. Fish Biol. 2004; 64, 1257-1271.
- Fishery Statistical Yearbook of Iran. Iranian Fisheries Organization. (In Persian). 2007; Page 56.
- Gouveia A. J. R. The use of poultry by-product and hydrolyzed feather meal as a feed for rainbow trout (*Oncorhynchus mykiss*). Published by Institute of Zoology, Faculty of Science, University of Forto. 1992; No 227, 24P.
- Grayton B. D. and Beamish F. W. H. Effects of feeding frequency on food intake growth and body composition of rainbow trout (*Salmo gairdneri*). Aquaculture. 1997; 11, 159-172.
- Jonsson N. and Jonsson B. Body composition and energy allocation in life history stages of brown trout. J. Fish Biol. 1998; 53, 13-15.
- Johnston, C. E. and Saunders, R. L. Parr-smolt transformation of yearling Atlantic salmon (*Salmo salar*) at several rearing temperatures. Can. J. Fish. Aquat. Sci. 1981; 38, 1189-1198.
- Kelly, S. P. and Woo, N. Y. S. The response of sea bream following abrupt hyposmotic exposure. J. Fish Biol. 1999; 55, 732-750.
- Kaushik S.J. and Oliva-Teles A. Effect of digestible energy on nitrogen and energy balance in rainbow trout. Aquaculture. 1989; 50: 89-101.
- Lee D.J. and Putnam C.B. The response of rainbow trout to varying protein energy ratio in a test diet. Journal of Nutrition. 1973; 103: 916-922.
- Love, R.M. The chemical biology of fishes. Academic Press, London. 1980.
- Nahhas, R., Jones, N. V. and Goldspink, G. Growth, training and swimming ability of young trout (*Salmo gairdneri* R.) maintained under different salinity condition. J. Mar. Biol. Ass. U.K. 1982; 62, 699-708.
- Nolan, D. T., Op't Veld, R. L. J. M., Balm, P. H. M., and Wendelaar Bonga, S. E. Ambient salinity modulates the response of the tilapia *Oreochromis mossambicus* (Peters) to net confinement. Aquaculture. 1999; 177, 197-309.
- Ohata M., and Watanabe T. Energy requirement for maintenance of body weight and activity for maximum growth in rainbow trout, fisheries Science. 1996; 62(5): 737-744.
- Otto, R. G. Effects of salinity on the survival and growth of smolt coho salmon (*Oncorhynchus kisutch*). J. Fish. Res. Board Can. 1971; 28, 343-349.

- Peters, D. S. and Boyd, M. T. The effect of temperature, salinity and availability of food on the feeding and growth of the hogchoker, *Trinectes maculatus* (Bloch and Schneider). J. Exp. Mar. Biol. Ecol. 1972; 7, 201–207.
- Rodrigues, A., Gallardo, M.A., Gisbert, E., Santilari, S., Ibarz, A., Sanchez, J. and Castello, O. Osmoregulation in juvenile Siberian sturgeon (*Acipenser baerii*). Fish Physiol. Biochem. 2002; 26, 345-354.
- Salam, A., Ali M., Chatta A.M., and Zaman, Q.U. Growth performance of cultured exotic Silver Carp (*Hypophthalmichthys molitrix*) under semi-intensive farming: An ecological approach. Acta Sci. 1993; 3, 89-100.
- Salam A. and Davies P. M. C. Body composition of Northern Pike (*Esox lucius* L.) in relation to body size and condition factor. J. Fish Res. 1994; 19, 193-204.
- Salam, A. and Mahmood, J.A.. Weight-length and condition factor relationship of a fresh water under yearling wild *Catla catla* (Hamilton) from River Chenab (Multan)", Pak. J. Zool. 1993; 25, 127-130.
- Steffens W. Replacing fish meal with poultry by-product meal in diets for rainbow trout (*Oncorhynchus mykiss*). Aquaculture. 1994; 124: 27-34.
- Wang, J.Q., Lui, H., Po, H., and Fan, L. Influence of salinity on food consumption, growth and energy conversion efficiency of common carp (*Cyprinus carpio*) fingerlings. Aquaculture. 1997; 148, 115–124.
- Weatherley, A.H. and Gill, H.S. The biology of fish growth. Academic Press, London. 1987.