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Body composition of big head carp (*Aristichthys nobilis*) in different weight classes

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Abstract

Big head carp (*Aristichthys nobilis*) is one of the most important kinds of fish in fish farming industry in freshwater. This research aims to investigate changes trend of rate of chemical compositions of big head carp fillet (*Aristichthys nobilis*) using regression equations. To do so, 40 fish with different weights were caught and the percentage rate of chemical compositions, moisture, fat, protein, ash, fiber, and carbohydrate content was measured. Then, the relationship between these factors and total weight of the fish was examined and the kind of relationship and their equation were determined. The results showed that there was a significant correlation between moisture, fat, and protein content in *Aristichthys nobilis* ($P<0.05$) and their regression relations were respectively ($r = 0.525$), ($r = 0.4802$), ($r = 0.4577$), while there was not a significant correlation between ash, fiber, carbohydrate content and weight ($P>0.05$). On the whole, as the fish weight increased, the rate of body moisture and fat increased, but the rate of body protein decreased.

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Introduction

In recent years, the consumption of fish and sea food has increased and the demand for aquatic products in increasing due to population growth, increase of income, and public preference for fish and aquatic nutrition rather than other kinds of food. Aquatic animals are a vital source of nutrition for human being. They are also a good source of micronutrients, minerals, fatty acids, and essential amino acids that distinguish them from other kinds of food. Therefore, fish and other aquatic animals are considered as excellent sources of food. Body composition of the fish is an important parameter which is used in ecology and physiology of the fish as is related to food situation, season, habitat, and body size of the fish.

Changes in proportion of water, fat, protein, and ash lead to a variety of stored energy in fish body which is affected by size, breeding season, access to food, physiochemical conditions of the environment, etc (Luo *et al.*, 2013). Biochemical compositions of fish body are different based on the kind of species, consumed food, and farming environment. It should be noticed that growth and chemical compositions of fish body could be directly influenced by changes of food sources (Kang'ombe *et al.*, 2007). The relation between length and weight of fish is a tool for optimal management of fish farming (Abimbola *et al.*, 2010). Different factors affect the chemical composition of fish body such as the fish size. One of the ways to estimate approximate composition of fish body is to use the equation of the relation between fish size and its approximate composition. (Ashraf *et al.*, 2011) examined chemical composition of the flesh of silver carp (*Hypophthalmichthys Molitrix*) and common carp (*Cyprinus carpio*) and found that the rate of moisture in silver carp was significant while the rates of protein and fat were significant in common carp.

This research aims to determine mathematical equations between approximate composition of fillet as dependent variable and fish weight as independent variable is different weights.

Material and method

Fish samples

Fresh cultured Big head carp (*Aristichthys nobilis*) were obtained from the pond of around ahvaz and immediately shipped to the Department of fisheries science at Islamic Azad University , branch of Ahvaz. Upon arrival, fillets were washed with cold water, weighed , measured and frozen immediately at - 20° C . For Compositional analyses, Fish fillets were dried at 60°C for up to 24 h, then stored at -20°C until further use and were analyzed in triplicate for lipid (Soxhlet Method(AOAC, 1990), crude fiber(AOAC, 1990) , moisture (AOAC, 1990) and Kjeldahl protein, which was calculated using the Kjeldahl nitrogen and conversion factor 6.25 (N_6.25) (AOAC,1990).

Statistical analysis

Data were subjected to Statistical analysis using SPSS software® version 11.0 (Statistical Package for Social Sciences). Values are expressed as mean ± standard deviation. The data were checked for normality with the Durbin-Watson test and transformed where necessary. The correlations between chemical content and weight were examined by regression. The regression curves were determined by choosing the best R2 values. The significance limits were set at 0.05.

Results

The relationship between total weight and Fillet's moisture

The relationship between total weight of Big head carp (*Aristichthys nobilis*) and the rate of moisture of fillet was determined in fig1 as linear regression. It was a negative linear regression with the formula of $y = -0.0026x + 81.836$. The relationship was significant with correlation coefficient of $R^2 = 0.06976$ at 95% level.

The relationship between total weight and the percentage of fillet protein of dry weight

The relationship between total weight of Big head carp (*Aristichthys nobilis*) and the rate of protein of muscle was determined in fig 2 as linear regression. It was a negative linear regression with the formula of

y = -0.002x + 79.117. The relationship was significant with correlation coefficient of R^2 = 0.4577 at 95% level.

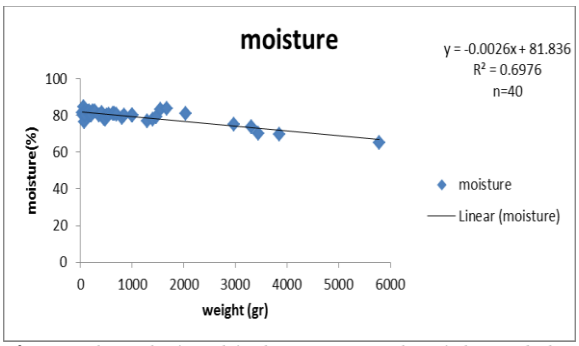

Fig. 1. The relationship between total weight and the percentage of moisture of wet weight of muscle in Big head carp (*Aristichthys nobilis*).

The relationship between total weight and the percentage of fillet fat of dry weight

The relationship between total weight of Big head carp (*Aristichthys nobilis*) and the rate of fat of muscle was determined in fig 3 as linear regression.

It was a positive linear regression with the formula of y = 0.0021x + 14.53. The relationship was significant with correlation coefficient of R^2 = 0.4802 at 95% level.

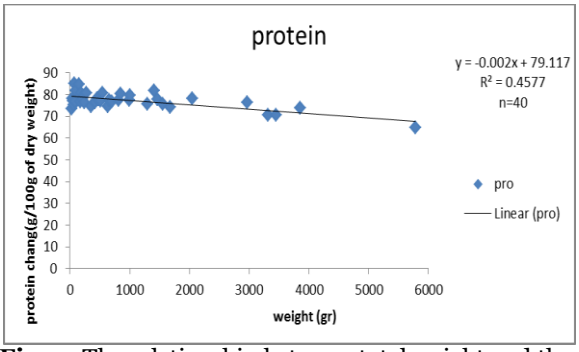

Fig. 2. The relationship between total weight and the percentage of protein of dry weight of muscle in Big head carp (*Aristichthys nobilis*)(g/100g of dry weight).

The relationship between total weight and the percentage of fillet ash of dry weight

The relationship between total weight of Big head carp (*Aristichthys nobilis*) and the rate of ash of muscle was determined in fig 4 as linear regression. The relationship lacked a significant correlation and Y = $6*10^{-5}x$ + 2.8619. The relationship was not significant with correlation coefficient of R^2 = 0.0612 at 95% level.

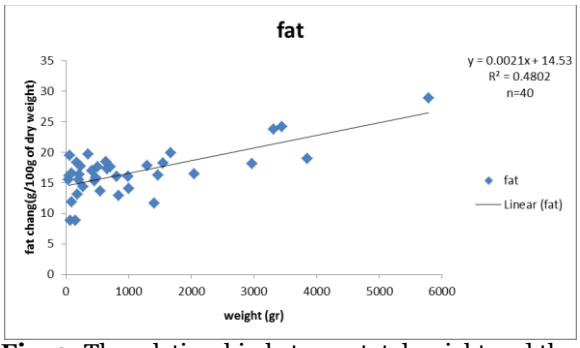

Fig. 3. The relationship between total weight and the percentage of fat of dry weight of muscle in big head carp (*Aristichthys nobilis*) (g/100g of dry weight).

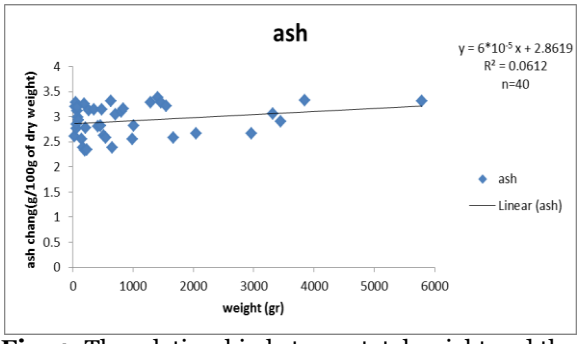

Fig. 4. The relationship between total weight and the percentage of ash of dry weight of muscle in Big head carp (*Aristichthys nobilis*)(g/100g of dry weight).

The relationship between total weight and the percentage of fillet carbohydrate of dry weight

The relationship between total weight of Big head carp (*Aristichthys nobilis*) and the rate of carbohydrate of muscle was determined in fig 5 as linear regression. The relationship lacked a significant correlation and y = $-4*10^{-5}x$ + 3.2611. The relationship was not significant with correlation coefficient of R^2 = 0.0136 at 95% level.

Discussion

The results of this research showed that there was a significant correlation between the weight and rate of protein of fillet and as the weight increased, the rate of protein in fillet decreased. The results were similar to Michael's findings in 1991 which reported the decrease of protein as the weight of Striped bass and Hybrid striped bass increased. (Luo *et al.*, 2013) reported a significant correlation between two species

of *Coreius guichenoti* and *Coreius heterodon* in upstream of the Yangtze River and concluded that there would often be a significant correlation between protein percentage in both species and the body mass index ($P<0.05$). Their findings were consistent with the results of this research. The results of a research on catfish (*Mystus bleekeri*) showed that there was a positive relationship between the weight of fish and protein and fat compositions (dry weight %) in a regression analysis. The same results were obtained between total length and body composition percentage (dry weight %) which were not consistent with the results of this research (Naeem *et al*., 2011). It seems like that the production of new protein fibers decreased in big head carps during the growth and as the length increases it decreases, too. It has been proved that the ratio of red muscles to total skeletal muscles is largely constant as the age increases. The decline of increasing trend of protein as the size of fish increased in this research or even or even its stop caused the decrease of regression line slope and also the decrease of its correlation coefficient (Fauconneau *et al*., 1995). In this research as the weight increased the rate of fat increased in big head carp fillet and there was a significant correlation between them. (Naeem *et al*., 2010) examined the approximate compositions of Big head carp (*Aristichthys nobilis*) body and in terms of body length and obesity coefficient in wet weight and concluded that there was a significant positive correlation between obesity coefficient and fat percentage which was consistent with the results of this research.(Luo *et al*., 2013) investigated the relationship between body composition and body mass index in two species of *heterodon Coreius* and *quichenoti Coreius* in upstream of the Yangtze River and concluded that there was a direct relationship between the rate of fat and increase of body mass in both species and the regression of fat percentage and body mass index was significant which was consistent with the regression relationships in the present research. (Naeem *et al*., 2011) investigated the relationship between body length and obesity coefficient in catfish (*Mystus bleekeri*) and found that there was an insignificant relationship between the rate of fat and body weight which was not consistent with the results of this research. In a study on Shank Fish (*Sparus aurata*), it was stated that there was not a significant relationship between the size of fish and the rate of fat (Grigiraskis *et al*., 2002) which was not consistent with the results of present research. Moreover (Rasmussen *et al*., 2006) found in a research that there was not any relationship between the length and the content of fat in Albacore Tuna Fish (*Tunnus alalunga*) while the results of this research showed a significant relationship between them. As the body weight increases, the rate body stored fat will increase, too (Alvarez *et al*., 1998; Cho *et al*., 1996).

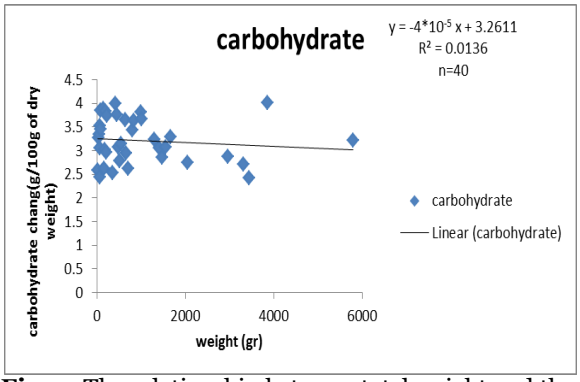

Fig. 5. The relationship between total weight and the percentage of carbohydrate of dry weight of muscle in Big head carp (*Aristichthys nobilis*)(g/100g of dry weight).

There is a negative correlation between the fat and protein of the meat and as the fat content increases, the meat protein will decrease which is consistent with the results of present research (Alvarez *et al*., 1998; Weatherly *et al*., 1997). In this research, there was not a significant relationship between the rate of ash and the weight of carp fillet, while in most researches the ash of total carp body has been investigated and the increase of total body ash is mainly affected by the fish skeletal system, therefore such a difference in the results of the rate of ash is not unexpected (Shearer., 1994). (Michael *et al*., 1991) investigated the relationship between relative weight and approximate composition of striped bass and hybrid striped bass and found out that the ash of the whole body decreased as the relative weight increased. (Naeem *et al*., 2011) reported a significant correlation between body ash and weight in *Mystus*

bleekeri .(Luo *et al.*, 2013) investigated the relationship between body composition and body mass in two species of *Coreius heterodon* and *Coreius guichenoti* and concluded that there was a significant relationship between the ash percentage and body mass in *Coreius heterodon*, but there was not any significant relationship between the ash and body mass in *Coreius guichenoti*. In this research a significant correlation was found between the rate of fillet moisture and the weight of fish. (Naeem *et al.*, 2010) investigated the relative compositions of Big head carp body (*Aristichthys nobilis*) in terms of the relationship between body length and obesity coefficient in wet weight and concluded that body weight had a negative effect on moisture percentage. Moreover, total length had a negative effect on moisture percentage, too which was consistent with the results of this research. In 2011, Naeem and his research team examined the relationship between body size and obesity coefficient in catfish (*Mystus bleekeri*) and figured out that there was a negative significant correlation between weight and water percentage which was consistent with the results of present research. (Michael *et al.*, 1991) studied the relationship between relative weight and approximate composition of striped bass and hybrid striped bass and concluded that there was an inverse relationship between weight and water which was consistent with the results of this research.

Conclusion

The regression relationship between the total body weight in big head carp (*Aristichthys nobilis*) and the rate of muscle moisture was as y = -0.0026x + 81.836 which was a significant relationship at 95% level.

The regression relationship between the total body weight in big head carp (*Aristichthys nobilis*) and the rate of muscle protein was as y = -0.002x + 79.117 which was a significant relationship at 95% level.

The regression relationship between the total body weight in big head carp (*Aristichthys nobilis*) and the rate of muscle fat was as y = 0.0021x + 14.53 which was a significant relationship at 95% level.

The regression relationship between the total body weight in big head carp (*Aristichthys nobilis*) and the rate of muscle ash was as $y = 6*10^{-5}x + 2.8619$which lacked a significant relationship at 95% level.

Refference

Abimbola AO, Kolade OY, Imbrahim AO, Oramadike CE, Ozor PA. 2010. Proximate and Anatomical Weight Composition of Wild Brackish *Tilapia guineensis* and *Tilapia melanotheron* . Internet Journal of Food Safety **12,** 100-103.

Alvarez MJ, Lopez-Bote CJ, Diez A, Corraze G, Arzel J, Dias J, Kaushik SJ, Bautista SJ. 1998. Dietary fish oil and digestible protein modify susceptibility to lipid peroxidation in the muscle of rainbow trout (Oncorhynchus mykiss) and sea bass (Dicentrarchus labrax). British Journals Nutrition. **80,** 281-289.

AOAC. (Association of Official Analytical Chemists). 1990. Official Methods Analysis. 15th ed. Association of Official Analytical Chemists, Washington, DC, USA.

Ashraf M, Zafar A, Naeem M. 2011. Comparative Studies on the Seasonal Variations in the Nutritional Values of Three Carnivorous Fish Species. international Journal of agriculture and biology **13,** 210-214.
http://dx.doi.org/11–067/ CCT/2011/ 13–5–701–706

Cho CY, Bureau DP. 1998. Development of bio-energetic models and Fish-rFEQ software to estimate production, feeding ration and waste output in aquaculture. Aquatic Living Resource **11,** 199–210. http://dx.doi.org/10.1016/s0990-7440(98)89002-5

Fauconneau B, Alami-Durante H, Laroche M, Marcel J, Vallot D. 1995. Growth and meat quality relations in carp Aquaculture. Czech journal **129**, 265-297.
http://dx.doi.org/10.1016/0044-8486(94)00309-c

Grigoriakis K, Alexis MN, Taylor KDA, Hole

M. 2002. Comparison of wild and cultured gilthead sea bream (*Sparus aurata*); composition, appearance and seasonal variations. International Journal of Food Sciences and Technology. Science **37,** 477–484. http://dx.doi.org/10.1046/j.1365-2621.2002.00604.x

Kang,ombe J, Likogwe JS, Eda H, Mtimuni JP. 2007. Effect of varying dietary level on feed intake, feed conversion, whole-body composition and growth of Malawian tilapia, *Oreochromis shiranus*-Boulenger. Aquaculture Research **38,** 373-380. http://dx.doi.org/10.1111/j.1365-2109.2007.01676.x

Michael L, Brown, Brian R, Murphy. 1991. Relationship of relative weight (Wr) to proximate composition of Juvenile *Striped bass* and *Hybrid striped bass*.Transactions of the American Fisheries Society **120,** 509-518. http://dx.doi.org/10.1577/15488659(1991)120%3C0509:rorwtp%3E2.3.co;2

Naeem M, Ishtiaq A. 2011. Proximate composition of *Mystus bleekeri* in relation to body size and condition factor from Nala Daik, Sialkot, Pakistan. African Journal of Biotechnology **10(52),** 10765-10763.

Naeem M, Salam A. 2010. Proximate composition of fresh water big head carp, *Aristichthys nobilis*, in relation to body size and condition factor from Islamabad,Pakistan. African Journal of Biotechnology **9(50)**, 8687-8692.

Rasmussen RS. 2001. Quality and farmed salmonids with emphasis on proximate composiotion, yeld and seusory charcteristics, Aquacultre. Trends in Plant Science **32,** 767-786. http://dx.doi.org/10.1046/j.1365-2109.2001.00617.x

Shearer KD. 1994. Factors affecting the proximate composition of cultured fishes with emphasis on Salmonids.Journal of Aquaculture Trends in Plant Science **119,** 63-88. http://dx.doi.org/10.1016/0044-8486(94)90444-8

Weatherly AH, Gill HS. 1997. The Biology of Fish Growth. Academic Press, London.

Yiping L, Qingda H, Yurong Z, Shuting L, Wen W. 2013. Comparison of the body proximate compositions of juvenile bronze gudgeon (*Coreius heterodon*) and largemouth bronze gudgeon (*C.guichenoti*) in the upstream region of the Yangtze River. Springer Plus journal **2,** 75. http://dx.doi.org/10.1186/2193-1801-2-75