▼ Journal of Research (Science), Bahauddin Zakariya University, Multan, Pakistan.
Vol.12, No.2, December 2001, pp. 200-206 ISSN 1021-1012

EFFECT OF ENVIRONMENTAL VARIABLES ON BODY COMPOSITION PARAMETERS OF *CHANNA PUNCTATA*

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Abstract: 57 wild *Channa punctata* from two different locations were selected for the comparison of body composition. 37 fishes were caught from Basti Ratan Wali, Multan (Site 1) and 20 fishes were caught from Talagang (Site 2). The mean values of body constituents varied significantly. The mean values of % fat and % organic contents were higher in site 1 than from fishes of site 2 while the mean values of ash and protein contents were higher in site 2 than site 1. These results of the comparison of body composition of two sites show that fishes of Multan were living in better environment than Talagang.

Keywords: Environmental variables, body composition, parameters, *Channa punctata*

INTRODUCTION

"Proximate body composition" is the analysis of water, fat, protein, and ash contents of the fish [Love 1980]. Carbohydrates and non-protein nitrogen compounds are also important constituents but are present in negligible amounts and are usually ignored for routine analysis [Cui and Wootton 1988]. The live weight of majority of fish usually consists roughly of water, 70-80%, protein, 20-30%, lipid, 2-12% [Love 1980, Weatherley and Gill 1987]. However, the values vary considerably within and between species, and also with size, sexual condition, feeding, time of the year and activity. The distribution of these substances among the various organs and tissues of the body may also show considerable differences [Weatherley and Gill 1987]. Chemical composition has led to the proximate analysis of many species. The expense of large-scale determination of protein and lipid provided an early stimulus for an acceptable shortcut for their determination. Protein content, which is a vital constituent of living cell, tends to vary relatively little in healthy fish, unless drawn upon during particular demands of reproduction or during food deprivation periods. These procedures are also helpful in percentage analysis of body constituents [Love 1980].

Body composition parameters are good [Love 1980, Weatherley and Gill 1987] indicators of the physiological condition of a fish but it is relatively time consuming to measure. Indices of condition that can easily and conveniently be measured prove to be good indicators of the body composition and growth of fish and are essentially needed for routine analysis of fisheries [Love 1980, Salam *et al*. 1991].

In general, it has been observed that a number of physical, abiotic and biotic factors affect the body composition parameters. These factors may be morphological, physiological, environmental and genetic in nature.

Channa punctata is an important member of fresh water fishes and it is commercially important due to its food value [Mirza 1990]. This fish prefer to live in muddy waters and streams and they have adapted to live in stagnant waters [Moyle and Cech 1998]. *Channa punctata* is carnivore in habit, prolific breeder, development is very rapid, matures in first year and attains maximum length of 30 cm [Talwar and Jhingran 1991].

In view of growth potential and popularity among fish consumers, present study was undertaken with an aim to monitor the growth and to compare the body composition of *Channa punctata* in wild conditions selecting two different sites using the technique of body composition parameters, as a tool to asses the growth of fishes in different environments as suggested by [Weatherley and Gill 1987]. This technique has been applied on a number of fish species [Salam and Janjua 1991, Salam and Mahmood 1993, Salam *et al.* 1993] and reviewed by Wootton [1990, 1998]. The two study sites vary geographically in such a way that site 1 (Multan) is in Indus flood plains and site 2 (Talagang) is located in salt range.

MATERIALS AND METHODS

Two different ecological regimes, i.e. Basti Ratan Wali, Multan and Talagang, District Chakwal were selected for this study during February 2000 to May 2000. The fishes were selected at random for present study. The fishes were killed, blotted dry, weighed to nearest 0.01g using an electronic digital top-pan balance and their length measured to nearest 0.1cm on fish measuring board. Body composition was determined by the methods of Love [1980], Weatherley and Gill [1987], Cui and Wootton [1988], Wootton [1990], Salam and Janjua [1991], Salam and Mahmood [1993], Salam and Davies [1994].

Excel and Minitab were used for statistical analysis, which included regression and calculation of correlation coefficient. Calculation of t-test and comparison of slopes were done following [Zar 1996].

RESULTS

When log total length of both sites were plotted against log total body constituents i.e. log total fat, log total ash, log total protein and log total organic content, it was observed that value of ‘b’ is better for site 1 than for site 2 for fat (Site 1, b = 2.66; Site 2, b = 1.39) and organic contents (Site 1, 2.67; Site 2, 2.04) (Fig. 1 a - d) while site 2 has better ‘b’ value for ash (Site 1, b = 2.95; Site 2, b = 3.57) and protein contents (Site 1, b = 2.66; Site 2, 2.99) (Fig. 1 c, d) than site 1.

When log wet weight of both sites was plotted against log total body constituents, i.e. log total fat, log total ash, log total protein and log total organic content, It was observed that value of ‘b’ is better for site 1 than for site 2 for fat contents (Site 1, b = 0.91; Site 2, b = 0.73; Fig. 2a) while site 2 has better ‘b’ value for ash (Site 1, b = 0.99; Site 2, b = 1.36; Fig. 2b) and protein contents than site 1 (Site 1, b = 0.91; Site 2, 1.27; Fig. 2c)

and organic contents have almost equal 'b' values for both sites (Site 1, b = 0.914; Site 2, b = 0.916; Fig. 2d).

The results of the comparison of body composition of *Channa punctata* from two different sites shows that *Channa punctata* of site 1 was living in better environment than *Channa punctata* from site 2. This is obvious from better 'b' values of body constituents of site 1 than site 2.

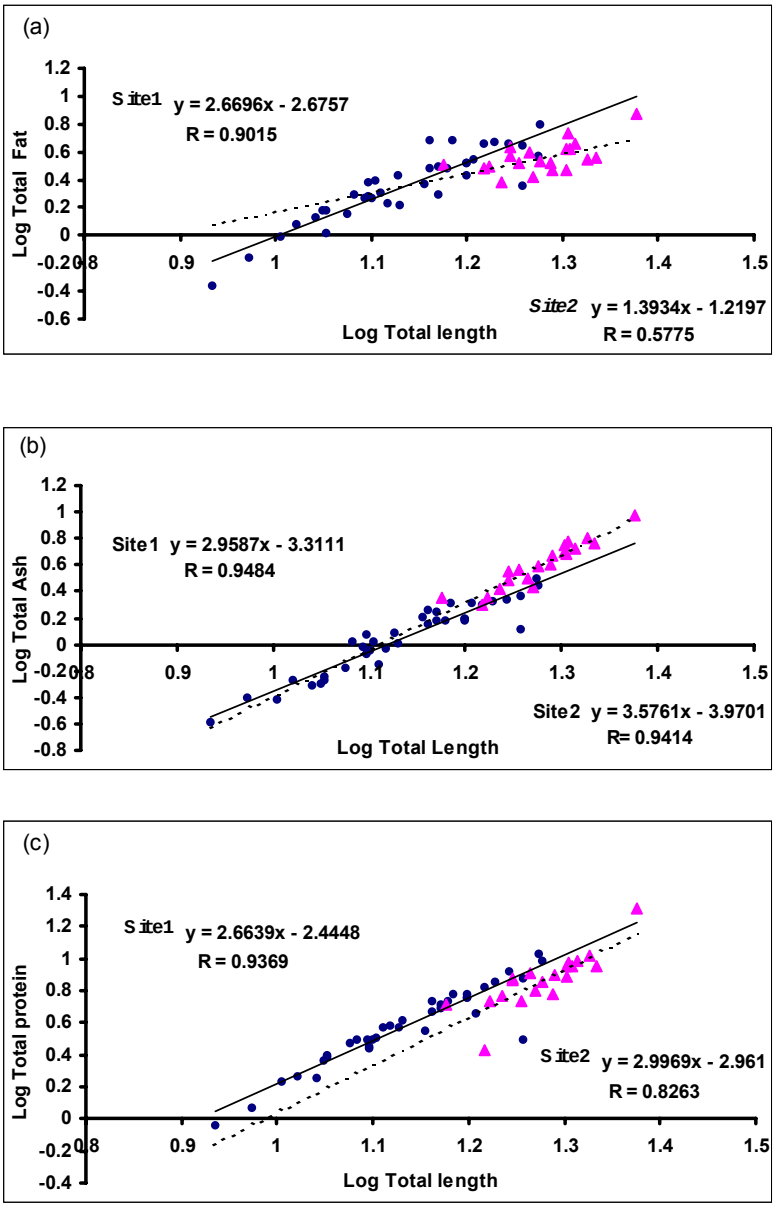

Fig. 1: Continued.

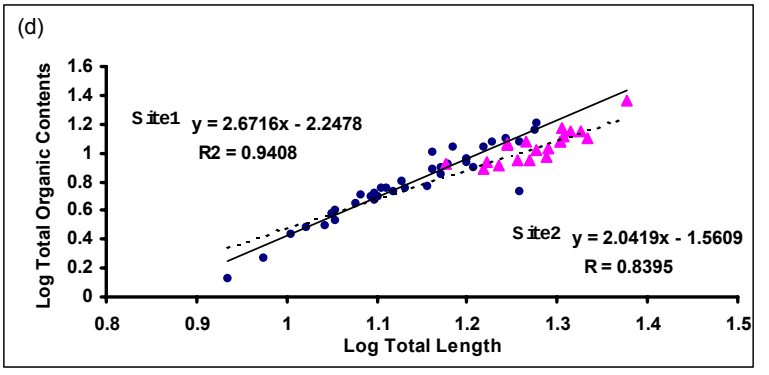

Fig. 1: The comparison of the relationship between log total length and (a) log total fat, (b) log total ash, (c) log total protein, (d) log organic contents of *Channa punctata* of two selected sites (site 1= Multan, site 2= Talagang). The regression equations are given on figures (straight line for site 1 and dotted line for site 2).

Table 1: Comparison of body composition of *Channa punctata* from two different ecological regimes.

Body constituent	Site 1	S.D	Site 2	S.D
% Water content	71.8	3.02	75.1	1.94
Fat (% wet weight)	8.94	1.8	6.01	1.05
Fat (% dry weight)	31.44	4.25	24.26	4.04
Ash (% wet weight)	4.36	0.64	6.6	1.29
Ash (% dry weight)	15.68	2.35	26.45	4.18
Protein (% wet weight)	14.84	1.89	12.3	2.09
Protein (% dry weight)	52.7	4.74	49	6.62
Organic (% wet weight)	23.82	2.84	18.26	1.54
Organic (% dry weight)	85.29	3.35	73.6	6.22

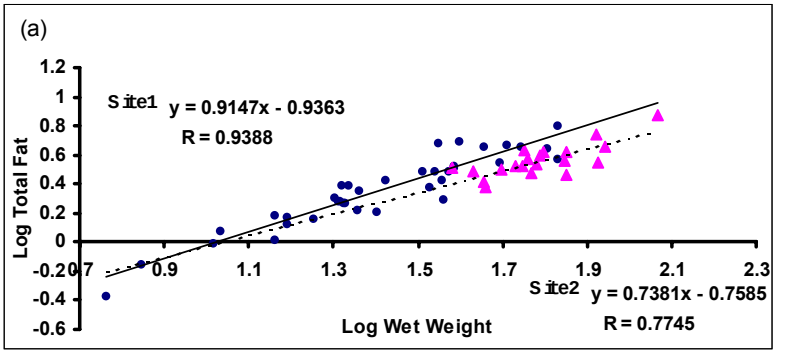

Fig. 2: Continued.

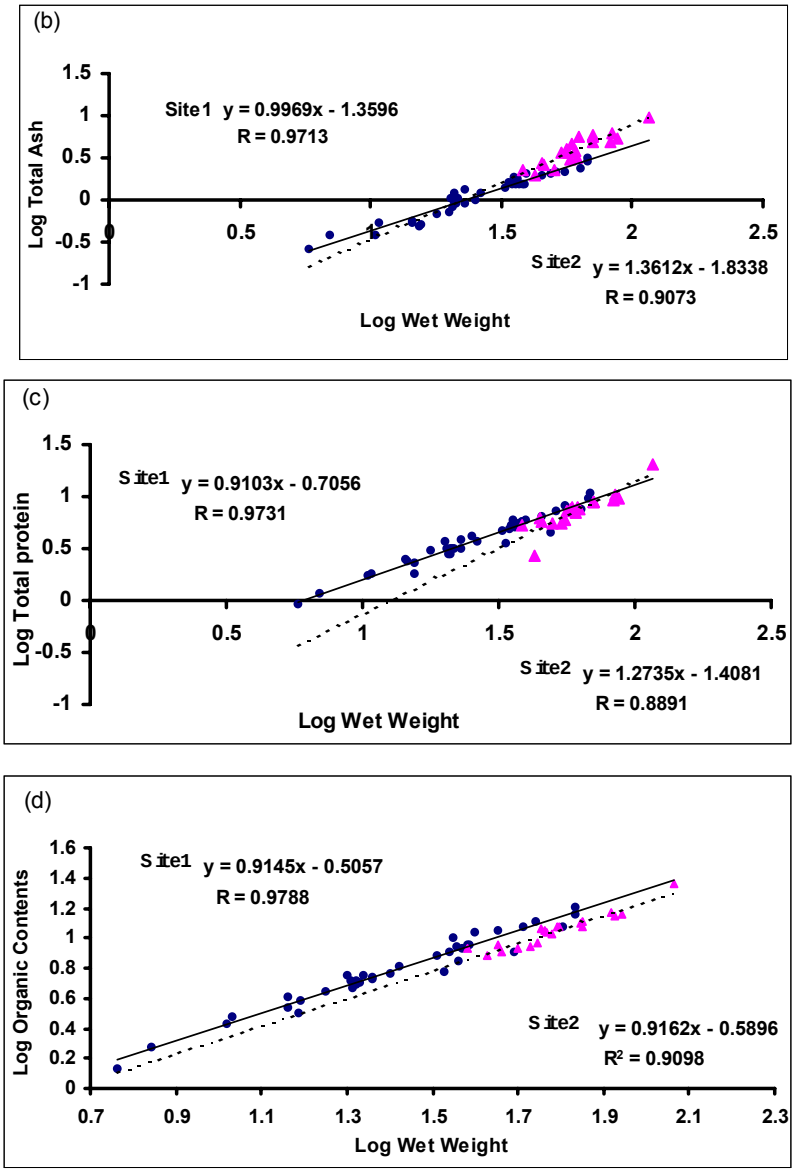

Fig. 2: The comparison of the relationship between log wet weight and (a) log total fat, (b) log total ash, (c) log total protein, (d) log organic contents of *Channa punctata* of two selected sites (site 1= Multan, site 2= Talagang). The regression equations are given on figures (straight line for site 1 and dotted line for site 2).

DISCUSSION

The comparison of body composition and growth performance of *Channa punctata* from two different ecological regimes shows that although the 'b' value of both sites is less than b = 3.0 but *Channa punctata* from site 1

has better health conditions than from site 2. This difference in 'b' value may be due to the fact that fishes from site 1 were sampled from a natural pond while fishes of site 2 from a natural pond mixed with sewage water. The effect of this factor is obvious from the comparison of body constituents (% body weights) of both sites (Table 1). Similar conclusions were drawn when body constituents, i.e., fat, ash, protein and organic content, of both sites were compared.

When an allometric approach developed initially [Huxley 1942] and proposed and reviewed recently [Weatherley and Gill 1987], was applied here, it showed that slope 'b' of log regression of the relationship between total body constituents and body length and weight when compared with b = 1 or b = 3 (an isometric slope) is a good predictor for isometric or allometric increase of their constituents. This approach has been used for many fish species by various investigators [Shearer 1984, Salam and Davies 1994] and advocated to develop predictive equations using length or weight as a predictor for total body constituents rather than percentages. The predictive equations in the present study indicate that regression model can be used to accurately predict whole body level of water, protein, fat, ash and organic content at specific fish length and weight.

These results confirm the observations of many fishery biologists that body composition of the same fish may vary in different conditions. These variations may be due to different feeding conditions, different water quality, state of maturity and sex [Hile and Jobes 1940, Frost 1945, LeCren 1951, Stansby 1954, Brett *et al.* 1969, Craig *et al*. 1989, Javaid *et al.* 1992].

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