http://www.pjbs.org

PJBS

ISSN 1028-8880

# Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 5 (10): 1123-1125, 2002


# Growth Performance of *Channa punctata* from Two Ecological Regimes of Punjab, Pakistan

Muhammad Ali, Abdus Salam, Furhan Iqbal and Bakhtyawar Ali Khan
Zoology Division, Institute of Pure and Applied Biology,
Bahauddin Zakariya University, Multan, Pakistan

**Abstract**: Growth of fish population from two sites was significantly different from each other (comparison of b = 2.9 and 2.29 P < 0.001). Condition factor also showed similar trend. Mean value of condition factor for site 1, K = 1.04 and mean condition factor for site 2, K = 0.75. Growth performance was higher in site 1 than fishes of site 2. It is concluded that the conditions for growth of *Channa punctata* were better at site 1, i.e., Basti Rattan Wali, Multan than at site 2, i.e., Talagang, Chakwal.

**Key words:** Growth performance, *Channa punctata*, ecological regimes, condition factor

## Introduction

The term growth signify change in mass and the variables undergoing this change may be length or weight, volume or mass, either organism's whole body or of its various organs and tissues or it may be related to the body components i.e. organs and tissues. Growth may also be related to change in number of animals in a population (Weatherly and Gill, 1987).

*Channa punctata* is an important member of fresh water fishes and is commercially useful due to its food value (Mirza, 1975; 1990). This fish prefers to live in waters of muddy streams and they have also adapted to live in stagnant waters (Moyle and Cech, 1998). *Channa punctata* is a carnivore in habit, prolific breeder, development is rapid, matures in first year and attains maximum length of 30 cm (Talwar and Jhingran, 1991).

In view of its growth potential and popularity among fish consumers, present study was developed with an aim to monitor and compare the growth of *Channa punctata* in wild conditions selecting two different sites using the technique of mass-length and condition factor parameters as a tool as suggested by Weatherley and Gill (1987). This technique has been applied on a number of fish species by Khan *et al.* (1991), Salam and Janjua (1991, 1992), Javaid *et al.* (1992), Salam and Mahmood (1993) and Salam *et al.* (1993) and reviewed by Wootton (1990, 1998). The objective of the current study was to compare the growth performance of the fish at two sites having different ecological regimes

## Materials and Methods

Basti Rattan Wali, Multan District and Talagang, Chakwal District were selected for this study during February to May 2000. The two selected sites were different from each other in such a way that site 1 is located in the plains of southern Punjab which is canal irrigated area, while site 2 is located in Potohar region of northern Punjab which is semi mountainous rain fed area. The fish were selected at random and killed, blotted dry, weighed to the nearest 0.01 g using an electronic digital top-pan balance (Chyo, Japan). Their length was measured to the nearest 0.1 cm on fish measuring board. Condition factor (K) for each fish was calculated using the formula of Weatherly and Gill (1987), Wootton (1990, 1998).

Using computer packages Excel and Minitab statistical analysis was carried out including regression analysis and calculation of correlation coefficient. Calculation of t-test and comparison of slopes were done by Zar (1996).

## Results

The relationship between wet body mass (M) and total length (TL) of *Channa punctata* from two different ecological regimes was exponential (Fig. 1) having the general form:

$$M = a L^b$$

When the data was logarithmically transformed, a linear relationship was obtained having the general form:

$$\log M = \log a + b \log L$$

The values of the constants (a=intercept and b= slope) and regression parameters are given (Table 1). It was observed that growth of *Channa punctata* was significantly different at two sites. The growth was significantly higher at Basti Rattan Wali, Multan (b = 2.9) than at Talagang ( b = 2.29). When slope "b" of each site was compared with isometric slope b = 3 (Cube Law), it was observed that the value of b for both sites was lower than b = 3 indicating a negative allometry (Fig. 2).

Condition factor (K) of both sites when correlated with wet body mass (M) or length (TL), it was found to be unaffected by length or weight of both sites. Multiple comparisons showed that condition factor at site 1 was significantly higher than at site 2 (Figs. 3 and 4). It was therefore concluded that *Channa punctata* at site 1 achieved better condition and its growth performance was comparatively better than at site 2.

## Discussion

In fish, weight is considered to be a function of length. According to Wootton (1998), if the fish retains the same shape, its specific gravity remain unchanged during lifetime, than it is growing isometrically and the value of exponent 'b' would be exactly 3.0 (Ricker, 1975). A value less than 3.0 shows that the fish become lighter for length, as it grows while an exponent greater than 3.0 indicates that the fish becomes heavier for its length as it increases in size.

In present study, value of b = 2.9 for site 1 and b = 2.29 for site 2 shows that *Channa punctata* of both sites are growing with negative allometry showing exponentially slow growth. This is also interesting that cube law (b = 3.0) appears to be violated in both sites due to less gain in relative weight. Many species have been reported not to conform to cube relationship as shown here by *Channa punctata* (Javaid and Akram, 1972; Rafiq, 1992; Salam and Sharif, 1997) (Table 2). The cube law may be held in some cases (Salam and Janjua, 1991; Salam and Davies, 1992; Salam and Khaliq, 1992; Salam *et al.*, 1993).

Most fishes do not conform to the cube law because they change their shape with growth (Martin, 1949) and the exponent 'b' may have values significantly lower or higher than 3.0. The value of 'b' may vary with feeding (Le Cren, 1951), state of maturity (Frost, 1945), sex (Hile and Jobes, 1940) and furthermore between different populations of a species (Hile, 1936; Jhingran, 1968) indicating the taxonomic differences in small populations which is also evident from the present study.

Condition factor (K) remains constant with increasing body size for *Channa punctata* from both sites showing that condition

Table 1: Weight-length relationship of *Channa punctata* involving wet weight, total length and condition factor: correlation coefficient (r), intercept (a), regression coefficient (b) and standard error of b (SE)

| Site | Relationship | N | r | a | b | SE (b) | T-value B = 3 |
|---|---|---|---|---|---|---|---|
| 1 | Log total length (x) Log wet weight (y) | 37 | 0.9544*** | -1.8647 | 2.88 | 0.1535 | 0.756$^{ns}$ |
| | Total length (x) Condition factor (y) | 37 | 0.221$^{ns}$ | 0.95 | 0.006 | 0.0045 | 0.04$^{ns}$ |
| | Wet weight (x) Condition factor (y) | 37 | 0.2437$^{ns}$ | 1.01 | 0.001 | 0.0007 | 0.011$^{ns}$ |
| 2 | Log total length (x) Log wet weight (y) | 20 | 0.9055*** | -1.1487 | 2.29 | 0.2556 | 2.75* |
| | Total length (x) Condition factor (y) | 20 | 0.2798$^{ns}$ | 1.01 | -0.007 | 0.0202 | 0.021$^{ns}$ |
| | Wet weight (x) Condition factor (y) | 20 | 0.0073$^{ns}$ | 0.86 | 0.001 | -- | -- |

ns = non significant * = P < 0,05 *** = P < 0.001 1 = Basti Rattan Wali 2 = Talagang

Table 2: Weight-length and condition of various fish species

| Species | a | b | K | Source |
|---|---|---|---|---|
| *Catla catla* | -1.45 | 2.66 | 1.16 - 1.41 | Javaid and Akram (1972) |
| *Labeo rohita* | -2.04 | 3.06 | 0.83 - 1.32 | Salam and Janjua (1991) |
| *Cirrhinus mrigala* | -2.03 | 3.02 | -- | Salam and Khaliq (1992) |
| *Rita rita* | -2.13 | 3.1 | 0.85 - 1.34 | Rafiq (1992) |
| *Cirrhinus reba* | -1.42 | 2.47 | 0.79 - 0.97 | Salam and Sharif (1997) |
| *Notopterus chitala* | -2.52 | 3.2 | 0.47 - 0.74 | Salam and Sharif (1997) |
| *Channa punctata* (site 1) | -1.88 | 2.9 | 0.84 - 1.17 | Present study |
| *Channa punctata* (site 2) | -1.13 | 2.28 | 0.3 - 1.13 | Present Study |

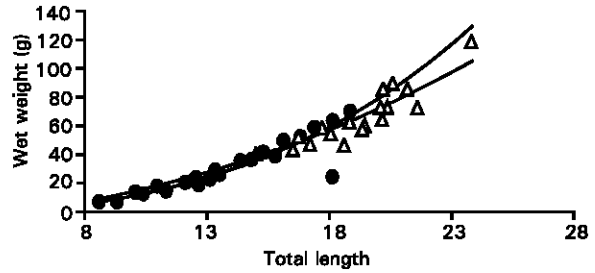


Fig. 1: The relationship between total length and wet weight of *Channa punctata* (circles for site 1 and triangles for site 2)

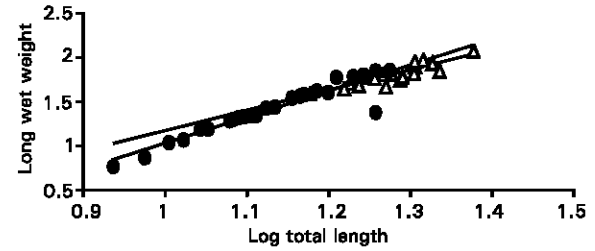


Fig. 2: The relationship between total length and log weight of *Channa punctata* (symbols as for Fig. 1)

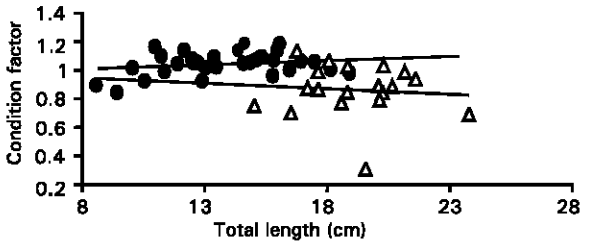


Fig. 3: The relationship between total length and condition factor of *Channa punctata* (symbols as for Fig. 1)

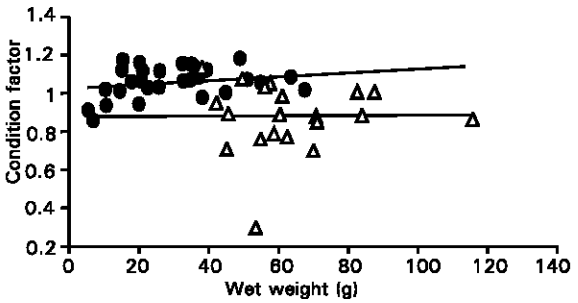


Fig. 4: The relationship between total length and condition factor of *Channa punctata* (symbols as for Fig. 1)

factor is not affected at all by increasing body length and mass of fish but the mean value of 'k' was comparatively better for site 1 (K = 1.04) than for site 2 (K = 0.75). It is therefore concluded that better living conditions led to improve the condition factor of the fish. The results from the present study suggest that the living condition of the site: 1 Basti Rattan Wali Multan were better than Talagang, Chakwal.

## References

Frost, W.E., 1945. The age and growth of eels (*Anguilla anguilla*) from the Windermere catchment area. Part 2. J. Anim. Ecol., 4: 106-124.

Hile, R. and F.W. Jobes, 1940. Age, growth, and production of the yellow perch. *Perca flavescens* (Mitchill), of Saginaw Baya. Trans. Am. Fish. Soc., 70: 102-122.

Hile, R., 1936. Age and growth of Cisco, *Leucichthys artedi* (LeSuer) in the lakes of North Eastern high land, Wisconsin. Bull. U.S. Bur. Fish Wash., 48: 211-217.

Javaid, M.Y., A. Salam, M. N. Khan and M. Naeem, 1992. "Weight-length and condition factor relationship of a fresh water wild Mahaseer (*Tor putitora*) from Islamabad (Pakistan)". Proc. Pak. Cong. Zool., 12: 335-340.

Javaid, M.Y. and M. Akram, 1972. "The length-weight relationship and condition of seven fresh water fishes of Pakistan". Bull. Dept. Zool. Univ. Punjab, Article, 6: 1-27.

Jhingran, V.G., 1968. Synopsis of the biological data of *Catla catla* (Ham.) 1822, FAO Fish Synopsis (32) Rev. 1.

Khan, M.S., M.A. Ambak, K.J. Ang and K.M. Mohsin, 1991. Length-weight relationship and relative condition of a Malaysian freshwater catfish, *Mystus nemurus* Cuvier and Valenciennes, in Chenderoh Reservoir. J. Fish Biol., 22: 373-376.

Le Cren, E.D., 1951. "The weight-length relationship and seasonal cycle in gonad weight and the condition in Perch (*Perca fluviatilis)*". J. Anim. Ecol., 20: 201-219.

Martin, W.R., 1949. The mechanics of environmental control of body form in fishes. Univ. Toronto Stud. Biol., 58: 1-91.

Mirza, M.R., 1975. Fresh Water Fishes Zoogeography of Pakistan. Bijdr. Dierk., 45: 143-180.

Mirza, M.R., 1990. Fresh Water Fishes of Pakistan (Urdu Ed.). Urdu Science Board, 299, Upper Mall, Lahore, pp: 6-130.

Moyle, P.B. and J.J Cech, 1998. "Fishes, an Introduction to Ichthyology". Prentice Hall, Englewood Cliffs, New Jersey 07632. pp: 60-98.

Rafiq, M.A., 1992. Body composition of wild Rita (*Rita rita*) in relation to body size and condition factor. M. Sc. Thesis, Dep. Zool., Govt. College, Multan, Pakistan.

Ricker, W.E., 1975. Computational interpretation of biological statistics of fish population. Fish. Res. Bd. Can. Bull., 191: 382.

Salam, A. and J.A. Mahmood, 1993. Weight-length and condition factor relationship of a fresh water under yearling wild *Catla catla* (Hamilton) from River Chenab (Multan). Pak. J. Zool., 25: 127-130.

Salam, A. and P.M.C. Davies, 1992. Weight-length relationship of fresh-water gold fish, *Carassius auratus* L. Pak. J. Zool., 24: 329-331.

Salam, A. and M.Y. Janjua, 1992. The relationship between changes in body size, condition factor and body composition in young rohu (*Labeo rohita*). J. Res. Sci, 4: 7-13.

Salam, A. and M.Y. Janjua, 1991. Morphometric studies in relation to body size of farmed Rohu, *Labeo rohita*. A culturable major carp from Multan. J. Res. Sci., 3: 59-63.

Salam, A. and R. Khaliq, 1992. Weight-length and condition factor relationship of a farmed mrigal, *Cirhinus mrigala*. J. Res. Sci., 4: 15-18.

Salam, A. and Z. Sharif, 1997. Body composition and meat quality studies of some riverine commercial fishes. M.Sc. Thesis, B. Z. Univ. Multan.

Salam, A., M. Ali, A.M. Chatta. and Q.U. Zaman, 1993. Growth performance of cultured exotic Silver Carp (*Hypophthalmichthys molitrix*) under semi-intensive forming: An ecological approach. Acta Sci, 3: 89-100.

Talwar, P.K. and A.G. Jhingran, 1991. Inland Fishes. Vol. 2, IBH Publish. Co. Pvt. Ltd, Bombay, pp: 25-79.

Weatherley, A.H. and H.S. Gill, 1987. The Biology of Fish Growth. Academic Press, London.

Wootton, R.J., 1990. Ecology of Teleost Fishes. 1st ed. Chapman and Hall, London, pp: 43-169.

Wootton, R.J., 1998. Ecology of teleost fishes. 2nd ed. Dordrecht: Kulwer. pp: 7-88.

Zar, J.H., 1996. Biostatistical Analysis. 3rd ed. Prentice Hall: London, pp: 230-465.