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Fish biology

LABORATORY STUDIES ON THE FOOD CONVERSION AND GROWTH IN A HIMALAYAN FISH *NOEMACHEILUS MONTANUS* (McCLELLAND)

BADANIA LABORATORYJNE NAD WYKORZYSTANIEM POKARMU I WZROSTEM *NOEMACHEILUS MONTANUS* (McCLELLAND)

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Laboratory studies were made on the conversion efficieny of food by *Noemacheilus montanus* (McClelland), abundantly found in high, altitude streams of Garhwal Himalaya. The fish were fed and reared on two types food, viz., Natural food (macrozoobenthos) and Commercial fish meal (CFM) in different groups for 30 days. There was no marked difference in the feeding rate of *N. montanus* fed on natural food and CFM. The specific growth rate was estimated to be 6.34 ±0.30 and 6.68± 0.11 mg/gm fish/day for natural food and CFM fed groups respectively. The conversion efficiency of the fish reared on CFM was higher in comparison to natural food. A positive correlation was observed between feeding rate and specific growth rate.

INTRODUCTION

The 'loach' (*Noemacheilus montanus* McClelland) is a small sized fish scarcely attracting the attention of fishery biologists in the past, though it is found abundantly in the high altitude fluvial system of Garhwal Himalaya. Availability of food in terms of quality and quantity is recognised as one of the major factors regulating the biomass of fish (Brown 1957). Studies on food conversion has its importance due to its application in resource management. The success of any culture is dependent upon the availability of suitable food for survival and growth of fish during early stages. Therefore, utilization of artificial food will pave the way for improving the survival and growth of fish in the intensice fish culture.

Considerable work has been done on the food conversion efficiency of freshwater fishes by Galinat (1960), Pandian (1967), Shireman et al. (1980) Sukumaran and Paulraj

Table 1

Food intake, growth, specific growth rate and conversion efficiency along with 95% confidence limit in *Noemacheilus montanus*. The values are mean of ten individuals (mean± SD)

S. No.	Group	Body weight (mg)	Food intake (mg/fish/ /day)	Feeding rate (mg/fish/ /day)	Growth (mg/fish/ /day)	Specific growth rate (mg/fish/day)	Conversion efficiency k_1 (%)
1.	Natural food fed (Control)	832.72 ± 24.33	61.79± 3.25	74.35± 5.32	5.27± 0.13	6.34± 0.30	8.55± 0.42
	95% confidence limit	–	± 5.96	± 10.14	± 0.24	± 0.54	± 0.77
2.	Commercial fish meal fed (Experimental)	799.81 ± 15.72	62.29± 2.99	77.87± 2.38	5.35 ± 0.11	6.68± 0.11	8.59± 0.19
	95% confidence limit	–	± 4.20	± 4.38	± 0.19	± 0.21	± 0.34

(1984), Nandecsha et al. (1989). However, very littlie information is available on the food conversion efficiency of hillstream fishes of Garhwal Himalaya (Juyal et al. 1990). The present study is aimed for developing a scientific approach to the fish culture in this mountainous region. Therefore, it will have an immense applied value.

MATERIALS AND METHODS

The live specimens of *Noemacheilus montanus* (783–862 mg) were collected from the small streams of Garhwal Himalaya (Latitude 32°0′ –32°57′ N, longitude 80°0′ – 80°11′ E), brought to the laboratory and acclimatized for 30 days (temperature 11.0 ±1.0°C, dissolved oxygen 9–10 ppm and moderate photoperiod of 10–12 hours) in the experimental aquaria. The aquarium water was continuously areated to maintain the required oxygen level. The fishes were reared on 'natural food' (macrozoobenthos) (Control Group) and 'commercial fish meal' (CFM, Experimental group) in different groups of ten individuals each. The uneaten food was removed from the aquaria on the next day. Thus, feeding continued for 30 days.

The various parameters of energetics were determined as follows –

$$\text{Feeding rate (specific growth rate) (mg/gm fish/day)} = \frac{\text{Food consumed (growth)}}{\text{Initial biomass X days}}$$ (Kosi Onodera 1962)

$$\text{Conversion efficiency } K_1 (\%) = \frac{\text{Growth}}{\text{Food intake}} \times 100$$ (Reddy et al. 1977)

$$\text{Food conversion ration} = \frac{\text{Total dry weight of food (food required) (Kg)}}{\text{Total wet weight gain (Flesh production) (Kg)}}$$ (Krishnan and Reddy 1983–84)

The results were confirmed by repeating the experiments under similar conditions.

RESULTS AND DISCUSSION

As evident from the data (table 1), the feeding rate of *N. montanus* fed CFM is relatively higher than the specimens fed on natural food. These values of feeding rates (74.35±5.32 and 77.87±2.38 respectively) are lower when compared with those of *Heteropneustes fossilis* (217.26, Reddy and Katre 1979), *Tor putitora* (200.58 for CFM and 181.28 for natural food; Juyal 1991) and *Barilius bendelisis* (158.48 for CFM and 166.66 for natural food; Sharma et al. 1991). The food intake is governed by the development of appetite which, in turn, depends upon the amount of food remaining in the gut (Brett 1971 and Pandian 1975).

The specific growth rate was observed to be 6.34 and 6.68 mg/gm fish/day for natural food and CFM fed groups of *N. montanus* respectively. Thus, the perusal of data

Table 2

Statistical relationships between feeding rate and Specific growth rate in *Noemacheilus montanus*

S. No.	Group	Regression coefficient (b)	Correlation coefficient (r)
1.	Natural food fed groups	0.0410	0.7674
2.	CFM fed groups	0.0368	0.7760

reveals that each gm of initially stocked biomass of fish produces 6.34 mg biomass from the consumption of 74.35 mg/gm fish/day natural food (Table 1). A positive correlation was observed between feeding rate and specific growth rate in natural food fed (0.7614) and CFM fed (0.7760) groups of *N. montanus* (Table 2). The feeding rate is not the only factor responsible for a better growth but the stress, choice of food, quality and quantity of food, temperature and favourable environmental conditions to affect the growth (Jobling 1983).

The present study shows that there is no significant difference in conversion efficiency of *N. montanus* reared on the natural food and CFM (Table 1). The 95% confidence limit indicates that true mean of conversion efficiency stands between 8.55 ±0.77 and 8.59 ± 0.34 in natural food fed and CFM fed groups. The conversion ratio (14.99 : 1) of CFM fed groups is higher as compared to natural food fed groups of *N. montanus* (Table 3), and these conversion ratio are very low with the similar values of *Rasbora daniconius* (Nagendran 1980), *Mystus vittatus* (Arunachalam and Reddy 1981),*Barilius bendelisis* and *T. putitora* (Juyal 1991) (Table 3). However, the conversion ratio for natural food fed and CFM fed groups of *N. montanus* are higher than those of *Anguilla nebulosa* (19.60 : 1) (Reddy et al. 1977).

On the basis of the present study, it may be inferred that *N. montanus* prefers artificial food (CFM) in addition to the natural food. So these foods may be tried as artificial or supplementary foods while culturing these fishes.

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Table 3

Food conversion ration in some freshwater teleosts

S. No.	Name of fish species	Food type	Body weight (mg)	Conversion ratio	References
1.	*Noemacheilus montanus* (McClelland)	*macrozoobenthos*	805–862	15.93 : 1	present work
		CFM	783–825	14.99 : 1	"
2.	*Tor putitora* (Hamilton)	*macrozoobenthos*	250–264	3.07 : 1	*Juyal* 1991
		CFM	219–282	3.12 : 1	"
3.	*Barilius bendelisis* (Hamilton)	*macrozoobenthos*	468–524	5.75 : 1	"
		CFM	495–689	8.81 : 1	"
4.	*Anguilla nebulosa* (McClelland)	*Tubifex spp.*	110–562	19.60 : 1	*Reddy* et al. 1977
5.	*Channa gachua* (Hamilton)	"	831–987	2.80 : 1	*Krishnan* and *Reddy* 1983–84
6.	*Mystus vittatus* (Bloch)	"	757–1064	8.90 : 1	*Arunachalam* and *Reddy* 1981
7.	*Rasbora daniconius* (Hamilton)	"	425–775	10.20 : 1	*Nagendran* 1980

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BADANIA LABORATORYJNE NAD WYKORZYSTANIEM POKARMU I WZROSTEM *NOEMACHEILUS MONTANUS* (McCLELLAND)

STRESZCZENIE

Badania dotyczyły efektywności wykorzystania pokarmu przez *Noemacheilus montanus*, gatunku licznie występującego w wysoko położonych strumieniach Garhwal Himalaya.

Rybom zadawano 2 typy pokarmu; pokarm naturalny (makrozoobentos) i mączkę rybną (CFM) i podawano go różnym grupom doświadczalnym ryb przez 30 dni. Nie stwierdzono istotnych różnic w szybkości żerowania doświadczalnych grup ryb.

Tempo wzrostu dla grupy ryb karmionej pokarmem naturalnym i CFM wynosiło odpowiednio 6,34 ± 0,30 i 6,68 ± 0,11 mg/g ryby/dzień.

Efektywność wykorzystania pokarmu przez ryby karmione CFM była wyższa niż ta określona dla pokarmu naturalnego. Zanotowano korelację między intensywnością żerowania a tempem wzrostu ryby.

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