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BREEDING, AGE AND GROWTH OF THE FRESHWATER SHARK *WALLAGO ATTU* (BLOCH AND SCHNEIDER) FROM THE DHIR BEEL OF THE BRAHMAPUTRA BASIN, ASSAM, INDIA.

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ABSTRACT

The Dhir beel, one of the major live beels of the Brahmaputra basin, Assam, has an area of 689 ha and is situated in Dhubri district of Assam. The dominance of freshwater shark, *Wallago attu* (8.10%) in the beel is a striking feature. Restricted breeding of *W. attu* once a year from June to Septemebr was observed. The mean observed length was 37.5, 65.0, 84.5 and 99.0 cm in the 6th, 12th, 18th and 24th months of age respectively. The length growth coefficient (K), the asymptotic length ($L\infty$), and the arbitrary origin of the growth curve (t_0), for *W. attu* were estimated to be 0.054484 per month, 136.16 cm and 0.0355 month respectively. The calculated life span ($T\infty$) of the fish is 123.86 months (about 10 years). The weight growth parameters were estimated where the monthly growth coefficient (K), the asymptotic weight ($W\infty$) and the arbitrary origin of the growth curve (t_0) were found to be 0.0743 per month, 7636.92 gram and 0.431908 month respectively. The length - weight relationship follows the cube law.

INTRODUCTION

The floodplain lakes (locally called as beels) form the most potential fishery resources of the state of Assam covering a total area of 1 lakh ha and are capable of producing an annual fish crop of about 1000 kg/ha (Yadava, 1988). These natural waterbodies are mostly connected with the river Brahmaputra and its tributaries (live beels) and harbour a large number of fish fauna (indigenous to this region) comprising Indian carps, catfishes, featherbacks and *Hilsa ilisha*. Recruitment in the live beels takes place either by inbreeding or by migration from the river or tributaries through the connecting channels.

The Dhir beel, one of the major live beels of the Brahmaputra basin, Assam, has an area of 689 ha. The physico-chemical properties of the soil and water and the biotic components of the beel depict medium to high levels of production potential of up to 160 kg/ha/yr. Further, amongst the catfishes, *W. attu* forms a substantial fishery in the Dhir beel. The abundance of benthic organisms as well as weed fishes in the beel might have favoured the dominance of *W. attu* among the catfishes. The present investigation was taken up to study the breeding, age and growth of *W. attu* from the Dhir beel of the Brahmaputra basin, Assam.

MATERIAL AND METHODS

Recruitment pattern has been traced from the length frequency data collected from the Dhir beel during 1981 -1984 by the Central Inland Capture Fisheries Research Institute (CICFRI) substation at Guwahati. The relative condition factor was estimated in order to decipher the intensity of spawning in different seasons. The spawning intensity of *W.attu* as a function of time was determined by the annual recruitment pattern which was built by retracing the length-frequencies for each month to their zero age by means of the age-length key (Pauly, 1982) in order to indicate the recruits (in % to the total annual recruitment) resulting from each month spawning. The relative condition factor Kn (Le Cren, 1951) was estimated from the following form :

$$Kn = \frac{w}{W} \qquad (1)$$

where, w is the observed weight and W is the

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calculated weight estimated from the equation, $W = a L^b$ ---------- (2)
where, a and b are constant and exponent respectively while L is the length of the fish. Kn was calculated for different lengths and for different months, and used as an index of maturation, spawning and postspawning conditions.

In the scatter diagram of length modes (i.e. from the length- frequency data for *W. attu*) plotted on the ordinates against time in successive months on the abcissa, the progression of modes was traced freehand through time and extrapolated to the time axis in order to identify the number of broods per year class and to determine the growth of successive broods (Devaraj, 1983). The data pertaining to the juvenile stages were transposed wherever necessary for the same month of different years for the purpose of bridging the data gaps to help extrapolate growth lines. Each brood was considered separately for determining length in cm - at - age in months. The mean length - at - age thus calculated was smoothened by a running average of three in order to remove chance fluctuations, if any.

The von Bertalanffy (1938) growth function (VBGF) was fitted (Eq. 3) to the mean length (cm) - at - age (months) data computed from the results of modal progression analysis,

$$l_t = L\infty \ (1 - e^{-K (t - t_0)}) \text{---------- (3)}$$

The growth parameters in Eq. 3 namely, the asymptotic length ($L\infty$), the growth coefficient (K) and the arbitrary origin of the growth curve (t_0) were calculated by Bagenal's (1955) method.

The age of the fish for a given length has been derived from the growth formula (Eq.3) by taking log e on both sides of the equation. In order to find out the value of $T\infty$ corresponding to $L\infty$, a value of l_t very close to $L\infty$ was substituted in the growth equation.

Six hundred and twentysix *W. attu* of both the sexes were used for length-weight relationship. The weight W in gram - at - length (L) in cm relationship (Eq.2) was fitted. The weight growth parameters for fitting the von Bertalanffy equation (Eq.4) for the weight - at - age,

$$W_t = W\infty \ (1 - e^{-K (t - t_0)})^3 \text{-------- (4)}$$

were solved by Bagenal's (1955) method.

RESULTS AND DISCUSSION

Recruitment into the *W. attu* stock in Dhir beel was rather high at 4.16, 5.64, 4.56, 3.53 and 3.63 % in the months of January, February, March, April and May respectively, lowest during June at 1.52 % and July at 0.99%, but again increased from August at 2.49 to 3.66, 4.78, 3.84 and 2.75 % in the months of September, October, November and December (Table I). This evidently supports the earlier observation by Qasim and Qayyum (1962) that breeding of *W. attu* is restricted but prolonged till the end of the monsoon during June to September.

Table I : *Recruitment pattern (%) according to months for W. attu during 1980 - 1984.*

Year	J	F	M	A	M	J	J	A	S	O	N	D
1980	-	-	-	-	-	-	-	18.18	22.73	22.73	22.27	9.09
1981	0.97	0.14	0.14	0.56	1.67	1.53	3.75	6.11	16.67	32.78	21.25	14.44
1982	35.93	19.76	7.78	7.19	9.58	4.79	2.99	2.99	1.80	0.60	1.20	5.39
1983	8.11	27.02	13.51	10.81	16.22	9.46	2.70	2.70	2.70	1.35	1.35	4.05
1984	4.88	20.73	32.93	23.78	12.80	2.44	2.44	-	-	-	-	-
Monthly Average	4.16	5.64	4.53	3.53	3.36	1.52	0.99	2.49	3.66	4.79	3.84	2.75

The relative condition factor Kn for different months revealed considerable variation. It was high in June and December, moderate in July and October and low from January to May and in August, September and Novermber (Fig.1) Kn values were high in the length groups in the range of 15.0 cm to 30.0 cm, but almost steady in the range of 35.0 cm to 90.0 cm (Fig. 2). Freehand curves drawn through the length modes indicated restricted breeding of *W. attu* once a year from June to September (Fig.3).

The mean observed growth in length in cm - at - age in months was 37.5, 65.0, 84.5 and 99.0 cm in the 6th, 12th, 18th and 24th months respectively. The length growth coefficient (K), the asymptotic length ($L\infty$) and the arbitrary origin of the growth curve (t_0) for the species were estimated to be 0.05 per month, 136.16 cm and 0.04 month respectively. The lengths estimated by the von Bertalanffy's equation 37.8, 65.2, 84.9 and 99.26 cm at the age of 6th, 12th, 18th and 24th months respectively agree well with the observed lengths. The estimated life span ($T\infty$) of the fish is 123.86 months (about 10 years).

The length (L in cm) and weight (W in grams) relation based on the observed data on total length L (cm) and the corresponding total weight W (gram) is fitted (Fig.4) by Eq.5 as follows

$$W = 0.07\ L^{2.9} \text{---------- (5)}$$

where r^2 value was found to be 0.98.

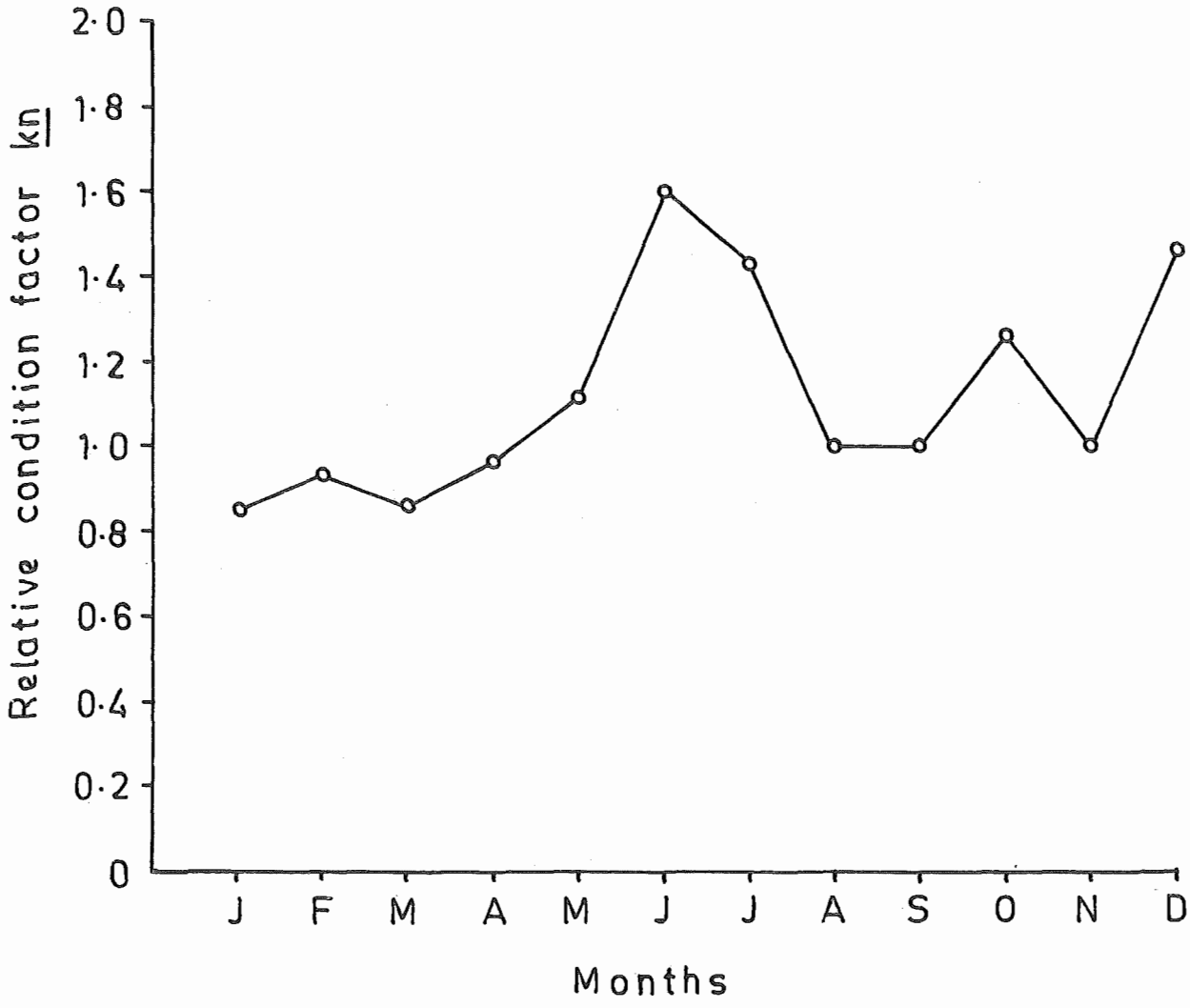

Fig. 1 : *Monthwise relative condition factor (Kn) for W. attu (M + F).*

The weight growth parameters were estimated for the weight (g) data. The monthly growth coefficient (K), the asympototic weight ($W\infty$) and the arbitrary origin of the growth curve (t_0) were estimated to be 0.07, 7636.9 g and 0.43 month respectively.

A high rate of growth in *W. attu* was observed in Dhir beel. Growth rates vary in different ecosystems, as can be observed from Table 2 for different species. The higher values of $L\infty$, $W\infty$ and K for *W. attu* in the present study vividly reflect the very high productivity and ample food for the fish in Dhir beel. The size of 70 cm attained by *W.attu* in the first year in Indian waters (Jayaram, 1977) is very close to the calculated length of 65 cm in the first year, in the present study. Further, the asymptotic length ($L\infty$) calculated for the species (136.16 cm) is close to the highest length (103 cm) observed in the length frequency data in the present study.

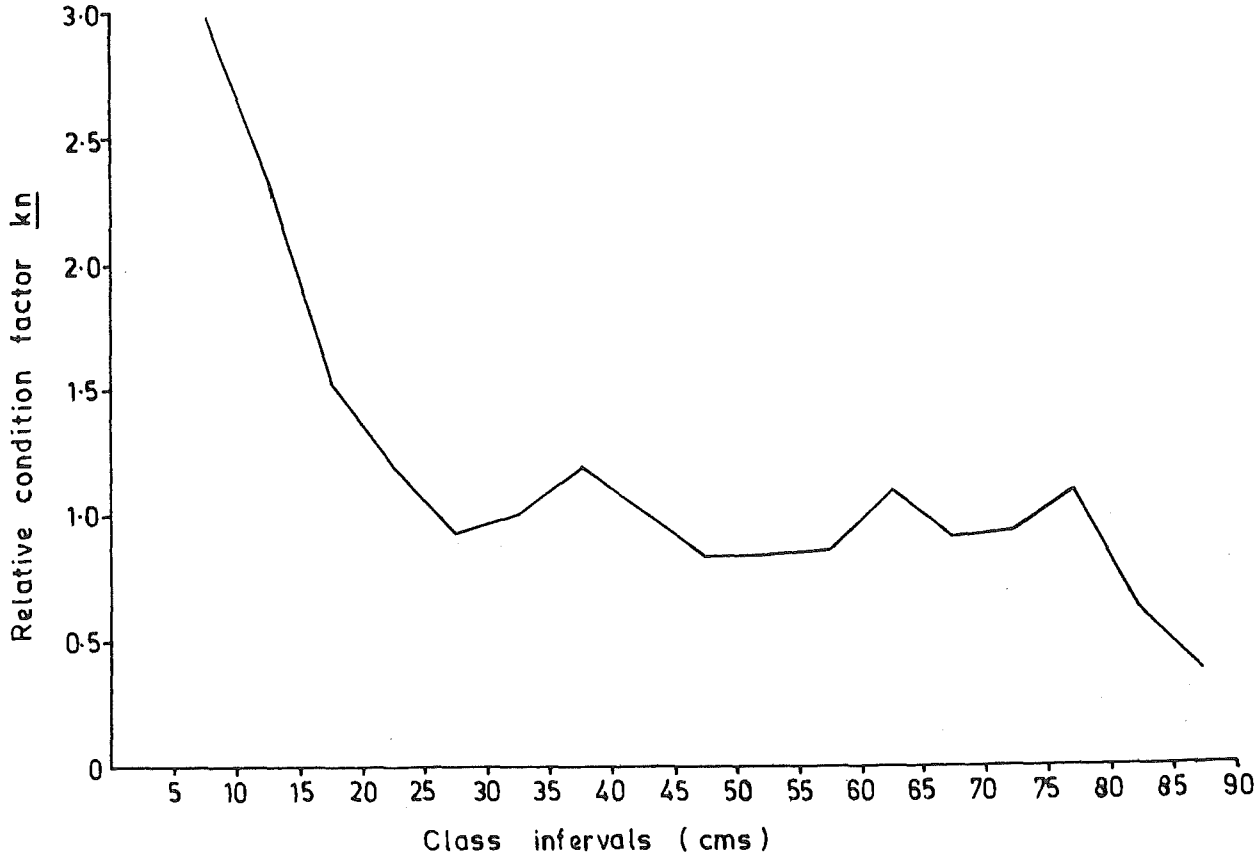

Fig. 2 : *Lengthwise relative condition factor (Kn) for W. attu (M + F).*

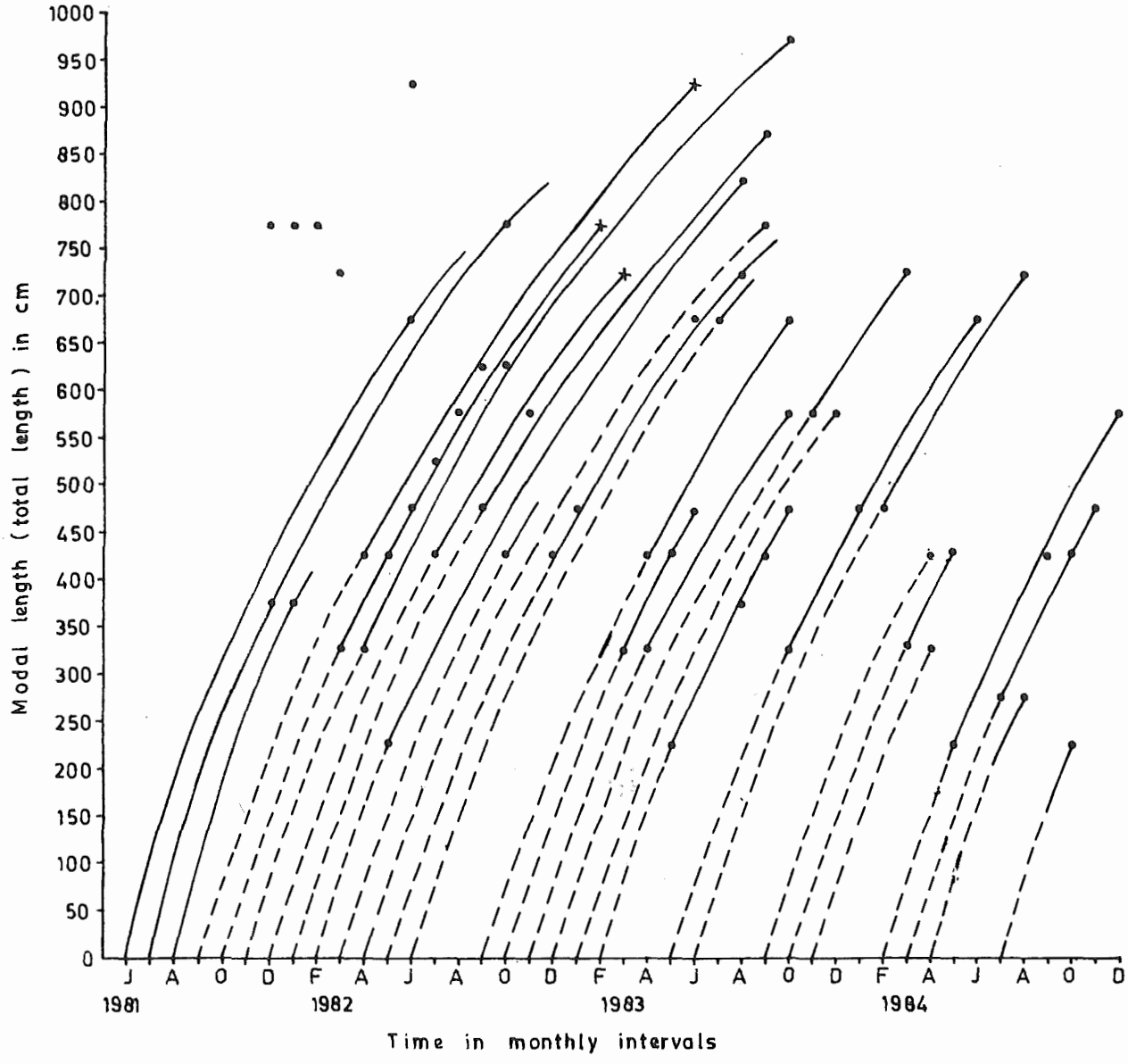

Fig. 3 : *Growth lines fitted through the scatter diagram of length modes plotted against time indicating the major broods of W. attu during 1981-1984.*

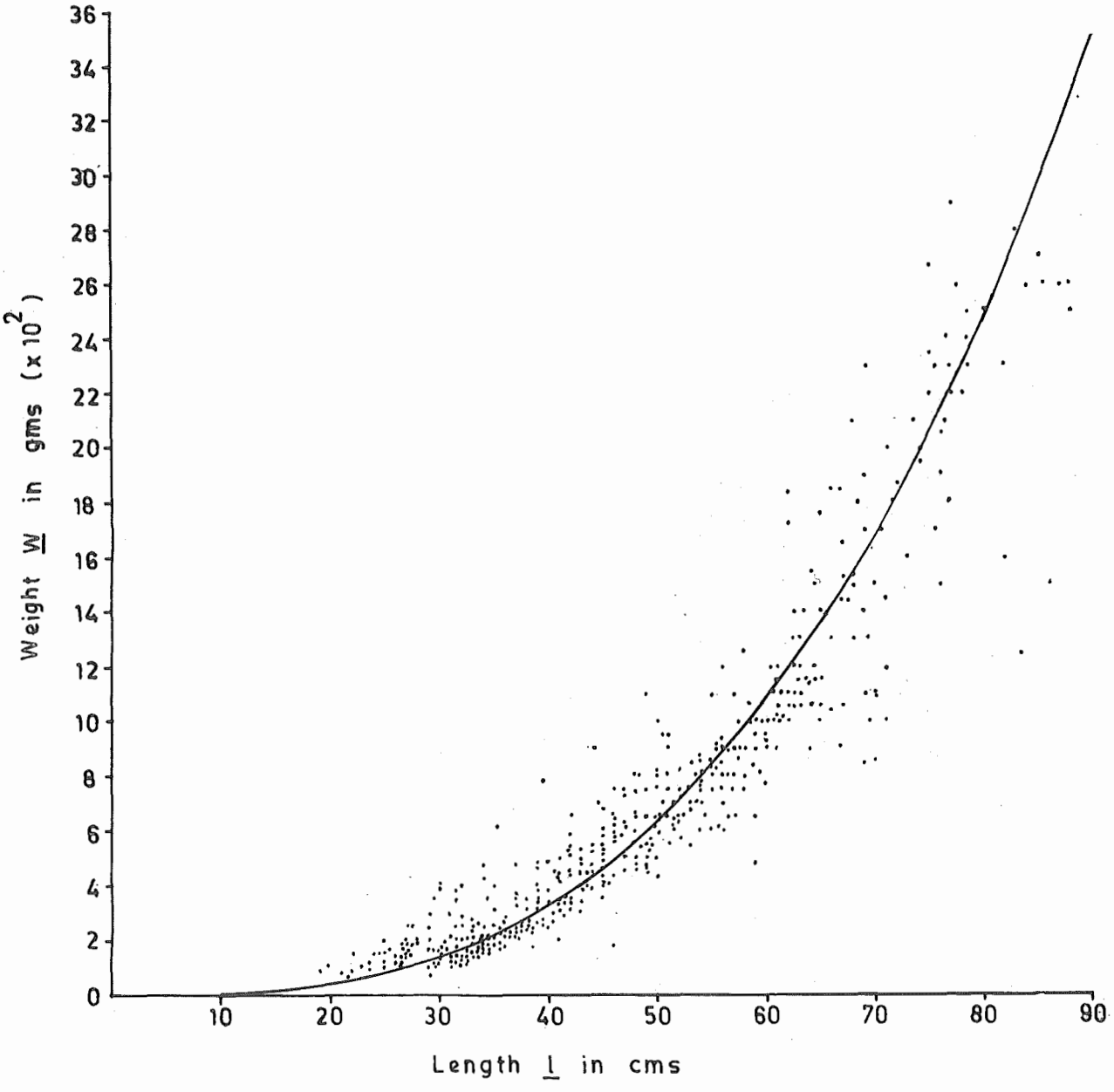

Fig. 4 : *Length - weight relationship in respect of W. attu (M + F) 1981-1984.*

Table II : *Growth parameters of von Bertalaffy equation calculated for Labeo rohita and a few siluroid catfishes from different ecosystems.*

Species	L∞ (mm)	K (annual)	t0 (monthly)	Locality	Author
Labeo rohita	1015.00	0.276	0.33	River Ganga and Yamuna	Khan and Siddiqui (1973)
Labeo rohita	1517.90	0.923	-1.10	Getalsud reservoir, Bihar	Anon. (1983)
Labeo rohita	912.00	0.382	-0.13	Govindgarh Lake	Shreeprakash and Gupta (1986)
Labeo rohita	1197.00	0.250	0.20	River Brahmaputra, Assam	Chowdhury (1989)
Pangasius pangasius	936.00	0.20	-0.85	Nagarjunsagar reservoir, Andhra Pradesh	Anon. (1983)
Mystus aor	860.00	0.23	-0.55	"	Anon. (1983)
Pseudeutropius tarkee	470.00	0.27	-0.21	"	Ramakrishnaiah (1984)
Pangasius pangasius	867.6 (M) 943 (F)	0.22 (M) 0.20 (F)	-0.09 (M) 0.02 (F)	"	"

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