STUDY ON RELATIONSHIP BETWEEN TOTAL LENGTH, WEIGHT AND SCALE LENGTH OF FRESH WATER FISH *CATLA CATLA*.

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ABSTRACT
The length weight relationship, total length-standard length relationship and fish length average total scale length relationship of *Catla catla* were studied during the year 2013-2014 by correlation and regression method. Positive correlation between total length and weight of fish, standard length and total length was observed

KEY WORDS: Average total scale length, standard length, total length.

INTRODUCTION
Data on length-weight, standard length-total length is required for developing management measures for both aquaculture and wild fisheries (Anvar Ali *et al.,* 2013).The length-weight relationship is important to understand the growth dynamics of the fish population (Sachinandan Dutta, Sourav Maity, Abhra Chanda, Anirban Akhand, Sugata Hazra).Several workers have studied length-weight, total length-standard length, total length-scale length, (Moutopoulos, Stergiou) gave an account on length-weight, length-length relationship fish species from the Aegean sea (Greece).(Ujjania, 2012) Studied comparative age and growth of Indian major carp *Catla catla* in selected water bodies of Southern Rajasthan.Nirmal Thakur studied age and growth of Mugli cephalus Linnaeus from the Mahanadi estuaries system. The aim of the present study is to determine relationship between length-weight, total length-standard length, and total length-scale length of *Catla catla.*

MATERIALS AND METHODS
Fish samples of *Catla catla* were brought to the fishery laboratory and fixed in 5% formalin solution. Fishes were measured for total length and standard length in (cm) and weighed in (gm) using scale and digital balance. The standard length measurement was taken from the tip of the snout to the base of the tail in cm. (Subba[1] and Adhikaree[2], 2011) 10 scales were taken from above the lateral line and just posterior to the base of the dorsal fin. (Beamish, Harvey, 1969). These scales were placed in separate envelopes for further study, the average total length of fish was calculated. The data obtained from the measurements was computed for regression and correlation coefficient values. (Subba and Adhikaree, 2011).
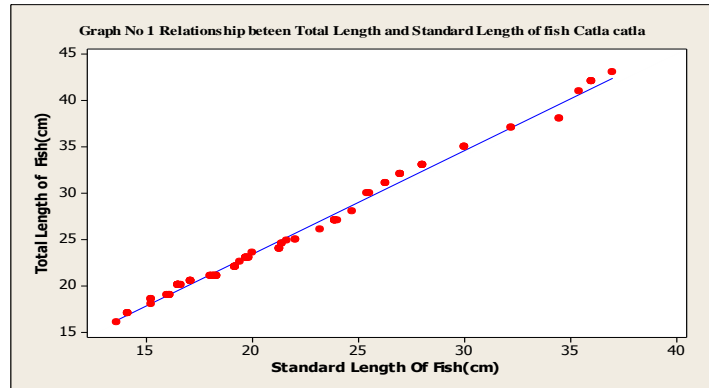
RESULTS AND DISCUSSION
The relationship between total length and standard length (TL &SL) was determined according to Pearson correlation and regression equation. Total length and standard length was calculated as   r = 0.996. Log TL=0.971+ 1.12 Log SL.
It can be said that the significant correlation exist between total length and standard length. The length weight relationship of *Catla catla* during the study period was analyzed using Pearson correlation and regression equation. The linear relationship between length and weight is shown in (Table 2). The correlation coefficient (r) value is 0.977 the monthly data for 1 year was pooled and obtained the following regression equation Log TL =15.2+0.0345 Log W.
Highest correlation in the present study shows that regression values were highly significant. Correlation among total length and total scale length was also observed, the relationship which was found to be highly significant in the logarithmic form (Table 3) can be expressed by the formula r = 0.981. Log TL = 6.11 + 20.9 Log TSL.

Johal and Tandon (1983) while studying the age and growth of *Catla catla* and *Cirrhinus mirgala* from lake Sukhna on the basis of scale studies interpreted that *Catla catla* up to 3 year of life increase rapidly in length but in 4th year and onwards there is an appreciable increase in weight as compared to length .Several workers have studied length-weight relationship in different fish species. Negi (2013) estimated length-weight relationship for species of *Labeo rohita*. Length-weight relationship of 12 Indian freshwater fish species was studied by Dubey *et al*, (2012).Ward, *et al*, (1992) has stated that the size of individual fish is strongly influenced by environment condition, such as temperature and food

supply the relationship between fish's length and its weight vary too-over time and between location depending on the abundance of food competitions and reproductive activity. Ujjania (2012) has observed that growth constant average reduced in subsequent years of age. Singh (1998) observed that with increase in age there is decrease in specification rate of linear growth and specific rate of weight increase.

Table 1. Relationship between Total Length and Standard Length of fish *Catla catla.*

Sr.no	Total Length of Fish(cm)	Standard Length Of Fish(cm)	Sr.no	Total Length of Fish(cm)	Standard Length Of Fish(cm)	Sr.no	Total Length of Fish(cm)	Standard Length Of Fish(cm)
1	30	25.4	35	42	36	69	24.5	21.4
2	35	30	36	23	19.7	70	25	22
3	32	27	37	24	21.3	71	27	23.9
4	41	35.4	38	33	28	72	42	36
5	22	19.2	39	20	16.5	73	43	37
6	20	16.5	40	22	19.2	74	21	18.3
7	19	16	41	24.5	21.4	75	23	19.8
8	18.5	15.2	42	23.5	20	76	24	21.3
9	20	16.5	43	23	19.7	77	22	19.2
10	19	16	44	24.8	21.6	78	28	24.7
11	20	16.5	45	22.5	19.4	79	19	16.1
12	20	16.5	46	24	21.3	80	22	19.2
13	20	16.5	47	23	19.8	81	20.5	17.1
14	21	18	48	22	19.2	82	42	36
15	21	18	49	25	22	83	20	16.5
16	20.5	17.1	50	27	23.9	84	21	18.3
17	17	14.1	51	31	26.3	85	26	23.2
18	21	18.1	52	37	32.2	86	27	23.9
19	20.5	17.1	53	32	27	87	31	26.3
20	33	28	54	21	18.2	88	38	34.5
21	27	23.9	55	23	19.8	89	37	32.2
22	21	18.1	56	17	14.1	90	38	34.5
23	20	16.5	57	21	18.2	91	20	16.6
24	22	19.2	58	20.5	17.1	92	20	16.5
25	21	18.2	59	33	28	93	30	25.5
26	20.5	17.1	60	27	23.9	94	35	30
27	23	19.7	61	18	15.2	95	32	27
28	22	19.2	62	16	13.6	96	27	24
29	20	16.5	63	21	18.3	97	21	18.3
30	23	19.7	64	20	16.5	98	20	16.5
31	21	18.2	65	23	19.7	99	17	14.1
32	20	16.6	66	24	21.3	100	18.5	15.2
33	19	16.1	67	35	30			
34	33	28	68	19	16.1			

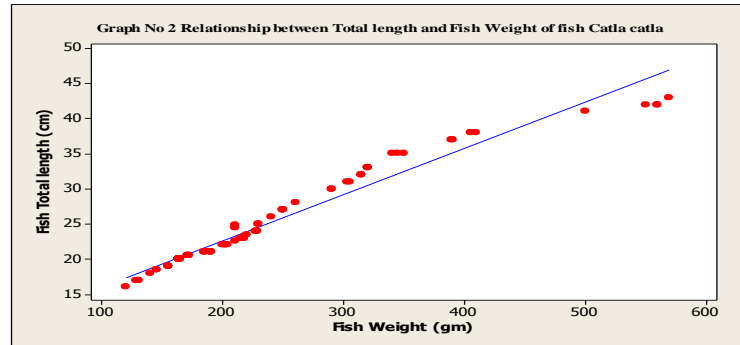Graph No 1 Relationship beteen Total Length and Standard Length of fish Catla catla

Correlation: SLF, TLF Pearson correlation of SLF and TLF= 0.996
The regression equation is
Total Length of Fish (cm) =0.937 +1.12 Standard Length of Fish (cm)

Table 2. Relationship between Total length and weight of fish Catla catla.

Sr No.	Fish Total length (cm)	Fish Weight (gm)	Sr No.	Fish Total length (cm)	Fish Weight (gm)	Sr No.	Fish Total length (cm)	Fish Weight (gm)
1	30	290	35	42	550	69	24.5	210
2	35	340	36	23	216	70	25	230
3	32	315	37	24	228	71	27	250
4	41	500	38	33	320	72	42	560
5	22	200	39	20	165	73	43	570
6	20	163	40	22	203	74	21	190
7	19	155	41	24.5	210	75	23	218
8	18.5	145	42	23.5	220	76	24	228
9	20	163	43	23	216	77	22	203
10	19	155	44	24.8	210	78	28	260
11	20	163	45	22.5	210	79	19	155
12	20	163	46	24	227	80	22	204
13	20	163	47	23	216	81	20.5	172
14	21	185	48	22	203	82	42	560
15	21	185	49	25	230	83	20	165
16	20.5	171	50	27	250	84	21	190
17	17	128	51	31	303	85	26	240
18	21	185	52	37	389	86	27	250
19	20.5	171	53	32	315	87	31	305
20	33	320	54	21	190	88	38	405
21	27	250	55	23	216	89	37	390
22	21	185	56	17	130	90	38	410
23	20	163	57	21	190	91	20	165
24	22	201	58	20.5	172	92	20	165
25	21	186	59	33	320	93	30	290
26	20.5	172	60	27	250	94	35	350
27	23	215	61	18	140	95	32	315
28	22	201	62	16	120	96	27	250
29	20	164	63	21	190	97	21	190
30	23	216	64	20	164	98	20	165
31	21	190	65	23	216	99	17	130
32	20	164	66	24	227	100	18.5	145
33	19	155	67	35	345			
34	33	320	68	19	155			

Graph No 2 Relationship between Total length and Fish Weight of fish Catla catla
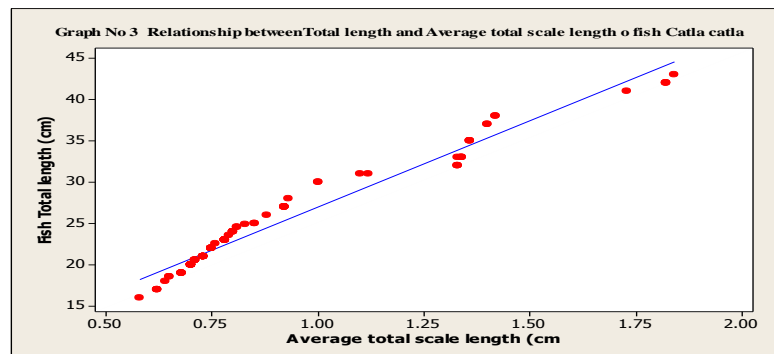
Correlation: FTL, FW Pearson correlation of FTL and FW= 0.977
The regression equation is
Fish Total length (cm) = 9.38 + 0.0660 fish weight (gm)

Table 3. Relationship between Total length and Average total scale length of fish *Catla catla.*

Sr No.	Fish Total length (cm)	Average total scale length (cm)(Avg.)	Sr No.	Fish total length (cm)	Average total scale length (cm)(Avg.)	Sr No.	Fish Total length (cm)	Average total scale length (cm)(Avg.)
1	30	1.0	35	42	1.82	69	24.5	0.81
2	35	1.36	36	23	0.78	70	25	0.85
3	32	1.33	37	24	0.80	71	27	0.92
4	41	1.73	38	33	1.34	72	42	1.82
5	22	0.75	39	20	0.70	73	43	1.84
6	20	0.70	40	22	0.75	74	21	0.73
7	19	0.68	41	24.5	0.81	75	23	0.78
8	18.5	0.65	42	23.5	0.79	76	24	0.80
9	20	0.70	43	23	0.78	77	22	0.75
10	19	0.68	44	24.8	0.83	78	28	0.93
11	20	0.70	45	22.5	0.76	79	19	0.68
12	20	0.70	46	24	0.80	80	22	0.75
13	20	0.70	47	23	0.78	81	20.5	0.71
14	21	0.73	48	22	0.75	82	42	1.82
15	21	0.73	49	25	0.85	83	20	0.70
16	20.5	0.71	50	27	0.92	84	21	0.73
17	17	0.62	51	31	1.1	85	26	0.88
18	21	0.73	52	37	1.40	86	27	0.92
19	20.5	0.71	53	32	1.33	87	31	1.12
20	33	1.33	54	21	0.73	88	38	1.42
21	27	0.92	55	23	0.78	89	37	1.40
22	21	0.73	56	17	0.62	90	38	1.42
23	20	0.70	57	21	0.73	91	20	0.70
24	22	0.75	58	20.5	0.71	92	20	0.70
25	21	0.73	59	33	1.34	93	30	1.0
26	20.5	0.71	60	27	0.92	94	35	1.36
27	23	0.78	61	18	0.64	95	32	1.33
28	22	0.75	62	16	0.58	96	27	0.72
29	20	0.70	63	21	0.73	97	21	0.73
30	23	0.78	64	20	0.70	98	20	0.70
31	21	0.73	65	23	0.78	99	17	0.62
32	20	0.70	66	24	0.80	100	18.5	0.65
33	19	0.68	67	35	1.36			
34	33	1.34	68	19	0.68			

Graph No 3 Relationship betweenTotal length and Average total scale length o fish Catla catla

Pearson Correlation: FTL, TSL   Pearson correlation of FTL and TSL =0.981.
The regression equation is
Fish Total length (cm) = 6.11 + 20.9
Average total scale length (cm)

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