Studies On the Length-Weight Relationship and Condition Factor

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Abstract: *Chanda nama*(n=100),*Parambasis ranga*(n=100),*Channa gachua*(n=64) and *L. guntea*(n=80) were collected from the fish market of Pathsala under jurisdiction of district Barpeta (Assam) by direct purchase from the sales man. The specimen of different size of length ranging from a mimimum to a considerably available maximum size of either specis were selected for present studies in good condition .All the samples of species were collected from last part of December month to first part of January ,2022.The relationship between the length and weigth of each specimen converted to the statistical values and have expressed by table .The length weight relationship of the specieses present studies were calculated by using the general equation ,$W=cL^n$; W=weight, L=length The equation when expressed in logarithmic form become Log W= log C+ n log L.The values of c and n can be determined empirically.The following formula can be used to determined the exponent value

$$\text{Log C} = \frac{\sum \log W(\log L)^2 - \sum \log L(\log L \times \log W)}{N \times \sum (\log L)^2 - (\sum \log L)^2}$$

$$\text{Log n} = \frac{\sum \log W - N\log C}{\sum \log L}$$

The coefficient of condition or ponderal index can also be ascertained from the length weight relationship in an important aspect in fishery research and provide additional information about spawning,feeding and other repect related to well being of fish.In the present study the ponderal index of the specieses were separately calculated by using the following formula as suggested as Lecren 1951; and Fulton's Condition Factor i.e $K_n = W/L^3 \times 100$ or $K_n = \frac{w}{\hat{w}}$, Where,W=observed weight , $\hat{w}$=expressed weight

For Chandanama the condition factor is found between 1.1 to 4.2 being the minimum and maximum respectively followed by parambasisranga0.85 to 1.99 being the minimum and maximum respectively, channagachua0.58 to 0.78 being the minimum and maximum respectively and Lepidocephalichthysguntea 0.76 to 1.21 being the minimum and maximum respectively.

Keywords: Larvivorousfish,Length-Weight Relationship, Condition factor, Fultons condition factor, spawning, Empirically.

INTRODUCTION

Barpeta,one of district of Assam is rich in fresh water fishes having larvicidalafficacy and of in the use of mosquito population.Mosquitoes are vectors of several disease and carry parasites ofmalaria,phylaria,yellow fever etc. They breed in all source of stagnant water and shallow wood,infestedpond,swamp,pits and all other kinds of inland water bodies.Fish is a natural enemy of mosquioto acts and larvae and used as a means of biological control has been recognized since olden times.Alarvicidal fishes should posses the following features.It should be small size so as to capable of moving freely,carnivorous in habit and surface feeder ,ability to breeds in stagnant water having no food value.These fishes have capacity to survive under adverse condition in deep sea and shallow water.

In the taxonomic evaluation with special reference to fish and fisheries,length and weight are considered to be very important parameters.The growth of the fishes does related with the length and weight which are relative to each other in the way that knowing the length alone the weight of a fish can be determined of the relationship is pertinent in study of fish taxonomy but more pertinent to the growth and population dynamics of the growth.

It iscustomary to evaluate the length of different sizes of a particular fish species at different ages through which a definite growth in terms of weight is maintained.The length weight relationship is made more simpliedin regard to estimation of the indices by way of empirical of data,plotting against each other parameter to have a definite curve.One can speak about the length weight relationship of a fish species by looking into curve.To know the growth rate of the fishes different types of fish species must be brought for knowing the length and weight parameters together, so that species wise variation growth rate can be formulated.On the otherhand,this two parameters together are helpful in regulating the fisheries in general.It is because that one avoid additional time consuming part by measurinasg all the individuals of cultured fishes if definite length of a fish species is known from time to time, infact, length and weight is a standard unit for determining the growth parameters in a fish population. The application of length-weight relationship in fisheries has two folds-firstly used for estimating weight of a fish for a given length and second in determining condition factor.The condition factor again determines the general well being of a fish in the way of growth .When the condition factor is greater than one the well being of the fish is considered as good.This acts for better production in a better space

to give better spawn.Present work has been carried out to study the length weight relationship and condition factor of four larvivorousfishes i.e*Chanda nama, Parambasis ranga, Channa gachua* and *Lepidocephalichthys guntea* from pathsala of Barpeta district

STUDY AREA :

The experimental area pathsala lies in the co-ordinates between 26.5119^0N latitude and 91.1809^0E longitude The area is about 39 km away from Barpeta District. Most of the villagers near pathsalatown are dependent on the fisheries and the farmers principal mode of earnings are the pisciculture practices. These farms are watered by the ever running Pahumara River, a tributary of the river Brahmaputra.
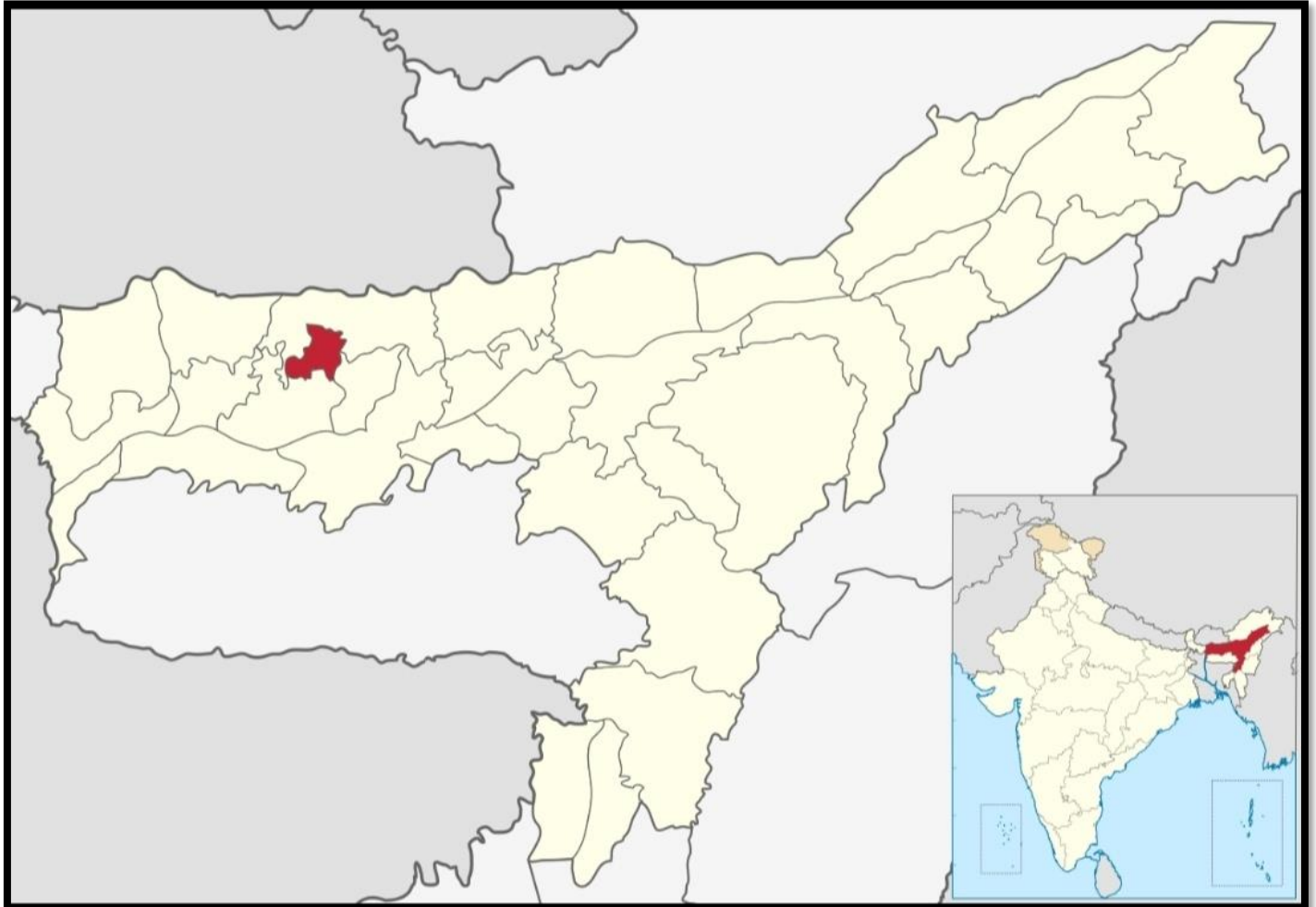
MAP OF ASSAM SHOWING STUDY AREA

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In the taxonomic evaluation with special reference to fish and fisheries,length and weight are considered to be very important parameters.The growth of the fishes does related with the length and weight which are relative to each other in the way that knowing the length alone the weight of a fish can be determined of the relationship is pertinent in study of fish taxonomy but more pertinent to the growth and population dynamics of the growth.

It iscustomary to evaluate the length of different sizes of a particular fish species at different ages through which a definite growth in terms of weight is maintained.The length weight relationship is made more simpliedin regard to estimation of the indices by way of empirical of data,plotting against each other parameter to have a definite curve.One can speak about the length weight relationship of a fish species by looking into curve.To know the growth rate of the fishes different types of fish species must be brought for knowing the length and weight parameters together, so that species wise variation growth rate can be formulated.On the otherhand,this two parameters together are helpful in regulating the fisheries in general.It is because that one avoid additional time consuming part by measurinasg all the individuals of cultured fishes if definite length of a fish species is known from time to time, infact, length and weight is a standard unit for determining the growth parameters in a fish population. The application of length-weight relationship in fisheries has two folds-firstly used for estimating weight of a fish for a given length and second in determining condition factor.The condition factor again determines the general well being of a fish in the way of growth .When the

condition factor is greater than one the well being of the fish is considered as good.This acts for better production in a better space to give better spawn.Present work has been carried out to study the length weight relationship and condition factor of four larvivorousfishes i.e*Chanda nama, Parambasis ranga, Channa gachua* and *Lepidocephalichthys guntea* from pathsala of Barpeta district

Photographs of collected specimens

Channa gachua (Ham 1822)

Parambasis ranga (Ham 1822)

Chanda nama (Ham 1822)

Lepidocephalichthys guntea (Ham 1822)

MATERIALS AND METHODS-

Collected species were washed thoroughly with water then preserved in 5% formalingseparately .This specimen were brought to the laboratory and their length and weigth were recorded individually. Total no. of each species were divided into groups consisting of four individuals in one group. The length were measured by using the measuring scale (varnier scale)to the minimum of millimeter in length and the weigth were measured by physical balance to the minimum of milligram in weigth.

RESULT AND DISCUSSION:

The present studies of length-weight relationship of four different species fail to show identical relationship in respect to their weight . The studies shows that increase of weight in *Parambasis ranga* with increase of its length.If observed to be more significant than in *Chanda nama*.The calculated value therefore may be accounted for an isometric growth pattern in the species. However the calculated value for *Chanda nama* shows slightly negative tendency indicating its allomatric pattern of growth in contrast to the

isometric growth of the *Parambassis ranga*.In case of *Channa gachua*isometric growth pattern has been found while perfect isometric growth pattern has been found in *Lepidocephalicthys guntea*.

All these observation appear to indicate that single value of "c" and "n" may not be responsible for entire size range of the fishes. A similar view was put forwarded by *Clark,1928 and Jhingran,1952*. The lower value of length weight relationship in the species may be due to some differences in their structure, shape and size of the body. The evaluated data from this study is represented in tablulated form below

1.*Chanda nama*(Ham,1822)

The result of length weight relationship and condition factor of *Chanda nama* consisting during the period of investigation over 100 individuals into 25 groups has been depicted in table 1

TABLE-1

SL No	Length(L)	Weight(W)	Log(L)	Log(W)	Log(L x W)	(logL)^2	C.F
1	6.5	2.61	0.81	0.41	0.332	0.656	0.95
2	6.5	2.93	0.81	0.46	0.372	0.656	1.06
3	5	1.32	0.69	0.12	0.082	0.476	1.05
4	5.2	1.32	0.71	0.12	0.085	0.504	0.93
5	6.7	2.58	0.82	0.41	0.336	0.672	0.85
6	5.6	1.54	0.74	0.18	0.133	0.547	0.87
7	5.5	1.57	0.74	0.19	0.140	0.547	0.94
8	5.6	1.55	0.74	0.19	0.140	0.547	0.88
9	6.2	2.66	0.79	0.42	0.331	0.624	1.11
10	6.3	2.79	0.79	0.44	0.347	0.624	1.11
11	6.1	2.25	0.78	0.35	0.273	0.608	0.99
12	5.8	2.24	0.76	0.35	0.266	0.577	1.14
13	6.7	2.84	0.82	0.45	0.369	0.672	0.94
14	5.6	1.67	0.74	0.22	0.162	0.547	0.95
15	6.8	3.06	0.83	0.48	0.398	0.688	0.97
16	6.4	3.03	0.80	0.48	0.384	0.64	1.15
17	6.2	2.60	0.79	0.41	0.323	0.624	1.09
18	7.2	3.70	0.85	0.56	0.47	0.722	0.99
19	6.7	3.53	0.82	0.54	0.442	0.672	1.17
20	5.5	1.58	0.74	0.19	0.140	0.547	0.94
21	5	1.20	0.69	0.07	0.048	0.547	0.96

22	5.5	1.62	0.74	0.20	0.48	0.528	0.97
23	5.3	1.44	0.72	0.15	0.108	0.64	0.96
24	6.4	2.74	0.80	0.43	0.344	0.64	1.04
25	5.9	2.11	0.77	0.32	0.264	0.592	1.02

After conducting the experiment the value of " log c" is found to be -0.5496 and value of "n" is found to be 1.0620. The L-W relationship equation can be expressed as

Log w=log c+ nlog L
= -o.5496+1.0620 log L

 The condition factor is found between 1.1 to 4.2 being the minimum and maximum respectively during the study period.The minimum value of condition factor i.e 1.1 in the fish length of 5 to 5.5 mm size group and the maximum value of condition factor i.e 4.2 is found in the fish length of 4 to 4.5 mm size group.

2.*Parambasis ranga*(Ham,1822)

The result of length weight relationship and condition factor of *Parambasis ranga*consisting during the period of investigation over 100 individuals into 25 groups has been depicted in table 2

TABLE 2

Sl.no	Length(L)	Weight(W)	logL	LogW	Log(LxW)	(logL)^2	C.F
1	3.5	1.21	0.544	0.082	0.044	0.044	2.8
2	1.8	0.40	0.255	-0.39	-0.099	-0.038	6.7
3	3.8	1.45	0.579	0.161	0.093	0.014	2.6
4	4.1	2.61	0.612	0.416	0.254	0.105	3.7
5	1.3	0.30	0.113	-0.52	-0.058	-0.030	1.3
6	4.6	1.36	0.662	0.133	0.088	0.011	1.39
7	5.2	1.80	0.715	0.255	0.182	0.046	1.2
8	3.3	1.12	0.518	0.0492	0.025	0.0012	3.1
9	4.5	1.40	0.653	0.146	0.095	0.013	1.5
10	5	2.12	0.698	0.326	0.227	0.074	1.6
11	4.7	1.55	0.672	0.190	0.127	0.013	1.4
12	3.1	1.20	0.491	0.079	0.038	0.074	4.02
13	4.2	1.57	0.623	0.195	0.121	0.0241	2.1
14	4.3	1.58	0.633	0.195	0.123	0.003	1.9
15	4.2	1.55	0.623	0.190	0.118	0.023	2.09
16	4.5	2.01	0.653	0.303	0.197	0.022	2.2
17	3.5	1.24	0.544	0.093	0.050	0.059	2.8
18	3.5	1.28	0.544	0.107	0.058	0.0046	2.9
19	3.6	1.32	0.556	0.120	0.066	0.0062	2.8

20	3.7	1.45	0.568	0.161	0.091	0.0079	2.8
21	3.7	1.45	0.568	0.161	0.091	0.0146	2.8
22	2.8	1.14	0.447	0.156	0.025	0.0014	5.1
23	4.4	1.4	0.643	0.146	0.093	0.0169	1.6
24	4.6	1.50	0.662	0.176	0.116	0.0204	1.5
25	5.2	1.65	0.716	0.217	0.155	0.033	1.1

After conducting the experiment the value of " log c" is found to be -0.2650 and value of "n" is found to be 0.872. The L-W relationship equation can be expressed as

$$\text{Log } w = \log c + n\log L$$
$$= -0.2650 + 0.872\log L$$

The condition factor is found between 0.85 to 1.99 being the minimum and maximum respectively during the study period. The minimum value of condition factor i.e 0.85 in the fish length of 6 to 6.7mm size group and the maximum value of condition factor i.e 1.99 is found in the fish length of 5 to 5.5 mm size group.

3.*Channa gachua (Ham, 1822)*

The result of length weight relationship and condition factor of *Channa gachua* consisting during the period of investigation over 64 individuals into 16 groups has been depicted in table 3

TABLE-3

Sl No	Length (L)	Weight (W)	log L	Log W	Log LxW	(lop L)^2	C.F
1	11.3 12	18.2	1.053	1.26	1.327	1.1088	1.26
2	9.5	19.4	1.078	1.28	1.379	1.1620	1.12
3	10.7	9.8	0.977	0.99	0.967	0.9545	1.14
4	12	10.9	1.021	1.037	1.058	1.0424	0.08
5	12.4	18.7	1.07	1.271	1.359	1.1449	0.9
6	12.4	17.3	1.093	1.238	1.35	1.1446	0.55
7	11.8	9.2	1.071	0.963	1.031	1.147	0.78
8	10.3	8.6	1.01	0.934	0.943	1.0201	1.21
9	11	16.2	1.041	1.209	1.358	1.0836	0.91
10	11.3	13.2	1.053	1.12	1.179	1.1088	1.05
11	7.8	5	0.892	0.698	0.623	0.7956	0.93
12	9	6.8	0.954	0.832	0.793	0.9101	1.04
13	10.1	10.8	1.004	1.033	1.037	1.0080	0.73
14	12.4	14.1	1.093	1.149	1.255	1.1946	1.07

| 15 | 9.5 | 9.2 | 0.977 | 0.963 | 0.940 | 0.9545 | 1.07 |
| 16 | 10.3 | 11.7 | 1.012 | 1.068 | 1.180 | 1.0241 | 1.23 |

After conducting the experiment the value of " log c" is found to be -2.41and value of "n" is found to be0.987 The L-W relationship equation can be expressed as

Log w=log c+ nlog L

=-2.41 +0.987 log L

The condition factor is found between 0.58 to 0.78being the minimum and maximum respectively during the study period.The minimum value of condition factor i.e 0.58 in the fish length of 10 to 10.07mm size and weight 10.9 mg of studied group and the maximum value of condition factor i.e 0.78 is found in the fish length of 12 mm size and weight 19.4 mg of the group.

4.*Lepidocephalichthysguntea (Ham, 1822)*

The result of length weight relationship and condition factor of *Lepidocephalichthyesguntea*consisting during the period of investigation over 80 individuals into 20 groups has been depicted in table 4.

TABLE-4

Showing Length Weight Relationship of *Lepidocephalichthys guntea*

Sl No	Length(L)	Weight(w)	Log L	Log W	Log LxW	(log L)2	C.F
1	6.2	2.81	0.79	0.44	0.847	0.347	1/17
2	5.3	1.55	0.72	0.19	0.136	0.136	1.04
3	5.6	1.60	0.74	0.20	0.148	0.148	0.91
4	4.7	0.79	0.67	0.10	0.067	0.067	0.76
5	4.6	1.02	0.66	0.008	0.005	0.005	1.04
6	5.5	1.77	0.74	0.24	0.177	0.177	1.06
7	6	2.32	0.77	0.36	0.277	0.547	1.07
8	4.8	1.18	0.68	0.07	0.047	0.592	1.06
9	5.5	1.96	0.74	0.29	0.214	0.462	1.17
10	4.3	0.67	0.63	0.17	0.107	0.547	0.84
11	5.6	2.13	0.74	0.32	0.236	0.396	1.21
12	5.4	1.52	0.73	0.18	0.131	0.547	0.96
13	5.5	1.44	0.74	0.15	0.111	0.532	0.86
14	5.9	2.01	0.79	0.30	0.231	0.547	0.97
15	5.2	1.39	0.71	0.14	0.099	0.592	0.98
16	4.8	0.86	0.68	0.06	0.04	0.504	0.77
17	6.3	2.52	0.79	0.40	0.316	0.462	1
18	5.8	1.90	0.76	0.27	0.205	0.624	0.97
19	5.1	1.83	0.70	0.18	0.126	0.49	1.15
20	5	1.35	0.69	0.13	0.089	0.476	1.08

After conducting the experiment the value of " log c" is found to be -0.191 and value of "n" is found to be 1.031 The L-W relationship equation can be expressed as

Log w=log c+ nlog L

=-0.191 +1.031 logL

The condition factor is found between 0.76 to 1.21 being the minimum and maximum respectively during the study period.The minimum value of condition factor i.e 0.76 against length 4.7 mm and 0.79 mg in weight of the fish group and the maximum value of condition factor i.e 1.21 is found against the length of 5.6 mm and 2.13 mg in weight of the fish size group.

CONCLUSION:

The experimental results for condition factor in four larvivorous fishes during the study period varies from species to species and perhaps fluctuation of such results of the studied specimen are due to various environmental conditions.The current study provides the first baseline data L-W relationship and condition factor of the fishes from pathsalaarea.Such data is available forestablishing and monitoring for management of these larvivorous fishes.

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