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Assessment of fecundity of fish *Macrones vittatus* (Bloch, 1794) from Bhategaon Dam, District Hingoli, Maharashtra State, India

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ABSTRACT

Present investigation deals with the assessment of fecundity of catfish *Macrones vittatus* (Bloch, 1794) collected from Bhategaon dam, Maharashtra during January to December 2011. The mean value of fecundity produced by an individual fish was found to vary between 2562 to 26316. In *Macrones vittatus* (Bloch, 1794) maximum number of eggs was observed in 162 mm in total length and 30065 mg in body weight, whereas, minimum was observed in 102 mm in total length and 9265 mg in body weight. The relationship of fecundity with other parameters such as Total length (TL), Total weight (TW), Ovary weight (OW) and Ovary length (OL) were found to be linear and non linear and the values of correlation coefficient (r) was 0.92, -0.11, 0.93 and 0.81.

Introduction

The number of eggs contained in ovary of a fish is termed as fecundity. The term fecundity denotes the egg laying capacity of a fish or it refers to the number of ripe eggs produced by a fish in one spawning season. It is an important aspect that must be understood to explain the variation of population as well as to make efforts for increasing the amount of fish yield and also helpful to estimate commercial potentialities of fish stock, life history, fish farming and actual management of the fishery. Fecundity appears to bear some broad relationship to the care of environment accorded to the eggs Lagler *et al*., (1967). Knowledge about fecundity of a fish is essential for evaluating the commercial potentialities of its stock, life history, practical culture and actual management of the fishery Lagler *et al*., (1956); Doha and Hye, (1970). The fecundity increases with an increase in the body measurements either as curvilinear or straight line relationship as stated recently by Jessop, (1993). There appeared to be greater relationship between fish length/weight and fecundity than between ovary length/weight and fecundity because correlation coefficient values are more significant in fish length/weight and fecundity than ovary length/weight and fecundity relationships. Similar relationship between body measurements and fecundity in fishes have also been recorded worldwide (Varghese 1973, 1976; Pathani, 1981, 1982; Singh *et al.*, 1982; Patzner, 1985; Dobriyal, 1988; Reddy and Rao, 1990; Jessop, 1993 and Gaur and Pathani, 1996). Considering the availability and importance to the common people, the present work was undertaken with a view to determine the fecundity of this species.

Material and method

Study Area- The Bhategaon Dam was selected for the present investigation which comes under Tahsil Kalamnuri, District Hingoli, M.S.India. It is situated 419.10 meters above the sea level, the surface water level is 420.62 meters and depth level is 412.85 meters. It is at 77^0 25' E longitude and 19^0 25'N latitude.

For the study of Fecundity, fishes were collected from sampling stations of Bhategaon Dam throughout the study period during January, 2011 to December, 2011. After collection, fishes were identified, and total length of each fish was measured to the nearest millimeter and body weight in milligram (mg) on a digital balance.

The total length of each ovary was recorded and after dissection weights were measured. Three sectional samples of each were removed with accompanying membranes from anterior, middle and posterior regions of the two lobes of ovaries each, following Lagler, 1956 and gravimetric method was used in the estimation of fecundity. The total number of eggs in the ovaries for each individual was calculated from the sample mean and the total weight of the ovaries. The eggs were counted under compound microscope and fecundity was estimated using the formula:

$$F = \frac{\text{Weight of gonad}}{\text{Total weight of fish}} \times 100$$

Results

In the present study, the fecundity of *Macrones vittatus* (Bloch, 1794) number of eggs produced by an individual's fish was found to vary between 2562 to 26316. Table No. 1, 2, 3 & 4 and Figure-1, 2, 3 & 4 shows the observations of the fecundity in relation to the length and weight of fish and length and weight of the ovaries respectively. The maximum number of eggs was obtained from a specimen of 162 mm in total length and 30065 mg in body weight whereas minimum number of eggs were obtained from a specimen measuring 102 mm in total length and 9265 mg in body weight.

Total length & fecundity relationship (Table No. 1)

The relationship between fecundity and total length of fish was found to be non linear. The increase in fecundity was 4.4428 times to the power of total length. The formula expressing the relationship between the fecundity and length of fish was calculated to be:

$F = 0.0237\ TL^{4.4428}$ $\quad r = 0.9211$

Where, 'F' and 'TL' represents fecundity and length and 'r' represent the coefficient correlation respectively. Taking the logarithms the equation is reduced to the linear form,

$\text{Log } F = -5.3971 + 4.4428 \text{ Log } TL$

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Weight of fish & fecundity relationship (Table No.2)

The relationship between fecundity and total weight of fish was found to be linear. The rate of increase being -0.0818 in this species and is expressed by the formula

$F = 20.2296\ TW^{-0.0818}$ r = -0.1198

Where, 'F' and 'TW' represents fecundity and weight and 'r' represent the coefficient correlation of the fish respectively. Taking the logarithms the equation is reduced to the linear form,

Log F= -0.0818 Log TW + 4.3384

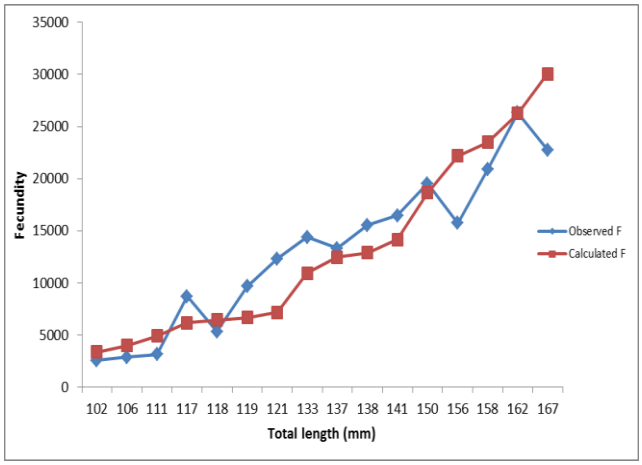

Figure-1: Showing relationship between Total length and Fecundity of *Macrones vittatus* (Bloch, 1794)

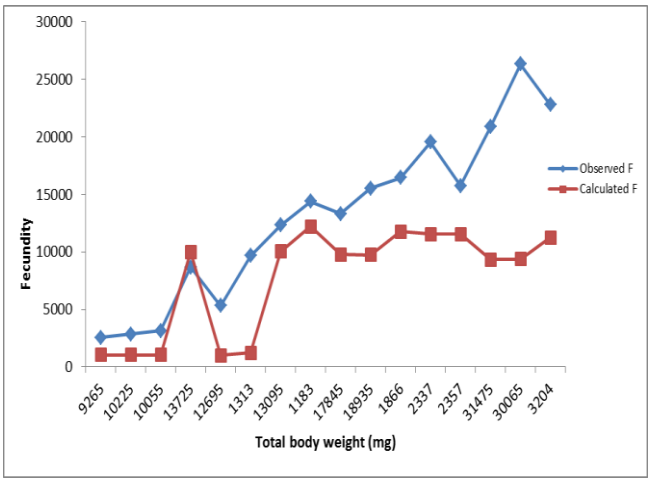

Figure-2: Showing relationship between Total body weight and Fecundity of *Macrones vittatus* (Bloch, 1794)

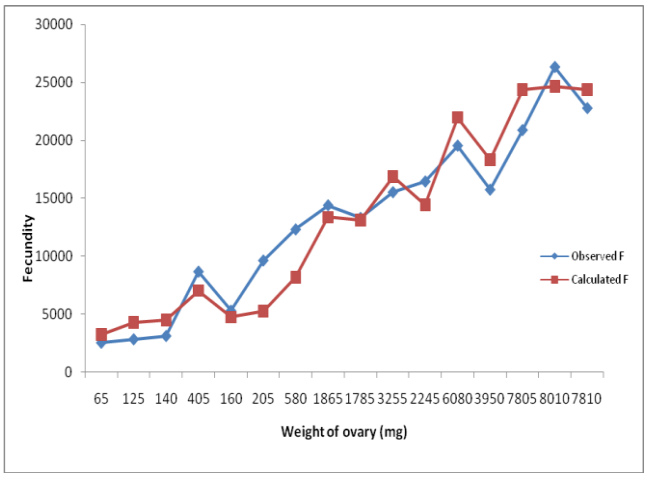

Figure-3: Showing relationship between Weight of Ovary and Fecundity of *Macrones vittatus* (Bloch, 1794)

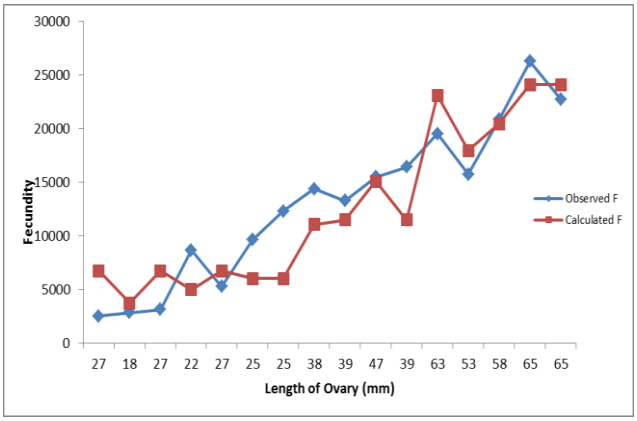

Figure-4: Showing relationship between Length of Ovary and Fecundity of *Macrones vittatus* (Bloch, 1794))

Ovary weight and fecundity relationship (Table No. 3)

The relationship between fecundity and weight of ovary was also found to be linear. The rate of increase being 0.4191 to the weight of ovary. The formula, which expresses the relationship between the fecundity and weight of ovaries, was calculated to be:

$F = 6.7533\ OW^{0.4191}$ r = 0.9380

Where, 'F' and 'OW' represents fecundity and weight of ovary and 'r' represent the coefficient correlation respectively. Taking the logarithms the equation is reduced to the linear form,

Log F= 2.7556 + 0.4191 Log OW

Length of Ovary & fecundity relationship (Table No. 4):

The relationship between fecundity and length of ovary of fish was found to be linear. The rate of increase being 1.449 times to the length of ovary and is expressed by the formula:

$F = 3.3776\ OL^{1.449}$ r = 0.8110

Where, 'F' and 'OL' represents fecundity and length of ovary and 'r' represent the coefficient correlation of the fish respectively. Taking the logarithms the equation is reduced to the linear form,

Log F= 1.7560 + 1.449 Log OL

Discussion

The maximum fecundity of *Macrones vittatus* (Bloch, 1794) was calculated to be 26316 eggs and this fecundity clearly shows a greater deviation from the fecundity estimated by Azadi, *et al.*, (1987). This may be due to the difference in environment and location as the environmental conditions are not same. A moderate degree positive correlation (linear relationship) was found between fecundity and total length, fecundity and ovary weight and fecundity and ovary length. Whereas the non linear relationship was observed in between fecundity and total body weight. The correlation co-efficient between fecundity and total length was 0.9211, fecundity and total body weight was -0.1198, fecundity and ovary weight was 0.9380 and fecundity and ovary length was 0.8110.

Nikolsky, (1963) noted that an increase in quantity of food increased the relative energy allocation to their reproductive capacity. The egg production was lower in some larger fishes due to the failure of ovarian maturation and feeding conditions. In brown trout *salmo trutta* the weight of the eggs declined. The reason was that while fecundity increased there was shortage of mature eggs on the ovary Bagenal, (1969). Several studies on fecundity of *M. gulio* Rao, (1981) were reported. Kumar and Haniffa, (2012) studied the fecundity of *M.cavasius* and observed fecundity is high in small size groups possessing high egg production, which strongly depends on the body weight. Some negative relationship was also noticed and this could be attributed to various seasonal changes, monsoon failure, non-availability of adequate food etc.

Table No.1: Showing Total length of fish, Observed and Calculated number of ova

Total length of fish in mm TL	Fecundity F	Log TL X	Log F Y	XY	X^2	Estimated		Difference between observed and calculated F
						Y	F	
102	2562	2.0086	3.4086	6.8465	4.0344	3.5266	3362	800
106	2860	2.02531	3.4564	7.0002	4.1018	3.6008	3988	1128
111	3143	2.04532	3.4973	7.153	4.1832	3.6898	4896	1753
117	8686	2.06819	3.9388	8.1462	4.2774	3.7913	6184	2502
118	5319	2.07188	3.7258	7.7194	4.2927	3.8077	6422	1103
119	9648	2.07555	3.9844	8.2696	4.3077	3.824	6668	2980
121	12327	2.08279	4.0909	8.5205	4.338	3.8562	7181	5146
133	14402	2.12385	4.1584	8.832	4.5109	4.0386	10920	3482
137	13317	2.13672	4.1244	8.8126	4.5654	4.0958	12470	847
138	15529	2.13988	4.1911	8.9685	4.5791	4.1098	12870	2659
141	16454	2.14922	4.2163	9.0616	4.619	4.1513	14170	2284
150	19541	2.17609	4.2909	9.3374	4.7354	4.2707	18650	891
156	15749	2.19312	4.1973	9.205	4.8096	4.3464	22200	6451
158	20882	2.19866	4.3198	9.4979	4.8342	4.371	23500	2618
162	26316	2.20952	4.4202	9.7664	4.8818	4.4192	26250	66
167	22773	2.22272	4.3574	9.6851	4.9403	4.4779	30050	7277
Total	209508	33.9274	64.378	136.8219	72.0109	64.3771	209781	41987
Average	13094.25	2.12046	4.0236	8.5513688	4.5006813	4.0235688	13111.313	2624.1875

Table No.2: Showing Total Weight of fish, Observed and Calculated number of ova

Total body weight of fish in mg 'TW'	Fecundity F	Log TW X	Log F Y	XY	X^2	Estimated		Difference between observed and calculated F
						Y	F	
9265	2562	3.96685	3.4086	13.5213	15.7358	4.0138	1032	1530
10225	2860	4.00966	3.4564	13.8588	16.0773	4.0103	1024	1836
10055	3143	4.00238	3.4973	13.9977	16.019	4.0109	1025	2118
13725	8686	4.13751	3.9388	16.2969	17.119	3.9998	9995	7661
12695	5319	4.10363	3.7258	15.2894	16.8398	4.0026	1006	4313
1313	9648	3.11826	3.9844	12.4245	9.7235	4.0832	1212	8436
13095	12327	4.11711	4.0909	16.8424	16.9505	4.0015	10030	2297
1183	14402	3.07298	4.1584	12.7787	9.4432	4.0869	12220	2182
17845	13317	4.25152	4.1244	17.5349	18.0753	3.9905	9783	3534
18935	15529	4.27727	4.1911	17.9266	18.2949	3.9884	9736	5793
1866	16454	3.27091	4.2163	13.791	10.6988	4.0707	11770	4684
2337	19541	3.36866	4.2909	14.4547	11.3478	4.0627	11550	7991
2357	15749	3.37236	4.1973	14.1548	11.3728	4.0624	11540	4209
31475	20882	4.49797	4.3198	19.4301	20.2316	3.9703	9340	11542
30065	26316	4.47806	4.4202	19.7939	20.053	3.9719	9374	16942
3204	22773	3.50569	4.3574	15.2757	12.2898	4.0515	11260	11513
Total	209508	61.5508	64.378	247.3714	240.2721	64.3774	121897	96581
Average	13094.25	3.84693	4.0236	15.460713	15.017006	4.0235875	7618.5625	6036.3125

Table No.3: Showing Weight of Ovary, Observed and Calculated number of ova

Weight of Ovary in mg (OW)	Fecundity F	Log (OW) X	Log F Y	XY	X^2	Estimated		Difference between observed and calculated F
						Y	F	
65	2562	1.81291	3.4086	6.1794	3.2866	3.5155	3277	715
125	2860	2.09691	3.4564	7.2476	4.397	3.6346	4311	1451
140	3143	2.14613	3.4973	7.5057	4.6058	3.6552	4521	1378
405	8686	2.60746	3.9388	10.2702	6.7988	3.8486	7057	1629
160	5319	2.20412	3.7258	8.2121	4.8581	3.6795	4780	539
205	9648	2.31175	3.9844	9.211	5.3442	3.7246	5304	4344
580	12327	2.76343	4.0909	11.3047	7.6365	3.914	8204	4123
1865	14402	3.27068	4.1584	13.6008	10.6973	4.1266	13390	1012
1785	13317	3.25164	4.1244	13.411	10.5731	4.1186	13140	177
3255	15529	3.51255	4.1911	14.7216	12.338	4.228	16900	1371
2245	16454	3.35122	4.2163	14.1296	11.2306	4.1604	14460	1994
6080	19541	3.7839	4.2909	16.2365	14.3179	4.3418	21970	2429
3950	15749	3.5966	4.1973	15.0959	12.9355	4.2632	18330	2581
7805	20882	3.89237	4.3198	16.8141	15.1505	4.3872	24390	3508
8010	26316	3.90363	4.4202	17.2548	15.2383	4.3920	24660	1656
7810	22773	3.89265	4.3574	16.9619	15.1527	4.3874	24390	1617
Total	209508	48.3979	64.378	198.1569	154.5609	64.3772	209084	30524
Average	13094.25	3.02487	4.0236	12.384806	9.6600563	4.023575	13067.75	1907.75

Table No.4: Showing Length of Ovary, Observed and Calculated number of ova

Length of Ovary in mm (OL)	Fecundity F	Log (OL) X	Log F Y	XY	X^2	Estimated		Difference between observed and calculated F
						Y	F	
27	2562	1.43136	3.4086	4.8789	2.0488	3.8304	6767	4205
18	2860	1.25527	3.4564	4.3386	1.5757	3.5751	3759	899
27	3143	1.43136	3.4973	5.0059	2.0488	3.8304	6767	3624
22	8686	1.34242	3.9388	5.2875	1.802	3.7015	5029	3657
27	5319	1.43136	3.7258	5.333	2.0488	3.8304	6767	1448
25	9648	1.39794	3.9844	5.57	1.9542	3.7819	6052	3596
25	12327	1.39794	4.0909	5.7187	1.9542	3.7819	6052	6275
38	14402	1.57978	4.1584	6.5694	2.4957	4.0455	11100	3302
39	13317	1.59106	4.1244	6.5621	2.5314	4.0619	11530	1787
47	15529	1.6721	4.1911	7.008	2.7959	4.1793	15110	419
39	16454	1.59106	4.2163	6.7083	2.5314	4.0619	11530	4924
63	19541	1.79934	4.2909	7.7208	3.2376	4.3637	23110	3569
53	15749	1.72428	4.1973	7.2373	2.9731	4.2549	17990	2241
58	20882	1.76343	4.3198	7.6176	3.1096	4.3117	20490	392
65	26316	1.81291	4.4202	8.0134	3.2866	4.3834	24120	2196
65	22773	1.81291	4.3574	7.8996	3.2866	4.3834	24120	1347
Total	209508	25.0345	64.378	101.4691	39.6804	64.3773	200293	43881
Average	13094.25	1.56466	4.0236	6.3418188	2.480025	4.0235813	12518.313	2742.5625

Similar results have been observed in *Heteropneustes fossilis* as reported by Reddy and Rao (1991). King and Udo, (2001) reported that the fecundity of *Periophthalmus barbarus* increased with increase in total weight as expected.

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