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RESEARCH ARTICLE

"Estimation of Freshwater Cat Fish Population of Order Siluriformes, Family- Bagridae From Marathwada Region, (Ms), India By Delury (1947) Catch Effort Method".

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Abstract

The present study deals with the estimation of freshwater fish population of cat fishes Order Siluriformes (Bagridae family) from Marathwada Region by Delury (1947) Catch Effort Method. During the study period October 2006 to September 2008, it was observed that population of cat fishes, order Siluriformes (Bagridae family) is decline, Bagridae family contribute 03 genus and 09 species. Cat fishes are live fishes and having commercial as well as good food value and use as a substitute food for common people, due to over exploitation, pollution and unscientific practices of fishing are play an important role in declining fish population of cat fishes.

Introduction:-

Cat fish (Siluriformes) are a diverse group of fish representing more than 3000 species, 478 genera and 36 families. They contribute 1/3 of the freshwater fish fauna of the globe. There are about 158 species of inland cat fishes from 50 genera and 13 families in India. The work will provide future strategies for development of cat fish species conservation and it is the first effort in this direction.

Material and Methods:-

To study the characterization of fish population, during the period October 2006 to September 2008, perennial sampling sites were selected from five districts (site I, site II, site III, site IV, site V and site VI) of five districts (Aurangabad, Jalna, Parbhani, Nanded and Beed). which were distributed to cover complete area under Marathwada region to study abundance of fish species. Weekly data were collected throughout the year, by successive netting with the help of skilled local fishermen. Locations were changed for the collection of fish species according to the season. Individual kg/effort was recorded to calculate the frequency of occurrence and relatively abundance of fish species where the numbers of efforts were 4.

To estimate fish population, during the period October 2006 - September 2008 indirect regression method was used (Delury, 1947). This regression method employs data on catch per unit of effort to arrive at an estimate of population. The procedure cannot be applied unless the population shows a reduction per fishing effort. The reduction is proportional to the extent of the depletion. The simplest means of estimating population number by this method is to graph the data into straight regression line. In such a graph, the catch per unit of effort lies at the ordinate while total catch including the latest sample at the abscissa. Extraplotation of the regression line to its intercept with the 'x' axis gives a value, which is approximation of population number.

The **correlation coefficient (r)** and Regression equation were as described by, Mungikar (2003).

$r = \frac{\sum(X-\overline{X})(Y-\overline{Y})}{\sqrt{\sum(X-\overline{X})^2(Y-\overline{Y})^2}}$	i] $\sum(X-\overline{X})^2 = \sum X^2 - \frac{[\sum X]^2}{N}$ ii] $\sum(Y-\overline{Y})^2 = \sum Y^2 - \frac{[\sum Y]^2}{N}$ iii] $\sum(X-\overline{X})(Y-\overline{Y}) = \sum XY - \frac{[\sum X][\sum Y]}{N}$
Regression equation $y = a + bx$	**Simultaneous equation to derive the values of a and b** $na + \sum Xb = \sum Y$ $\sum Xa + \sum X^2 b = \sum XY$ **Population of fish was then calculated as:** $p = \frac{a}{b}$

Where, X and Y are the two variables. 2) While 'N' denotes number of observation. 1) P= population of fish 2)'a' and 'b' are constants 3) X and Y are variables 4) n = number of obs.

Ichthyofaunal diversity of bagridae family from Marathwada region year 2006-2008

Siluriformes	Bagridae	*Mystus*	*armatus , bleekeri, cavasius, vittatus, horai, and montanus,*
		Sperata	*seenghala and aor*
		Rita	*gogra*

Table 01 Fish Species Population From Marathwada Region

Name of Fish	Site I		Site II		Site III		Site IV		Site V		Site VI	
	2006-2007	2007-2008	2006-2007	2007-2008	2006-2007	2007-2008	2006-2007	2007-2008	2006-2007	2007-2008	2006-2007	2007-2008
Mystus armatus	—	—	—	—	*	*	—	—	*	*	—	—
Mystus bleekeri	274	252	257	195	311	240	321	288	252	232	283	264
Mystus cavasius	250	249	281	221	—	—	263	258	233	218	247	221
Mystus vittatus	—	—	—	—	—	—	—	—	*	*	*	*
Mystus horai	—	—	—	—	—	—	—	—	*	*	*	*
Mystus montanus	—	—	—	—	238	208	224	221	*	*	257	239
Sperata aor	—	—	—	—	—	—	—	—	*	*	288	243
Sperata seenghala	—	—	—	—	—	—	—	—	*	*	*	*
Rita gogra	—	—	—	—	—	—	—	—	—	—	*	*

*** Negligible population, -- Not Available, # All the values are in number**

PLATE-01

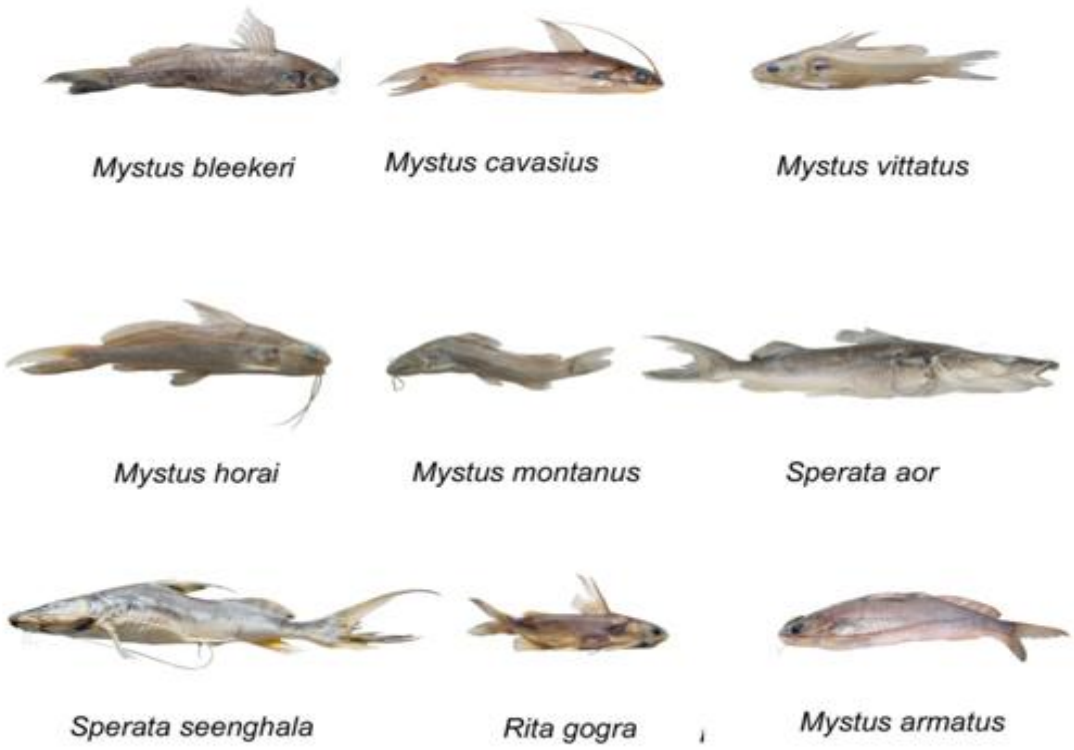


Table: 1 *Mystus bleekeri*

	Site I		Site II		Site III		Site IV		Site V		Site VI	
Week	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**
1	23.5	26.2	20.5	22.5	26	24.5	29	32	31.2	36	33.2	32
2	22.4	23.5	19.5	21	25.3	23	28	30	30.2	35.2	32.5	31
3	22	23	19	20.6	25	22.5	27	29	29	34.2	32	30.5
4	21.5	21	18.6	20.4	24.1	21	28.1	28.3	28.6	33.2	31	29
5	21	23.5	18.2	19.5	24	20	26.5	27	28	33	30	28.5
6	20.6	22	17.5	19.3	23.6	22.6	27	26.5	27.5	32.6	29.6	28
7	20.4	22.1	17	18.6	23	19	28.5	25.5	26	31.5	29	27.6
8	22.5	21.5	16.5	18.4	22.5	18.5	28	26	25.6	31	28.5	27
9	20	21.5	16	17.6	22.1	18	26	25	25.2	29.6	27	26.3
10	19.6	21	18	17	22	17.6	25	24.1	24	29	26	26
11	19	20	17.5	16.5	21.3	17	24.3	22.5	23.2	28.5	25.5	25.1
12	18.5	19.5	16	16	21	16.5	24	25.5	25	28	27	25
13	18	19.2	15.2	15.2	20.6	16	23.1	24	22.5	29.5	25.3	24.6
14	17.6	18.5	15	15	19.5	15.4	22.5	21	22	29	24	23
15	17	19	14.8	14.6	19	15	22	20	21	27.5	23.6	22.5
16	18	17.6	14	14	18.5	14.3	24	19.6	19.6	27	23.4	21
17	16.5	17	13.5	13.6	18	13.5	21.5	19	19	26.5	22	20.3

18	16	17	13	13	17.6	13	21	18.5	18.5	26	21	21.6
19	15.4	16	12.5	12.5	17	12.5	20.1	18	18	25.4	19.5	20
20	15	17.5	12	12	16.5	12	19.8	19.6	19.6	25.01	21	19.6
21	14.6	18	11.5	15	16	11.6	19	17	19	24.3	20.5	19
22	14	15.4	11.4	14.5	15.4	11.4	20.5	16.5	17.5	24	23	18.5
23	15.5	14.4	11	13	16.5	10.5	20	19.5	17	23	22	18
24	15	13.5	10.6	11.2	18	10	18.6	17.6	16.5	22.3	20	17.5
25	13.5	13	10.2	10.5	15.3	12.5	18.4	17	16.2	21	19.5	16.2
26	13	12.6	9.5	10	15	12	18	16.2	16	20.3	18	15.3
27	12.5	12.2	9	9.6	14.6	9.5	19	16	15.4	19.2	17.5	15
28	12	12	10.5	9	15	12	20.1	18.5	16	19	21	16
29	15	13.5	12.5	8.5	16.5	13.5	21.5	19	17.5	20	22	19.5
30	16	14	13.6	8	17.5	14.5	22.4	21	18.2	21.5	22.5	21
31	16.7	17	14.5	7.6	18	17.3	23.6	23.5	23.5	23	24.6	23.5
32	19	20	16	7	19	20.1	24	24	24	24	25	21
33	17	17	14	6.5	21	16.5	22.1	22.6	22.5	21	21	20
34	15	15.2	13.5	6.2	19.5	13.2	20	20	20	20	20	19
35	13.2	13.2	11	5.6	18	10.2	18	17.3	16.2	17	19.6	17.2
36	12	12	9.2	5.3	16.5	9	17.6	16	14	16	19	17
37	11.5	11.5	8.5	5	15	8.5	17.2	14.2	13.5	15	18	16
38	11	10.5	8	6.5	13	8	17	14	12.5	14	17.2	15.2
39	10.5	9.6	7.6	6	12.5	7.6	16.5	13.2	12	13	16	14
40	10	8.5	7.2	4.6	12	7	16	13	10.2	10	15	13.5
41	9.5	8	6.8	4	11	6.5	15.4	12.5	10	9.6	14.3	12
42	8.5	7.5	6.4	3.5	11.5	6.1	14	12	9.4	8	13	11
43	7.6	7	6	3.2	10	5.4	12.5	11.2	8.2	7	12	10.2
44	6.5	6.5	5.5	3	9.5	5	11.2	10.5	7.5	6.5	10	9.5
45	6	6	5	2.5	9	4.5	10.2	9.5	6.5	6	9.2	8
46	5.5	5.5	4.6	2	8.5	4	9	8.5	5.4	5.5	8	6.5
47	5	4.5	4	1	8	3.5	8.5	7.4	5	5	7	6
48	5.5	4	3.5	0.5	7.6	3.5	7	6.5	4	4	5	4.5

*** Negligible population All values are in kg --- Not Available Effort = 4**

Table: 02 *Mystus cavasius*

	Site I		**Site II**		**Site III**		**Site IV**		**Site V**		**Site VI**	
Week	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**
1	22.5	23.6	23	23	-----	-----	23	23.6	40	36	20	19
2	21.3	23	22.6	22.5	-----	-----	22.5	23	39.6	34.5	19.5	18.5
3	20.5	22.5	21	21	-----	-----	21	22.5	39	33.2	19.2	18
4	20	21.8	20.6	20.3	-----	-----	20.6	21.1	38	32	18.6	17
5	19.6	22.5	20	21.5	-----	-----	22.5	21	37	30.1	18.2	18.5
6	19.2	20.6	19.5	21.2	-----	-----	20	20.5	38.5	33.5	19	16
7	18.7	20	19	19	-----	-----	19.8	22	38	32	17.6	15.8
8	18.4	19.6	20	18.6	-----	-----	18.6	22.5	36.5	29.6	17.2	16.4
9	20.5	19	18.6	18	-----	-----	18	20.3	36	28.5	18	15.9
10	19.5	18.6	18	17.1	-----	-----	19.8	19.6	35.1	26.7	19	14.6
11	19	18	17.6	18.5	-----	-----	19	19	35	25	18.5	14
12	18	19.5	18.3	16.2	-----	-----	17.6	18.8	34.8	23.8	16	13.5
13	17.6	19	17	16	-----	-----	16.5	18.2	35.5	23	15.7	13.1
14	16.5	17.6	16.4	15.5	-----	-----	15	17.6	35	24.5	15.2	12.8
15	16	18	15.4	14.3	-----	-----	14	17.1	33.4	22.5	14.6	12.4

16	17.5	17	14.6	14	-----	-----	13.6	16.8	33	22	14	11.5
17	15.6	16.5	17	13.2	-----	-----	15	16.2	32.5	21.6	13.8	11.1
18	15.2	16	16.5	13			16	19	31	20.8	13	10.6
19	14.8	15	14.5	12.6	-----	-----	14.3	18	33.6	22.6	15	9.6
20	14.6	14.3	14.3	12	-----	-----	13	15	30	19.8	14.5	9
21	13.8	14	13.6	11.5	-----	-----	12.6	14.8	29.6	18.6	12.6	10
22	14.5	13.6	13	11	-----	-----	12	14.6	27.6	17.6	12.1	8.7
23	15	13	12.7	10.5			11.6	13.8	26.5	17	12	8
24	13	12.6	12.1	10.2	-----	-----	11.1	13.5	24	18.5	11.8	7.6
25	12.8	12	14	9.6	-----	-----	14.5	13	23.5	18	11.2	7.3
26	12	11.6	11.6	9.2	-----	-----	13.2	12.5	22	16.6	10.5	7
27	11.6	11	11.4	8.5	-----	-----	10.6	12	20	15.3	10	9
28	11	12.5	12	10	-----	-----	11	13.2	19.5	15	9.6	8.5
29	12.5	13	13.2	13	-----	-----	12.5	15	21	16.5	11.5	11.1
30	13	15.3	15	14	-----	-----	14	16	23	17	12.6	12
31	14.6	17	16	14.5	-----	-----	16	17	24.5	17.8	13	13
32	16	18	16.5	15.2	-----	-----	19	19	25	18.6	14.5	14.5
33	14.3	14	13	13	-----	-----	16	16.5	24	16	13.5	12
34	11	13	12.3	11	-----	-----	14	14	21	13.5	10	11.6
35	10.6	10.6	11	9.6	-----	-----	12	12	19.6	12.5	9	8.6
36	10	10	10.6	8.6	-----	-----	11	11	17	11.6	8.6	6.5
37	9.8	9.6	10.1	8	-----	-----	9.6	10.6	16.5	11	8	6.1
38	9	9	9.8	7.8	-----	-----	9.4	10.4	15.2	10.6	9	5.5
39	8.5	8.6	9.4	6.5	-----	-----	8.7	10	14.8	10	7.8	5
40	9.5	8.1	10	6	-----	-----	10.5	9.5	13.5	9.8	7.1	4.8
41	9	8	10.5	5.5	-----	-----	8	9	15	8.6	7	4.4
42	7	7.6	9.1	5	-----	-----	7.6	8.6	11.6	8	6.8	4
43	6.5	7	8.6	4.5	-----	-----	7	7	10.7	7.6	6.2	3.6
44	5.5	6.2	8.1	4.1	-----	-----	6.2	6	9.6	7	5.5	3.1
45	5	6	9.5	3.6	-----	-----	5.5	5.5	8	6.8	5	2.8
46	4.3	5.5	7	3	-----	-----	6	4.5	7	6	4.6	2.4
47	4	5	6	2.5	-----	-----	4.3	4	6.5	5.9	4	1.5
48	3	4	4	2	-----	-----	4	3.6	5	5	3	1

*** Negligible population, All values are in kg, --- Not Available, Effort = 4**

Table: 03 *Mystus montanus*

	Site I		**Site II**		**Site III**		**Site IV**		**Site V**		**Site VI**	
Week	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**
1	-----	-----	-----	-----	16.5	24	27.5	17	-----	-----	21	29
2	-----	-----	-----	-----	15.5	23.5	27	16.5	-----	-----	20.6	28.5
3	-----	-----	-----	-----	15.1	23	26	16	-----	-----	20	28
4	-----	-----	-----	-----	15	22.5	25.5	15.5	-----	-----	19.5	27.6
5	-----	-----	-----	-----	14.8	21.5	24.8	15.2	-----	-----	19	26
6	-----	-----	-----	-----	15	20.3	23.6	15	-----	-----	20.4	25.5
7	-----	-----	-----	-----	14.3	19.5	24	14.6	-----	-----	19	25
8	-----	-----	-----	-----	14	18.5	24.5	14.5	-----	-----	18.7	26
9	-----	-----	-----	-----	13.8	19	23	16.2	-----	-----	18	24.5
10	-----	-----	-----	-----	13.5	17.5	22.5	15.5	-----	-----	19.5	23
11	-----	-----	-----	-----	13.7	16	21	14.1	-----	-----	17.6	23
12	-----	-----	-----	-----	13	17	20.5	13.8	-----	-----	17	22.5
13	-----	-----	-----	-----	12.5	17.5	19.5	13.4	-----	-----	16.5	24

14	-----	-----	-----	-----	12.2	15	20.5	12.7	-----	-----	19	23
15	-----	-----	-----	-----	11.5	14.6	19	12	-----	-----	16.3	19.6
16	-----	-----	-----	-----	11.3	14	18.6	11.6	-----	-----	15.2	19.1
17	-----	-----	-----	-----	11.1	13.8	18	10.6	-----	-----	15	18.5
18	-----	-----	-----	-----	10.9	13.2	17	10.2	-----	-----	14.9	18.2
19	-----	-----	-----	-----	10.6	12.7	19	9.6	-----	-----	14	17.6
20	-----	-----	-----	-----	10.2	12	16.5	9.1	-----	-----	13.5	16.3
21	-----	-----	-----	-----	9.8	14.1	15	8.6	-----	-----	13	15.4
22	-----	-----	-----	-----	9.5	12	14.8	9.2	-----	-----	12.5	16
23	-----	-----	-----	-----	9	11.5	13.2	9	-----	-----	15.6	17
24	-----	-----	-----	-----	8.8	10.5	12.5	8.7	-----	-----	12.1	15
25	-----	-----	-----	-----	8.6	10	12.1	7.6	-----	-----	11.7	14.2
26	-----	-----	-----	-----	8.2	9.4	11.4	7.2	-----	-----	12	14
27	-----	-----	-----	-----	8	9	10.2	6.7	-----	-----	11	13.5
28	-----	-----	-----	-----	8.5	8.6	11.5	7	-----	-----	10.8	14
29	-----	-----	-----	-----	9	9.5	12.2	9	-----	-----	13	16
30	-----	-----	-----	-----	9.5	11	13.5	11	-----	-----	14	17
31	-----	-----	-----	-----	11	13	14	12	-----	-----	15.5	19
32	-----	-----	-----	-----	13	15	15.5	13.5	-----	-----	16.5	21
33	-----	-----	-----	-----	7.5	13	14	11	-----	-----	13.5	18
34	-----	-----	-----	-----	7	11	11.6	9	-----	-----	12	16
35	-----	-----	-----	-----	8.2	10	10.5	8.2	-----	-----	10.2	13.5
36	-----	-----	-----	-----	8	8.5	10	7.5	-----	-----	9.5	12.6
37	-----	-----	-----	-----	6.7	6.4	9.5	6	-----	-----	9	12.5
38	-----	-----	-----	-----	6	6	9	5.5	-----	-----	8.6	11.6
39	-----	-----	-----	-----	7.1	5.5	8.5	5	-----	-----	8.1	10.6
40	-----	-----	-----	-----	5.4	5.2	8	4.7	-----	-----	7.5	10
41	-----	-----	-----	-----	5.1	4.7	10	4.3	-----	-----	8.5	9.5
42	-----	-----	-----	-----	4.8	4.1	7.6	3.7	-----	-----	7.1	8.6
43	-----	-----	-----	-----	4.1	4	7	3	-----	-----	8.5	7.5
44	-----	-----	-----	-----	4	3.6	8.5	2.5	-----	-----	6	6
45	-----	-----	-----	-----	3.5	3.1	5.6	2	-----	-----	5.4	5.5
46	-----	-----	-----	-----	3	2.5	5	3	-----	-----	5	5
47	-----	-----	-----	-----	2.5	2	4	1.5	-----	-----	4.3	4.6
48	-----	-----	-----	-----	1	1	3.2	0.5	-----	-----	4	4

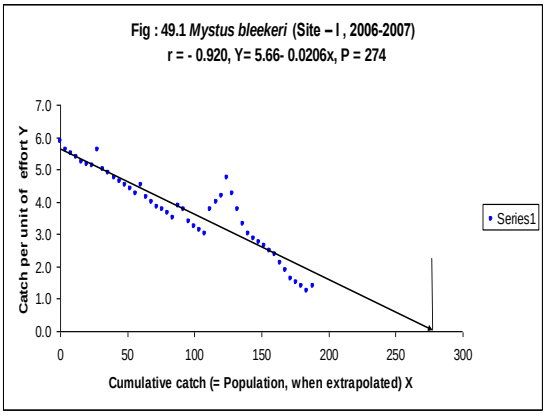
*** Negligible population, All values are in kg --- Not Available, Effort = 4**

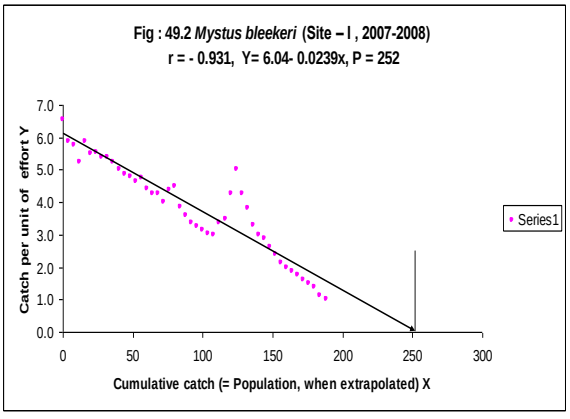
Table: 04 *Sperata aor*

	Site I		**Site II**		**Site III**		**Site IV**		**Site V**		**Site VI**	
Week	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**	**2006-2007**	**2007-2008**
1	-----	-----	-----	-----	-----	-----	-----	-----	*	*	22.5	17
2	-----	-----	-----	-----	-----	-----	-----	-----	*	*	21	16.5
3	-----	-----	-----	-----	-----	-----	-----	-----	*	*	20.8	13
4	-----	-----	-----	-----	-----	-----	-----	-----	*	*	20.6	15.5
5	-----	-----	-----	-----	-----	-----	-----	-----	*	*	20	16
6	-----	-----	-----	-----	-----	-----	-----	-----	*	*	19.8	16.4
7	-----	-----	-----	-----	-----	-----	-----	-----	*	*	18.6	15
8	-----	-----	-----	-----	-----	-----	-----	-----	*	*	20	14.8
9	-----	-----	-----	-----	-----	-----	-----	-----	*	*	18	14.2
10	-----	-----	-----	-----	-----	-----	-----	-----	*	*	17.6	13
11	-----	-----	-----	-----	-----	-----	-----	-----	*	*	17	12.6

12	-----	-----	-----	-----	-----	-----	-----	-----	*	*	18.3	12.1
13	-----	-----	-----	-----	-----	-----	-----	-----	*	*	16.9	11.5
14	-----	-----	-----	-----	-----	-----	-----	-----	*	*	16.4	10.6
15	-----	-----	-----	-----	-----	-----	-----	-----	*	*	15.8	12
16	-----	-----	-----	-----	-----	-----	-----	-----	*	*	14.6	11.5
17	-----	-----	-----	-----	-----	-----	-----	-----	*	*	16	10.5
18	-----	-----	-----	-----	-----	-----	-----	-----	*	*	16.5	10
19	-----	-----	-----	-----	-----	-----	-----	-----	*	*	14.4	9.8
20	-----	-----	-----	-----	-----	-----	-----	-----	*	*	14.3	9.6
21	-----	-----	-----	-----	-----	-----	-----	-----	*	*	13.8	9.4
22	-----	-----	-----	-----	-----	-----	-----	-----	*	*	13.2	8.7
23	-----	-----	-----	-----	-----	-----	-----	-----	*	*	12.5	9
24	-----	-----	-----	-----	-----	-----	-----	-----	*	*	12	10.2
25	-----	-----	-----	-----	-----	-----	-----	-----	*	*	13.5	8
26	-----	-----	-----	-----	-----	-----	-----	-----	*	*	11.6	7.9
27	-----	-----	-----	-----	-----	-----	-----	-----	*	*	11.4	7.5
28	-----	-----	-----	-----	-----	-----	-----	-----	*	*	11.2	7
29	-----	-----	-----	-----	-----	-----	-----	-----	*	*	13	9.5
30	-----	-----	-----	-----	-----	-----	-----	-----	*	*	14.5	10
31	-----	-----	-----	-----	-----	-----	-----	-----	*	*	15.6	12
32	-----	-----	-----	-----	-----	-----	-----	-----	*	*	16	13
33	-----	-----	-----	-----	-----	-----	-----	-----	*	*	14.2	11.5
34	-----	-----	-----	-----	-----	-----	-----	-----	*	*	12.3	9
35	-----	-----	-----	-----	-----	-----	-----	-----	*	*	11	6.8
36	-----	-----	-----	-----	-----	-----	-----	-----	*	*	10.5	6.2
37	-----	-----	-----	-----	-----	-----	-----	-----	*	*	10.3	6
38	-----	-----	-----	-----	-----	-----	-----	-----	*	*	9.7	7.5
39	-----	-----	-----	-----	-----	-----	-----	-----	*	*	9.5	5.8
40	-----	-----	-----	-----	-----	-----	-----	-----	*	*	10.8	5.4
41	-----	-----	-----	-----	-----	-----	-----	-----	*	*	10.5	5
42	-----	-----	-----	-----	-----	-----	-----	-----	*	*	9	6.2
43	-----	-----	-----	-----	-----	-----	-----	-----	*	*	8.5	4.8
44	-----	-----	-----	-----	-----	-----	-----	-----	*	*	8	4
45	-----	-----	-----	-----	-----	-----	-----	-----	*	*	10	3.6
46	-----	-----	-----	-----	-----	-----	-----	-----	*	*	7.4	3.2
47	-----	-----	-----	-----	-----	-----	-----	-----	*	*	6.5	2.4
48	-----	-----	-----	-----	-----	-----	-----	-----	*	*	4	2

*** Negligible population, All values are in kg, --- Not Available, Effort = 4**





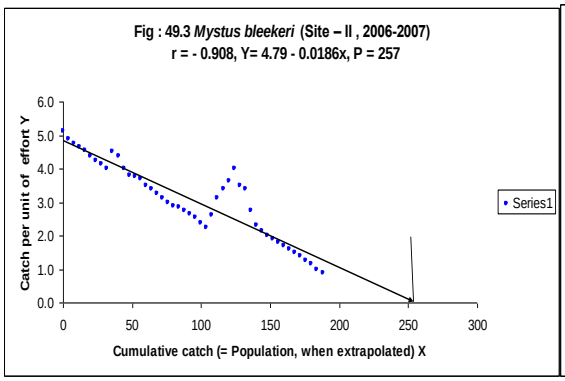


Fig : 49.3 Mystus bleekeri (Site – II , 2006-2007)
r = - 0.908, Y= 4.79 - 0.0186x, P = 257
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

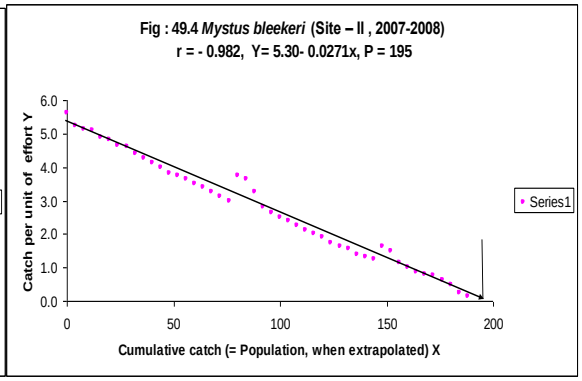


Fig : 49.4 Mystus bleekeri (Site – II , 2007-2008)
r = - 0.982, Y= 5.30- 0.0271x, P = 195
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

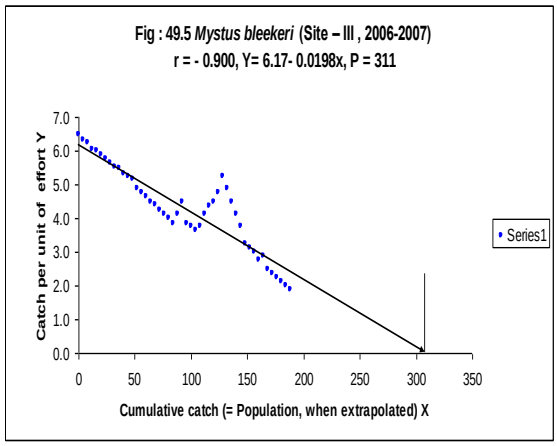


Fig : 49.5 Mystus bleekeri (Site – III , 2006-2007)
r = - 0.900, Y= 6.17- 0.0198x, P = 311
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

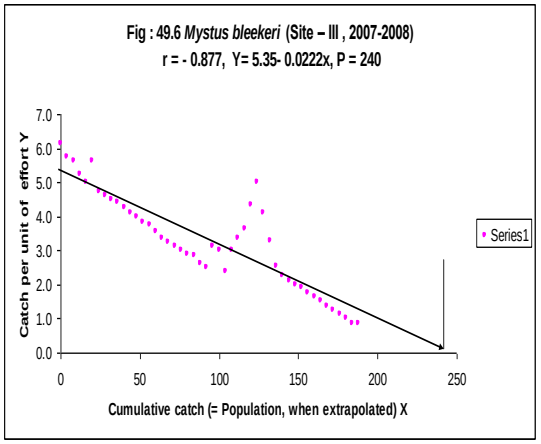


Fig : 49.6 Mystus bleekeri (Site – III , 2007-2008)
r = - 0.877, Y= 5.35- 0.0222x, P = 240
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

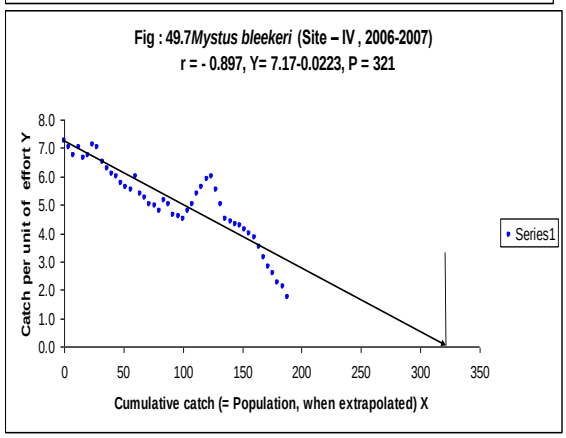


Fig : 49.7Mystus bleekeri (Site – IV , 2006-2007)
r = - 0.897, Y= 7.17-0.0223, P = 321
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

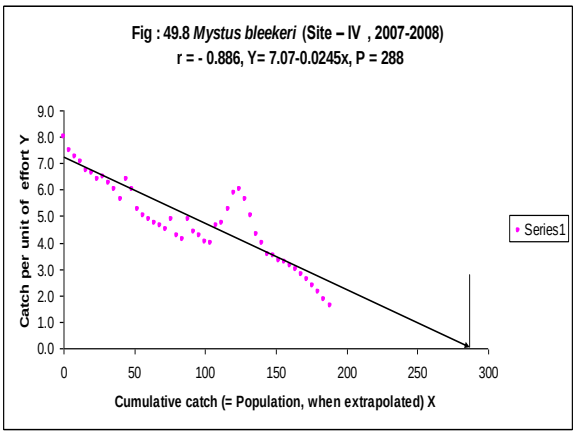


Fig : 49.8 Mystus bleekeri (Site – IV , 2007-2008)
r = - 0.886, Y= 7.07-0.0245x, P = 288
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

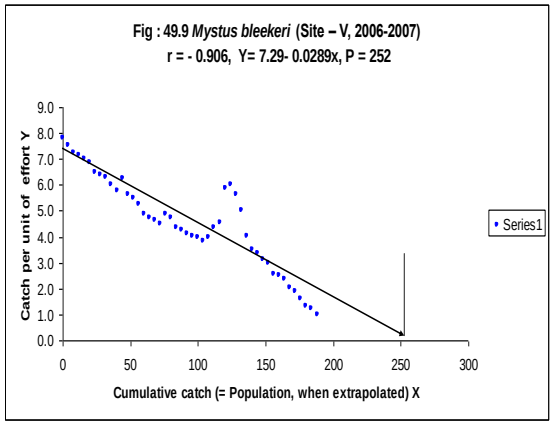


Fig : 49.9 Mystus bleekeri (Site – V, 2006-2007)
r = - 0.906, Y= 7.29- 0.0289x, P = 252
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

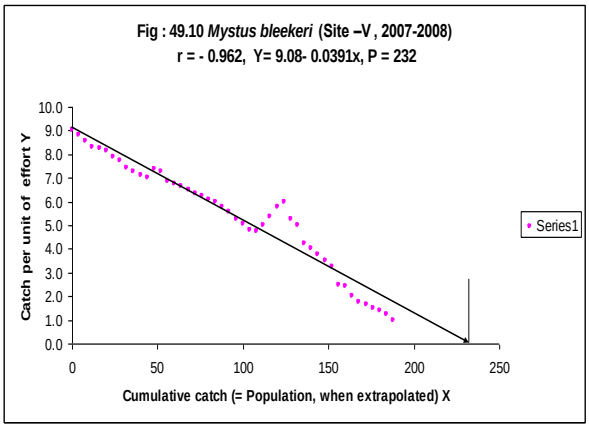


Fig : 49.10 Mystus bleekeri (Site –V , 2007-2008)
r = - 0.962, Y= 9.08- 0.0391x, P = 232
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

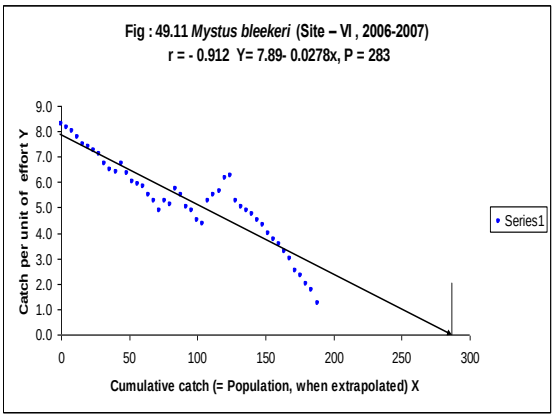


Fig : 49.11 Mystus bleekeri (Site – VI , 2006-2007)
r = - 0.912 Y= 7.89- 0.0278x, P = 283
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

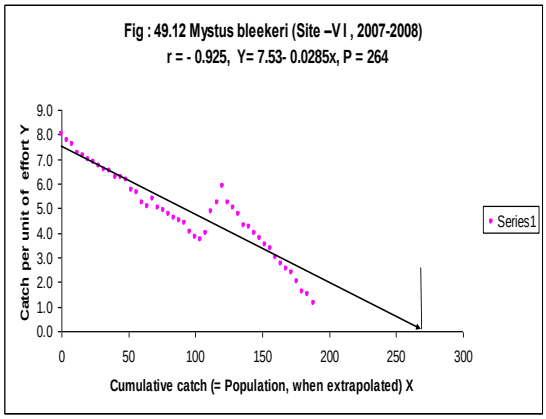


Fig : 49.12 Mystus bleekeri (Site –V I , 2007-2008)
r = - 0.925, Y= 7.53- 0.0285x, P = 264
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

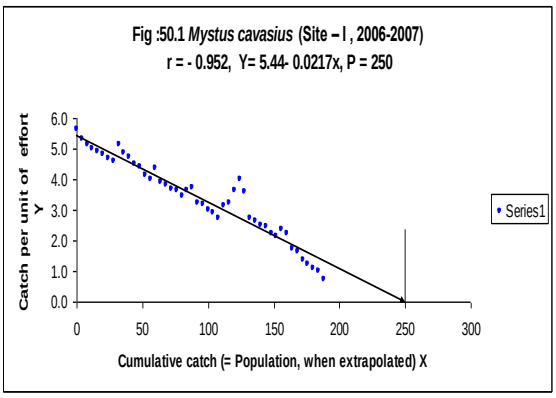


Fig :50.1 Mystus cavasius (Site – I , 2006-2007)
r = - 0.952, Y= 5.44- 0.0217x, P = 250
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

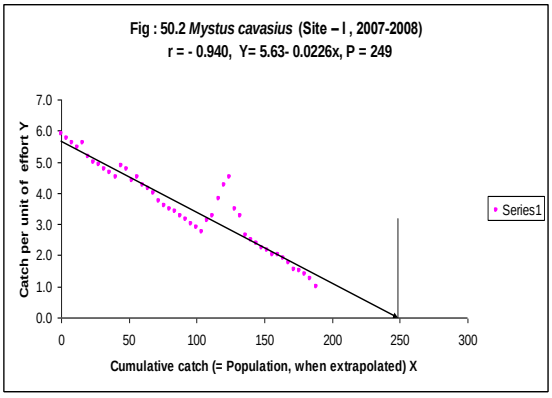


Fig : 50.2 Mystus cavasius (Site – I , 2007-2008)
r = - 0.940, Y= 5.63- 0.0226x, P = 249
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

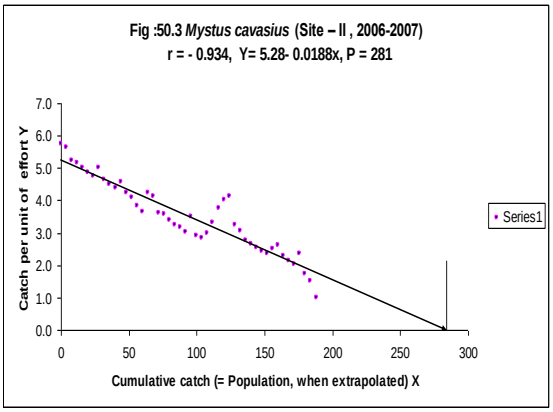


Fig :50.3 Mystus cavasius (Site – II , 2006-2007)
r = - 0.934, Y= 5.28- 0.0188x, P = 281
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

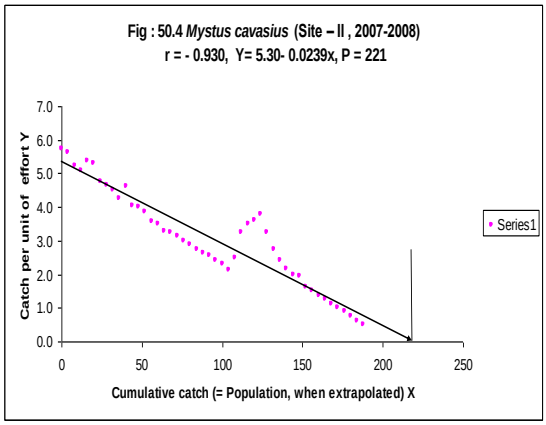


Fig : 50.4 Mystus cavasius (Site – II , 2007-2008)
r = - 0.930, Y= 5.30- 0.0239x, P = 221
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

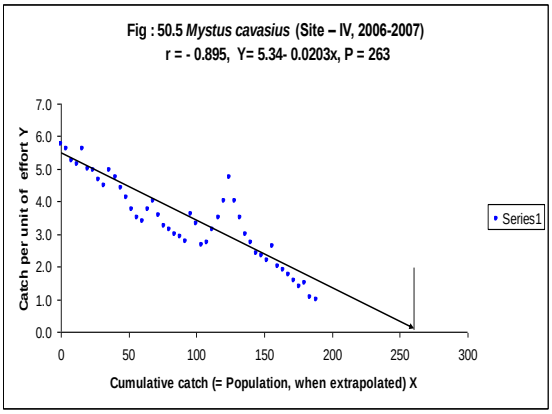


Fig : 50.5 Mystus cavasius (Site – IV, 2006-2007)
r = - 0.895, Y= 5.34- 0.0203x, P = 263
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

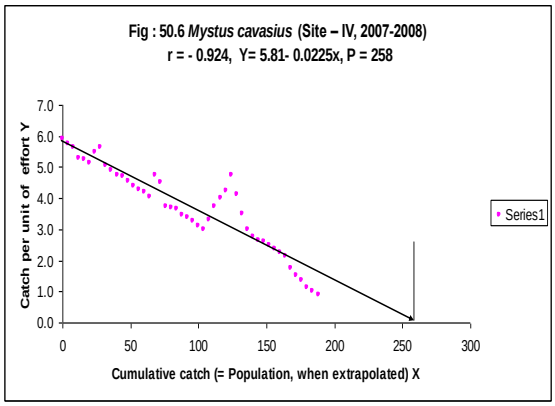


Fig : 50.6 Mystus cavasius (Site – IV, 2007-2008)
r = - 0.924, Y= 5.81- 0.0225x, P = 258
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

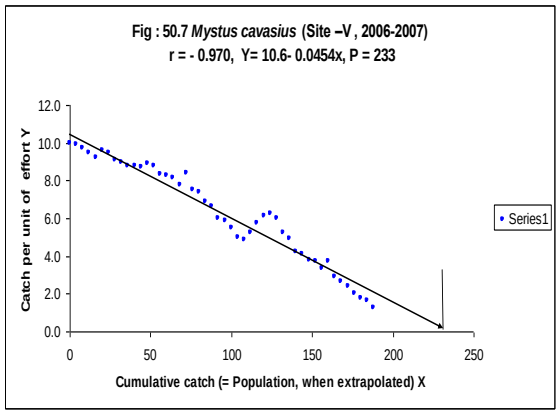


Fig : 50.7 Mystus cavasius (Site –V , 2006-2007)
r = - 0.970, Y= 10.6- 0.0454x, P = 233
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

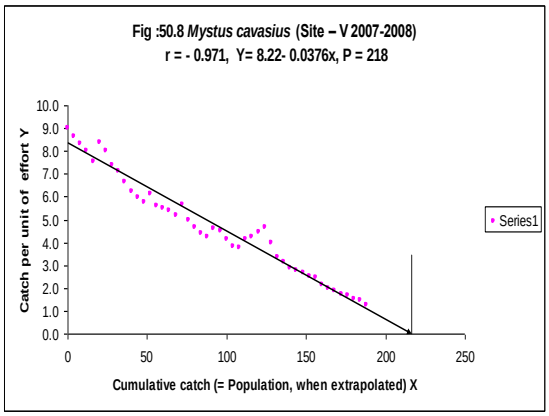


Fig :50.8 Mystus cavasius (Site – V 2007-2008)
r = - 0.971, Y= 8.22- 0.0376x, P = 218
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

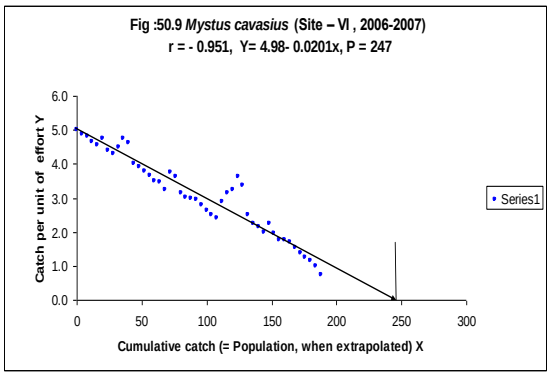


Fig :50.9 Mystus cavasius (Site – VI , 2006-2007)
r = - 0.951, Y= 4.98- 0.0201x, P = 247
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

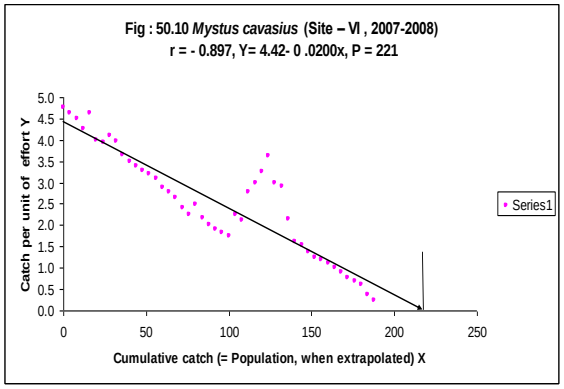


Fig : 50.10 Mystus cavasius (Site – VI , 2007-2008)
r = - 0.897, Y= 4.42- 0 .0200x, P = 221
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

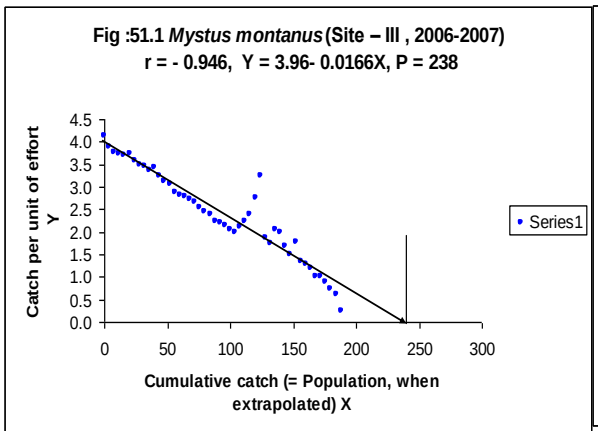


Fig :51.1 Mystus montanus (Site – III , 2006-2007)
r = - 0.946, Y = 3.96- 0.0166X, P = 238
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

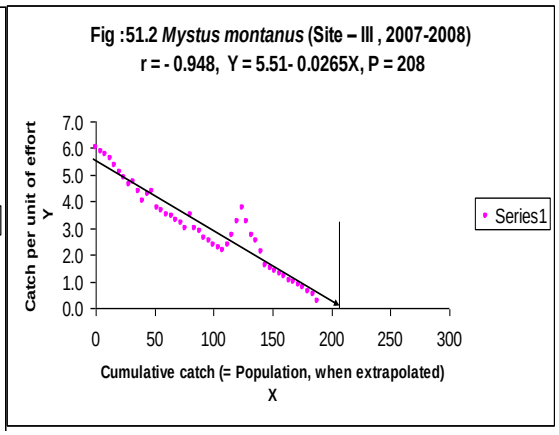


Fig :51.2 Mystus montanus (Site – III , 2007-2008)
r = - 0.948, Y = 5.51- 0.0265X, P = 208
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

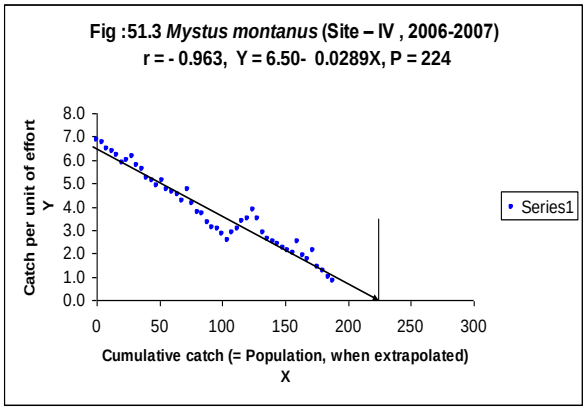


Fig :51.3 Mystus montanus (Site – IV , 2006-2007)
r = - 0.963, Y = 6.50- 0.0289X, P = 224
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1

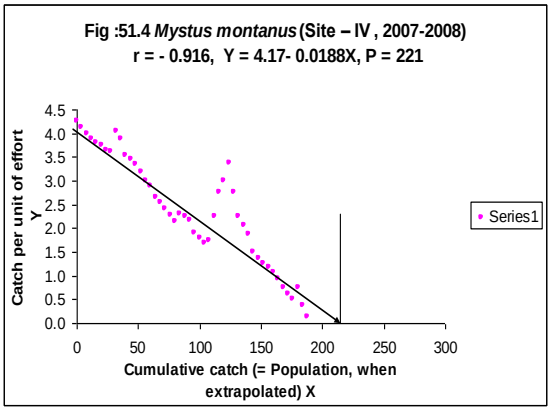
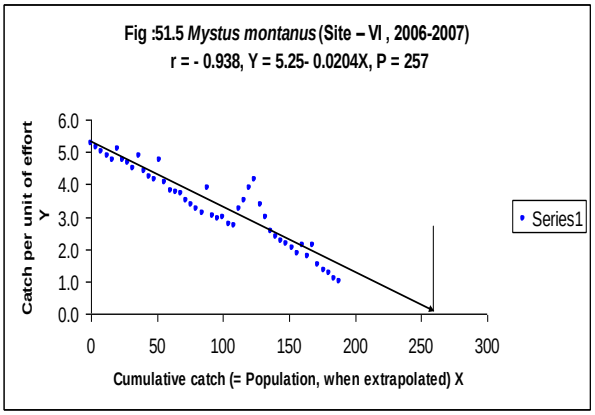
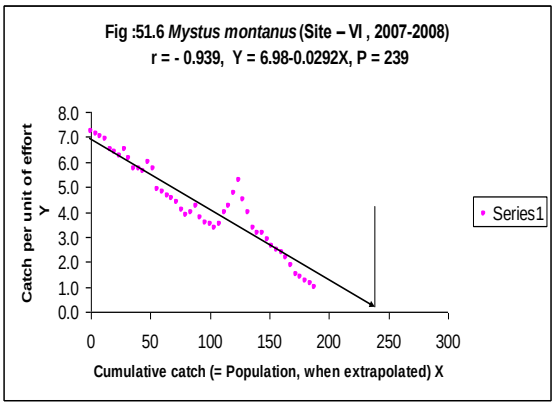
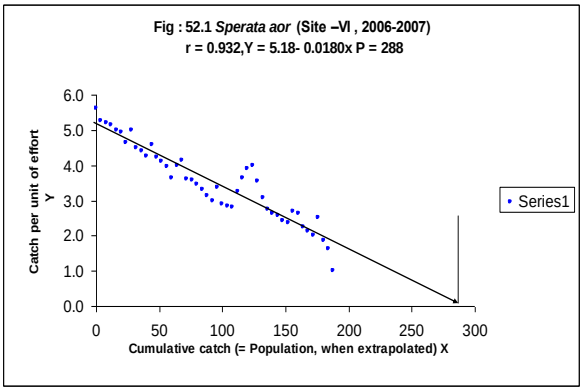
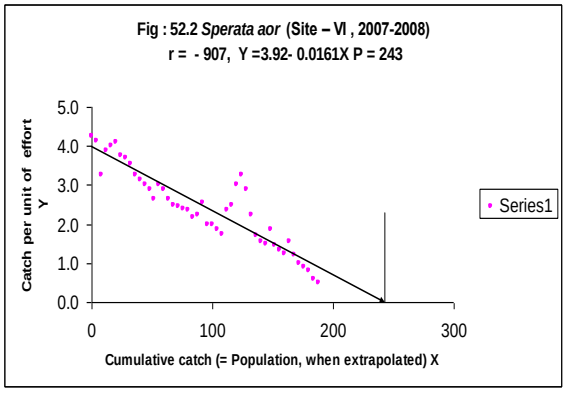


Fig :51.4 Mystus montanus (Site – IV , 2007-2008)
r = - 0.916, Y = 4.17- 0.0188X, P = 221
Catch per unit of effort Y
Cumulative catch (= Population, when extrapolated) X
Series1









Result and discussion:-

During the study period it was observed that population of cat fishes order Siluriformes (Bagridae family) are decline and the population of cat fishes of second year is less than as compare with the population of first year. Bagridae family contributes 03 genus and 09 species. Genus *Mystus* dominant with 06 species. Beside that *Sperata* genus contribute 02 species and *Reta* genus 01 species respectively.

During the present investigation maximum population of *Mystus bleekeri* was 321 at site IV in the year 2006-2007 and minimum was 195 at site II in the year 2007-2008, (Table 01).Maximum population of *Mystus cavasius* was 281 at site II in the year 2006-2007 and minimum was 218 at site V in the year 2007-2008, site III did not contribute to the population, maximum population to *Mystus montanus* was 257 at site VI in the year 2006-2007 and minimum was 208 at site III in the year 2007-2008, site I and II did not contribute to the population while site V had negligible population of *Mystus montanus*, (Table 01).

During the present investigation population of *Sparata aor* was 288 and 243 at site VI in the year 2006-2008 sites I, II, III, and IV did not contribute to the population while site V had negligible population of *Sparata aor*, (Table 01).Population of *Mystus vittatus, Mystus horai, Sperata seenghala* having no population at site I, II, III, IV and at site V and VI having negligible population. *Reta gogra* having no population at site I, II, III, IV and V and site VI having negligible population. Species like *Mystus armatus* showing no population at site I, II, IV and VI and at site III and V showing negligible population. *Sperata aor* is having no population at site I, II, III and IV and site V showing negligible population.The graph showing the regression value, value of Y and Population of fish.

During the study period it was observed that the fish population of *Mystus bleekeri* and *Mystus cavasius* are found at all the six site *Mystus cavasius was* not found at site III through out the year and species like *Mystus montanus* found population at site III, IV and site VI and *Sperata aor* found at site VI respectively but the population of cat fishes is decline in 2007-2008 as compare to 2006-2007.During the present investigation fish population at six study sites was carried out by Catch Effort Method described by Delury, (1947) and it was observed that sustained decline in the catch per unit effort is a reliable indication of regression of population in successive catching. Similar results were observed by Delury, (1947 and 1951) for estimation of biological population from Canada were sustained

decline in catch per unit of effort in the successive catching was observed. Cooper and Lagler, (1956) measured the fish population from North Amer by using catch effort method.

Carlander, (1955) estimated the population of fish in lakes were sustained decline in catch per unit of effort in the successive catching was observed. Omand, (1951) estimated the population of fish based on catch effort method and proccess in the successive catching. Fischler, (1965) estimated population of male blue crabs (*Callinectes sapidus*) by catch effort method and with the sustained decline in the catch per unit effort in successive catching. Paloheimo, (1963) estimated the population of lobster, when sustained decline in catch per unit of effort in the successive catching was observed. Riley *et al.,* (1992) estimated the trout population in small streams in North America and obtained similar result.

Schaefer, (1954) studies the dynamics of marine fish population from America by using catch effort method and found sustained decline in the catch per unit of effort in the successive catching.Schumacher and Eschmeyer, (1943) estimated fish population by catch effort method from lakes with similar result. Robin Mahon, (1980) estimated fish population density and biomass in streams of Canada by using catch effort method and he also found sustained decline in the catch per unit of effort in the successive catching.

Population density at river Bhadra of Western Ghats was studied by Shahnawaz *et al.,* (2009) and he observed that Cyprinidae family was most dominant with wide distribution of fish species. Gultneh Solomon *et al.,* (1981) studied fluctuation and distribution of the population density along with movement of Rose Bitter ling in Shein Tone river and concluide that Cyprinidae family was most dominant, Jatindra Nath Bhakta and Probir Kumar Bandopadhyay, (2007) studied the population density of exotic fishes in Churni River of West Bengal, India and shows that Cyprinidae family was dominant over the other families of fish communities.

Conclusions and Recommendations:-

- During the study period it was observed that the fish population of *Mystus bleekeri* and *Mystus cavasius* are found at all the six site *Mystus cavasius* was not found at site III throughout the year and species like *Mystus montanus* and *Sperata aor* found population at site III,IV and site VI and site VI respectively but it is decline in 2007-2008 as compare to 2006-2007.
- Maximum catch was observed in October while minimum during rainy season. Slight increase in fish catch during summer was observed due to loss of water evaporation.
- Human activities, water diversion, changes in method of land utility and deforestation may have contributed rapid impact on fish population. This may be due to the challenges faced by built structures in order to control floods and increased flow of water.
- Reduction in the size of habitat, unscientific methods of fishing, and unplanned fish harvesting during breeding season might have reduced the fish population and use of small mesh fishing gear at all six study sites might have been responsible for reduced population of fish species, and deforestation might have indirectly declined fish population due to excessive siltation and soil erosion in the catchment area.
- It was observed that population of fishes showed significant variation (Mungikar, 2003).
- Due to construction of dam, the down streams water flow was reduced as a result of which the migratory fishes were unable to move, and it affected the abundance and distribution of fish population.

Recommendations:-

- In order to maintain the population of cat fish fauna proper studies on effect of environmental condition on fish population with modern techniques are needed.
- Different cat fish species breed in different seasons. Usually female fishes with great number of eggs in their ovary are caught in high number during breeding season, due to which a large quantity of egg resource is perished. The fishing activity should be therefore banned during these months. The fine meshed nets like cast net, mosquito net, catching juvenile must be banned because they reduce survival rate of fish species.
- Due to over fishing and destructive fishing practices the fish stock and population and being declining and the situation demands strategies for protection of fishery resources.
- Proper care should be taken during construction of dam so that downstream should have enough water throughout the year for growth and survival of fish fauna and migratory fishes to move from upstream to downstream in order to maintain their population constant throughout the year.
- Farmers should be made aware about the losses in fish diversity to population due to excessive use of pesticides and the area inhabitated by rare species of fishes should be protected in the form of fish sanctuary.

- Cryopreservation of fish spermatozoa, eggs and embryo of indigenous fish species is employment to increase their survival rate and population.
- An improved breeding technique using bio filtration and formulating suitable larval feed has to be employed to increase larval survival and fish species population. To enhance reproductive rate, improved breeding techniques like induced breeding by Chinese hatchery and their other hatching models be used.
- Studies on fish growth, conservation of fish population be included in graduate and post graduate studies.
- Government should effectively implement legislation, policies and strategies towards fish growth, population and conservation.

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