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Observations on Sex Ratio and Fecundity of *Sillago sihama* (Forsskal, 1775) (Family; Sillaginidae) from Karachi Coast

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ABSTRACT

Observations on the sex ratio and fecundity of *Sillago sihama* have been made in this report. By the help of these observations we can say that the female to male ratio was found to be 1: 1.3 i.e. males are comparatively more abundant in small size groups. Mean fecundity was found to be 58781, the minimum and maximum being 5483 and 63244 from the fish measuring 180 – 189 mm T.L to 270 – 279 mm T.L respectively. Right lobe was found to be more fecund than the left one. The results will help to increase our knowledge of reproduction biology of *Sillago sihama* which can be utilize in aquaculture management and breeding programmes.

Keywords: Sex ratio, *Sillago sihama*, Fecundity, Karachi coast.

1. Introduction

Sillago sihama is most abundant in shallow water and is easily available in the coastal waters of Pakistan throughout the year from Korangi Creek (Korangi Harbour) to Kimari and Manora channels. The present study is undertaken to determine the sex ratio and fecundity (relationship of fecundity/total length, fecundity/body weight, fecundity/gonad length, fecundity/gonad weight).

Studies on sex ratio reveal segregation or aggregation of males and females in accordance with environmental conditions, the differential behavior of sexes, and due to fishing Khan & Hoda (1993) [1]. Different aspects of sex ratios of teleost species have been documented by various workers Silva & De Silva (1981) [2], Murty (1979, 1980) [3,4] and Murty & Ramalingam (1986) [5].

The sex ratio of only a few species of teleost fish from our coast is known Hoda (1986) [6], Hoda & Qureshi (1989) [7]. A study of overall or month wise sex ratio in a population according to size of fish is essential.

Fecundity is an adaptation to varying environmental conditions which work through the food supply, hence is the basic means of regulating the rate of reproduction changing conditions Dexter (1969) [8]. The fecundity in a single population may undergo considerable fluctuations in relation to the supply of nourishment.

Application of fecundity is concerned with productivity studies, Allen (1951) [9]. Fecundity may vary among different fishes and within the same species. Differences may be due to length of fishes and lengths and weights of gonads. Studies pertaining to fecundity reveal useful information about the reproductive potential of the fish species.

2. Material and Methods

Sex determination was done by examination of secondary sexual characters. Abdomen is cut open to determine the sex. Gonads were removed, weight and preserved in 7 % natural formalin solution after noting their size and coloration. Gonads were divided into seven maturity stages based on the gonad indices, size and color after the modification of ICES scale Wood (1930) [10] and Hoda (1985) [11]. The maturity stages description used for Sillago sihama is after Parrish, R. & Donna, H (1986) [12], Hoda (1987) [13] and Khan & Hoda (1998) [14].

The gonosomatic index can be estimated by determining its weight relative to the body weight. This can be expressed as follows:

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$$GSI = \frac{\text{Weight of gonads}}{\text{Body weight of fish}} \times 100$$

For fecundity determination, first the gonads were weighed then three portions (anterior, middle and posterior) of known weight from each lobe were taken into the Petri dish. Mature ova in each portion were counted with the help of daily counter and fecundity was calculated by the following formula:

$$F = W \frac{(Na + Nm + Np)}{(Wa + Wm + Wp)} \times 100$$

where W = weight of the ovaries, Wa, Wm,Wp and Na, Nm, Np are the weight and number of ova from anterior, middle and posterior portions of each lobe.

It is noticed that the males of sillago sihama form a slightly higher percentage of the catches than the females, ratio being 55.6: 44.4, Radhakrishnan (1957) [15]. According to my results the observed ratio is 53.66: 46.93 which is closer to the value observed by Radhakrishnan (1957) [15].

To ascertain the fact that the samples have been drawn from a population whose males and females are equally distributed. The theoretically expected ratio of 1:1 has been examined by the Chi-square $(X2)$ test. Table1 & 2 show that the total observed ratio of male to female 1: 1.13 differs significantly from the theoretical expected ratio of 1:1.

Analysis of 23 fecundity data indicates a direct relationship between fecundity and total length, fish weight, ovary weight, ovary length (Table 3, Figure 2).

**Table 1:** Sex ratio (Male: Female) of *Sillago sihama* in different size group.

Size range T.L (mm)	Ratio M : F	Proportion of male	X^2
100-109	5 : 0	1.0	5.00
110-119	8 : 0	1.0	8.00
120-129	6 : 0	1.0	6.00
130-139	21 : 3	0.87	13.5
140-149	20 : 4	0.83	10.6
150-159	47 : 17	0.73	14.0
160-169	69 : 35	0.66	11.1
170-179	33 : 32	0.50	0.01
180-189	28 : 42	0.40	2.80
190-199	13 : 37	0.26	11.5
200-209	5 : 26	0.16	14.2
210-219	9 : 16	0.36	1.96
220-229	10 : 16	0.38	1.38
230-239	3 : 3	0.50	-
240-249	0 : 11	0.00	11.0
250-259	0 : 2	0.00	2.00
260-269	-	-	-
270-279	0 : 1	0.00	1.00
Total	277 : 245	1.13	1.96

The mean fecundity for the female was calculated to be 58,781. The minimum and maximum being 54883 and 63244 from the fish measuring 180-189 mm TL to 270-279 mm TL respectively. The number of ova / gram body weight and ovary weight is determined to be 696 and 8437 respectively (Table 4).

Table 2: Sex ratio (Male: Female) of *Sillago sihama* in different months.

Sep. 03	4 : 29	0.12	18.9
Oct. 03	3 : 29	0.09	21.1
Nov. 03	15 : 6	0.71	3.85
Dec. 03	14 : 17	0.45	0.29
Jan. 04	16 : 15	0.51	0.03
Feb. 04	12 : 17	0.41	0.17
Mar. 04	18 : 8	0.69	3.84
Apr. 04	19 : 15	0.55	0.47
May.04	12 : 19	0.38	1.58
Jun. 04	17 : 13	0.56	0.53
Aug. 04	18 : 14	0.56	0.50
Sep. 04	13 : 24	0.35	3.27
Oct. 04	37 : 9	0.80	17.0
Nov. 04	19 : 10	0.65	2.79
Dec. 04	42 : 8	0.84	23.1
Jan. 05	18 : 12	0.60	1.20
Total	277 : 245	1.13	1.96
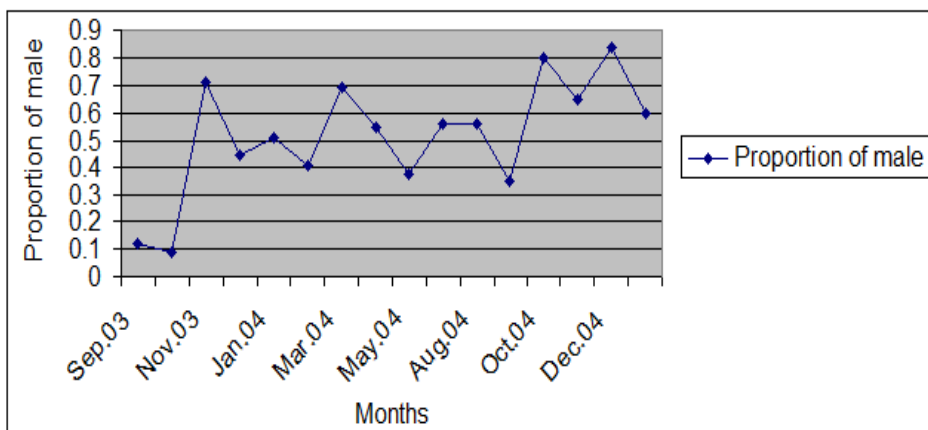
(a)
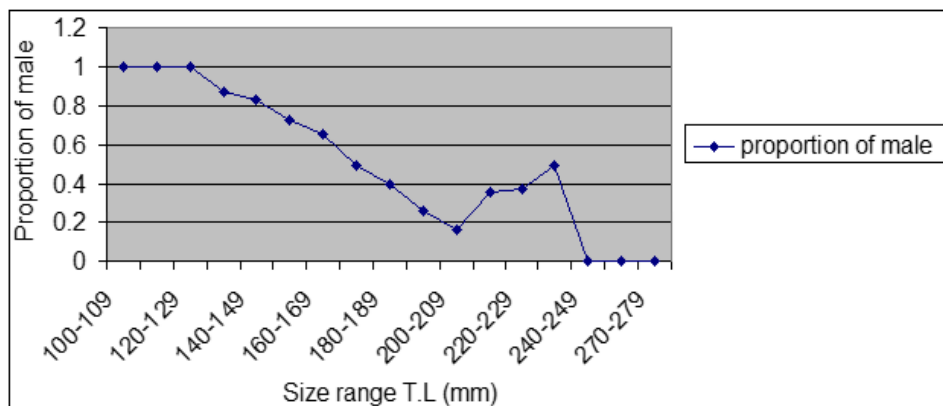
(b)

Fig 1: Sex ratio of S. sihama in (a) different months & (b) size groups.

Table 3: Average fecundity of right and left lobes of ovaries of *Sillago sihama.*

| Size group T.L (mm)	Frequency	Right lobe	Left lobe	Total eggs
180-189	3	28308	26575	54883
190-199	4	29606	27943	57549
200-209	2	29587	26762	56349
210-219	5	30656	28940	59596
220-229	5	30717	28606	59323
230-239	2	30061	27870	57931
240-249	-	-	-	-
250-259	1	31425	29950	61375
270-279	1	32973	30271	63244
180-279	23	30417	28365	58781

Table 4: Average of fecundity counts in various length groups of *Sillago sihama.*

| Freq.	T.L(mm) range	ave.T.L (mm)	ave. fish Wt.(g)	ave. ovary wt. (g)	ave. ova no.	Ova/g B.Wt	Ova/g Ovary./wt
3	180-189	187.33	55.33	5.70	54883	992	9629
4	190-199	197.75	60.75	6.37	57549	947	9034
2	200-209	202.50	68.00	6.35	56349	829	8874
5	210-219	216.00	81.60	7.60	59596	730	7842
5	220-229	225.20	92.00	7.72	59323	645	7684
2	230-239	231.50	98.00	7.75	57931	591	7475
1	250-259	256.00	134.00	7.20	61375	458	8524
1	270-279	271.00	168.00	7.50	63244	376	8433
23	180-279	223.41	94.71	7.02	58781	696	8437

(a)

(b)
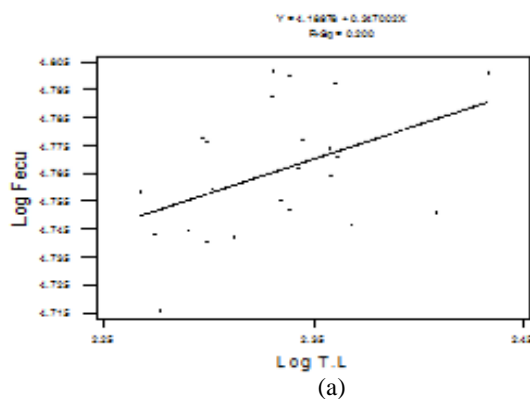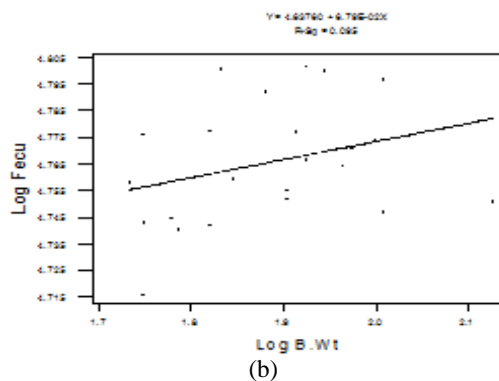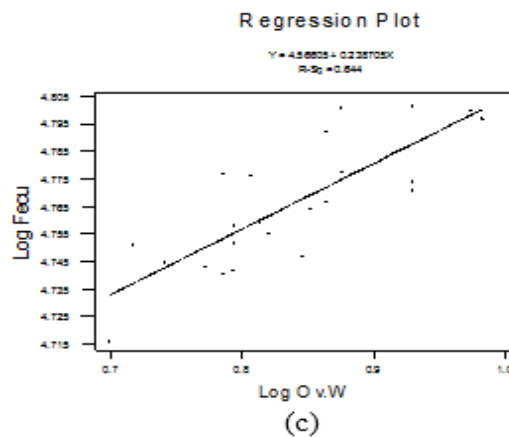
Fig 2: Log log relationship between fecundity and (a) log T.L (mm); (b) B. Wt (g), (c) Ovary Wt.

3. Discussion

In the present investigation the observed female to male ratio is 1:1.3, but males were comparatively more abundant in small size groups, Seshappa & Bhimachar (1955) [16]. It is noticed that the males of *Sillago sihama* form a slightly higher percentage of the catches than the females, the ratio being 55.66: 46.93 which is closer to the values observed by Radhakrishnan, (1957) [15]. The apparent differences in the monthly sex ratio are due to the sampling fluctuations or they do not follow the normal 1 : 1 ratio due to actual changes in the concentration of the sexes, Khan & Hoda, (1998) [14]. The sex ratio 1: 1 may also be affected by selective fishing in different season and schooling behavior in feeding and spawning grounds, Sarojini, (1957) [17], Silva & De Silva, (1981) [2], Lasiac, (1982) [18]. Furthermore the present samples from fish harbor may also be biased because of the selective size preferred by fishermen, Khan & Hoda, (1998) [14].

Clark (1934) [19] reported that the fecundity of a fish increased in proportion to the square of fish length. Simpson (1951) [20] stated that fecundity of the Plaice was related to the cube of its length. Several workers reported a straight line relationship between the fish weight and fecundity Bagenal, (1957) [21] Sarojini, (1957) [17]. Present study of fecundity of *Sillago sihama* found a straight line relationship between total length, body weight, ovary weight and fecundity. The results of present work are in agreement with their observations and it also reveals that the mean production of ova per gram of fish weight decreases with increasing weight of fish.

4. Acknowledgement

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