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FECUNDITY OF THE SNOW-TROUT, *SCHIZOTHORAX PLAGIOSTOMUS* (HECKEL) FROM GARHWAL HIMALAYA.

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ABSTRACT

Absolute fecundity of *S. plagiostomus* varied from 3474 in a fish measuring 345 mm (T.L.) and weighing 315 g to 13916 in a fish measuring 540 mm (T.L.) and weighing 1370 g. The weight of the fish ovaries accounted for 7.02 to 17.78% of the total weight of the fish. The average number of eggs per kg weight of fish and per gram of ovary weight was found to be 10820 and 81 respectively. The fecundity per kg of body weight was found to be 11539. The relationships between fecundity and other parameters (fish length/fish weight/ovary weight/ovary volume/ ovary length) and fish length-ovary weight and fish weight-ovary weight were also determined.

INTRODUCTION

Studies on the fecundity of fishes are very useful in understanding their reproductive potential. Several important reports are available on fish fecundity (Bagenal, 1957, 67; Chonder, 1977; Joshi and Khanna, 1980; Varghese, 1980 and Singh *et al*, 1982). The present communication deals with the fecundity of a commercially important food fish of Garhwal Himalaya.

MATERIALS AND METHODS

One hundred sixty two mature specimens of *S. plagiostomus* were collected from the snow-fed river Alaknanda of Garhwal Himalaya during 1984-85. The length and weight of fish and the length weight of the ovaries were measured in fresh condition for each specimen. The ovaries of each fish were dissected

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TABLE 1 : RELATIONSHIP BETWEEN FECUNDITY AND VARIOUS BODY AND OVARY PARAMETERS OF S. PLAGIOSTOMUS

Total length of Fish mm		No. of Fish	Fish Weight(g)		Ovary Weight(g)		Ovary Volume(ml)		Ovary length(mm)		Number of eggs	
Range	Average	exami - nation	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average
301-350	346	8	256-332	305.25	13.20-17.10	14.475	12-17	14.28	118-160	136.3	3474-4036	3856
51-400	376	40	372-555	420.75	24.71-45.50	33.020	22-44	32.15	132-165	148.8	3776-7148	5837
401-450	429	38	520-795	649.79	47.00-118.00	73.514	45-116	72.39	135-185	166.1	5688-8924	8084
451-500	479	48	805-1200	1020.42	88.60-197.30	148.248	85-196	146.10	174-230	210.9	8112-12958	9881
501-550	518	28	1150-1370	1256.07	188.20-252-.00	219.648	176.2-250.5	217.21	222-250	240.7	9538-13016	11862

out and fixed in 5% formaline. After hardening, they were taken out and kept on a filter paper for 30 minutes to drain out and evaporate the excess of water absorbed by them. The weight and volume of the preserved ovaries were carefully recorded. The sub-samples from the anterior, middle and posterior regions of both the ovaries were mixed and subjected to gravimetric (Simpson, 1959) and volumetric counts (Kandler and Pirwitz, 1957). The average of both the methods were recorded as mean the absolute fecundity.

Relative fecundity was determined by the ratio of total number of ova and total weight of fish. Relationship between the fecundity and fish weight/fish length/ovary volume/ovary weight/ovary length were established by applying the method of least square $Y = a+bx$. In Logarithmic from $\log Y = \log a+b \log x$ where Y = fecundity, x = body measurements (Total length/ body weight/ovary volume/ovary weight/ovary length). The constants *a* and *b* were calculated in each case.

RESULTS

Fish in high state of maturity viz. ripe or pre-spawning phase were selected for the study. During this phase, ovary becomes opaque, broad and highly vascular and its smooth surface disrupts by the presence of ripe ova heavily loaded with yolk. The fecundity of this species was studied in relation to body and ovary parameters.

Fecundity and fish length : This relationship is shown in Table 1 and Fig.1. According to mean values, the number of ova varied from 3856 in a fish measuring 346 mm (T.L.) to 11862 in the fish measuring 518 mm. The minimum fecundity was 3474 for a fish measuring 315 mm and the largest specimen of 540 mm had the maximum fecundity of 13916. The relationship between fecundity and total length of fish can be expressed as

$$F = -11243 + 44.57\ T.L.$$

Where F = fecundity and T.L. = Total length in mm.

A logarithmic transformation gives the straight line regression of log fecundity on log length (fig.1).

$$\text{Log } F = 0.15342 + 2.2882 \text{ Log TL } (r = 0.91190)$$

The transformation tends to equalize the variance throughout the range of lengths thereby avoiding the problem that fecundity of large fish is more variable than that of smaller ones.

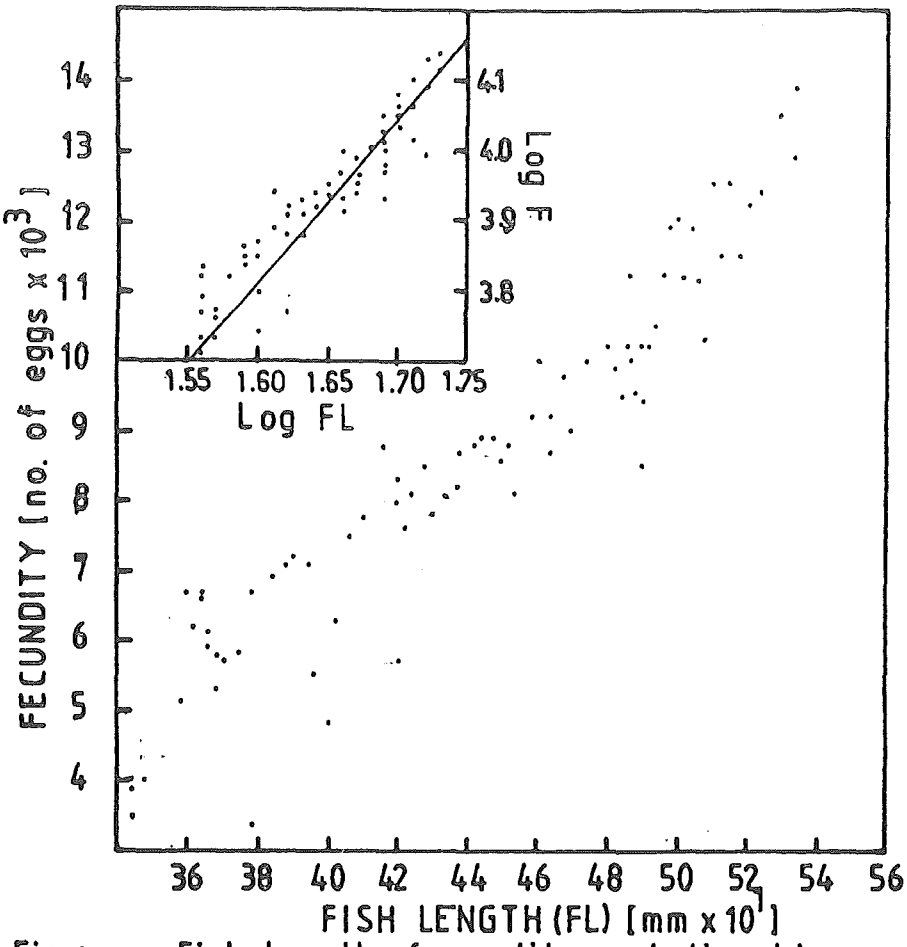

Fig. 1 Fish length-fecundity relationship

Fecundity and fish weight : The data relating to fish weight (Somatic + nonadal) and fecundity were plotted (Fig.2) showing

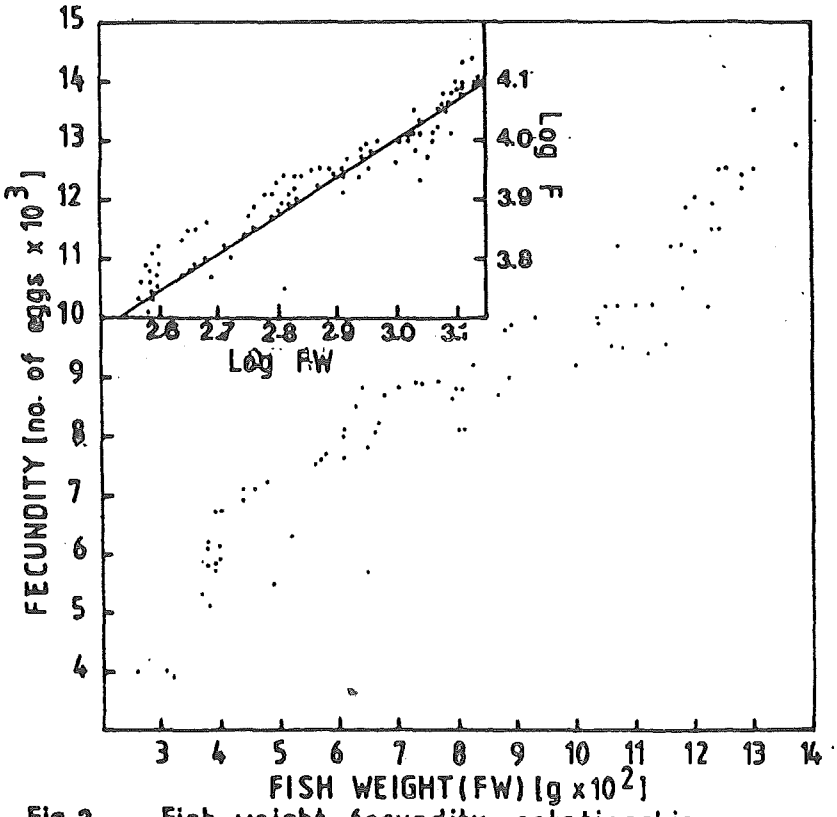

Fig. 2 Fish weight-fecundity relationship

the existence of an exponential relation. The relation between fish weight - fecundity was found to be F = 2228 + 7.772 FW

Log F = 2.0753 + 0.6428 log FW (r = 0.90690)

Where FW = Fish weight (somatic + gonadal).

Fecundity and ovary volume : The relationship between ovary volume and fecundity was found to close (Fig.3). The

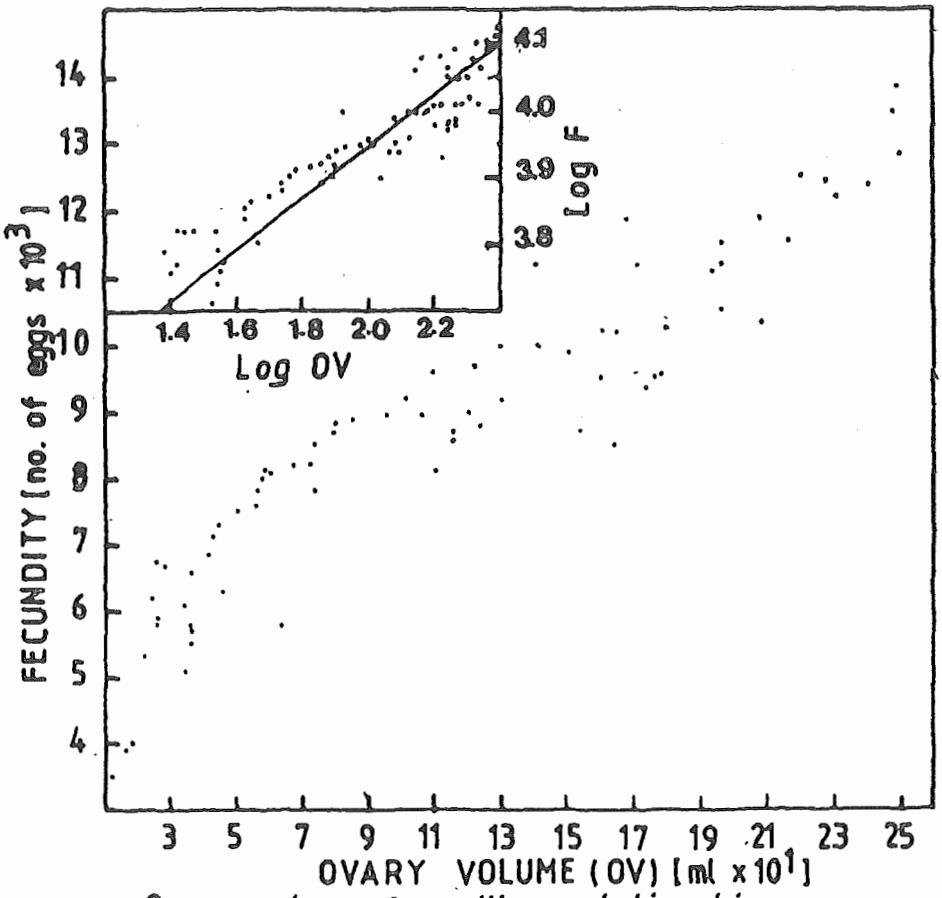

Fig. 3 Ovary volume-fecundity relationship

correlation coefficient (r = 0.93668) also indicates that the fecundity is more related to the volume of the ovary. The fecundity and ovary volume relationship can be expressed as F = 4396 + 36.380 OV, Log F = 3.2030 + 0.3719 log OV (r = 0.93668) Where OV = volume of the ovary.

Fecundity and ovary weight : In order to study this relationship the fecundity values were plotted against the respective weight of ovaries (Fig.4). Egg production ranged from 3474 in an ovary of 13.2 g to 13916 in an ovary of 252 g. The average number of ova per g weight of ovary was 81 eggs. The relationship between fecundity and ovary weight can be expressed as :

F = 4382 + 36.016 OW

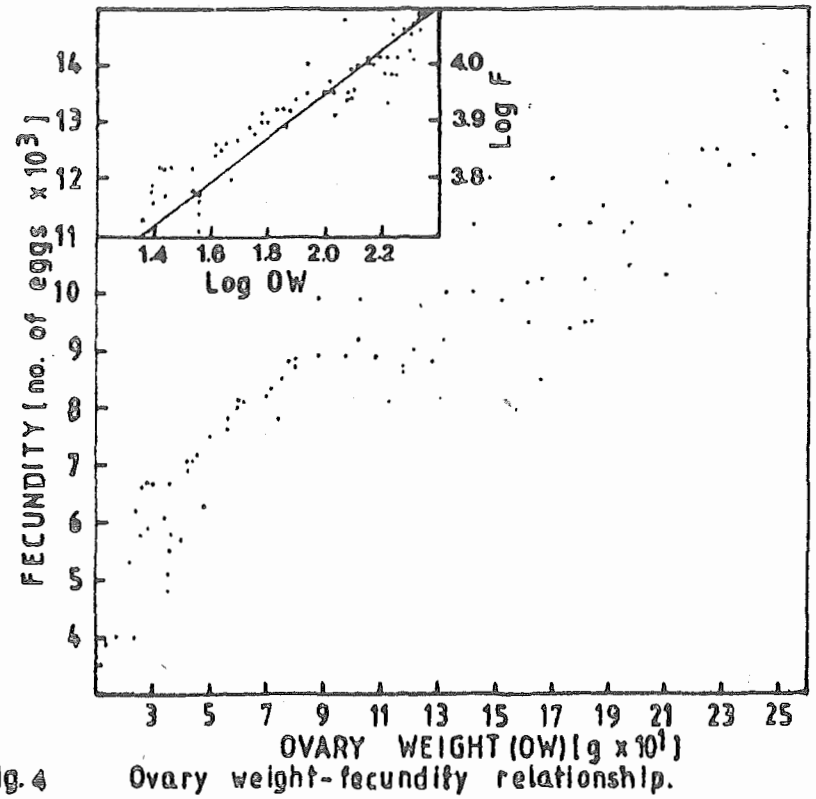

Fig. 4 Ovary weight-fecundity relationship.

Log F = 3.1973 + 0.3740 log OW (r = 0.93455).

Fecundity and ovary length : Fecundity increased with an increase in the length of ovaries (Fig.5). This relationship can

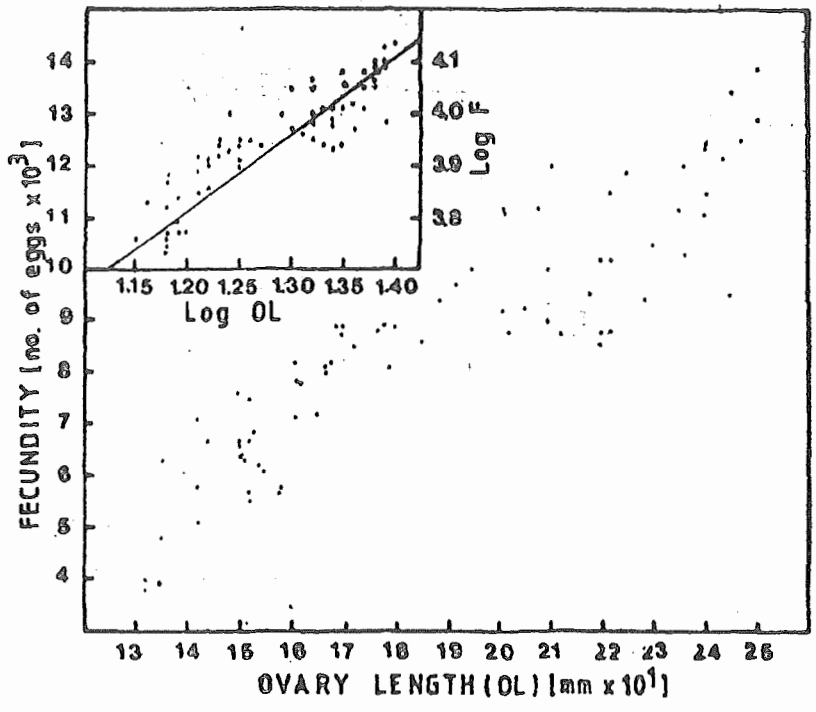

Fig. 5 Ovary length-fecundity relationship.

be expressed as : F = -4741 + 700.312 OL

Log F = 2.1021 + 1.4326 Log OL (r = 0.88148) where OL = length of ovary.

Ovary weight and fish weight : The weight of ovary of each fish was plotted against the fish weight (Fig.6) and an

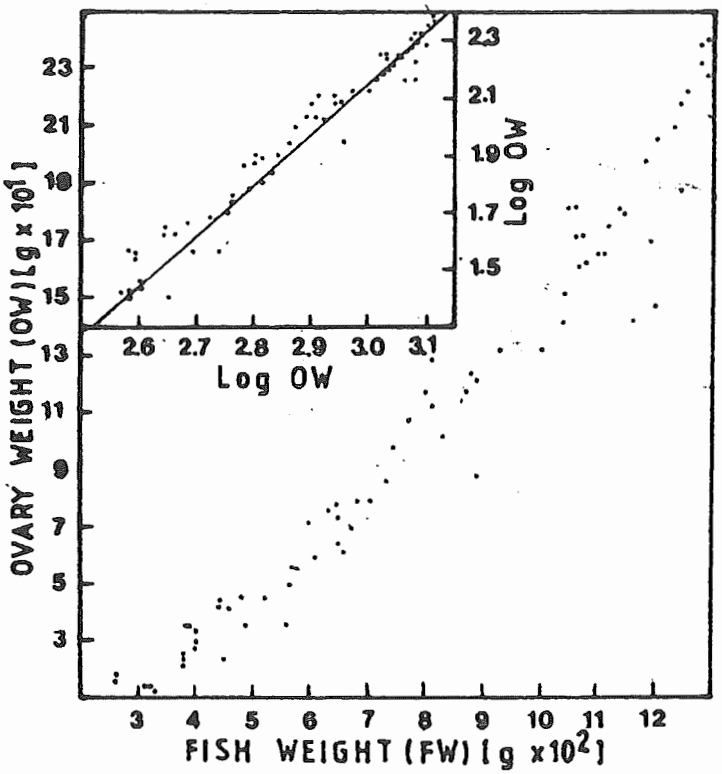

Fig.6 Fish weight-ovary weight relationship.

exponential relationship was found to exist which can be expressed as :

Ow = - 56.721 + 0.2115 FW

Log OW = - 3.0854 + 1.7495 Log, FW (r = 0.98063) Where FW = weight of fish and OW = Weight of ovary.

Ovary weight and fish length : The weight of ovary in a fish is influenced by its size. The relationship between total length of fish and ovary weight was found to be fairly close and may be expressed as :

OW = - 409 + 1.1789 FL

Log OW = - 8.2622 + 6.1951 FL, where OW = ovary weight and FL = total length of fish, (r = 0.98120).

TABLE 2 : RELATIONSHIP BETWEEN FISH WEIGHT, OVARY WEIGHT, FECUNDITY AND RELATIVE FECUNDITY IN S.PLAGIOSTOMUS

Weight of Fish (g)		No. of fish examined	Ovary Weight (g)		% of ovary weight in total weight of fish	No. of eggs FECUNDITY		No. of egg/g weight of ovary		No. of eggs/g weight of fish (Relative fecundity)	
Range	Average		Range	Average		Range	Average	Range	Average	Range	Average
01-400	366.81	32	13.20-36.92	25.74	7.02	3474-6700	5502	141-304	221	10.5-16.9	15
401-600	499.75	24	24.72-56.80	42.17	8.44	3776-7825	6282	130-169	150	8.4-15.9	13
601-800	674.40	30	59.22-118.00	79.15	11.74	5688-8924	8291	73-136	105	8.8-13.7	12
801-1000	877.79	18	88.60-132.00	117.44	13.38	8112-10010	9198	69-113	78	9.2-11.3	11
1001-1200	1117.78	36	145.90-197.30	170.94	15.29	9380-11958	10347	51-81	61	8.4-10.0	9
1201-1400	1277.73	22	188.21-252.00	227.21	17.78	10250-13916	12289	49-61	54	8.4-10.3	9

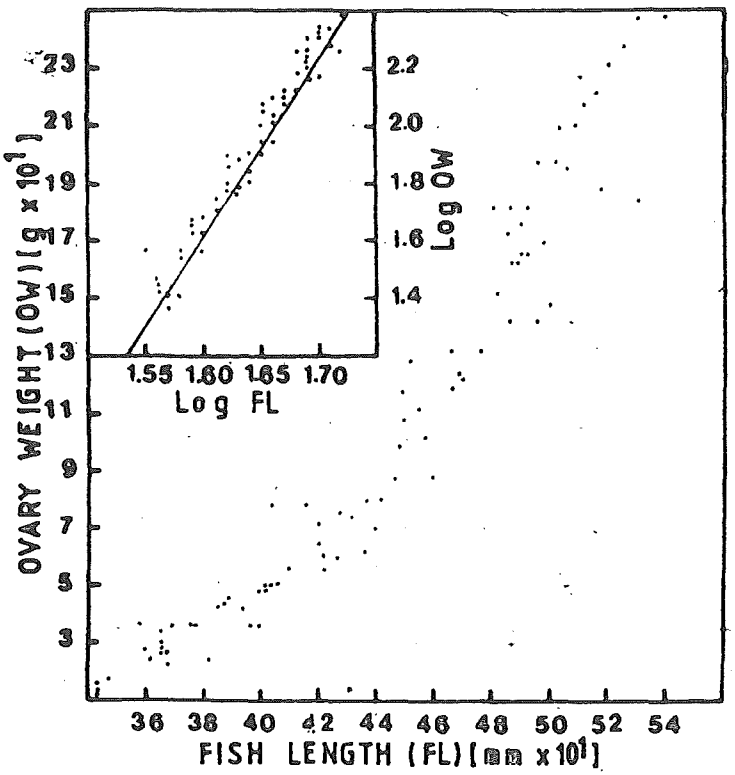

Fig. 7 Fish length-ovary weight relationship.

Relative Fecundity : The ratio of the total number of ova and total weight of fish was calculated for relative fecundity. It is 15 for average weight of 367 g of fish. This ratio goes on decreasing and it comes to about 9 for an average weight of 1198 g. Table 2 indicates that the total fecundity increases with a corresponding increase in the weight of the fish whereas the comparative fecundity decreases with an increase in weight.

DISCUSSION

Different relationship have been found to exist between fecundity and the various parameters. Clark (1934) reported that the fecundity of a species increases in proportion to the square of its length. Simpson (1951) established that the fecundity of the plaice was related to the cube of its length. Kestaven (1942), Swarup (1962), Panak and Coefield (1978) and Singh *et al*, (1982) reported a straight line relationship of the fecundity with the fish length. However, the fecundity of *S. plagiostomus* increases at a rate of 2.29 times of its length. A similar high exponential value of 2.36 and 2.68 was recorded in *Schizothorax richardsonii* (Misra, 1982) and *S.Niger* (Jyoti and Malhotra, 1972)

respectively.

Several workers reported a straight line relationship between the fish weight and fecundity (Bagenal, 1957; Sarojini, 1957; Joshi and Khanna, 1980; Singh *et al* 1982; Nauriyal, 1985; Pokhriyal, 1986). curvilinear relationship was noted in *Coilia dussumieri* (Varghese, 1980). As far as *Schizothorax* species are concerned various workers including Jyoti and Malhotra (1972), Raina (1977) and Misra (1982) correlated the fish weight and fecundity and found straight line relationship between fish weight and fecundity. The findings of the present work are in agreement with their observations and it also reveals that the mean egg production per gram of fish decreased with higher weight grouping of fishes.

In *S. plagiostomus* the fecundity is more closely related to fish length than fish weight. Similar views are expressed by Misra (1982) in *S. richarsonii* and Joshi and Khanna (1980) in *L. gonius* Contrary to these findings simpson (1951) laid more emphasis on fish weight.

A close correlation is usually expected between the number of eggs and ovarian weight and volume. According to Chondar (1977) and Joshi and Khanna (1980), the number of egg production ;depends upon the ovary weight more closely while during the course of the present investigation on *S. plagiostomus* it appears to be related more specifically to ovarian volume as also described by Nautiyal (1985) in *Tor putitora.*

Varghese (1976, 80) observed a curvilinear - relationship between fish length - ovary weight and fish weight - ovary weight in *C. ramcarati* and *C. dussumieri.* In *S. plagiostomus* curvilinearity is very close to the linear relationship. The regression coefficient values of these relationships indicate that rate of increase of ovary weight in relation to the body length is greater than the rate of increase of ovary weight in relation to body weight. The exponential value of 6.19 in the fish length - ovary weight of *S. plagiostomus* is greater than the corresponding values for *C. ramcarati* (Varghese, 1976) and *L. gonius* (Joshi and Khanna, 1980).

The reproductive potential of fishes of different size and from different localities has been discussed by Khan (1964), Chondar (1977), Joshi and Khanna (1980) and Nautiyal (1985) and results of fecundity have been expressed in terms of the number of egg/unit of body weight, i.e., relative fecundity, which is described as comparative fecundity by Das (1964), who calculated it to be 33.6 *(Wallagonia attu)* 37 *(Rita Rita),* 63

(Ophiocephalus marulius). The relative fecundity of *Labeo gonius* is 271 (Joshi and Khanna, 1980) and that of *tor putitora* 6(Nautiyal, 1985). .The present study on *S. plagistomus* revealed its relative fecundity as 12, which indicates that *S. plagiostomus* has a higher reproductive potential than *T. putitora* of the same riverine ecosystem.

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