MESH SELECTIVITY FOR SPOTTED SEER, SCOMBEROMORUS GUTTATUS (BLOCH & SCHNEIDER)

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An attempt has been made to evolve a suitable mesh size for the commercially significant size group of *S. guttatus*. To obtain maximum sustainable yield taking biological factors also in to consideration, 52 mm mesh bar nets are suggested for exploiting the fishery on both the East and West coasts of India.

INTRODUCTION

Buchanan — Wollaston (1927); Hogson (1927); Havinga and Deelder (1948); Nomura (1961) and Burd (1963) have stressed the importance of selecting the minimum mesh size in gill nets and trawls from the standpoint of conservation of population· Joseph and Sebastian (1964), on the other hand, emphasised the need for the selection of suitable mesh size to increase the out put of gill nets. Holt (1957) analysed the gill net data on the assumption that for two gill nets the meshes of which differ slightly in size, the shape of their selection curves is the same and the mean selection length is proportional to the mesh size. This method has been successfully made use of by Olsen (1959) and Olsen *et al* (1961) for herring and halibut; Peterson (1964) for pacific Salmon and Koura and Shahun (1969) for Nile perch. Baranov (1948) showed that the mesh size is proportional to the modal length of fish caught in it.

Based on studies conducted at Kakinada the East Coast and Cochin in the West Coast the correct mesh size of the gear required for the capture of commercially important size group of spotted seer (*S. guttatus*) has been evolved using Baranov's formula. The results are dealt with in this communication.

MATERIAL AND METHODS

Based on a survey of the existing seer gill nets on both the East and West coasts of India, three different mesh sizes viz· 50 mm, 60 mm and 70 mm mesh bar were selected for the studies. The experimental gear consisted of two fleets, one consisting of fifteen nets, five nets in each mesh size and the other consisting of nine nets, three nets in each size. Webbings were hung at a hanging coefficient of 0.5 horizontally, effecting the corresponding vertical coefficient of 0.86. In the absence of separate selvedge meshes, the upper

and lower edge meshes were doubled and reeved through the corresponding head and foot ropes.

The investigations were carried out during 1966—68 seasons. The nets were operated as surface drift nets from two 9.15 m. (30′) mechanised vessels. The depth of fishing ranged from 10—60 metres. The arrangement of the nets in each days operation was statistically designed. The buoyancy of head rope and weight of foot rope were kept constant throughout the period of experimentation. A total of 82 fishing operations were conducted and the necessary morphometric data collected. The predominant size groups of *S. guttatus* from the commercial seer fishery have also been recorded regularly from seer janding centres at both the east and west coasts.

RESULTS

The catch of three species of seer caught in the experimental gear is given in Table — I in both number and weight.

TABLE I: QUANTITY OF DIFFERENT SPECIES OF SEERS CAUGHT IN THE EXPERIMENTAL GEAR

Sl. No.	Mesh size bar length mm	S. Guttatus		S. Commersoni		S. Lineolatus		Total	
		No.	Wt. in kg	No.	Wt. in kg	No.	Wt. in kg	No.	Wt. in kg
A	50	185	193.54	39	110.80	16	30.10	240	334.44
B	60	60	79.05	35	114.35	15	26.50	110	219.90
C	70	20	21.72	25	89.05	. .	. .	45	46.92

The data have been analysed statistically by using analysis of variance technique, after converting the catch figures into their corresponding logarithmic values. The results of analysis are given in Table – II.

TABLE II: ANALYSIS OF VARIANCE TABLE FOR CATCH OF S. GUTTATUS

Source of variation	S. S.	D. F.	M. S.	F.
Total	19.0085	170		
Between nets	5.6106	2	2.8053	35.20**
Error	13.3979	168	0.0797	

** Indicates significance at 1% level
Critical difference for nets 0.1036
The mean logarithmic catches of the 3 nets
50 mm mesh bar   0.5334
60 mm mesh bar   0.2579
70 mm mesh bar   0.0945

The percentage length frequency distribution of the three species of seer computed from the data recorded at both the landing centres and those caught in the experimental gear are given in Table III.

TABLE III: PERCENTAGE LENGTH FREQUENCY DISTRIBUTION OF DIFFERENT SPECIES OF SEER IN COMMERCIAL AND EXPERIMENTAL CATCH

Size-group mm	S. Guttatus		S. Commersoni		S. Lineolatus	
	A	B	A	B	A	B
250 — 300	0.08	—	—	—	—	—
300 — 350	0.99	—	—	—	—	—
350 — 400	2.40	—	—	—	0.13	—
400 — 450	12.83	11.32	2.12	—	1.19	—
450 — 500	25.98	17.36	2.74	2.04	0.53	—
500 — 550	18.59	24.15	0.25	2.04	2.28	9.68
550 — 600	20.93	20.75	1.25	5.10	3.08	16.13
600 — 650	15.46	18.49	1.37	5.10	9.20	35.48
650 — 700	1.52	4.90	4.24	9.19	13.06	25.81
700 — 750	0.32	1.88	6.73	13.26	7.73	—
750 — 800	0.26	—	9.60	10.20	14.00	—
800 — 850	0.13	0.37	11.70	17.36	18.40	9.68
850 — 900	0.23	0.75	8.84	10.20	22.40	3.22
900 — 950	0.10	—	17.56	13.26	3.87	—
950 — 1000	0.08	—	12.58	10.20	3.33	—
1000 — 1050	0.10	—	9.58	1.02	0.80	—
1050 — 1100	—	—	3.60	—	—	—
1100 — 1150	—	—	3.48	—	—	—
1150 — 1200	—	—	2.12	1.02	—	—
1200 — 1250	—	—	1.50	—	—	—
1250 — 1300	—	—	0.75	—	—	—

A: Commercial catch

B: Catch in experimental nets.

Table — IV is formulated from the commercial catch data, showing predominant size group, their percentage representation and central values.

TABLE IV: PREDOMINANT SIZE-GROUPS PERCENTAGE COMPOSITION AND THE CENTRAL VALUES OF DIFFERENT SPECIES OF SEER

Name of species	Predominant size-group m m	Percentage representation	Central values m m
S. Guttatus	400 — 650	93.79	525
S. Commersoni	650 — 1000	71.25	825
S. Lineolatus	600 — 900	84.79	750

The number and percentage of *S. guttatus* caught in 'A' and 'B' nets are shown in Table — V, while mesh selectivity curves are presented in Figure — 1.

TABLE V: PERCENTAGE OF S. GUTTATUS IN THE NETS OF A AND B

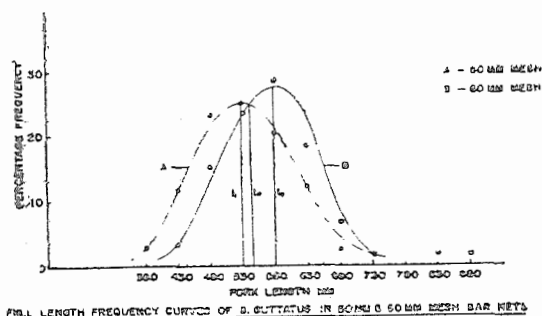| Length mm	A - Nets		B - Nets	
	Nos.	%	Nos.	%
380	5	2.70	—	—
430	22	11.89	2	3.33
480	43	23.24	9	15.00
530	45	24.33	14	23.33
580	38	20.54	17	28.33
630	23	12.43	11	18.33
680	5	2.70	4	6.67
730	3	1.62	1	1.67
780	—	—	—	—
830	—	—	1	1.67
880	1	0.54	1	1.67

Fig. 1

DISCUSSION

As evident from Table — I, 'A' nets (50 mm bar) are found effective for

S. guttatus whereas 'C' nets (70 mm bar) have shown restricted efficacy for *S. commersoni*. The selectivity of *S. guttatus* in 'A' nets is well marked and accounted to 3 and 9 times to those of 'B' and 'C' nets respectively. The results from the analysis of variance technique (Table – II) show that the variation between the nets is significant at 1% level. With a view to separate significant net effects, critical difference was evaluated. The results support the superiority of 'A' nets over 'B' and 'C' nets. when drift nets of different

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mesh sizes are employed in juxtaposition and the catches are repeated the percentage representation of the different length groups reflect the representation of the different groups in the stock of a population (von Brandt, 1955; S. Dutt, 1965). The percentage representation of seers given under the commercial catch in Table — III may be considered as the population in the broader sense since they were landed by gill nets of varying mesh sizes and in conformity with the normal frequency distribution. The percentage length frequency of seers in the experimental gear is also exhibiting the same general trend of commercial catch except for *S° lineolatus*. it is very likely that this may be due to the restricted availability of this species.

Selectivity of Experimental Nets

From Fig. 1, it is evident that the mesh-selectivity curves are in conformity with normal frequency distribution shifting mode length with increase of mesh size. As seen in Table —IV, the length groups of 525 mm, 825 mm and 755 mm represent the central values of the predominant size groups of *S. guttatus, S. commersoni* and *S. lineolatus* respectively. Baranov C(1948) showed that mesh size is proportional to the modal length of fish caught in it and established the relationship between them by the formula.

$$a = k \, l$$

Where 'k' is a constant

'a' mesh bar in mm.

and 'l' the modal length in mm. constant 'k' can be calculated empirically by two methods after experimenting with more than one probable mesh bar.

(1) *Length—measurement method*

$$k = \frac{2 \, (a_1 \, a_2)}{l_0(a_1 + a_2)}$$

Where a_1 and a_2 are the two mesh bars and l_0 the length of fish in mm caught in equal proportions by both the nets.

Substituting the values from Table-V and Fig. 1,

$$k = \frac{2 \, (50 \times 60)}{540 \, (50 + 60)} = 0.101$$

(2) *Modal length method*

Here the calculation is based by substituting values of modal lengths obtained in both the 50 mm and 60 mm bar nets.

$$k = \frac{a_1}{l_1} = \frac{50}{530} = 0.094$$

$$k = \frac{a_2}{l_2} = \frac{60}{580} = 0.103$$

530 mm and 580 mm represent the modal lengths recorded in 50 mm and 60 mm bar nets respectively. Taking the arithmetic mean of the three values,

$$k = \frac{0.101 + 0.094 + 0.103}{3} = 0.099$$

By substituting the value of 'k' in general formula the appropriate mesh size for any length group of *S. guttatus* is calculated. Relationship between mesh size and mean selection length of fish representing both the experimental and calculated values is whown in Fig. 2.
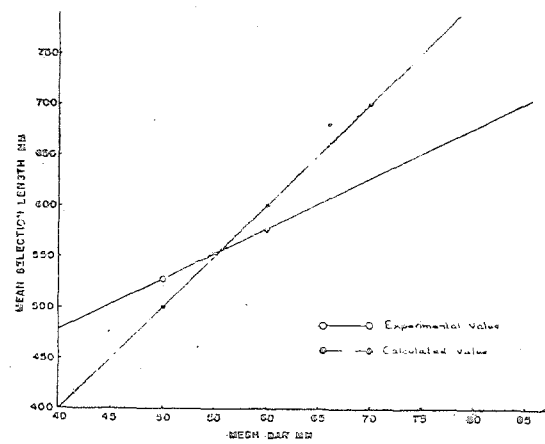

Fig. 2

The latter value was obtained by substituting the 'k' value for the three experimental mesh sizes. The reason for the

slight difference between the two values may be assigned to the unequal representation of different length-groups in the population. It follows, therefore the suitable mesh aize for the centrally represented length group of 525 mm and the most predominent commercial size group 480 mm of *S. guttatus* are 51.98 mm (525 x 0.099) and 47.50 mm (400 x 0.099) respectively. From the studies of Krishna Moorthy (1958) on the Biology of *S. guttatus* it is evident that 525 mm length group of *S. guttatus* would have spawned at least once.

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