RIBBONFISH FISHERY OF KAKINADA DURING 1974-1976

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ABSTRACT

The ribbonfish fishery of Kakinada during 1974-76 based on the landings by commercial trawlers showed that the annual catches varied from 371.6 to 632.4 tonnes and on an average formed 6.3% of the toltal fish catch. Among the six ribbonfish species, *Trichiurus lepturus* dominated and accounted for 73% of the total ribbonfish landings. The seasonal abundance and species composition of all the ribbonfishes; the length-weight relationships in *L. gangeticus* and *T. russelli;* and the periodicity of spawning in *L. gangeticus* are presented in the paper.

INTRODUCTION

An estimated 68,353 tonnes of ribbonfish were landed during 1976 (C.M.F.R.I. Newsletter No. 6, 1977), which formed about 5% of the total marine fish catch. Considerable information is available on aspects of taxonomy, biology and fisheries of ribbonfishes (Prabhu 1955, James 1967, Gupta 1967a, b and 1968, Silas and Rajagopalan 1974 and Narasimham 1976). The data on ribbonfish fishery of Kakinada, collected from trawler landings during 1974-76 are discussed and notes on some aspects of biology of *L. gangeticus* and *T. russelli* are presented in this paper.

MATERIAL AND METHODS

Three types of mechanised boats of the length range 9.14m-11.41m fitted with 20-75 H.P. engines operated daily varying from 6 to 12 hours of otter trawling off Kakinada (Lat. 16° 35'N to 17° 25'N and Long. 82° 20'E to 83° 10'E) in the depth range of 5-70 metres. Weekly observations were made and about 20% of the boats were examined for catch particulars and species composition. Further details regarding the craft, gear and the method of data collection are given by Muthu et al (1975). Since boats of three different sizes fitted with engines of different horse power, were engaged in fishing the area, the effort was standardised with respect to *"Sorrah,"* which was the largest and most consistant of all the vessels. The catch per hour of trawling (standard effort) is taken as an index to denote the abundance of fish in the area. On each observation day, a minimum of 3.5 kg of ribbonfish sample was collected to study the species composition and length-frequency distribution of the component species. The

length-weight relationships of *Lepturacanthus gangeticus* and *Trichiurus russelli* were calculated by the least square method using the formula log W = Log a + b Log L where W = the weight of fish in grams and L the length in mm. Unless otherwise stated, the total length was measured. Based on a sample of 17 fish and 500 ova from each fish the spawning periodicity in *L. gangeticus* was studied.

Fishery

In Tables 1, 2 and 3 are presented data on the month-wise estimated catches, % composition and catch rates in respect of the six species of ribbonfishes for the years 1974, 1975 and 1976 respectively.

The study brings to light that the ribbonfishes constitute a multispecies fishery, and formed 6.3% of the total fish catches landed by trawlers off Kakinada. Among them *T. lepturus* was dominant forming 73.0%, followed by *L. gangeticus* 12.9%, *L. savala* 4.6% and *E. muticus* 4.2%. The success of the ribbonfish fishery depended upon the pattern of the landings of *T. lepturus* while the other species were of little consequence to the fishery. The ribbonfishes were available throughout the year; with the peak season varying between years. Best catch rates, however were obtained generally during March-May and August-October.

Length-Frequency Distribution

T. lepturus: Based on the length ranges observed in 1974 (131-769 mm); 1975 (128-764 mm); and 1976 (185-1022 mm) and on the observations made by Narasimham (1976) on the growth of the species, it was evident that age structure of the bulk of the catches was limited to zero- and one-year-old fish (Fig 1).

Other species: The percentage length-frequency distribution pooled for the three years for the other ribbonfish species are also given in Fig. 1. *L. Savala* had a size range of 225-645 mm with modes at 375 and 525 mm. In *L. gangeticus* the size range varied from 195-585 mm with a conspicuous mode at 375 mm. The size range observed in *T. russelli* was 131-535 mm with a prominent mode at 345 mm. In *E. muticus* there was considerable variation in the size which ranged from 221-679 mm, with two distinct modes at 315 and 525 mm. Unlike in its congener, the size in *E. glossodon* is narrow and ranged from 282 to 469 mm with a distinct mode at 345 mm.

Length-Weight Relationship

L. gangeticus: The logarithmic regression equations calculated from data on 57 males ranging in sizes from 64 to 143 mm and 54 females from 86 to 157 mm. (sount-vent lengths) are as follows:—

$$\text{Males} : \text{Log } W = -4.6898 + 2.9902 \text{ Log } L.$$

$$\text{Females} : \text{Log } W = -4.3564 + 2.8186 \text{ Log } L.$$

TABLE 1. *Month-wise ribbon fish species composition (kg), catch rates (kg/hr) and their percentages in all ribbonfish for* 1974.

Species	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Totals*
T. lepturus	341	10555	22355	19460	10712	2511	6786	78770	18639	30351	53620	6208	260308
%	28.0	90.40	79.60	35.10	52.89	26.96	46.40	91.64	51.57	82.35	95.58	39.07	70.06
catch rate	0.02	0.43	1.10	1.27	0.75	0.22	0.48	5.47	1.81	2.52	4.43	0.65	1.47
T. russelli	877	969	——	12010	269	——	——	——	4742	——	2261	8856	29984
%	72.0	8.30	——	21.60	1.33	——	——	——	13.12	——	4.03	55.74	8.07
catch rate	0.05	0.04	——	0.78	0.02	——	——	——	0.46	——	0.19	0.92	0.17
E. muticus	—	152	——	——	410	——	1072	963	3394	641	——	464	7105
%	—	1.30	——	——	2.07	——	7.32	1.12	9.39	1.74	——	2.92	1.91
catch rate	—	0.01	——	——	0.03	——	0.08	0.07	0.33	0.05	——	0.05	0.04
L. gangeticus	—	——	5736	20020	8049	693	4788	6223	9224	3432	——	336	58501
%	—	——	20.40	36.10	39.75	7.44	32.74	7.24	25.52	9.31	——	2.11	15.74
catch rate	—	——	0.28	1.31	0.56	0.06	0.34	0.43	0.90	0.29	——	0.03	0.33
L. savala	—	——	——	3950	729	6111	1781	——	——	1625	——	——	14196
%	—	——	——	7.10	3.60	65.60	12.18	——	——	4.41	——	——	3.82
catch rate	—	——	——	0.26	0.05	0.54	0.13	——	——	0.41	——	——	0.08
E. glossodon	—	——	——	——	72	——	198	——	145	807	219	24	1465
%	—	——	——	——	0.35	——	1.35	——	0.40	2.19	0.39	0.15	0.01
catch rate	—	——	——	——	0.01	——	0.01	——	0.01	0.07	0.02	0.02	0.01
Total catch	1218	11676	28091	55440	20250	9315	14625	85956	36144	36856	56100	15888	371559
Catch rate	0.07	0.48	1.38	3.62	1.42	0.82	1.04	5.97	3.51	3.07	4.64	1.65	2.10

TABLE 2. *Month-wise ribbonfish species composition (kg), catch rates (kg/hr) and their percentages in all ribbonfish for* 1975.

Species	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	Oct	Nov	Dec	Totals
T. lepturus	9606	4472	23379	19540	31671	28962	7340	74944	48171	29790	10350	5106	293331
%	53.39	45.45	98.52	95.55	93.93	81.10	83.79	80.62	97.65	48.74	75.99	51.48	77.78
Catch rate	0.92	0.38	1.57	1.08	2.06	2.28	0.40	3.66	2.77	1.75	1.13	0.25	1.58
T. russelli	4705	5368	351	681	169	——	280	47	710	——	——	4812	17123
%	26.15	54.55	1.48	3.33	0.50	——	3.20	0.05	1.44	——	——	48.52	4.54
Catch rate	0.45	0.46	0.02	0.04	0.01	——	0.02	0.002	0.04	——	——	0.24	0.09
E. muticus	2961	——	——	——	——	——	150	13609	——	18306	170	——	35196
%	16.46	——	——	——	——	——	1.71	14.64	——	29.95	1.25	——	9.33
Catch rate	0.28	——	——	——	——	6750	410	——	——	1.07	0.02	——	0.19
L. gangeticus	376	——	——	229	1860	——	0.01	0.66	——	8697	1870	——	20192
%	2.09	——	——	1.12	5.52	18.90	4.68	——	——	14.23	13.73	——	5.35
Catch rate	0.04	——	——	0.02	0.12	0.53	0.02	——	——	0.51	0.20	——	0.11
L. savala	——	——	——	——	——	——	480	4360	449	4327	1230	——	10846
%	——	——	——	——	——	——	5.48	4.69	0.91	7.08	9.03	——	2.88
Catch rate	——	——	——	——	——	——	0.03	0.21	0.03	0.25	0.13	——	0.66
E. glossodon	344	——	——	——	——	——	100	——	——	——	——	——	444
%	1.91	——	——	——	——	——	1.14	——	——	——	——	——	0.12
Catch rate	0.03	——	——	——	——	——	0.01	——	——	——	——	——	0.002
Total catch	17992	9840	23730	20450	33700	35712	8760	92960	49330	61120	13620	9918	377132
Catch rate	1.72	0.84	1.59	1.14	2.19	2.81	0.49	4.53	2.84	3.58	1.48	0.49	2.03

TABLE 3. *Month-wise ribbonfish species composition (kg), catch rates (kg/hr) and their percentages in all ribbonfish for* 1976.

Species	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Totals*
T. lepturus	2655	9863	91440	51854	41321	——	4360	60591	121941	56227	11903	1956	454111
%	87.54	93.59	90.84	67.12	45.88	——	46.19	74.66	74.91	82.80	81.39	52.49	71.80
Catch rate	0.09	0.46	3.93	2.53	2.59	——	0.30	2.37	4.27	3.01	1.48	0.28	1.91
T. russelli	378	676	4630	9556	——	——	——	2776	——	——	——	1683	19699
%	12.46	6.41	4.60	12.37	——	——	——	3.42	——	——	——	45.18	3.11
Catch rate	0.01	0.03	0.20	0.47	——	——	——	0.11	——	——	——	0.24	0.08
E. muticus	——	——	——	——	——	1522	680	1712	7162	3008	1653	——	15737
%	——	——	——	——	——	13.52	7.20	2.11	4.40	4.43	11.30	——	2.49
Catch rate	——	——	——	——	——	0.07	0.05	0.07	0.25	0.16	0.21	——	0.07
L. gangeticus	——	——	4590	15104	47959	5957	2980	7223	12892	2316	——	——	99021
%	——	——	4.56	19.55	53.25	52.90	31.57	8.93	7.92	3.41	——	——	15.66
Catch rate	——	——	0.20	0.74	3.00	0.26	0.20	0.28	0.45	0.12	——	——	0.42
L. savala	——	——	——	742	784	3781	1420	8854	19371	3585	——	62	38599
%	——	——	——	0.96	0.87	33.58	15.04	10.91	11.90	5.28	——	1.67	6.10
Catch rate	——	——	——	0.04	0.05	0.16	0.10	0.35	0.68	0.19	——	0.01	0.16
E. glossodon	——	——	——	——	——	——	——	——	1417	2771	1069	25	5282
%	——	——	——	——	——	——	——	——	0.87	4.08	7.31	0.66	0.54
Catch rate	——	——	——	——	——	——	——	——	0.05	0.15	0.13	0.004	0.02
Total catch	3033	10539	100660	77256	90064	11260	9440	81156	162783	67907	14625	3726	632449
Catch rate	0.10	0.49	4.33	3.78	5.64	0.49	0.65	3.18	5.70	3.63	1.82	0.53	2.66

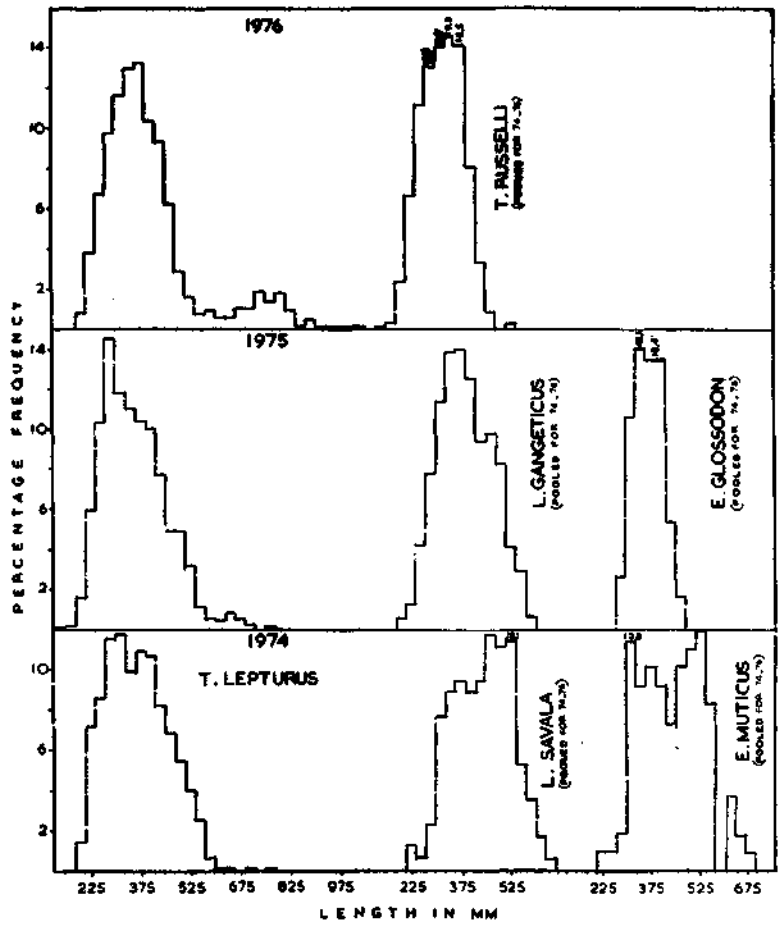

FIG. 1. Length-frequency distribution of ribbonfish species.

Analysis of covariance (Snedecor 1961) of the two regression equations showed (Table 4) that the regression co-efficients did not differ significantly. So the sexes were combined and the resultant regression equation was:

$$\text{Log } W = -4.4385 + 2.8615 \text{ Log } L.$$

With the corresponding parabolic equation:

$$W = 0.00003633\ L^{2.8615}$$

T. russelli: The material comprised of observations on 48 males in the length range 238-442 mm and 49 females in the range 262 -535 mm. The logarithmic regression equations obtained are as follows:—

Males : Log W = −5.7048 + 2.8018 Log L.

Females : Log W = −7.4754 + 3.4925 L.

TABLE 4. *Analysis of Covariance of the length-weight relationship of* L. gangeticus

	N	N-1	$\Sigma(x-\bar{x})(y-\bar{y})$	$\Sigma(x-\bar{x})^2$	$\Sigma(y-\bar{y})^2$	$b\Sigma(x-\bar{x})(y-\bar{y})$	$\Sigma(y-Y)^2$	N-2
Males	57	56	1.1001	0.3679	3.3610	3.2895	0.0715	55
Females	54	53	0.6542	0.2321	1.8968	1.3439	0.0529	52
Total	111	109	1.7543	0.6000	5.2578	5.1334	0.1244	107

N = Number of observations. $\Sigma(y-Y)^2$ = Sum of Spuares due to deviation from regression.

Test of heterogenity of regressions within the samples

Source of variation	*Degree of freedom*	*Sum of squares*	*Mean square*
Deviation from average total regression	108	0.1285	
Deviations from individual regressions within samples	107	0.1243	0.001162
Difference	1	0.0042	0.0042

F = 3.61
5% = 3.93
1% = 6.88

Analysis of covariance (Snedecor 1961) of the two regression equations showed (Table 5) that both the slopes and elevations differed significantly. The parabolic equations obtained were:

Males : $W = 0.000001971\ L^{2.8018}$

Females : $W = 0.00000003347\ L^{3.4925}$

In the other ribbonfishes studied, the regression coefficient of the length weight relationship varied from 3.0819 to 3.5233 (Prabhu 1955, Gupta 1967 b, 1968, James 1967, Narasimham 1970 and 76). In the present study the regression coefficients in *L. gangeticus* and in the males of *T. russelli* were comparatively lower.

TABLE 5. *Comparison of the Regression lines of the length-weight relationship of* T. russelli

	d.f.	Σx^2	Σxy	Σy^2	b	*Deviations from regressions* *d.f.*	*S.S.*	*M.S.*
Within								
Males	48	0.1360	0.3808	1.2861	2.8081	47	0.2193	0.004666
Females	49	0.1324	0.4625	1.7327	3.4925	48	0.1171	0.002440
Pooled (within)						95	0.3364	0.003541
Common	97	0.2684	0.8433	3.0188	3.1419	96	0.3692	0.003959
Slope						1	0.0328	0.0328
Between	1	0.0822	0.2583	0.8117				
Total	98	0.3506	1.1016	3.8305		97	0.3840	
Adjusted means						1	0.148	0.148

Comparison of slope : F = 6.93 (d.f. = 1, 95) $F_{5\%}$ = 3.945

Comparison of elevation : F = 3.74 (d.f. = 1, 96) 1% = 6.915

PERIODICITY OF SPAWNING IN *L. gangeticus*

The frequency distribution of ova diameter of individuals in stage III-V of maturation are presented in Fig. 2 Females with running ripe ovaries were not encountered in the catches. In stage III; two modes viz., one representing the immature ova at 6-10 md group (72 md = 1 mm); and the other representing mature ova (51-55 md group) could be seen. In stage IV the mode in the mature

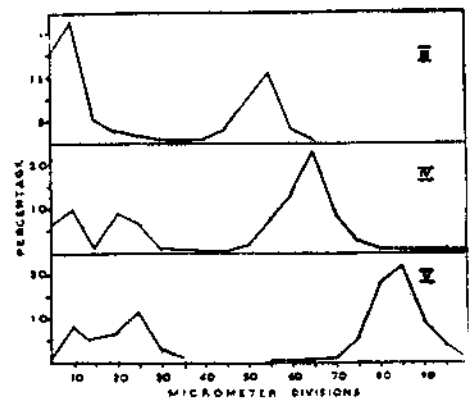

FIG. 2. Ova-diameter-frequency distribution in ovaries of different stages of maturation in *L. gangeticus*.

group of ova of stages III had shifted to 61-65 md group and there was also a mode at 16-20 md group. The latter group of ova were translucent with slight yolk deposition. In stage V the mature group of ova were separated from the immature and maturing ova; the mode of the mature group of ova was at 81-85 md group. The mode at 16-20 md in stage IV had further progressed to 21-25 md in stage V. In sum, it may be stated that only one batch of ova are separated from the parent stock to become mature and be released in one spawning act as evidenced by the presence of only one mature group of ova in mature ovaries. The presence of fish in stages IV and V in considerable numbers during May-July indicates that the species is likely to spawn in these months.

In all the other ribbonfishes studied, the mature ova are distinctly and widely separated from the immature stock (Prabhu 1955, James 1976, Tampi et al 1968, Narasimham 1976) similar to the condition observed in *L. gangeticus* in the present study.

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