

THE RESOURCE CHARACTERISTICS OF THE RIBBONFISH  
*TRICHIURUS LEPTURUS* LINNAEUS AT VIZHINJAM,  
SOUTHWEST COAST OF INDIA \*

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ABSTRACT

The annual landings of the ribbon fish *Trichiurus lepturus* at Vizhinjam during 1979-81 fluctuated between 583 t and 3429 t with an average at 2124 t forming 43% of the total fish catch. The active fishery season was from June to October with peak landings during July and August/September. Boat seine contributed 96% of the catch with a maximum CPUE of 111.5 kg. Hooks and line, shore seine and gill net accounted for the rest of the catch. The size and maturity distribution and sex-ratio of *T. lepturus* in the catches are given along with its food and feeding habits. The disposal and utilisation of the catch are also briefly described.

INTRODUCTION

LARGE varieties of fishes support the fisheries at Vizhinjam. The ribbonfish fishery at Vizhinjam is supported by a single species *Trichiurus lepturus* and though highly seasonal, it ranks foremost among the different fisheries off Vizhinjam by contributing about 42.6% of the local annual fish landings. However, there is no detailed account available on the nature of this resource except the brief mentions by Nayar (1958), James (1965), Radhakrishnan (1973) and Luther *et al.* (1982). Hence an attempt is made here to study the salient features of the resource.

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MATERIAL AND METHODS

The data collected for three years from 1979 to 1981 are utilised for the fishery part and the biology part has been written based on the first two years data. For estimating the fishery, observations were made weekly twice and the catch was raised to the month as described by Sekharan (1965). The method given in the above work has been followed to estimate the number of fish in each size group and also to find out the catch per unit of effort (CPUE). For the biological studies, 30 to 50 fishes were collected from different gears separately and analysed.

EXPLOITATION

*Fishing crafts and gear:* The main craft employed at Vizhinjam for fishing the ribbonfish is the catamaran (*Maram*) and the next important one being the dugout canoe (*Vallam*). The details about these crafts are given by Bal and Banerji (1951) and Nayar (1958). Boat seine (*Thattumadi*) is the main gear used for the exploitation of this resource in this area, as also hooks and lines (*Choonda*) to get

bigger sized individuals during the peak season and occasionally gill nets (*Pattuvala*, *Konchuvala*, etc.) are also operated to exploit this resource.

of the favourable launching conditions prevailing there. This and the repeated operations of a unit in a day, usually two to three times when there is plenty of resource in

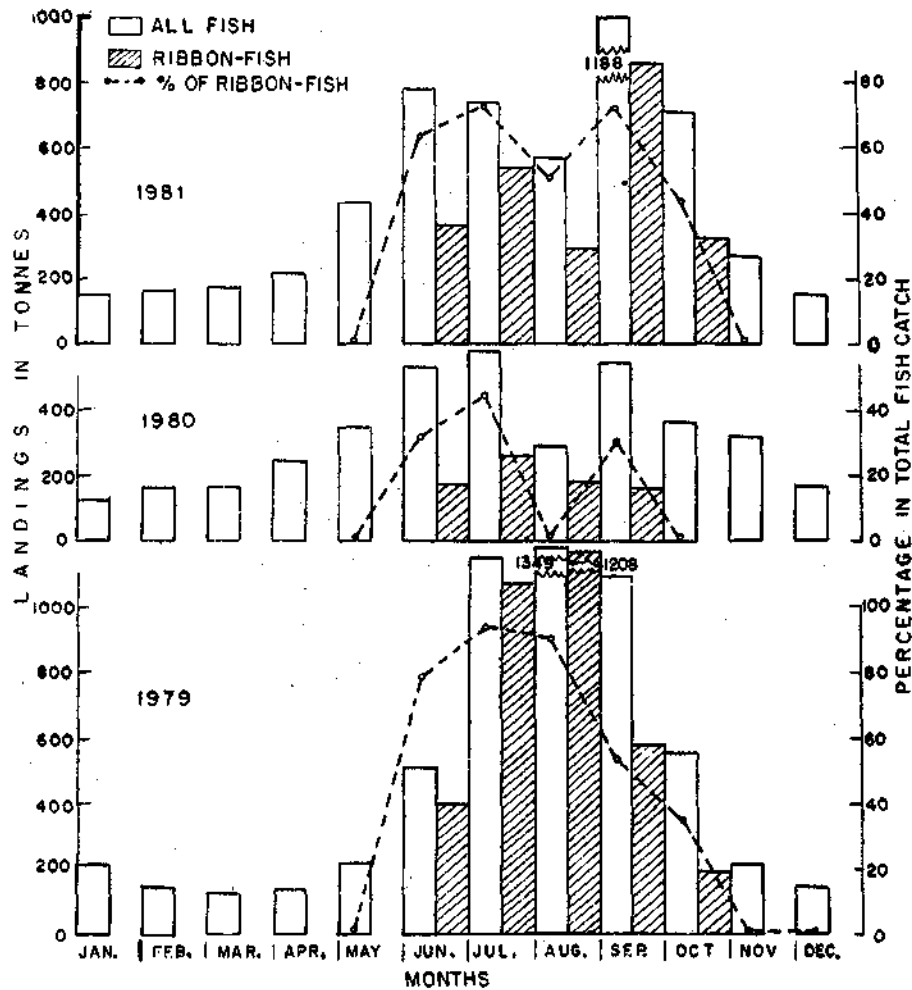


FIG. 1. A comparison of ribbonfish landings with that of all fish at Vizhinjam during 1979-81.

**Fishing methods :** The fishing is done during both day and night at Vizhinjam. During the peak season from June to August fishermen from neighbouring places like Pulluvilai, Adimalathurai, Kochupalli and Poovai migrate to Vizhinjam with their fishing units, because

the nearby area also contribute to the bulk landings of the ribbonfish during the season. Sometimes, during the glut season, a catamaran merely lands the catch, while operation of the boat seine is being continued by two other catamarans.

## TREND OF THE FISHERY

The average annual yield of *Trichiurus lepturus* at Vizhinjam has been estimated as 2124 tonnes during 1979-81 forming 42.6% of the local fish landings. In 1979 the fishery was extremely good with a total landing of 3429 t forming 58.7% of the total fish catch. But in 1980 a setback was noticed and the catch touched a lowest level of 583 t forming only 15.3% of the local landings. However, in 1981 an improvement was noticed over the previous year in the fishery of the ribbonfish and the catch was estimated at 2,360 t and it formed 44.4% of the total fish landings of the year (Fig. 1).

During 1979 though the ribbonfish started appearing in the catches in April good quantity landed only during June to October contributing to 99.9% of the years catch with peak landings in August amounting to 1,208 t. In 1980 the fishery lasted for four months from June to September with peak landings during July contributing to 43.8% of the year's catch. Surprisingly during August of this year only 1.8 t were landed forming 0.6% of the years catch. In 1981 the fishery started in April and lasted till October with total absence during May. However, the fishery was steady from June to October with maximum landings (850 t) during September, forming 71.7% of the fish catch. From the foregoing account it is seen that the active season for the ribbonfish fishery at Vizhinjam starts by June and ends by October with peak landings during July and August/September months.

## GEARWISE CONTRIBUTION TO THE RESOURCE

Boat seine was the chief gear used for the fishery, landing nearly 96% of the annual catch of the ribbonfish (Fig. 2). Its average annual contribution has been estimated as 2045 t. About 98% of the annual boat seine effort was expended during June to October.

Ribbonfish formed about 63 to 81% of the fish catch by boat seine during the above period. The average annual CPUE ranged between 26.6 and 68.0 kg with an average at 50.0 kg during the period (Table 1). In 1979 the maximum catch per effort recorded was 111.5 kg in October and the minimum was

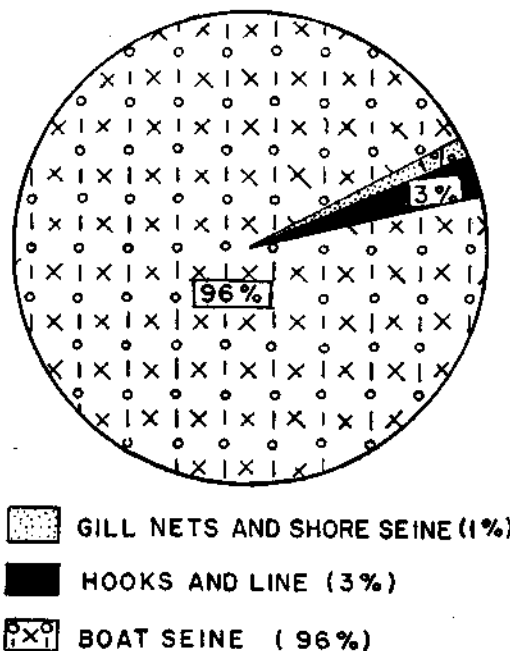


FIG. 2. Gearwise contribution of ribbonfish at Vizhinjam during 1979-81.

43.38 kg in June. During 1980 it ranged between 26.7 and 40.7 kg, with the exception of August when it touched a lowest level of 0.5 kg. In the year 1981 the minimum (41.2 kg) and maximum (100.2 kg) were observed respectively during June and October. Thus in all the three years we could see the lowest CPUE for this gear in June at the beginning of the season (with the exception in 1980) and the highest at the end of the season September/October. Since boat seine is a non-selective gear it brings fishes of a wide size range (4.0-108.0 cm)

About 3% of the ribbonfish catch was landed at Vizhinjam by hooks and line with an annual average contribution of 75.6 t (Fig. 2). Its CPUE varied from 0.02 to 32.3 kg (Table 1). The annual average CPUE varied between 0.4 kg and 3.5 kg. Since this unit is being operated in deeper waters it normally brings bigger fishes, ranging from 62 cm to 104 cm, though in small numbers. Irrespective of the ribbonfish season it is operated throughout the year at Vizhinjam. However, during the ribbonfish fishery season more numbers of unit are operated (Table 1).

The gill nets contributed about 0.98% to the ribbonfish catch. Their average annual contribution was estimated as 0.8 t with maximum landings during 1980 with 1.2 t and minimum landings during 1981 with 0.1 t. The CPUE varied between 0.001 kg and 0.710 kg (Table 1). Since this gear is operated in deeper waters bigger size fishes are normally caught.

#### BIOLOGY

*Size distribution:* Unlike in other areas the fishery at Vizhinjam is supported by individuals

TABLE 1 a. Monthly catch, effort and CPUE of *Trichiurus lepturus* at Vizhinjam

Months	Boat seine						Shore seine 1979					
	1979			1980			1981			1979		
	No. of units	Catch (kg)	CPUE (kg.)	No. of Units	Catch (kg)	CPUE (kg)	No. of units	Catch (kg)	CPUE (kg)	No. of units	Catch (kg)	CPUE (kg)
Jan.	31	—	—	—	—	—	111	—	—	400	—	—
Feb.	67	—	—	29	—	—	32	—	—	329	—	—
Mar.	158	—	—	134	—	—	207	—	—	331	—	—
Apr.	80	—	—	420	—	—	150	—	—	120	—	—
May	200	—	—	124	—	—	518	—	—	96	—	—
June	8,993	3,90,079	43.38	5,933	1,58,597	26.73	8,732	3,59,907	41.22	45	589	13.03
July	17,478	10,64,361	60.00	8,541	2,53,082	29.63	11,813	5,35,959	45.37	—	—	—
Aug.	12,915	10,41,397	80.63	3,061	1,628	0.53	6,854	2,89,138	48.19	55	172	3.13
Sep.	6,150	5,63,105	91.56	3,400	1,38,463	40.72	11,300	8,33,130	73.73	90	—	—
Oct.	1,722	19,200	111.50	797	—	—	3,139	3,14,573	100.21	179	—	—
Nov.	—	—	—	129	—	—	—	—	—	401	465	1.16
Dec.	—	—	—	155	—	—	17	—	—	320	34	0.11
Total	47,794	32,50,942	68.02	20,723	5,51,770	26.63	42,873	23,32,707	54.41	2,366	1,260	0.56

Shore seines are operated throughout the year at Vizhinjam except June/July due to rough weather. During the ribbonfish fishery season a small quantity (1.3 t) with 42-84 cm was landed by this gear during 1979 with monthly CPUE varying from 0.11 kg to 13.1 kg and the CPUE for the year was at 0.53 kg only. During the other two years of observation no landing of ribbonfish by this gear was recorded,

having a wider size range. The length frequency distribution of *T. lepturus* in the catches during 1979 and 1980 are given in Fig. 3. During the first year of the study the fishery was represented by individuals of 4-108 cm size. The smaller sized (4-30 cm) fish was found only during July and August. The prominent size groups observed in the various months were 56 and 64 cm in June, 8 and 64 cm in July, 20 and

TABLE 1 b. *Monthly catch, effort and CPUE of T. lepturus at Vizhinjam by hooks and line from 1979 to 1981*

Months	1979			1980			1981		
	No. of Units	Catch (kg)	CPUE (kg)	No. of Units	Catch (kg)	CPUE (kg)	No. of Units	Catch (kg)	CPUE (kg)
Jan.	5,579	—	—	4,805	—	—	5,536	—	—
Feb.	5,350	—	—	6,308	—	—	6,090	—	—
Mar.	5,579	—	—	6,578	—	—	6,647	—	—
Apr.	5,166	—	—	5,829	—	—	5,033	—	—
May	1,739	—	—	4,133	—	—	5,492	—	—
June	600	263	0.44	2,166	8,966	4.14	2,933	—	—
July	1,619	207	0.13	5,407	—	—	3,892	4,339	1.11
Aug.	5,166	1,66,741	32.28	10,346	171	0.02	6,165	—	—
Sep.	7,400	8,750	1.18	7,566	20,698	2.74	5,100	18,900	3.71
Oct.	3,926	165	0.04	7,884	—	—	9,223	3,627	0.39
Nov.	4,238	—	—	5,143	—	—	7,799	—	—
Dec.	4,753	—	—	11,689	—	—	5,338	—	—
Total ..	51,115	1,76,126	3.45	77,854	29,835	0.38	69,248	26,866	0.40

TABLE 1 c. *Monthly catch, effort and CPUE of T. lepturus at Vizhinjam by gillnet from 1979 to 1981*

Month	1979			1980			1981		
	No. of Units	Catch (kg)	CPUE (kg)	No. of Units	Catch (kg)	CPUE (kg)	No. of Units	Catch (kg)	CPUE (kg)
Jan.	1,558	—	—	2,983	—	—	4,373	—	—
Feb.	1,040	—	—	2,931	—	—	3,570	—	—
Mar.	3,496	—	—	3,868	—	—	4,919	—	—
Apr.	4,382	33	—	6,001	—	—	6,332	90	0.0
May	10,849	41	—	13,638	—	—	8,951	—	—
June	3,469	900	0.26	4,332	1,237	0.29	2,367	—	—
July	—	—	—	—	—	—	2,633	—	—
Aug.	—	—	—	—	—	—	—	—	—
Sep.	—	—	—	2,000	—	—	900	—	—
Oct.	654	—	—	6,443	—	—	3,837	—	—
Nov.	1,913	—	—	4,543	—	—	3,933	—	—
Dec.	1,825	—	—	4,302	—	—	4,490	—	—
Total	29,186	974	0.03	50,951	1,237	0.02	46,305	90	—

64 cm in August, and 68 cm in September, October and November. In 1980 the minimum and maximum size groups represented the catch were 12 cm and 108 cm respectively. Like the previous year this year also the smaller fishes upto 34 cm size group were found only during July and August, with modes respectively

at 20 and 24 cm size groups. During June, at the start of the season, the fishes were found in between size groups 36 and 100 cm with a prominent mode at 52 cm size group. In July, apart from the smaller size groups, bigger size groups in between 60 and 74 cm with mode at 64 cm were also present. In August

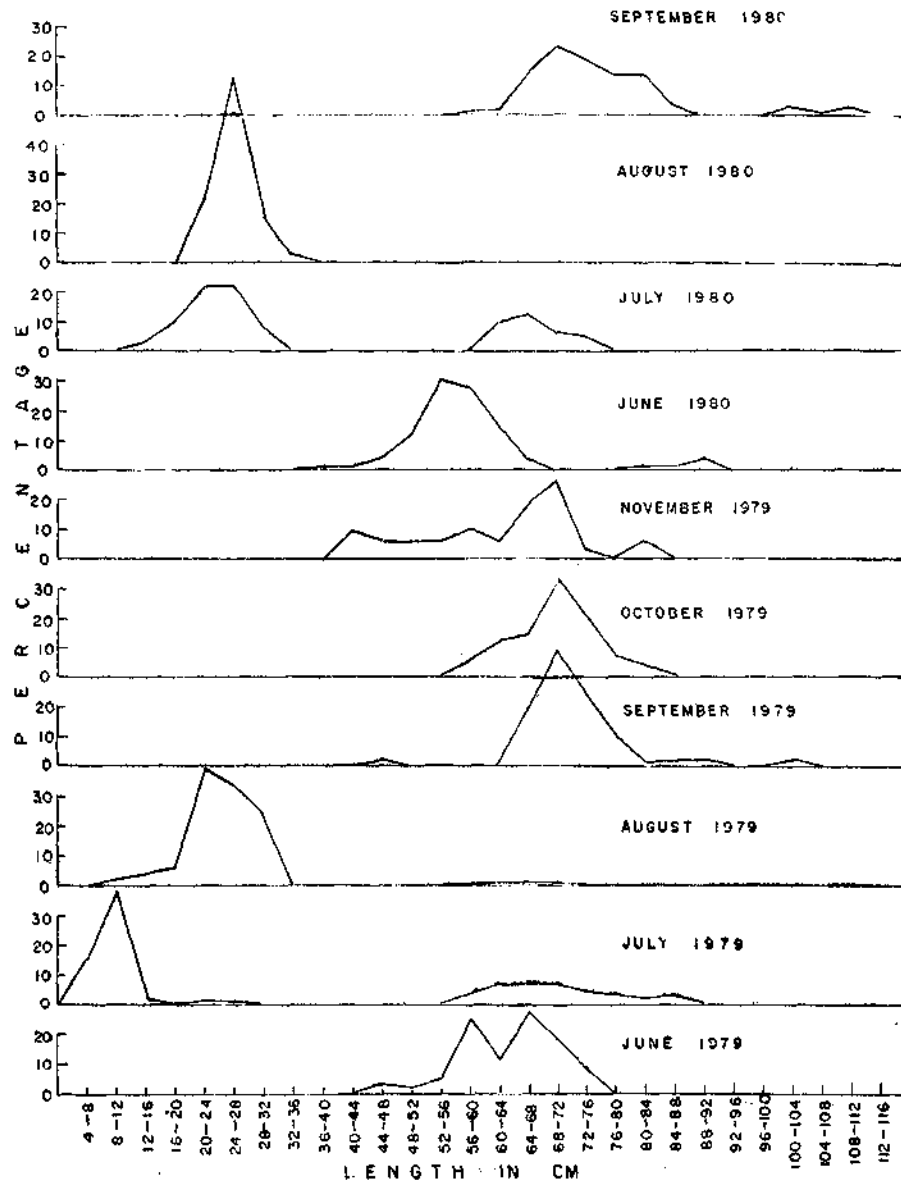


FIG. 3. Size distribution of *Trichurus lepturus* in the landings at Vizhinjam during 1979-'80.

only smaller fishes within the size range 20-34 cm with a mode at 24 cm were available. During September only bigger fishes falling between 56 and 108 cm and having modes at 68 cm, 100 cm and 108 cm represented the catch.

**Sex-ratio and maturity:** In both the years females outnumbered males in the catches by all the gears. The overall indeterminate: male: female ratio being 6.1:36.7:57.2 in 1979 and 35.1:28.2:36.7 in 1980 (Table 2).

cm were observed in good quantities in the landings of small meshed boat seines in the first week of July 1979. These observations give us an idea about the existence of a spawning ground off Vizhinjam for this species.

**Food and feeding habits:** Individuals with Empty stomach dominated the catch by all gears. Fish mainly *Stolephorus* spp. was found to be the chief food item of this fish. Next to fish, *Acetes* sp. was the chief item of food. Normally ribbonfish fishery at Vizhinjam

TABLE 2. Sex ratio and gonadal condition of female *Trichiurus lepturus* at Vizhinjam

	1979								1980					
	June	July	Aug.	Sep.	Oct.	Nov.	Total	%	June	July	Aug.	Sep.	Total	%
<b>Sex Ratio</b>														
Male	26	60	37	37	23	8	191	36.7	58	19	—	29	106	28.2
Female	87	92	41	22	35	21	298	57.2	54	36	—	48	138	36.7
Indeterminates	2	—	30	—	—	—	32	6.1	1	—	131	—	132	35.1
Sample size	115	152	108	59	58	29	521	—	113	55	131	77	376	—
<b>Maturity</b>														
Immature (I)	54	18	6	3	4	11	96	32.2	31	—	—	2	33	23.9
Resting (II)	31	53	22	14	28	6	154	51.7	19	15	—	29	63	45.6
Developing (III, IV)	2	6	9	2	3	3	25	8.4	3	6	—	15	24	17.4
Gravid (V, VI)	—	—	—	—	—	—	—	—	—	15	—	—	15	10.9
Spent (VII)	—	15	4	3	—	1	23	7.7	1	—	—	2	3	2.2
Total	87	92	41	22	35	21	298	—	54	36	—	—	376	—

About 67% of females examined for maturity during 1979 was with gonads in resting, developing and spent state of maturities. The remaining were all immature. In 1980 about 76% of the sexed females were with resting, developing, gravid and spent gonads. The rest of them were all immature. A part of the catch recorded during July and August were indeterminates. Oozing specimens landed by boat seines were observed towards the end of May in 1979. Early juveniles measuring 4 to 12

coincides with the fisheries of *Stolephorus* and *Acetes* and these two groups can be considered as the indicator species for the ribbonfish fishery in this area. Movements of anchovy shoals into the inshore regions coinciding with the ribbonfish fisheries at Vizhinjam has been reported by Luther (1981) also. Other food items encountered in the stomach were the oilsardine, lesser sardine, *Saurida* sp., silverbellies, *Sillago* sp., Carangids, mackerel, catfish, Balistids, Sciaenids, *Decapтерus* sp., cuttlefish,

and prawns (Table 3). The cannibalistic behaviour of the fish was also noticed in a few occasions. Though it is a pelagic shoaling form, its food consists of a variety of demersal fishes and prawns.

#### UTILISATION

The catch of each fishing unit is generally sold in auction. A small fish market exists in the landing centre itself. But major quantity is being iced and sent to far away markets by trucks. During glut season, the excess quantity is salted and marketed with or without sun-drying. If the fish is small in size they are

TABLE 3. Relative importance of food items in the stomach contents of *Trichiurus lepturus* during 1979-80

Food items	1979	1980
<i>Stolephorus</i> spp.	26.3	32.3
<i>Acetes</i> sp.	19.2	18.8
Oilsardines	11.6	7.5
Lesser sardines	8.3	9.0
<i>Decapterus</i> sp.	11.8	7.5
Other carangids	1.3	—
Sciaenids	0.6	—
Silverbellies	1.2	2.3
Ribbonfish	1.2	2.3
<i>Sillago</i> sp.	—	0.8
Catfish	—	0.8
<i>Saurida</i> sp.	1.3	—
Mackerel	0.6	—
Balistids	1.3	—
<i>Ambassis</i> sp.	0.6	—
Prawns	1.9	3.0
Cuttlefish	1.3	0.8
Semidigested fish material	11.5	15.0
Total stomach examined (excluding empty stomach)	156	133

dried without salt also. Though it is consumed by all classes of people because of its cheapness and abundance, it is preferred more by the poor. It is normally used in fresh condition. It is considered to be an effective bait for

catching quality fishes like seerfishes, tunas and carangids.

#### REMARKS

The representation of the ribbonfishes to the local fisheries has been estimated as 19.4% (712 t) in the fifties (Nayar, 1958), 23.5% (592 t) in the sixties (Radhakrishnan, 1973) and 22.6% (1021 t) in the seventies (Luther *et al.*, 1982). In the present observation the average annual landings has been estimated as 2124 t forming 43% of the local catch. Thus, about a three fold increase over the ribbonfish landings of the fifties, a four fold increase over the sixties and a two fold increase over the seventies are noted during the study period. The studies based on the resource surveys conducted during 1972-75 showed the average potential off the Kerala Coast as 3.3 times higher than the average landings in the region indicating greater scope for the increased exploitation of this resource (Anon., 1986). As suggested by Rao *et al.* (1977), one of the effective ways to increase the harvesting of ribbonfish resource is to intensify the fishing pressure during the monsoon months since the highest standing stock is found at the time on the shelf and to extend the fishing operations as well to deeper waters. Along the southwest coast the present fishery is unable to take advantage of the situation, because of rough weather conditions prevailing during the monsoon.

*Trichiurus savala* (= *Lepturacanthus savala*) and *T. haumela* (= *T. lepturus*) were the two species of ribbonfishes known to occur in this area upto nineteen sixties (Nayar, 1958; Radhakrishnan, 1973). However, the studies by Luther *et al.* (1982) and the present one could find only *T. lepturus* in the landings.

Prabhu (1955) pointed out that it is probable that the postlarvae of *Trichiurus haumela* (*T. lepturus*) grow to a size of 7 to 9 cm in length in a period of 1½ month, which according to him, agrees with the observations of Tang



and Wu (1936). If that is acceptable, the juveniles occurring in the fisheries at Vizhinjam around 4 cm length in the month of July would be less than a month-old and could be the products of the spawning which would have been taken place in June as presumed by Prabhu (1955). This is further evidenced by the collection of oozing specimens on 23-5-'79 from one of the boat seine landings at Vizhinjam. According to Tampi *et al.* (1971) this species spawns more than once in a year along the Madras Coast and the two seasons are roughly around May-June and later in November-December. This conclusion was made by the above authors based on the repeated appearance of the early stages at almost half-yearly intervals off the above coast. Narasimham (1972) while reporting from Kakinada says that the spawning period for this species is prolonged and is from January to September. But at Vizhinjam the informations so far gathered indicate that there is only one spawning for this fish and is around May-June months.

Our existing knowledge of the early stages of this species refers to a 5.4 cm stage by Tang and Wu (1936), a 6.7 cm specimen by Nair (1952), a 6.3 cm specimen by James (1965) and 3.7 cm stage by Narasimham (1972). But at Vizhinjam a fishery existed for the juveniles of 4-12 cm size along with other juvenile fishes in the first week of July 1979 and were caught by the small meshed boat seines.

The minimum size at maturity for this species is 41-43 cm (Anon., 1986). It is interesting to note that the maximum quantity of ribbonfish caught at Vizhinjam during the study period was above this size only. Hence fishing those size groups above 43 cm may not affect the stock. At the same time exploiting the juveniles during July-August may have an adverse effect on the fisheries. This has to be viewed seriously and proper regulatory measures taken urgently to protect the stock.

According to Prabhu (1955) this species attains a length of 18 cm in the first year, 30 cm in the second, 46 cm in the third and 54 cm in the fourth year of its life. It is interesting to note that Prabhu's data does not include the size groups above 56 cm. Misu (1958) while studying the age and growth of *T. lepturus* from East China Sea and Yellow Sea, has calculated the age of the fish from otolith studies, has given first to sixth year of the fish as 18.3, 27.7, 33.1, 37.0, 40.1 and 42.1 cm respectively. Narasimham (1978) has given the age as 27.3 cm at 6 months and 41.6 cm at the end of one year. Tampi *et al.* (1971) estimated the age as one year when it is around 30 cm and four years when it is around 90 cm in length. At Vizhinjam the size above 56 cm supports the fishery to the maximum and fish above 100 cm appears to be common.

Ribbonfishes exhibit diurnal migration (Rao *et al.*, 1977). They migrate to deeper waters during day and to the surface during night hours. Its distribution in the deeper waters is evident from the types of food it takes also. A portion of its diet (Table 3) consists of fishes such as *Saurida* sp., silverbellies, *Sillago* sp., catfish, cuttlefish and prawns. Bigger sized *T. lepturus* are normally fished from deeper waters off Vizhinjam by hooks and line during day time. But the contribution by this gear to the ribbonfish fishery is only 3%. If bottom trawling as suggested by Rao *et al.* (1977) during day time is introduced that can increase the catch of bigger sized fish from the bottom. But some areas off Vizhinjam are not suitable for bottom trawling due to the presence of corals. In such areas bottom set gill nets and hooks and line operated from mechanised vessels could be used to increase the catch of bigger individuals.

The overall trend towards ribbonfish fishery in the area is encouraging. The ice plants and cold storage plants are insufficient to meet the needs especially during peak fishing season. Inadequate storage facilities force the fishermen

to sell their catches at throwaway prices at times. Though sun-drying is practiced, the area available in the beach for drying is inadequate. Therefore providing facilities for drying the catch artificially seems to be a step forward in the direction of their proper and

efficient utilization. Preparation of fish meal from the ribbonfish for human consumption seems to be advisable so as to get maximum benefit out of the catch. Steps should be taken to export this fish to foreign countries so as to make the industry lucrative.

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