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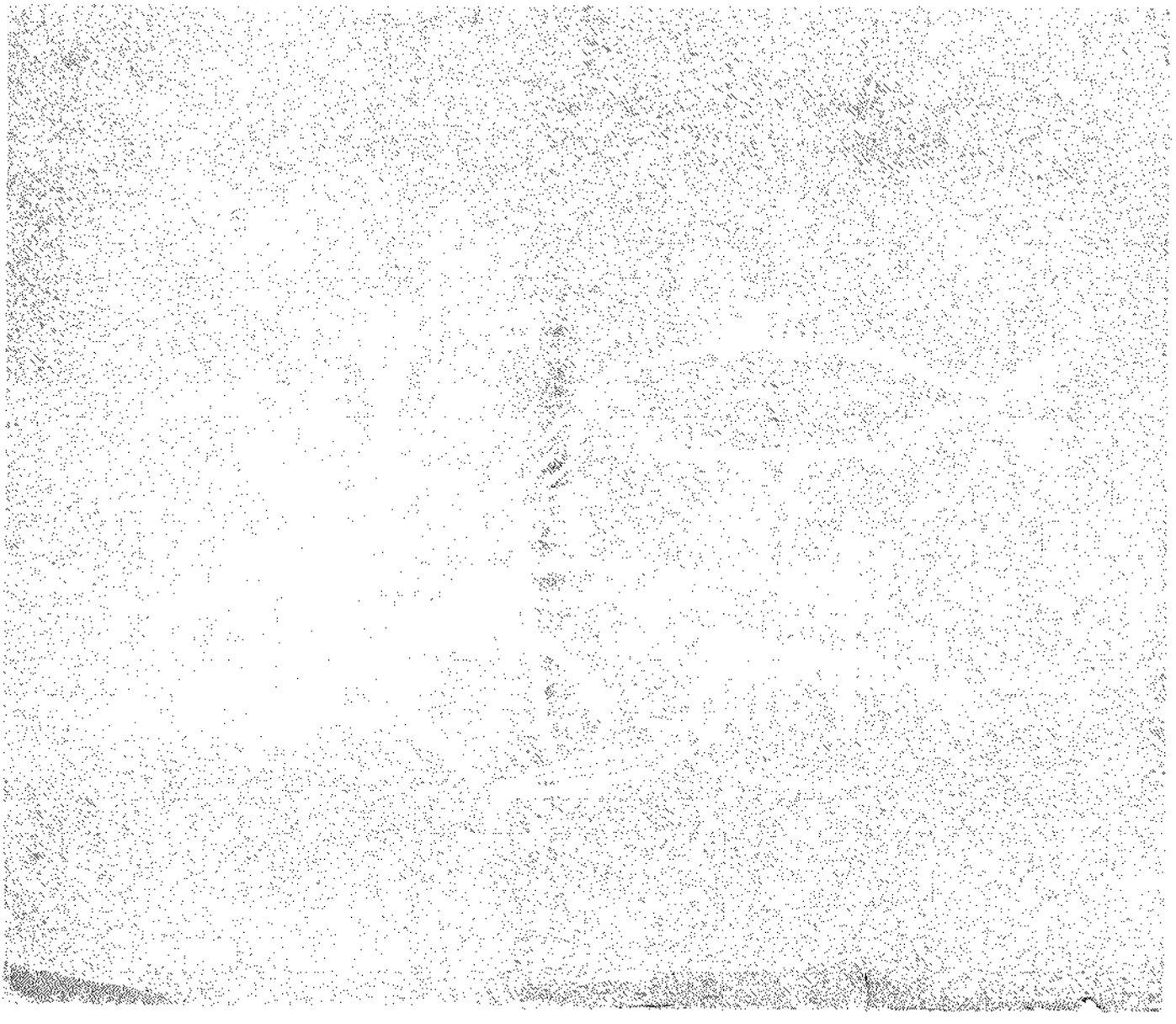

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THE RIBBON-FISH RESOURCES OF INDIA

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ABSTRACT

Ribbon-fishes constitute one of the important commercial fisheries of India, the annual catches fluctuating about 29,000 m. tons and forming 3·80% of the total marine fish landings (average for 1958–67). They are caught almost all along the Indian coast and form an exclusive fishery of considerable magnitude at a number of places, especially in the southern peninsular region. The States of Andhra Pradesh, Madras and Kerala account for the greater percentage of annual catches. A limited fishery exists in Hooghly-Matlah estuaries.

Though the catches are constituted by more than one species at several places, it is certain, that the bulk of the catches are contributed to by *Trichiurus lepturus* which moves in great shoals and appears to migrate from east to west around Cape during August to October when it is caught in large quantities. On such occasions, the fishery is supported by spent fishes, about 50 to 75 cm, which could be caught to any extent possible without being detrimental to future stocks as such fish would have spawned at least once. The other three species, *Lepturacanthus savala*, *Eupleurogrammus muticus* and *E. intermedius*, though comparatively not very important, yet form the fishery singly or cojointly at some places.

The usual gear for these fishes are the shore seines and the boat seines. Catches could be substantially improved in the southern region between Idinthakarai and Vizhingam if the information of appearance of shoals between August and October is promptly passed on to the fishing centres in between and they are effectively fished at this time.

THE estimated annual landings of ribbon-fishes from the seas around India during the period 1950 to 1967 ranged from 16,452 to 56,298 m. tons, forming 1·98 to 9·68% of the total marine fish production. The highest production of 56,298 m. tons and the lowest of 16,452 m. tons were recorded in the years 1953 and 1963 respectively. While the maximum percentage contribution to total marine fish catch was also in 1953, the minimum was in 1960 when the ribbon-fish catch amounted to 17,467 m. tons. From this, it is clear that ribbon-fishes constitute one of the commercially important groups of fishes in India, the catches of which have touched the 10% level. It is also evident that the catches highly fluctuate from year to year. The average landings for the ten-year period from 1958 to 1967 amount to about 29,000 m. tons, forming 3·80% of the total marine fish production.

The ribbon-fishes belonging to the family Trichiuridae are caught almost all along the Indian coast and form an exclusive fishery of considerable importane at a number of places, especially in the southern peninsular region. The four species, *Trichiurus lepturus* Linnaeus, *Lepturacanthus savala* (Cuvier), *Eupleurogrammus intermedius* (Gray) and *Eupleurogrammus muticus* (Gray) are found along both east and west coasts of India but the dominance or otherwise of individual species varies at different places. However, it is certain that on an all-India basis and from the fishery point of view, *T. lepturus* should be considered the dominant species, contributing to at least approximately 75% of the ribbon-fish catches of the country. A comprehensive account of the ribbon-fishes of India was given by James (1967).

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Though the ribbon-fishes are caught in all the maritime States of India, the States of Andhra Pradesh, Madras and Kerala account for the greater percentage of the annual landings. In West Bengal, a limited seasonal fishery exists in the Hooghly and Matlah estuaries and Sunderbans especially in the lower zones from September to March, peak catches being obtained from November to February. All the four species of ribbon-fishes occur in this area but *L. savala*, *T. lepturus* and *E. muticus* are more common, of which the first is reported to be the dominant species. *L. savala*, and *T. lepturus* are reported to contribute to about 13% of the total catches of fishes from this area. The total size ranges for the three species are *L. savala*, 15 to 45 cm.; *T. lepturus*, 12·7 to 54·3 cm.; and *E. muticus*, 14 to 34 cm. The fishery is supported by juvenile, immature and maturing fishes. Mature individuals of *L. savala* are reported to occur near the mouth of Hooghly. Ribbon-fishes are caught in bag nets in this area. Along the Orissa coast, *T. lepturus*, *L. savala* and *E. muticus* occur, the last named species appearing to be dominant in the fishery, the season extending from July to about November. The catches for West Bengal and Orissa together ranged from 53 to 1,377 m. tons during 1956–67. There is an improvement in the catch from 1961 onwards which is over 500 m. tons per annum.

All the four species of ribbon-fishes are available along the Andhra Pradesh coast. In the northern area, they are caught abundantly between July and December. *T. lepturus* is the dominant species, individuals measuring up to 75 cm. are quite common. In the central region, near Kakinada area also, *T. lepturus* dominates, forming 60–80% of the ribbon-fish catches, followed by *L. savala*, *E. intermedius* and *E. muticus* in the order of abundance. The size ranges of three of the common species occurring here are, *T. lepturus*, 110–1,142 mm.; *L. savala*, 50–850 mm.; and *E. intermedius*, 105–483 mm. Boat seines account for the bulk of the catches, followed by shore seines. Very meagre quantities are landed in gill nets and trawls, the catch rate in the latter being 2 to 6 kg. per hour of trawling. Time of peak landings varies from year to year, but usually there is a peak in summer. During the peak period, ribbon-fishes contribute to as much as 50–60% of total fish catch in this area. Further south, in the Masulipatam area, T. *lepturus* seems to be the common species. Generally, along the Andhra Pradesh coast, ribbon-fishes are common after August up to about December. The magnitude of the catches in Andhra Pradesh is quite high, fluctuating between 1,110 and 1,508 m. tons from 1950 to 1967, maximum catch having been obtained in 1965.

The ribbon-fish fishery at Madras commences in the month of September normally, the catches ncreasing steadily and reaching a peak in December when they form about 60% of the total landings and about 20% of the annual catches. Usually, November to January period experiences heavy catches. All the four species occur in the area, but *T. lepturus* forms the bulk of the catches, the size range being 140–850 mm. Large fish measuring 1,200 mm. are also caught in the region in nylon gill nets operated at 50 m. depth. *L. savala* ranging in size from 165–210 mm. is caught in good quantities in December. Juveniles of ribbon-fishes occur almost throughout the year at Madras, indicating that the breeding grounds are not far from the coastal region. Shore seines and boat seines account for the commercial catches. South of Madras, the ribbon-fish fishery season commences by about middle of October and lasts till December. *T. lepturus* is the common species up to south as far as Point Calimere. Of all the places in this area, at Nagapattinam, *T. lepturus* contributes to heavy catches in the season. Further south, in the Palk Bay and Gulf of Mannar, *T. lepturus*, *L. savala* and *E. intermedius* occur together of which, the last named species is predominant, occurring almost round the year in the vicinity of Mandapam. The occurrence of *L. savala* is only seasonal from November to about February and that of *T. lepturus* only as stray individuals or occasional shoals between July and December. The size ranges for the three species in this area are *E. intermedius*, 50 to 430 mm.; *L. savala* 61 to 564 mm.; and *T. lepturus* 254 to 895 mm. Ribbon-fishes, especially *T. lepturus* of the size range 400 to 750 mm., contribute to about 1% of the trawl catches from Gulf of Mannar in the vicinity of Mandapam during November to March period. On the whole, it may be said that no regular and substantial fishery exists in the area. Shore seines, bag nets and trawl nets are the usual gear in which they are caught in this region. Stray specimens of *T. lepturus*, 800 to 960 mm (S.V. length 330–370 mm.) are also caught in nylon drift gill nets in the months of August and September, operating at depths ranging from 20 m. to 50 m. Along the extreme south-east coast of India, only *T. lepturus* and *L. savala* are caught,

the former being more abundant than the latter. Large shoals of *T. lepturus* appear in the inshore waters after August, the fishery extending from September to November. The catches are composed of large fish, 500–750 mm. in the spent stage. Bag nets are the most important gear in this region, ribbon-fishes forming 50 to 90% of the catches in the season. At Cape Comorin, *T. lepturus* and *L. savala* occur but the fishery is mainly sustained by shoals of the former, which appear to migrate from east to west during the months August to October, when they are landed in large quantities in bag nets from inshore waters. About 25% of the fish catches at this place is formed by ribbon-fishes, available in small quantities throughout the year with peak occurrence from July to October. Ribbon-fish catches in Madras State varied from 3,091 to 24,545 m. tons between 1950 and 1967. During the same time the same trend is observed at Colachel and further north at Vizhingam along the south-west coast of India (Kerala), the shoals appearing successively at the places from south to north. On such occasions, it is possible for the fishing units to repeat their operations and fish throughout the day, the total catch amounting even to 50 to 60 m. tons a day. Once the shoal moves away the catches decline. It is known in the southern peninsular region that these migratory shoals enter the coastal waters sometimes more than once during the season creating further opportunities for intense fishing. The ribbon-fish resources of Kerala State highly fluctuate between 636 and 2,110 m. tons during the years 1950–67.

Along the Mysore coast also, *T. lepturus* and *L. savala* occur, of which, the former is more common. Ribbon-fishes are caught, in shore seines called 'Rampan' nets in this area. Ribbon-fish catches are poor in the State, and ranged from 20 to 987 m. tons from 1950 to 1967. Limited quantities of ribbon-fishes about 400 m. tons per year are landed along the Goa coast, *T. lepturus* being the dominant species. Occasional shoals of *T. lepturus* are known to enter inshore waters at Ratnagiri and the vicinity along the Maharashtra Coast. The shoals are composed of fish about 750 mm. *L. savala* is also known to occur in this area but comparatively of lesser fishery importance. The general season for the fishery extends from September to December. At Bombay, all the four species of ribbon-fishes occur, but *E. muticus* appears more common than others, size range being 130 to 560 mm., occurring from November to March. They are mainly caught in bag nets called the 'dol nets' in this region. The trawls also land small quantities of *T. lipturus* of the size about 750 mm. Fairly good catches of ribbon-fishes are obtained in Maharashtra State from 1,771 to 21,579 m. tons during the period 1950 to 1967. Along the Gujarat Coast all the four species are caught in 'dol net' but the catches are meagre, ranging from 206 to 7,670 m. tons for the period 1950–67. While only *T. lepturus* of very negligible quantities is caught at the Andaman and Nicobar Islands, ribbon-fishes do not seem to occur around the Laccadive group of Islands.

From the foregoing it is clear that the ribbon-fish resources are considerable but fluctuate within wide limits in the States of Andhra Pradesh, Madras and Kerala and that fairly good quantities are available in the Maharashtra State and to some extent, in Gujarat. The resources are poor in Mysore, West Bengal and Orissa.

Brief biological notes on the individual species which have a bearing on the commercial catches of ribbon-fishes are given below.

T. lepturus.—The most important species from the fishery point of view. It is widely distributed, occurring almost throughout the coasts of India. Bulk of the ribbon-fish catches are contributed to by this speies at several places along the Indian coast. It appears to move in large shoals in coastal areas, especially during the period August to October, during which time it seems to migrate from east to west around Cape when it is fished in very large quantities. Therefore, the success and fluctuations of the fishery are attributable to a great extent to migrating shoals of *T. lepturus*. There is good evidence of appearance of shoals at Kakinada, Madras, Nagapattinam, Dhanushkodi, Idinthakarai, Cape Comorin, Colachel, Vizhingam and Ratnagiri where special efforts are also necessary to increase the output, taking advantage of this habit of the species, repeating regularly almost every season. As the migration of this species has always been observed to be from the east to west around Cape, it is possible that it is related to the direction and movement of surface

currents in the Bay of Bengal and along the coasts of India and Ceylon with the establishment of North-East monsoon. The presence of shoals in coastal waters from Visakhapatnam to about Nagapattinam, their absence thereafter and reappearance at Idinthakarai, and movement around Cape and north along west coast up to about Ratnagiri during the period June to December may perhaps be explained thus. At about the same time, there is coincidence of occurrence in large quantities of the white-bait (fishes of the genus *Stolephorus*) and the shrimp (genus *Acetes*) which form favourite food items of these fishes. The fish in such shoals range in size between 500–750 mm. and are in spent condition. Therefore, intense fishing for such fish, under the present methods of exploitation, is not considered detrimental to future stocks. There are indications that the average commercial size is about 750 mm. and fish measuring over 1,000 mm. are not rare, suggesting the life span to be much higher than what is at present known. While the species has been supposed to spawn only once in a year for a short period in June, data gathered recently on the maturity and occurrence of juveniles point out that spawning period is either extended or the species spawns more than once a year. The breeding grounds do not seem to be far away from the coast. In view of the above facts, it need not be emphasised that a detailed study on this species is necessary.

L. savala —This species is next in importance to *T. lepturus* considering the maximum size it attains, abundance and the contribution to fishery. It is also distributed almost all along the coast of India but does not exclusively form a fishery at any place, except that it is probably the dominant species in certain places like the Hooghly-Matlah estuarine system. Individuals measuring about 850 mm. are not rare but the commercial size range varies from about 150–500 mm. In the Hooghly-Matlah estuarine system (Gupta, 1967), the commercial catches indicate that they include fish of the sixth year class, the fish attaining maturity at about 407 mm. The spawning season appears to be prolonged from about May to September. A somewhat similar trend has been noticed in the Kakinada area where the upper limit for commercial size (740 mm.) is more than in the Hooghly-Matlah estuaries (500 mm.). Juveniles of this species, about 60 mm., are frequently caught in inshore areas wherefrom it may be inferred that this species also spawns in the vicinity of coastal waters.

E intermedius and *E muticus* —These two species, together, are comparatively of lesser importance than either *T. lepturus* or *L. savala*, from the abundance point of view. Though they occur singly or conjointly with the other species of ribbon-fishes, their contribution to the catches is meagre. *E. intermedius* appears continuously distributed along the Indian coast when compared to *E. muticus* which is very discontinuously distributed, appearing to be restricted to the northern latitudes. *E. intermedius* is particularly abundant in Palk Bay, in the vicinity of Mandapam and *E. muticus* along the Orissa, and Bombay coasts.

The total size range of *E. intermedius* varies from 50–500 mm. in the Palk Bay region, the commercial size being 140–350 mm. The life span of the species is about four years, attaining maturity at about 300 mm. when it is about 2 years old. It spawns over a long period, intense spawning taking place in March–April, August–September and November–December. Juviniles 50 mm. and above occur in the fish catches as also few ripe and running fish suggesting the nearness to shore of the spawning grounds.

Detailed biological information is not available for *E. muticus*, but from the available data, the total size range for the species varies from 200 to 600 mm., the commercial size being 350–500 mm. From the information available on the maximum size of the species (about 600 mm.) and judged in comparison with the closely related species, *E. intermedius*, this species is also likely to have a life span of about four years. Maturity studies indicate that this species also spawns more than once, the exact season and duration of which are yet to be fixed.

Heavy catches of ribbon-fishes are obtained usually between July and December, the peak season differing from place to place and year to year. Fishing methods for ribbon-fishes along the Indian coast suggest that they are usually caught in inshore regions in comparatively shallow areas at

3 to 6 metres depth. They are best caught in the shore seines and the boat seines. The capture of ribbon-fishes in trawl nets does not seem to have any significance from the fishery point of view. Their occasional capture in drift nets also proves the unsuitability of the gear for these fishes. It it however possible that trials with purse seines in inshore areas during the season at important centres may be fruitful.

At most places where these fishes are caught, there is a drawback of the indigenous gear (catamarans with bag nets) from the point of view of lack of space for the catch on the craft and time taken for travel to and from the fishing area, especially when operations are to be repeated on special occasions when there is scope for fishing continuously. Intense fishing also creates problem of disposal and utilisation of catch. If these problems are solved by suitable measures, there seems to be ample scope to step up production. As already pointed out, organisation of intense fishing during August–October period in the southern peninsular region between Idinthakarai and Vizhingam by promptly passing on the information of appearance of shoals of *T. lepturus* to the other centres in between, can also lead to increased catches of ribbon-fishes in the area. The shoals have been observed to appear as suddenly as they disappear.

Ribbon-fishes, although consumed in the fresh condition to a certain extent, are mostly cured with salt or sun-dried. The products have good internal and external markets. They form a sizeable component of the dry-fish export trade to the eastern countries, especially Ceylon, which can further be improved by better exploitation of the ribbon-fish resources of India.

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