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Diet composition and feeding behavior of largehead hairtail *Trichiurus lepturus* Linnaeus 1758 along the Eastern Arabian Sea and Western Bay of Bengal

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Information on diet composition and feeding habits of species is very much essential for the scientific planning to develop sustainable management plans. The feeding biology of *Trichiurus lepturus* was studied during 2014 to 2018 from 6167 and 3346 specimens collected on a weekly basis along Eastern Arabian Sea (EAS) and Western Bay of Bengal (WBB), respectively. Crustaceans mainly represented *Acetes* spp. (98.6 %) and were categorized as dominant and preferred (%QI = 51.35; %IRI = 53.31) food item; teleosts were categorized as dominant and secondary (%QI = 47.46; %IRI = 45.71) food items and molluscs as accidental and accessory food items of *T. lepturrus* based on the values of dietary coefficient and Index of Relative Importance along the Eastern Arabian Sea (EAS) while, teleosts were completely dominant (%QI = 99.61; %IRI = 99.27) with both molluscs (%QI = 0.34; %IRI = 0.56) and crustaceans (%QI = 0.01; %IRI = 0.17) forming accessory and accidental food items along the Western Bay of Bengal (WBB). The teleostean prey items belonging to 23 genera were encountered in the guts of *T. lepturus* from EAS with *Stolephorus* spp. (17.09 %), *Sardinella longiceps* (6.65 %), *Decapterus* spp. (5.75 %), *Rastrelliger kanagurta* (1.36 %), and *Megalaspis cordyla* (0.89 %) as major component; whereas, in WBB, 16 genera of teleosts representing *Sardinella longiceps* (50 %), *Stolephorus* spp. (31.52 %), *Decapterus* spp. (4.57 %), and *Rastrelliger kanagurta* (2.26 %) formed the major portion of diet by %IRI. Crustaceans were dominated by *Acetes* spp. (52.61% IRI) in EAS, while other crustaceans' contribution as prey item was negligible. However, along WBB, the crustaceans' contribution as food components was very minimal. Molluscs did not contribute much as dietary constituents of *T. lepturus* in both EAS and WBB. About 50.15 % and 56.83 % of the stomachs had food content in various proportions in EAS and WBB, respectively and rest of the stomachs were empty.

[**Keywords**: Arabian Sea, Bay of Bengal, Food and Feeding, Ribbonfish, Stomach fullness]

Introduction

The largehead hairtail *Trichiurus lepturus* is dominant among the eight ribbonfish species reported from Indian waters and supports commercial fishery all along the Indian coasts[1,2]. The species is known to occur in dense schools in the estuarine waters, shallow inshore areas and also in deeper oceanic waters up to 350 m depth[3,4]. Due to the massive demand for export to China and other Southeast Asian countries, the species is being harvested expansively all along the Indian Coast[5]. Knowledge on diet composition and feeding habits of species is very much essential for evaluating the role and position of marine fishes in the ecosystems and also to study the biology and population characters[6,7]. Further, feeding ecology of a species is utmost important for scientific planning and to develop sustainable management plans[8,9]. Ribbonfish plays an important role in controlling the populations of lower trophic level as they are top predators[10] with their trophic level is just below that of sharks and dolphins[11].

Food and feeding habits of ribbonfish has been studied from several parts of the world's marine ecosystems; Gulf of Mexico[12], East China Sea and Yellow Sea[13], Southwestern Taiwan[11], Karachi coast, Pakistan[14], South China Sea[15], Southeastern Brazil[16], coastal waters of Nigeria[17] and coastal waters of Cote d'Ivoire[18]. However, only few region-specific studies on food and feeding habits of ribbonfish have been reported from the Indian waters[19-21]. Multiday trawl fleets expanded their area of operation both vertically and horizontally to exploit *T. lepturus* both in west and east coasts of India to meet the domestic and export demand. Hence, it is imperative to have a collective information on feeding biology of *T. lepturus* on a regional (Eastern Arabian Sea and Western Bay of Bengal) and national level, which will help fishery managers and policy makers to devise and compose effective management strategies for judicial exploitation of this commercially important resource along the Indian coast. Therefore, the present study was taken up to investigate the feeding biology of *T. lepturus* in detail along the Eastern Arabian Sea (EAS) and Western Bay of Bengal (WBB).

Materials and Methods

Samples of *T. lepturus* were collected on a weekly basis during 2014 to 2018 from the multiday trawl boats operating from fish landing centres located in the states of Gujarat, Maharashtra and Karnataka along the EAS and from Tamil Nadu and Andhra Pradesh along WBB (Fig. 1). The details of the landing centres, crafts and gears operated, depth of operation and quantity of samples collected from each landing centres of various states along the Indian coast are described in Table 1. The samples were collected all through the year, except during June – July along the EAS and April – May along WBB, when the ban on operation of mechanized fishing vessels was imposed. The collected specimens were transported in iced condition to the laboratories of respective regional centres/stations of ICAR-CMFRI located in respective states for further detailed analysis.

The Total Length (TL) nearest to 0.1 cm and Weight (W) nearest to 0.1 g of all the specimens was measured with the help of graduated measuring scale and digital weighing balance, respectively. Sex was assessed visually based on the presence of testes and ovary after cutting open the fish carefully from the ventral side of the belly portion. The stomach of each specimen was visually assessed for the stomach fullness based on the quantity of food present in the gut and classified on a six-point scale as empty, trace, quarter full, half, three-fourth full and full. Later, the stomach was carefully cut open and all prey items were separated and identified to lowest possible taxa following Fischer & Bianchi[22] and Smith & Heemstra[23]. The prey numbers of each species/genera were recorded and their respective weight were taken to 0.01 g accuracy. The prey items were categorized as teleosts, crustaceans and molluscs. Partially

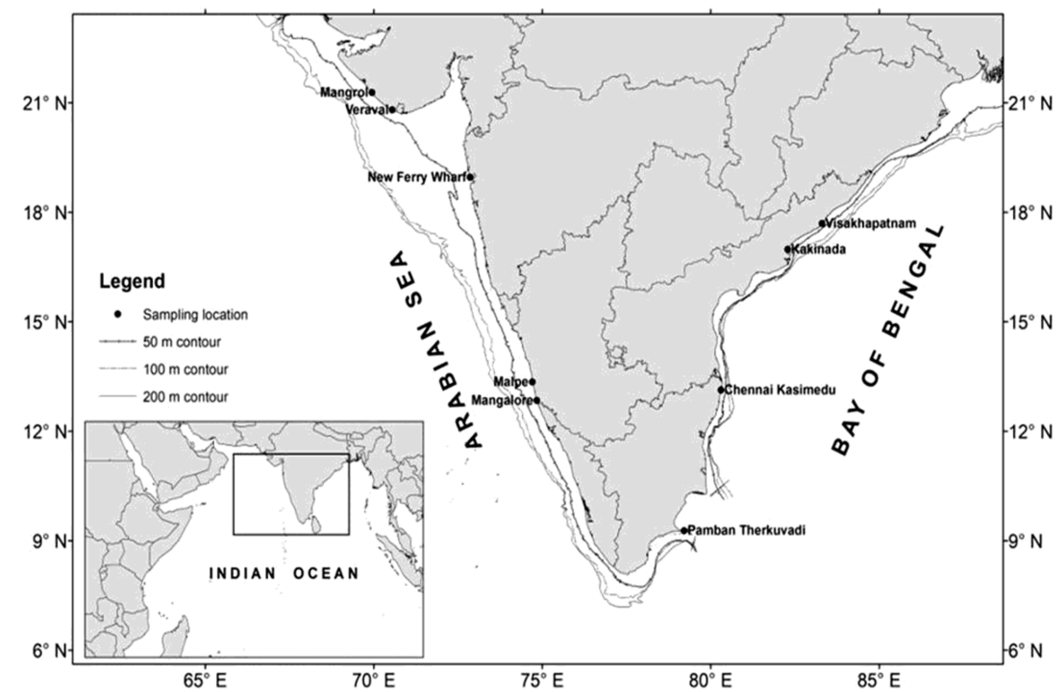

Fig. 1 — Location of sampling stations along the Eastern Arabian Sea and Western Bay of Bengal, India with depth of operation of multiday trawl boats for the exploitation of *Trichiurus lepturus*

Table 1 — Details of major crafts and gears, depth of operation and sample size of *Trichiurus lepturus* collected during January 2014 to December 2018 from various landing centres located in different states along the Eastern Arabian Sea and Western Bay of Bengal

State	Landing centres	Major crafts	Depth (m)	No. of samples collected		
				Female	Male	Total
Eastern Arabian Sea						
Gujarat	Veraval and Mangrol fishing harbours	Multiday trawl boats	20 – 450	622	533	1155
Maharashtra	New ferry Wharf, Mumbai	Multiday trawl boats	10 – 80	944	626	1570
Karnataka	Mangalore and Malpe fishing harbours	Multiday trawl boats	20 – 120	1946	1496	3442
Total				3512	2655	6167
Western Bay of Bengal						
Tamil Nadu	Kasimedu, Chennai and Pamban Therkuvadi fishing harbours	Single day and multiday trawls	30 – 100	1018	982	2000
Andhra Pradesh	Visakhapatnam and Kakinada fishing harbours	Multiday trawl boats & Motorised crafts (Hook & lines)	30 – 200	693	653	1346
Total				1711	1635	3346

Table 2 — Diet composition of *Trichiurus lepturus* from Eastern Arabian Sea and Western Bay of Bengal, India based on the Dietary coefficient (QI) and Index of Relative Importance (IRI)

Diet components	QI	%QI	Diet category	IRI	%IRI	Diet category
Eastern Arabian Sea						
Crustaceans	257.19	51.35	Dominant	1099.78	53.31	Dominant & Preferred
Teleosts	237.69	47.46	Dominant	943.00	45.71	Secondary
Molluscs	5.98	1.19	Accidental	20.35	0.99	Accessory
Western Bay of Bengal						
Teleosts	1345.32	99.61	Dominant	2862.83	99.27	Dominant
Molluscs	4.54	0.34	Accidental	16.20	0.56	Accessory
Crustaceans	0.80	0.01	Accidental	4.79	0.17	Accessory

*Diet components were grouped as dominant if QI ≥ 200, secondary if > 20 and ≤ 200, and accidental group if QI < 20 based on the QI values; † Diet component consisting ≥ 50 % of the total IRI were grouped as dominant and preferred, between 25 – 50 % as secondary, and rest as accessory food items

digested food items which were not identifiable were grouped separately as unidentified item under each category. The Stomach Fullness Index (SFI) was calculated as per Chiou *et al*.[11] using the following equation:

$$\text{SFI} = \frac{\text{Weight of stomach contents (g)}}{\text{Body weight (g)} - \text{Weight of stomach contents (g)}} \times 100$$

The index of relative importance (IRI) was calculated using the indices; the frequency of occurrence (%F), gravimetric index (%W) and the numerical index (%F) as per Pinkas *et al*.[24]. The IRI was calculated following the equation: %IRI = (%N + %W) × %F. Based on the %IRI, the prey items comprising 50 % of the total were considered as preferred prey, those forming more than 25 % as secondary prey and the prey forming less than 25 % as accessory food as per Rosecchi & Nouaze[25].

The importance of each prey category in the diet of *T. lepturus* was assessed by estimating the dietary coefficient (QI) according to the method of Salagado *et al.*[26] using the equation QI = %N × %W. The prey items were grouped as dominant when QI is more than or equal to 200; secondary, when QI is more than or equal to 20 but less than 200; and accidental group, when QI is less than 20.

Results and Discussion

Dietary coefficients and index of relative importance

Crustaceans mainly represented *Acetes* spp. (98.6 % IRI) were categorized as dominant and preferred (%QI = 51.35; %IRI = 53.31), teleosts as dominant and secondary (%QI = 47.46; %IRI = 45.71) and molluscs as accidental and accessory food items of *T. lepturus* based on the values of dietary coefficient and Index of relative Importance, respectively (Table 2) along the Eastern Arabian Sea (EAS). However, teleosts were completely dominant (%QI = 99.61; %IRI = 99.27) with both molluscs (%QI =

0.34; %IRI = 0.56) and crustaceans (%QI = 0.01%; %IRI = 0.17%) forming accessory and accidental food items of *T. lepturus* (Table 2) along Western Bay of Bengal (WBB). The dominance of crustaceans (55.3 %) and teleosts (45.7 %) as food items of *T. lepturus* in this study from EAS is very well supported by the earlier reports from Karnataka[20] and Gujarat[21]. These studies have documented the dominance of teleosts constituting 47.16 % and 61.38 % along with crustaceans forming 45.22 % and 35.35 % along Gujarat and Karnataka coasts, respectively. In contrast, the total dominance of teleosts (99.27 %) as prey component with molluscs (0.56 %) and crustaceans (0.17 %) together forming less than 1 % of the diet component recorded in this study is in line with the previous studies in the coastal waters of Taiwan[27], south-western Taiwan[11], the coastal Cote d'Ivoire[18] in which teleosts contributed to 90 %, 94.6 %, and 92.5 %, respectively by weight to the total prey composition of *T. lepturus*.

The dominance of both teleosts and crustaceans in the diet of *T. lepturus* in EAS and only by teleosts in WBB could be due to the variation in the easy availability of prey item in two different ecosystems. The dominance of crustaceans in the diet along with teleosts in EAS could be possibly due to the availability of enormous quantity of *Acetes* spp. along west coast of India which is almost lacking in WBB. This is evidenced in the present study where in *Acetes* spp. alone formed 52.6 % (%IRI) of the total diet content and 98.7 % of the crustaceans (Table 3) as prey component along the EAS. The results of Vase *et al.*[29] is comparable with the present study as they documented *Acetes* spp. as major component

Table 3 — Prey composition in the gut of *Trichiurus lepturus* in terms of frequency of occurrence (F), number (N), weight (W) and index of relative importance (IRI) from the Eastern Arabian Sea, India

Prey items	F	%F	N	%N	W	%W	IRI	%IRI
Crustaceans	590	21.74	6502	69.11	1185.89	6.15	1099.78	53.33
Acetes spp.	418	15.40	6270	66.65	734.50	3.81	1085.31	52.61
Solenocera spp.	102	3.76	176	1.87	271.80	1.41	12.34	0.60
Unidentified shrimps	54	1.99	44	0.47	99.85	0.52	1.96	0.10
Crabs	9	0.33	7	0.07	48.87	0.25	0.06	0.01
Squilla	7	0.26	5	0.05	30.87	0.16	0.11	0.01
Teleosts	1991	73.36	2740	29.14	17029	88.46	943.00	45.68
Stolephorus spp.	567	20.89	727	7.73	1760.79	9.15	352.52	17.09
Sardinella longiceps	187	6.89	234	2.49	3356.90	17.44	137.27	6.65
Decapterus spp.	202	7.44	294	3.13	2468.30	12.82	118.68	5.75
Rastrelliger kanagurta	78	2.87	79	0.84	1714.60	8.91	28.01	1.36
Megalaspis cordyla	74	2.73	99	1.05	1087.20	5.65	18.27	0.89
Trichiurus lepturus	58	2.14	72	0.77	819.80	4.26	10.74	0.52
Saurida spp	60	2.21	99	1.05	464.20	2.41	7.66	0.37
Nemipterus spp.	41	1.51	44	0.47	667.94	3.47	5.95	0.29
Thryssa spp.	55	2.03	70	0.74	316.60	1.64	4.84	0.23
Johnius spp.	34	1.25	34	0.36	497.80	2.59	3.69	0.18
Apogon spp.	44	1.62	93	0.99	261.90	1.36	3.81	0.18
Priacanthus spp.	17	0.63	91	0.97	812.20	4.22	3.25	0.16
Bregmaceros spp.	35	1.29	70	0.74	74.10	0.38	1.46	0.07
Lactarius lactarius	23	0.85	95	1.01	82.30	0.43	1.22	0.06
Epinephelus spp.	10	0.37	10	0.11	266.06	1.38	0.55	0.03
Lagocephalus spp.	12	0.44	15	0.16	118.20	0.61	0.34	0.02
Odonus niger	6	0.22	6	0.06	111.08	0.58	0.14	0.01
Cynoglossus spp.	12	0.44	16	0.17	89.00	0.46	0.28	0.01
Coilia spp.	15	0.55	24	0.26	28.50	0.15	0.22	0.01
Platycephalus spp.	11	0.41	13	0.14	116.70	0.61	0.30	0.01
Leiognathes spp.	6	0.22	6	0.06	29.70	0.15	0.05	0.002
Upeneus spp.	4	0.15	4	0.04	49.00	0.25	0.04	0.002
Atul mate	3	0.11	5	0.05	27.20	0.14	0.02	0.001
Unidentified fish	437	16.10	540	5.74	1808.7	9.39	243.70	11.81
Molluscs	133	4.90	165	1.75	1038.40	5.39	20.35	0.99
Uroteuthis spp.	90	3.32	122	1.30	846.30	4.40	18.88	0.91
Sepia spp.	35	1.29	35	0.37	129.60	0.67	1.35	0.07
Unidentified cephalopods	8	0.29	8	0.09	62.50	0.32	0.12	0.01

representing 43 % of total diet component of *T. lepturus* along Northern Arabian Sea. Similarly, the dominance of *Acetes* spp. in the waters of Karnataka[20] and Gujarat[21] has been well documented. Further, *Acetes* spp. as one of the primary food components of most of the predatory and carnivorous fish species has been well-reported along the Northeastern Arabian Sea[28,29].

Prey composition of teleosts

The teleosts prey belonging to 23 genera were encountered in the guts of *T. lepturus* from EAS. The major component of this group, according to their dominance based on %IRI (Table 3) were *Stolephorus* spp. (17.09 %), *Sardinella longiceps* (6.65 %), *Decapterus* spp. (5.75 %), *Rastrelliger kanagurta* (1.36 %), and *Megalaspis cordyla* (0.89 %). These fish species/genera belonging to the families Engraulidae, Clupeidae, Carangidae and Scomridae contributed 70 % of total teleostean content in the stomach of *T. lepturus*. The contribution of other 18 genera was very minimal with their individual contribution by %IRI was less than 1 % (Table 3). In addition, the partially digested and unidentified teleosts contributed to about 11.81 % in the gut of *T. lepturus* from EAS.

In case of WBB, 16 genera of teleosts were identified from the gut of *T. lepturus* (Table 4), among them; *Sardinella longiceps* (50 %), *Stolephorus* spp. (31.52 %), *Decapterus* spp. (4.57 %) and *Rastrelliger kanagurta* (2.26 %) formed the major portion by %IRI. These four species/genera together formed 89 % to the total teleosts observed in the stomach and the rest was from other 12 genera with their individual contribution less than 1 % (%IRI). The partially digested and unidentified teleosts constituted to 7.72 % of the total teleostean diet (Table 4).

In general, both in EAS and WBB, four species/genera namely, *Stolephorus* spp., *Sardinella longiceps*, *Decapterus* spp. and *Rastrelliger kanagurta* belonging to the families Engraulidae, Clupeidae, Carangidae and Scomridae formed the major portion among the identifiable teleosts. Similar type of dominance of diet comprising of anchovies and sardines among the teleosts was reported for *T. lepturus* from India and elsewhere[18-20,30-33]. In

Table 4 — Prey composition in the gut of *Trichiurus lepturus* in terms of frequency of occurrence (F), number (N), weight (W) and index of relative importance (IRI) from the Western Bay of Bengal, India

Prey items	F	%F	N	%N	W	%W	IRI	%IRI
Teleosts	1345	90.29	3356	92.28	16492.96	96.19	2862.89	99.24
Sardinella longiceps	445	29.87	746	20.51	4862.01	28.35	1459.43	50.61
Stolephorus spp.	266	17.85	1348	37.06	2376.40	13.86	909.10	31.52
Decapterus spp.	105	7.04	335	9.20	1627.90	9.49	131.66	4.57
Rastrelliger kanagurta	88	5.90	96	2.65	1443.56	8.42	65.32	2.26
Caranx spp.	34	2.28	105	2.89	740.21	4.32	16.45	0.57
Trichiurus lepturus	37	2.47	68	1.87	758.08	4.42	15.57	0.54
Other sardines	31	2.09	147	4.05	421.16	2.46	13.63	0.47
Megalaspis cordyla	37	2.47	74	2.03	324.45	1.89	9.70	0.34
Lagocephalus spp.	26	1.71	37	1.01	362.73	2.12	5.36	0.19
Saurida spp	20	1.33	28	0.78	432.50	2.52	4.40	0.15
Selar spp.	26	1.71	28	0.78	209.59	1.22	3.43	0.12
Leiognathes spp.	20	1.33	40	1.09	140.10	0.82	2.54	0.09
Thryssa spp.	20	1.33	20	0.55	153.15	0.89	1.92	0.07
Liza spp.	20	1.33	20	0.55	70.90	0.41	1.28	0.04
Polynemus spp.	9	0.57	9	0.23	42.54	0.25	0.28	0.01
Upeneus spp.	9	0.57	9	0.23	22.69	0.13	0.21	0.01
Unidentified fish	155	10.40	247	6.79	2505.00	14.61	222.62	7.72
Crustaceans	54	3.62	176	4.83	92.74	0.54	4.79	0.18
Acetes spp.	14	0.95	128	3.51	31.20	0.18	3.51	0.12
Metapenaeus dobsoni	14	0.95	20	0.55	39.70	0.23	0.74	0.03
Unidentified prawns	17	1.14	20	0.54	16.17	0.09	0.38	0.02
Crabs	9	0.57	9	0.23	5.67	0.03	0.15	0.01
Molluscs	91	6.09	105	2.89	562.39	3.27	16.20	0.58
Uroteuthis spp.	48	3.24	62	1.72	389.96	2.27	12.91	0.45
Sepia spp.	17	1.14	17	0.47	51.90	0.30	0.88	0.03
Unidentified cephlopods	26	1.71	26	0.70	120.53	0.70	2.41	0.08

contrast, fishes belonging to Synodontidae, Priacanthidae, Scianidae, Latidae[27] and a myctophid, *Benthosema pterotum* and *Bregmaceros lanceolatus*[11] are also documented as chief constituent of ribbonfish. Based on these details, it is apparent that ribbonfish is an opportunistic feeder which consumes the prey which readily exists in their location than searching for the food item.

Cannibalism in ribbonfish

Along with other fishes, *T. lepturus* was also found in the gut both from EAS (%W = 4.26) and WBB (%W = 4.42) which shows cannibalism to some extent. The cannibalism (%W) recorded in previous studies were 11.9 %[(ref. 13)] in the Yellow Sea, 25.2 %[(ref. 34)], 35.2 %[(ref. 33)] in the East China Sea and 21.6 %[(ref. 15)] in the South China Sea. The cannibalism recorded in the present study is comparatively very less and almost comparable with the previous reports from Karnataka[20] and South-western Taiwan[11]. Cannibalism has been advocated as an approach to transmit energy from a smaller to large sized individuals[11,35], thereby the population size can be regulated[36] when the population is abundant.

Prey composition of crustaceans

Crustaceans were dominated by *Acetes* spp. (52.61, %IRI) in EAS, while other crustaceans in the gut of *T. lepturus* recorded were *Solenocera* spp. (0.60 %), unidentified partially digested prawns (0.10 %), crabs (0.01 %), and squilla (0.01 %) whose contribution as prey item was negligible. However, along the WBB, the total quantity (%IRI) of crustaceans (0.18 %) was very minimal with *Acetes* spp. (0.12 %), *Metapenaeus dobsoni* (0.03 %), unidentified prawns (0.02 %), and crabs (0.01 %) as food components.

Prey composition of molluscs

Molluscs contribution as dietary constituents of *T lepturus* in both EAS and WBB are less and accounted for 0.99 and 0.58 % in terms of %IRI. The main molluscans observed in the gut were *Uroteuthis* spp., *Sepia* spp., and unidentified cephalopods with %IRI contribution of 0.91, 0.07 and 0.01 % in EAS and 0.45, 0.03 and 0.08 % in WBB, respectively.

Feeding intensity

Among 6167 *T. lepturus* specimens studied in EAS, 3093 (50.15 %) fishes had food content in various proportions (Table 5) and others had empty stomach (49.85 %). In WBB, out of 3346 specimens analysed, 1902 (56.83 %) had food in various magnitude while others had empty stomach (43.17 %). The higher percentage of empty stomachs was noticed from both EAS and WBB in *T. lepturus* and is in accordance with the previous investigations from the Indian waters[19-21,37,38] and elsewhere[11,15,18,31]. Occurrence of high numbers of empty stomach is a usual character of carnivorous fishes which feed on other fish species[39,40]. In addition, the less proportion of food and empty stomach condition could be due to the high calorie of the diet which demands less quantity of food[41]. The percentage of empty stomachs were more in EAS compared to WBB and this could be related to many factors such as availability of food, type of gears employed for harvesting the fish, size of fish harvested, time of harvest, and spawning season. High percentages of empty stomachs is a usual phenomenon and is a characteristic of ichthyophagous fishes and is being reported in most of the carnivorous fish[2,9,39-40]. Among the possibilities for higher empty stomachs include spontaneous ejection of food during their struggle to get away from the trawlnets[12,27,40] as more than 95 % of ribbonfish being landed by multiday trawlers along the Indian coast. Moreover, the ribbonfish is a nocturnal feeder, which feeds more actively during night than day[11,27]. Multiday trawlers normally fish for a duration of about 8 – 13 days per trip and hence the timing of fishing also plays an important role. The fish caught during day could be having more empty stomachs than the fishes caught during night time.

Feeding intensity in term of Stomach Fullness Index (SFI) in *T. lepturus* revealed that the October month was having higher values in EAS and August to September in WBB compared to other months and this is mainly connected with the reproductive activity as ribbonfish spawning activity peaks during January – April in EAS[4,42] and October – December and May in WBB[19,37,43]. Hence, the feeding intensity along EAS is more during the pre-spawning period (October) as more nutrients are required for gonadal maturation and to get ready for spawning during January to April. Similarly, in WBB, the peak feeding in terms of SFI observed during August – September is a preparatory period for the maturation of gonads and to spawn during October – December. From the previous investigations, it is evident that the reproductive activity demands maximum nutrition in case of ribbonfish[11]. Both in the case of EAS and WBB, some months recorded lower SFI and others have moderate values and this could be due to the spawning activity of ribbonfish throughout the year with peak spawning restricted to a particular

Table 5 — Feeding intensity (%), empty stomach ratio and Stomach Fullness Index (SFI) during different months and size groups of *Trichiurus lepturus* along Eastern Arabian Sea and Western Bay of Bengal

Months/Size	Full	Three-fourth	Half	One- fourth	Trace	Empty	SFI Mean ± SE
Eastern Arabian Sea							
January	3.57	5.28	10.27	16.83	17.69	46.36	2.14±0.19
February	2.90	5.19	12.98	12.98	19.69	46.26	2.41±0.20
March	2.97	4.20	11.19	11.54	14.16	55.94	2.44±0.62
April	0.78	4.51	6.86	15.29	13.92	58.63	1.93±0.24
May	2.71	3.29	8.53	17.05	15.89	52.52	2.02±0.22
August	5.96	4.40	10.21	13.05	25.11	41.28	1.81±0.22
September	2.51	4.44	8.73	13.31	16.86	54.14	1.61±0.19
October	5.28	5.12	13.44	21.28	15.36	39.52	3.94±0.45
November	3.06	3.89	9.72	17.08	17.64	48.61	1.97±0.21
December	2.56	2.88	10.22	14.38	14.70	55.27	1.06±0.12
< 50 cm TL	0.80	1.60	6.15	11.76	15.51	64.17	1.26±0.23
50.1 – 60 cm TL	1.07	2.63	8.38	14.42	18.68	54.83	1.77±0.26
60.1 – 70 cm TL	2.24	3.05	10.36	17.23	20.07	47.06	2.03±0.13
70.1 – 80 cm TL	5.26	5.80	11.33	15.15	17.20	45.26	2.36±0.17
80.1 – 90 cm TL	5.35	5.71	12.49	14.74	15.10	46.61	2.52±0.27
> 90 cm TL	7.16	10.74	12.02	15.86	6.39	47.83	2.98±0.53
Western Bay of Bengal							
January	6.15	10.00	12.31	14.62	13.85	43.08	2.72±0.38
February	9.09	9.09	4.55	13.64	9.09	54.55	3.29±1.00
March	7.69	11.54	11.54	15.38	11.54	42.31	0.27±0.19
April	6.67	10.00	10.00	16.67	13.33	43.33	0.86±0.33
June	1.02	1.02	7.14	15.31	25.51	50.00	1.15±0.35
July	14.39	5.04	11.51	13.67	7.19	48.20	2.92±0.58
August	14.07	4.44	13.33	12.59	14.81	40.74	3.76±0.71
September	13.92	5.06	18.99	15.82	17.09	29.11	4.03±0.56
October	11.76	2.94	7.65	15.88	12.94	48.82	2.40±0.36
November	4.65	2.33	9.30	24.03	15.50	44.19	1.54±0.23
December	28.42	10.53	11.58	10.53	8.42	30.53	3.94±0.91
< 50 cm TL	13.43	5.56	13.43	18.52	14.81	34.26	4.50±0.51
50.1 – 60 cm TL	13.66	6.30	14.92	14.50	15.55	35.08	3.54±0.33
60.1 – 70 cm TL	8.00	4.00	10.67	16.67	12.67	48.00	1.77±0.19
70.1 – 80 cm TL	6.76	2.70	18.92	12.16	13.51	45.95	0.88±0.22
80.1 – 90 cm TL	11.11	3.70	7.41	7.41	11.11	59.26	2.27±0.96
> 90 cm TL	2.94	2.94	8.82	11.76	5.88	67.65	0.91±0.35

season[4,10]. In addition, the variation in feeding intensity is also linked with the seasonal difference in temperature and water quality that influence the physiological activity of the fish and presence of prey items[44,45]. Generally, the feeding intensity fluctuates depending on the season, the availability of preferred food items, the maturity stages of the organism and the spawning season. The very low feeding intensity recorded along WBB during March and April could be due to the spawning activity of *T. lepturus* as it exhibits prolonged spawning and spawns throughout the year in varied proportion. A moderate spawning activity between December and April has been reported for *T. lepturus* from Bay of Bengal[19]. The feeding intensity in terms of SFI was more in case of larger fishes compared to smaller individuals in EAS while in case of WBB smaller fishes had more SFI than larger ones. The variations in feeding intensity among different size groups of *T. lepturus* may be explained by the foraging ability of the fish in each size class, as well as the availability of prey items that correspond to the niche they occupy.

The present study specifies that *T. lepturus* is an opportunistic carnivore fish and its major food items is teleosts and crustaceans (mainly *Acetes* spp.) in the Eastern Arabean Sea, whereas it feeds mainly on teleosts in the Western Bay of Bengal. Among teleosts, *Stolephorus* spp., *Sardinella longiceps*, *Decapterus* spp., and *Rastrelliger kanagurta* belonging to the families Engraulidae, Clupeidae, Carangidae and Scomridae formed the major portion of diet components along both the regions. This is the first comprehensive study conducted on food and feeding habits of *T. lepturus* from most of the maritime states of India. The information generated from this comprehensive study would help in developing appropriate management plans for sustainable harvest and conservation of *T. lepturus*, one of the major fishery resources along both west and east coast of India.

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Conflict of Interest

The authors declare that they have no competing or conflict of interest.

Ethical Statement

The dead specimens were collected from the fish landing centre for the study following scientific collection ethics.

Author Contributions

KMR: Collection of data, conceptualization, investigation, data curing, formal analysis and writing - original draft; PR & EMA: Conceptualization, supervision, resources, writing – review & editing; and SG, MS, MM, CA, PAA, HMM, RV & ADN: Collection of data, investigation, and formal analysis.

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