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Stomach content analysis of *Terapon jarbua* (Forsskal) from Parangipettai coast, South East Coast of India

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ABSTRACT

Fishes are the most attractive, remarkable and amazing form of aquatic animal life. Food is a significant factor in the ecology of fishes and required the growth, development, reproduction and extensive migration circuits. Food and feeding habits of fish is a helpful of fishery biology and culture aspects. In this study were investigate the feeding habits of Terapon jarbua and analysis of the stomach contents there penetrating any other foreign particle or parasites. The various food items recorded from the stomach of T. jarbua during the study period. Generally, the food items found in the examined stomachs were grouped into ten categories. The male fish of Terapon jarbua stomach contents as identified feed compositions in the following order; Digested matter < Sand grains< Polychaetes < Fish < Miscellaneous < Crustacean< Phytoplankton <Bivalves < Gastropods < Zooplankton. The female fish of T.jarbua stomach contents as identified feed compositions in the following order; Miscellaneous< Crustacean < Fish < Polychaetes < Sand grains < Digested matter < Zooplankton < Gastropods < Bivalves < Phytoplankton were recorded as respectively. The findings of this study indicate that nematodes not observed in Terapon jarbua stomach region. The feeding rate and intensity were higher and the feeding intensity varied monthly. Changes in the prevalence and intensity of infection in ovarian parasite on gonadal areas, but in the stomach content seriously not observed any infection and parasites.

Key words: Food, feeding habits, *T. jarbua*, stomach analysis, parasites

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INTRODUCTION

Fish necessitate food to supply the energy that they require for movement, growth, development, survival and existence. It plays an important role in the reproduction and spawning behavior of the fish [1]. It's the main concerns of daily living in fishes, in which fish devotes large portion of its energy searching for food [2]. As the nature of food depends to a great extent upon the nature of environment, the problem is interesting from specific, as well as ecological point of view [3, 4 &5]. In the present study of the food and feeding habits of marine and estuarine fish species is a subject of continuous research because it constitutes the basis for the development of a successful fisheries management programme on fish [6&7]. The identification of stomach or gut contents allows us to know about food consumption, feeding and assimilation rates, cannibalism and even habitat segregation. A number of scientists have also studied various aspects of food and feeding habits of several fish species from Indian waters [8, 9, 10, 11, 12, 13&14]. Fish are no exception to this and information on their food and feeding habits is very essential for a better understanding of their life history [15, 16, 17&18]. Fish eat other fish that eat planktons and algae, which are contaminated with environmental pollutant because these chemicals are concentrated in the fat of the fish [19]. Parasites are a natural occurrence, not contamination. Roundworms called nematodes are the most common parasite found in marine fishes. *Terapon jarbua* are the predator- prey pyramid within fresh water as well

as in marine water and therefore tend to be infected by a considerable range of parasites, which occur in large number. Philometrids are an important group of animal parasites occurring in the adult stage usually in *Terapon jarbua* hosts, practically invading reproductive system of the host [15]. This study aims at a more detailed analysis of the food and feeding habits of *T.jarbua* with a view to augmenting the previous knowledge on the biology and analysis the stomach content there prober checking any of the foreign particle or parasites especially Philometrids are formed and are not as it should be investigated.

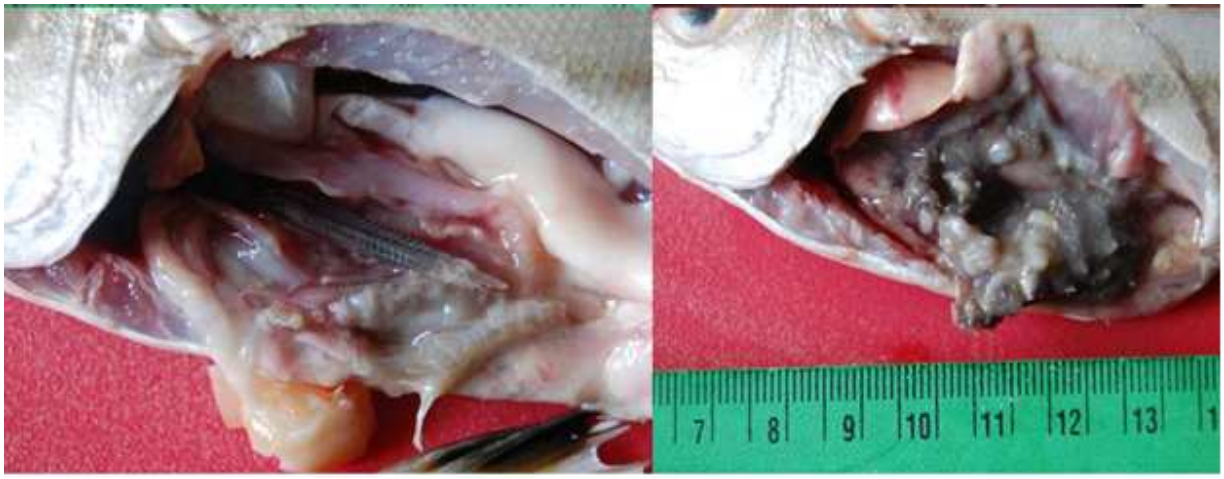

Plate 1: Stomach content analysis of different male *T.jarbua*

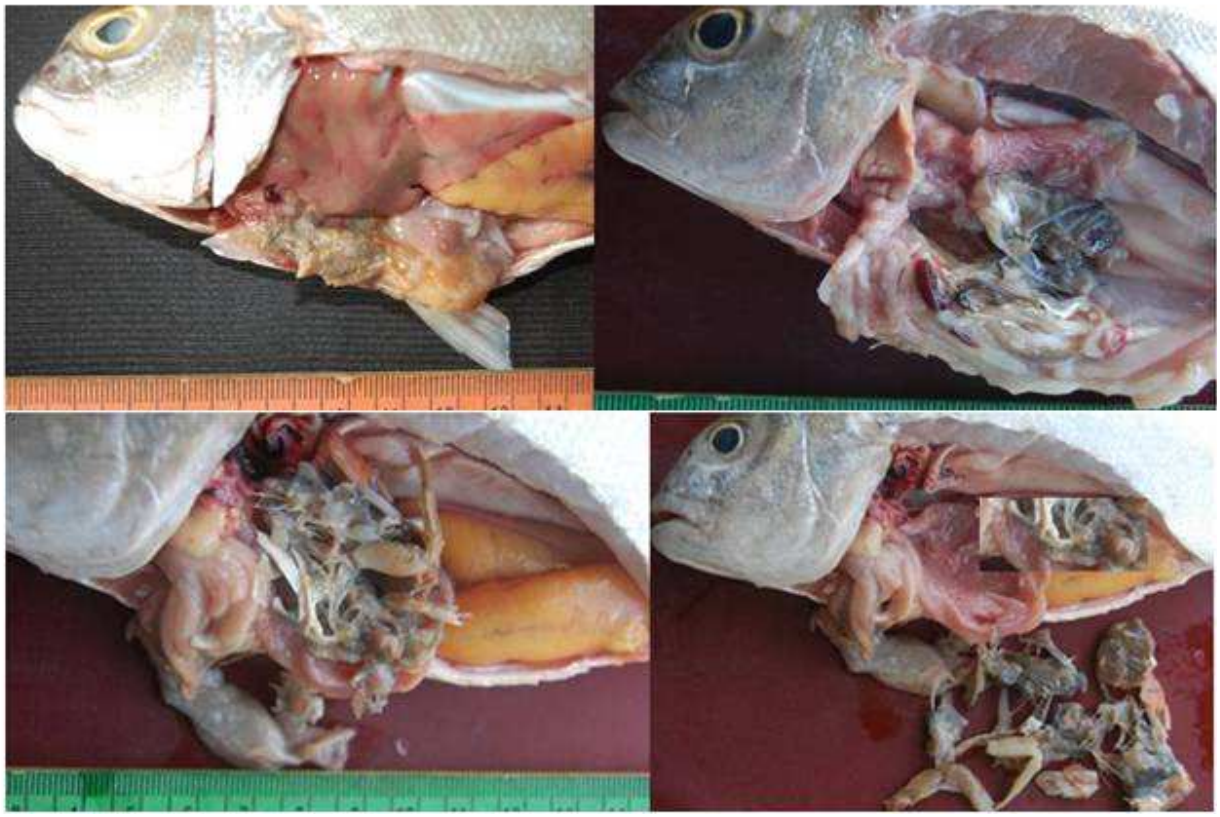

Plate 2: Stomach content analysis of different female *T.jarbua*

MATERIALS AND METHODS

The fishes were collected from the landings at Parangipettai coast during the January 2011 and December 2011. After collection, the fishes were stored in ice boxes and the stomachs were removed and fixed 10% buffered formalin. The stomach contents were later analyzed in the laboratory, stomach contents of different male and female. Immediately after the collection the standard length of the fishes were recorded before removing the stomach. After dissecting of the alimentary system, different components of the stomachs were recorded (Plate 1 & 2). They were split open by a pair of scissors and emptied in a petri dish for examination with the help of zoom dissection binocular microscope. The food items were identified up to the family level wherever possible. During the analysis, regurgitated stomach was discarded [20]. Occurrence method is the simplest way of recording the food relating to the number of stomach containing one or more individuals of each food item and the number were expressed as percentage of all stomachs those containing food [21&22]. The frequency of various components in the food of the species was estimated by the occurrence method [23] and the same was expressed in percentages. All fish were examined for the presence and occurrence of external and internal parasites according to [24].

RESULTS

Table 1: Different food items recorded from the stomachs of *T. jarbua* (January2011-December 2011)

S. No	Food item	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
I	**Crustacean**												
1	Crab	10.3	8.5	12.6	17.5	25.3	15.2	12.3	10.2	8.5	14.5	12.1	10.3
2	Tannaids	9.5	4.2	5.8	8.2	5.6	7.6	5.6	6.5	6.3	5.8	5.2	6.7
3	Isopods	7.8	3.6	5.4	6.2	5.2	6.8	4.3	7.8	7.1	5.2	6.3	5.8
4	Amphipods	10.0	5.8	6.2	7.2	6.2	6.4	5.2	6.5	6.3	4.9	5.2	5.7
5	Small prawn	12.2	7.1	6.8	7.0	5.2	6.5	5.4	6.3	6.0	6.1	7.1	6.4
6	Shrimps	14.1	10.3	8.5	8.6	7.1	7.2	6.2	5.8	5.2	5.6	5.6	7.1
7	Mysids	7.5	5.8	4.6	5.8	6.2	6.3	5.7	5.9	5.6	5.3	5.8	7.5
8	Copepods	5.4	4.7	4.3	6.3	7.3	7.1	6.2	6.1	5.3	6.9	6.1	6.8
9	Lucifer	4.6	3.6	3.8	4.5	5.8	6.8	6.4	7.5	6.1	7.7	6.8	6.9
10	Egg and Larva	8.3	4.2	3.5	5.8	6.1	6.3	4.5	6.4	5.9	8.5	7.2	7.6
II	**Polychaetes**												
1	*Armandia sp*	4.3	6.7	5.6	8.5	10.7	12.5	10.9	8.7	8.2	11.2	10.3	7.5
2	*Capitella sp*	5.8	3.9	4.6	5.7	4.9	5.2	4.6	3.5	5.2	7.5	4.6	5.2
3	*Cossura sp*	6.5	2.4	2.8	4.6	4.3	5.6	4.8	-	6.3	4.5	5.7	4.8
4	*Eunice sp*	-	5.3	5.2	6.2	5.7	5.2	4.9	5	5.6	4.1	4.3	4.6
5	*Glycera sp*	4.9	4.6	5.1	4.5	6.2	4.5	5.6	5.7	5.3	5.9	6.2	5.3
6	*Hesione sp*	7.5	6.8	5.6	7.4	6.1	5.2	4.8	4.6	4.8	4.3	4.6	5.2
7	*Magalona sp*	5.5	3.5	-	4.2	5.6	5.8	6.2	5	3.7	4.6	4.7	6.3
8	*Nephtys sp*	5.1	4.5	4.9	5.3	5.8	6.5	6.1	5.4	5.2	5.3	5.6	5.7
9	*Onuphis sp*	4.3	4.1	3.6	3.5	3.5	3.4	-	6.5	5.9	5.2	6.1	6.5
10	*Ophelia sp*	5.1	4.6	5.6	5.7	5.9	5.4	6.1	6.3	6.2	7.5	5.6	5.5
III	**Fish**												
1	*Stolephorus indicus*	5.2	5.8	6.5	9.5	12.5	14.5	8.5	9.5	6.5	7.5	8.5	6.8
2	*Thryssa malabarica*	4.6	4.5	6.8	5.3	5.9	5.8	4.7	4.8	5.9	8.5	6.5	7.5
3	*Chirocentrus dorab*	6.4	5.8	3.4	5.4	7.4	6.5	5.4	5.3	7.5	4.6	5.9	5.8
4	*Arius arius*	5.9	6.2	5.9	6.7	6.8	6.3	5.8	5.6	6.4	5.2	5.6	4.3
5	*Mugil cephalus*	3.2	4.1	5.3	4.6	4.1	4.2	-	8.5	7.1	6.3	5.7	5.9
6	*Hemiramphus far*	7.1	6.5	6.8	7.2	6.5	5.3	4.9	4.9	4.3	4.1	4.3	5.1
7	*Platycephalus indicus*	6.3	4.2	4.1	5.2	6.3	5.2	6.1	6.3	4.5	5.1	4.9	5.2
8	*Epinephelus tauvina*	5.3	5.1	5.3	5.4	5.6	6.3	8.2	6.4	6	5.8	-	4.1
9	*Sillago sihama*	4.3	5.7	-	4.5	4.2	8.1	4.5	4.3	4.8	5.3	5.8	6.1
10	*Caranx sem,*	5.2	5.4	5.7	6.2	6.3	5.7	6.3	-	5.7	6.2	5.2	5.3
11	*Lutjanus fulviflamma*	3.2	5.3	4.2	9.3	8.5	11.4	6.8	6.2	7.5	8.5	7.5	6.1
12	*Upeneus sulphureus*	4.5	4.2	4.7	5.6	5.7	4.2	4.8	4.3	6.2	5.7	6.2	5.7
13	*Terapon puta*	3.6	-	4.2	4.7	5.2	5.7	6.4	6.5	7.5	3.4	3.5	5.3
14	*Trichiurus lepturus*	4.2	4.7	5.3	5.1	6.3	4.7	4.3	5.2	4.2	4.3	3.2	3.4
15	*Pampus argenteus*	4.8	4.6	-	5.2	4.6	4.8	5.7	5.6	5.4	5.1	5.2	4.2
16	*Triacanthus biacculeatus*	6.5	6.3	6.5	6.4	5.7	5.2	5.3	-	4.9	4.2	4.8	4.8
17	Fish larvae	3.8	3.6	4.3	4.6	4.5	5.1	4.6	4.5	5.8	5.6	5.2	5.4
18	Fish scales	5.4	4.7	4.7	4.5	4.6	3.5	4.2	5.3	5.4	4.8	5.1	4.8
19	Fish eggs	3.5	3.1	3.2	3.9	4.5	5.3	5.1	4.3	4.2	4.3	4.8	5.4
IV	**Bivalves**												

1	*Arca sp*	4.1	3.8	3.5	4.2	3.1	4.1	4.2	5.3	5.1	4.7	4.3	5.2
2	*Anadara sp*	6.5	4.5	4.6	4.7	5.1	4.8	4.6	4.9	4.8	3.1	4.5	4.7
3	*Cardium sp*	5.3	0	5.1	4.5	4.3	4.7	5	4.6	5.6	2.8	3.8	3.1
4	*Meretrix sp*	3.9	4.6	4.8	2.8	0	2.6	2.9	3.2	3.4	2.5	2.3	2.6
5	*Pecten sp*	5.4	4.5	4.6	3.7	2.1	2.1	4.3	0	4.5	4.3	3.6	3.2
6	*Placenta sp*	5.9	5.3	5.7	3.4	0	3	2.7	3.1	4.6	5.1	4.1	3.6
V	**Gastropods**												
1	*Bullia sp*	3.6	3.2	0	3.2	3.4	3.6	3.7	4.5	4.2	4.3	4.1	4.6
2	*Cerithium sp*	3.5	2.9	2.7	3.1	2.9	0	3.8	3.4	3.6	3.2	3.9	4.2
3	*Cerethedia sp*	2.6	2.3	4.2	2.4	2.6	2.7	2.6	3.2	4.3	0	3.6	3.9
4	*Natica sp*	3.1	3.5	0	2.9	2.3	2.4	3.6	3.5	2.6	2.4	2.3	2.6
5	*Umbonium sp*	2.6	2.9	2.5	3.2	2.4	2.9	2.6	2.8	0	2.5	2.6	2.3
6	*Xancus sp*	3.5	3.8	4.6	3.1	0	4.6	5.3	5.2	4.3	3.9	3.1	2.9
VI	**Zooplankton**												
1	*Acartia sp*	2.8	2.6	2.5	2.4	2.8	2.9	2.6	3.6	3.5	3.6	3.4	3.8
2	*Canuella sp*	2.7	2.3	2.4	2.6	0	2.9	3.5	4.3	4.6	0	3.6	4.1
3	*Cervinia sp*	2.4	2.1	2.6	2.7	2.8	2.6	2.4	2.3	2.4	2.6	3.1	3.5
4	*Diarthrodes sp*	2.6	2.9	2.8	2.5	2.6	3.1	4.2	3.2	3.6	4.3	5.6	2.7
5	*Eucalanus sp*	0	2.3	2.6	3.4	3.2	3.6	3.4	3.6	3.2	3.6	3.1	3.6
6	*Microsetella sp*	3.6	3.3	3.4	3.6	0	4.3	4.5	3.6	2.9	2.8	2.6	2.5
7	*Macrosetella sp*	4.5	4.3	3.6	3.1	2.9	2.6	2.4	2.3	2.6	2.5	3.5	3.6
8	*Oithona sp*	3.6	3.1	2.9	3.6	3.1	3.8	4.1	3.6	3.5	3.6	3.5	0
9	*Rhicalanus sp*	2.9	2.8	2.6	3.4	3.6	3	3.5	2.9	0	2.9	2.6	2.8
10	*Sagitta sp*	2.3	2.6	2.8	3.6	3.1	0	2.4	2.3	2.5	2.3	2.5	2.6
VII	**Phytoplankton**												
1	*Coscinodiscus sp*	2.8	0	4.5	3.6	2.6	2.5	2.4	2.5	2.3	2.1	2.6	5.2
2	*Cyclotella sp*	2.6	2.4	3.6	2.7	-	2.6	2.5	2.9	2.1	4.2	4.3	4.6
3	*Diploneis sp*	2.6	2.8	2.3	2.5	3.6	3.5	0	4.3	2.7	2.3	2.5	2.9
4	*Planktoniella sp*	2.1	2.4	2.3	2.5	2.7	2.5	2.8	3.4	-	3.1	2.9	2.7
5	*Thalassiosira sp*	3.2	3.6	-	2.5	2.4	2.6	2.6	2.7	2.6	2.8	2.6	3.1
6	*Ditylum sp*	2.5	2.8	2.6	2.7	2.6	3.1	3.5	3.6	3.4	2.6	2.8	2.9
7	*Triceratium sp*	2.7	-	2.6	2.8	2.5	3.4	2.6	2.1	2.4	2.3	2.7	2.8
8	*Navicula sp*	2.1	2.4	3.8	-	3.4	3.2	2.9	2.7	2.5	3	2.1	2.3
9	*Odentella sp*	2.9	2.8	2.3	2.4	2.6	2.7	2.8	2.6	3	3.8	3.2	-
VIII	**Sand grains**	15.6	18.5	25.6	27.3	19.5	18.3	17.4	16.3	14.5	13.6	17.1	18.2
IX	**Digested matter**	12.5	10.5	13.2	9.8	8.5	7.9	8.9	8.5	7.8	7.6	7.6	10.3
X	**Miscellaneous**	30.2	34.2	32.5	26.5	28.5	24.5	29.5	31.5	27.5	39.5	34.5	35.6

Table 2. Monthly Variation in the Percentage Composition of Food of Male and Female in *T.jarbau* (January 2011-December 2011)

S:No	Food item	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Monthly average
1	**Crustacean**	8.84	6.84	7.28	9.13	9.47	9.02	7.32	8.17	7.38	8.35	7.98	8.38	8.18
2	**Polychaetes**	7.56	7.166	6.64	8.58	9.06	9.15	8.33	7.83	8.71	9.28	8.91	8.74	8.33
3	**Fish**	7.62	7.36	7.12	8.96	9.44	9.65	8.33	7.99	9.00	8.56	8.02	8.29	8.36
4	**Bivalves**	10.03	7.32	9.12	7.51	4.70	6.87	7.64	6.80	9.03	7.25	7.29	7.22	7.56
5	**Gastropods**	7.89	7.76	5.84	7.47	5.67	6.76	9.01	9.43	7.93	6.80	8.18	8.55	7.61
6	**Zooplankton**	7.29	7.51	7.47	8.16	6.35	7.57	8.65	8.28	7.51	7.33	8.69	7.55	7.70
7	**Phytoplankton**	7.50	6.13	7.66	6.92	7.15	8.33	7.05	8.55	6.70	8.36	8.20	8.46	7.58
8	**Sand grains**	7.03	8.33	11.53	12.3	8.78	8.24	7.84	7.34	6.53	6.12	7.70	8.20	8.33
9	**Digested matter**	11.05	9.28	11.67	8.66	7.51	6.98	7.86	7.51	6.89	6.71	6.71	9.10	8.33
10	**Miscellaneous**	8.06	9.13	8.67	7.07	7.61	6.54	7.87	8.41	7.34	10.54	9.21	9.50	8.33

Table 3. Monthly Variation in the Percentage Composition of Food of male *T.jarbau* (January 2011-December 2011)

S:No	Food item	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Monthly average
1	**Crustacean**	2.21	3	3.4	3.56	3.73	3.49	2.6	3.08	3.59	3.16	2.99	3.1	3.16
2	**Polychaetes**	2.7	3.58	3	3.28	3.53	3.58	3.17	2.91	3.36	3.5	4.4	4	3.42
3	**Fish**	3	2.68	3.36	3.46	3.7	3.8	3.17	3	3.5	3.28	3.01	4.1	3.34
4	**Bivalves**	5.02	2.66	4.46	2.75	1.3	2.34	2.82	2.3	4.5	2.63	2.65	2.5	2.99
5	**Gastropods**	3.94	2.78	1.92	2.64	1.835	2.38	3.51	3.72	2.96	3.2	3.09	3.2	2.93
6	**Zooplankton**	2.65	2.76	2.74	3.08	2.175	1.19	3.33	3.1	2.76	2.66	3.34	3.8	2.79
7	**Phytoplankton**	3.65	2.07	2.8	2.4	2.57	3.16	3.43	3.28	2.35	3.16	4	3.2	3
8	**Sand grains**	2.51	3.15	5.76	5.1	3.38	3.1	2.91	2.66	3.26	2.06	3.8	3.9	3.47
9	**Digested matter**	4.51	3.5	4.83	3.3	3.75	2.5	2.9	3.75	3.44	3.35	3.36	3.6	3.56
10	**Miscellaneous**	3	3.56	3.33	2.53	2.8	2.2	2.94	3.21	2.67	4.27	4.6	3.8	3.24

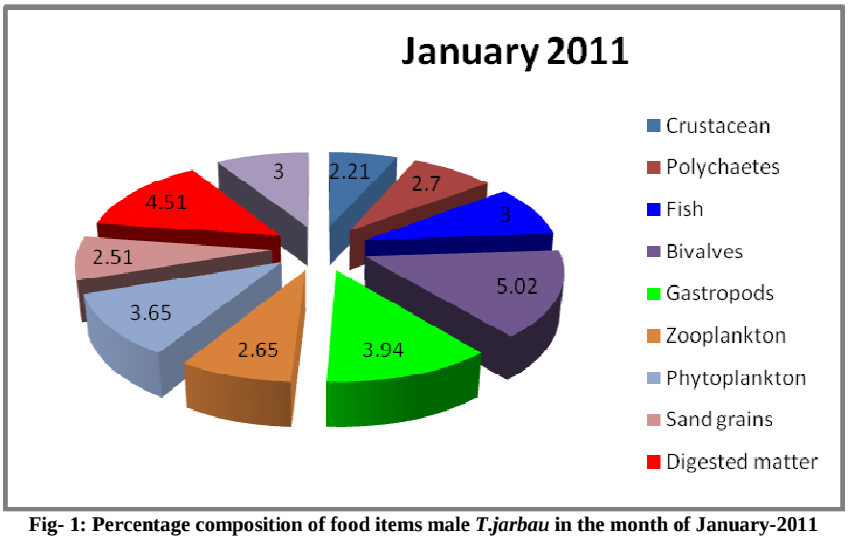

Fig- 1: Percentage composition of food items male *T.jarbau* in the month of January-2011

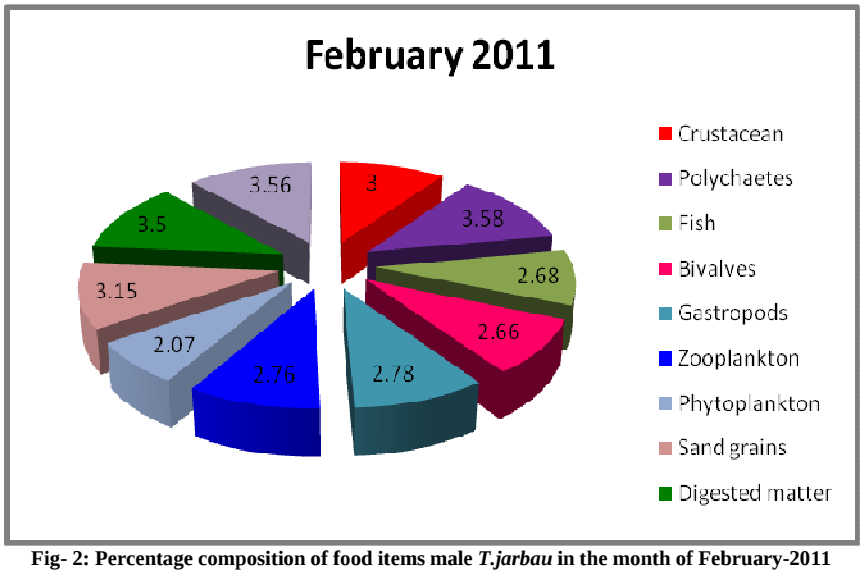

Fig- 2: Percentage composition of food items male *T.jarbau* in the month of February-2011

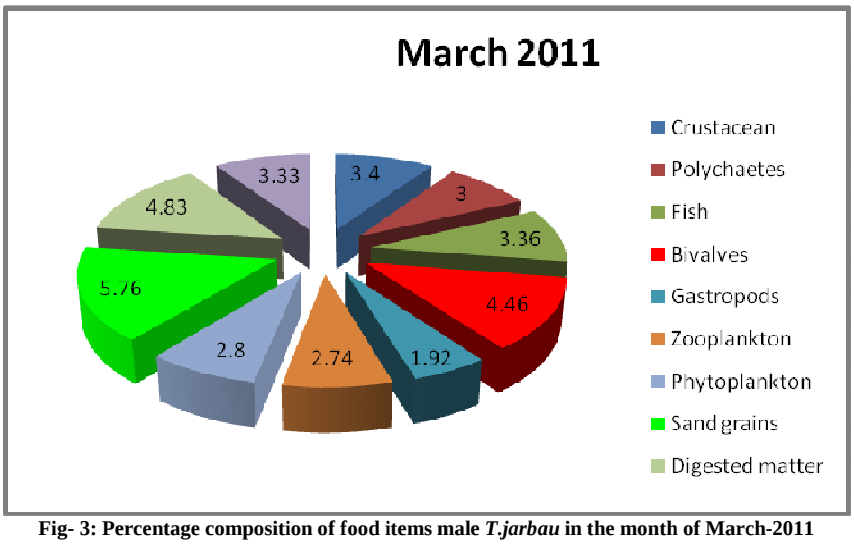

Fig- 3: Percentage composition of food items male *T.jarbau* in the month of March-2011

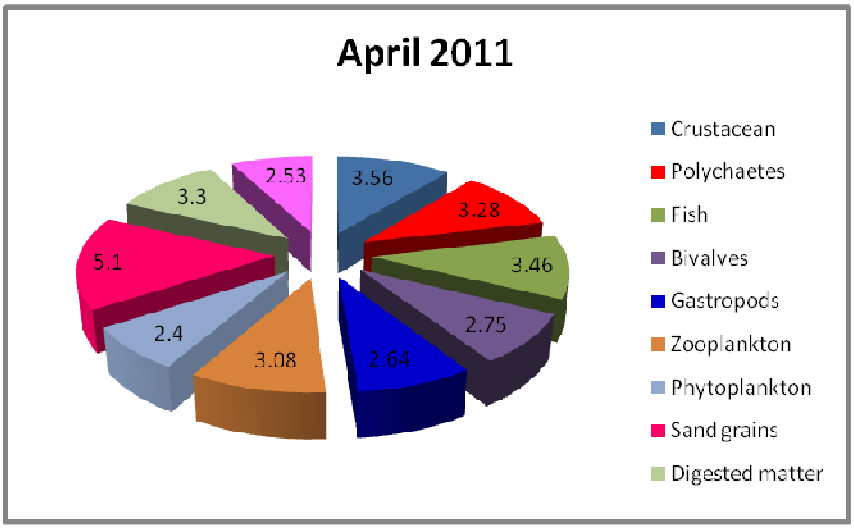

Fig- 4: Percentage composition of food items male *T.jarbau* in the month of April-2011

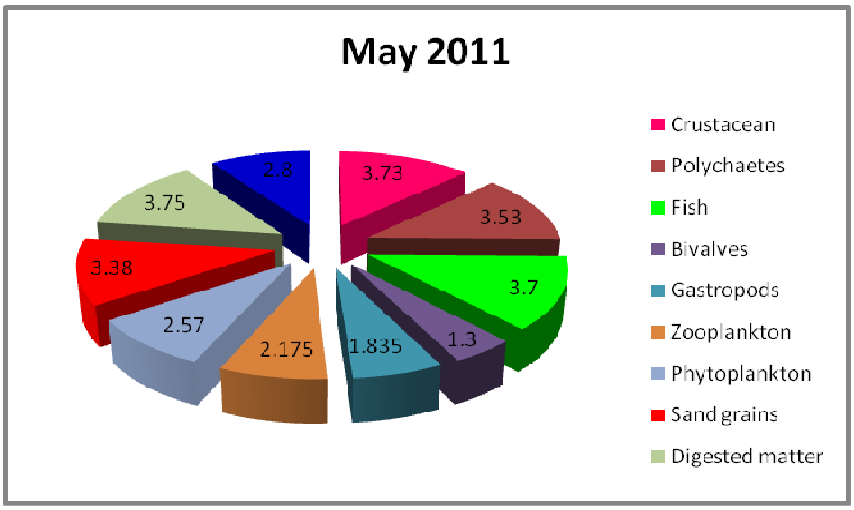

Fig- 5: Percentage composition of food items male *T.jarbau* in the month of May-2011

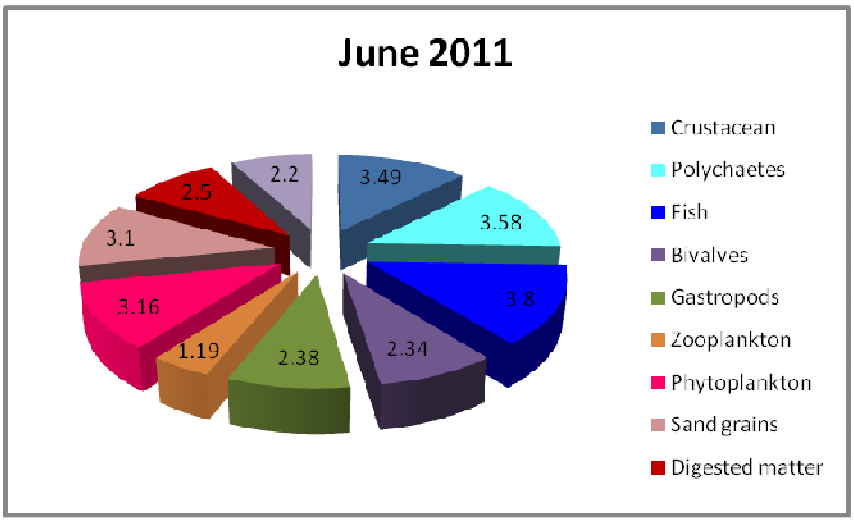

Fig- 6: Percentage composition of food items male *T.jarbau* in the month of June-2011

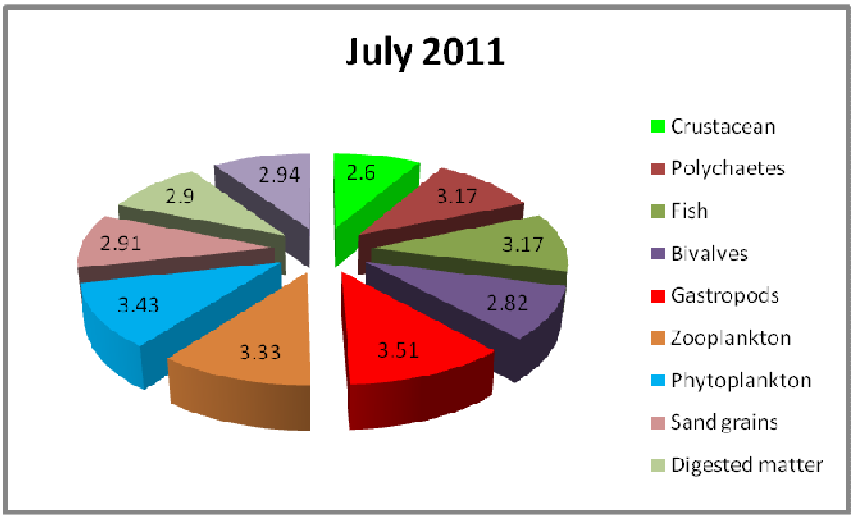

Fig- 7: Percentage composition of food items male *T.jarbau* in the month of July-2011

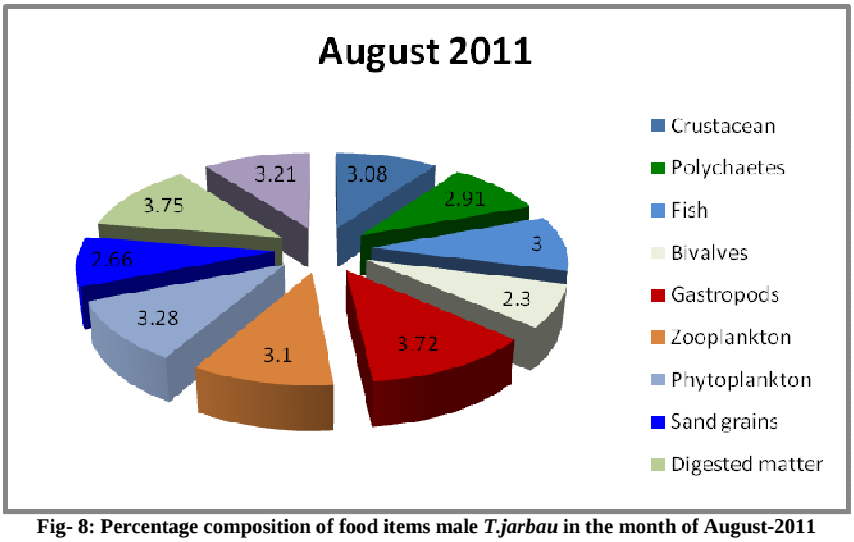

Fig- 8: Percentage composition of food items male *T.jarbau* in the month of August-2011

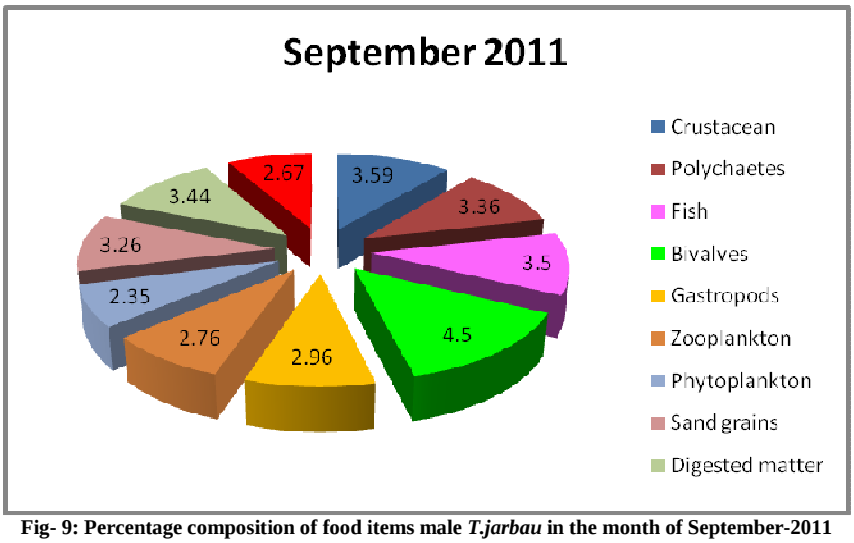

Fig- 9: Percentage composition of food items male *T.jarbau* in the month of September-2011

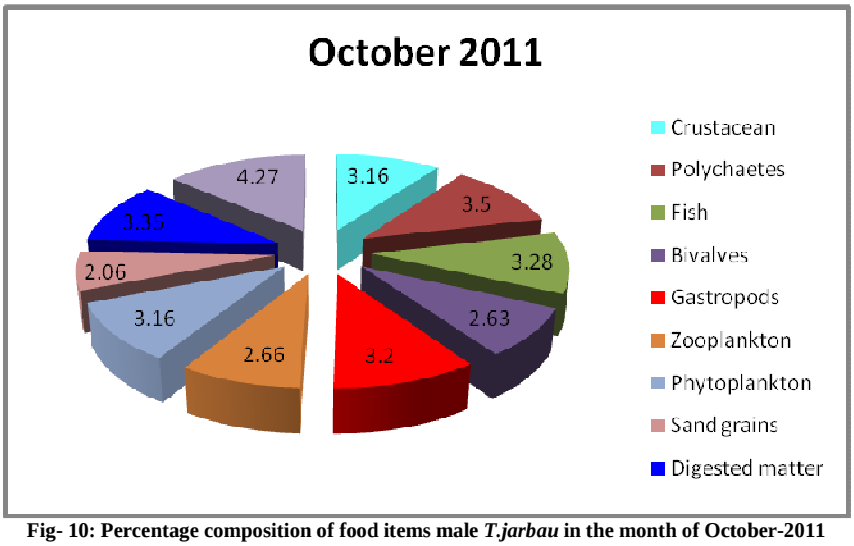

Fig- 10: Percentage composition of food items male *T.jarbau* in the month of October-2011

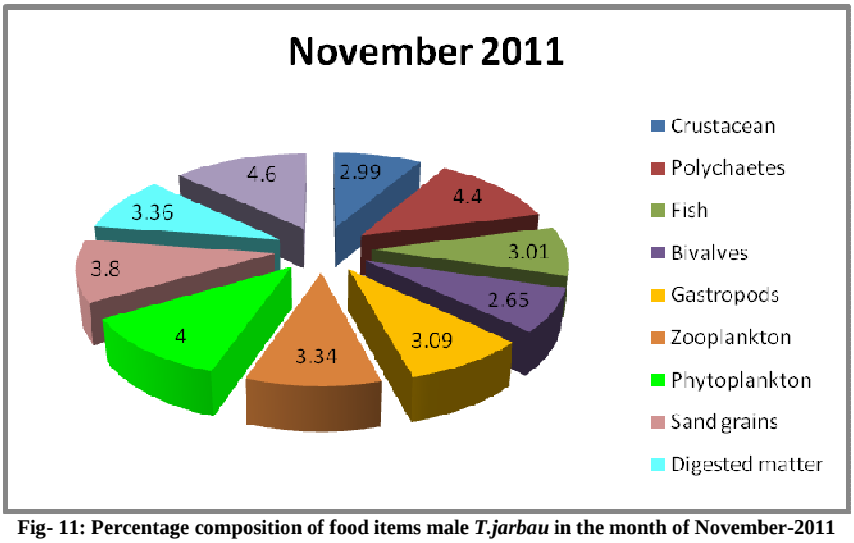

Fig- 11: Percentage composition of food items male *T.jarbau* in the month of November-2011

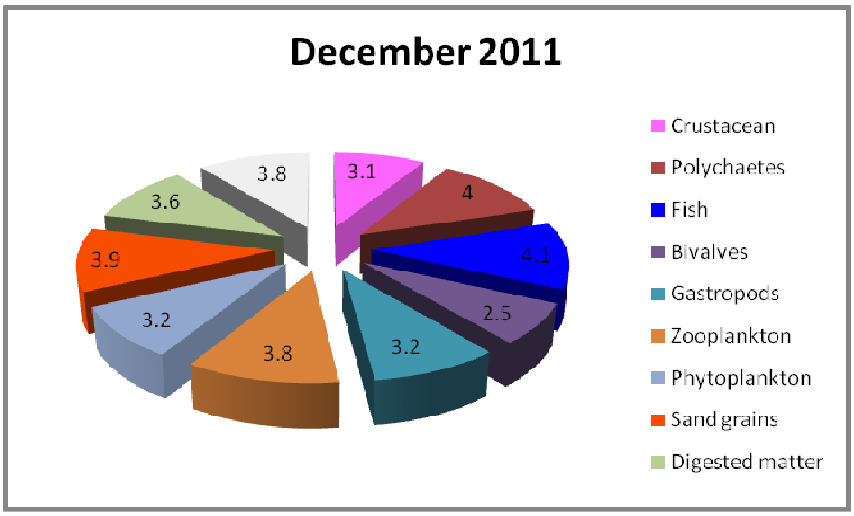

Fig- 12: Percentage composition of food items male *T.jarbau* in the month of December-2011

Table 4. Monthly Variation in the Percentage Composition of Food of Female *T.jarbau* (January 2011-December 2011)

S:No	Food item	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Monthly average
1	**Crustacean**	6.63	3.84	3.88	5.57	5.74	5.53	4.72	5.09	3.79	5.2	4.99	5.28	5.02
2	**Polychaetes**	4.86	3.59	3.64	5.3	5.53	5.58	5.17	4.93	5.36	5.78	4.51	4.74	4.91
3	**Fish**	4.62	4.68	3.76	5.5	5.74	5.85	5.17	5	5.5	5.28	5.01	4.15	5.02
4	**Bivalves**	5.02	4.66	4.66	4.76	3.4	4.54	4.82	4.5	4.53	4.63	4.65	4.72	4.57
5	**Gastropods**	3.955	4.98	3.92	4.84	3.84	4.38	5.51	5.72	4.98	3.6	5.09	5.38	4.68
6	**Zooplankton**	4.645	4.76	4.735	5.08	4.18	3.79	5.33	5.18	4.76	4.68	5.35	3.78	4.69
7	**Phytoplankton**	3.85	4.07	4.86	4.52	4.58	5.17	3.63	5.28	4.35	5.2	4.2	5.26	4.58
8	**Sand grains**	4.525	5.18	5.77	7.2	5.4	5.14	4.93	4.68	3.27	4.06	3.9	4.3	4.86
9	**Digested matter**	6.54	5.78	6.84	5.36	3.76	4.48	4.96	3.76	3.45	3.36	3.35	5.55	4.77
10	**Miscellaneous**	5.06	5.57	5.34	4.54	4.81	4.34	4.94	5.21	4.67	6.27	4.61	5.75	5.09

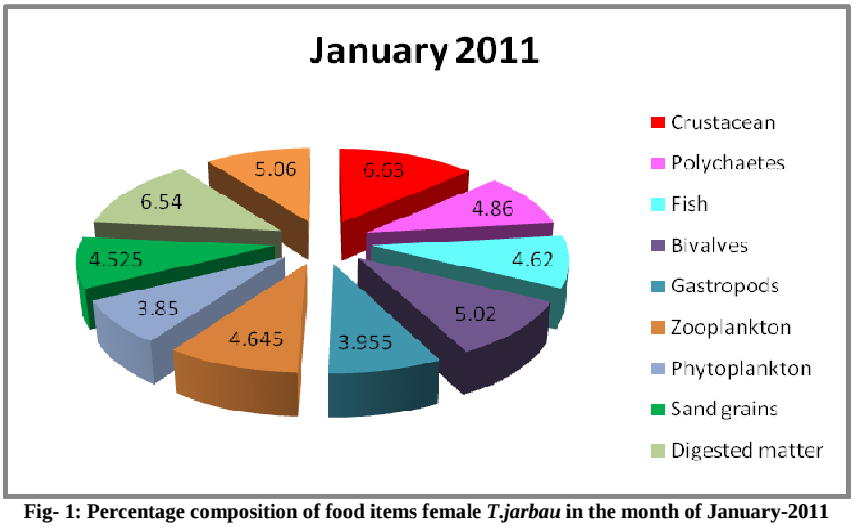

Fig- 1: Percentage composition of food items female *T.jarbau* in the month of January-2011

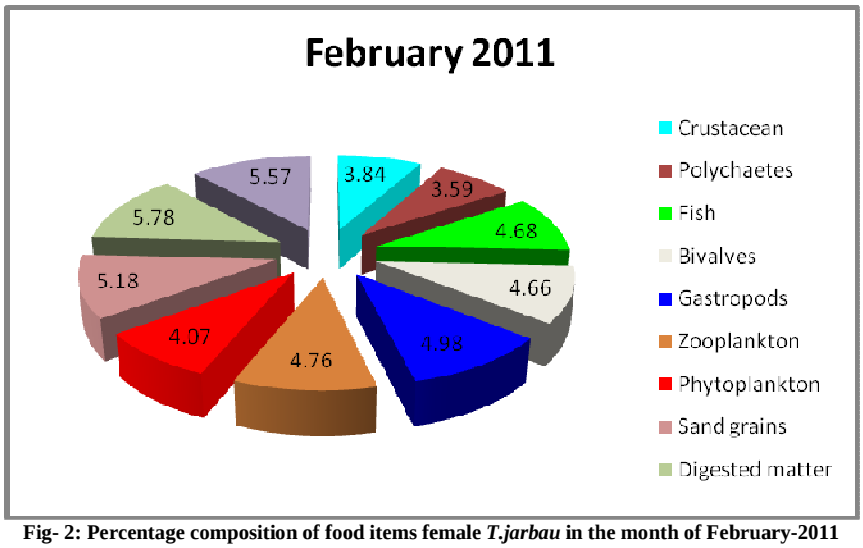

Fig- 2: Percentage composition of food items female *T.jarbau* in the month of February-2011

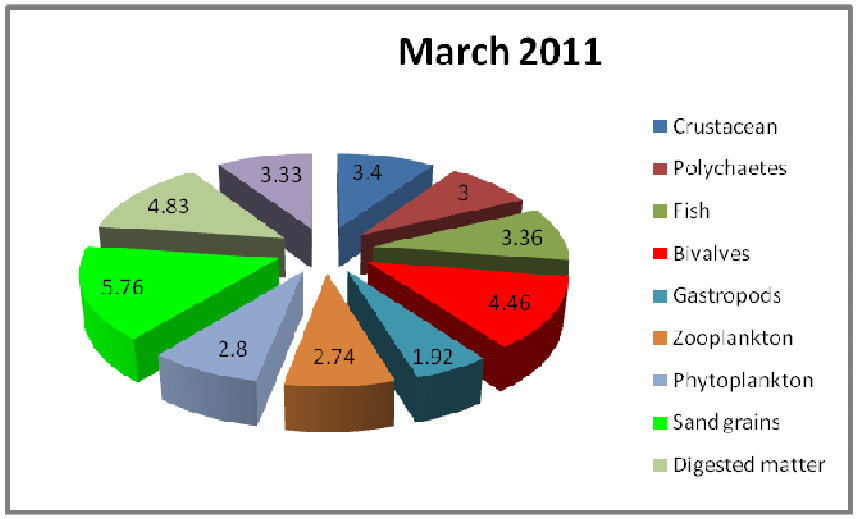

Fig- 3: Percentage composition of food items female *T.jarbau* in the month of March-2011

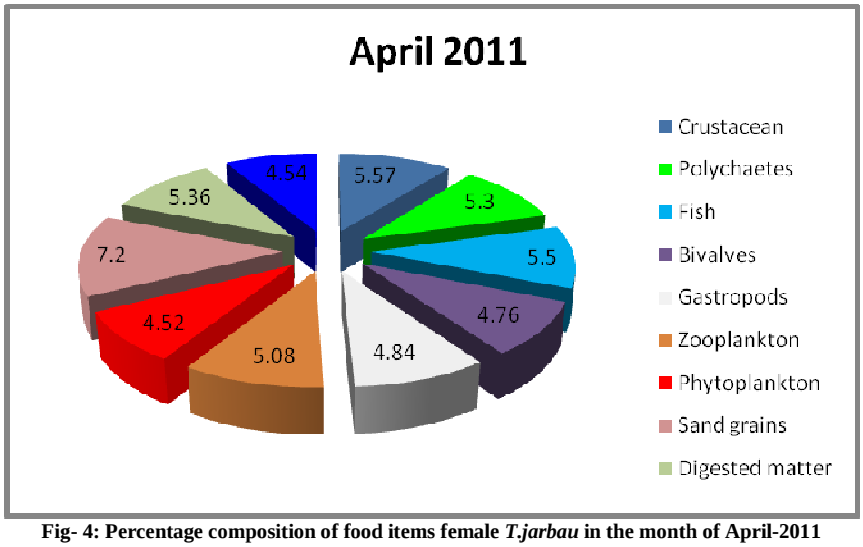

Fig- 4: Percentage composition of food items female *T.jarbau* in the month of April-2011

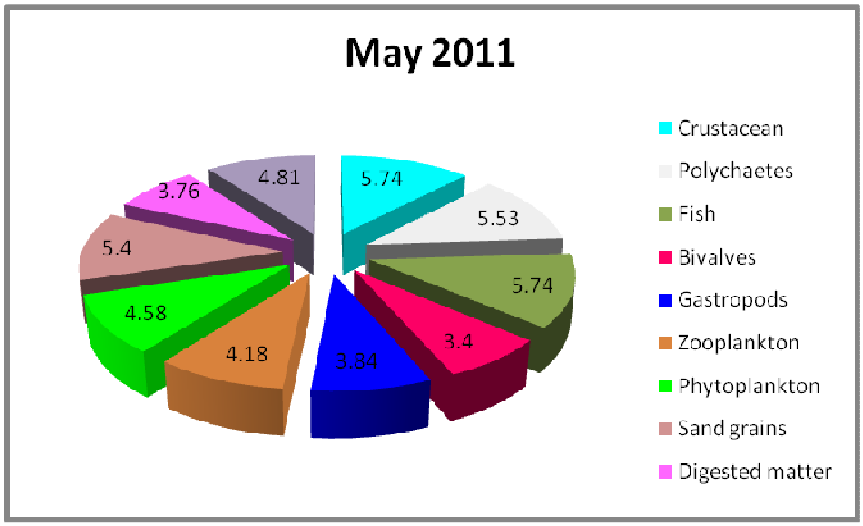

Fig- 5: Percentage composition of food items female *T.jarbau* in the month of May-2011

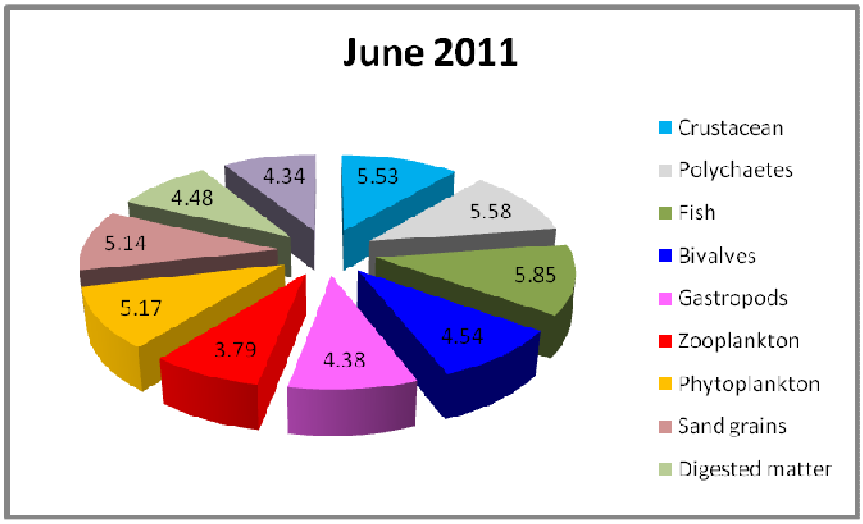

Fig- 6: Percentage composition of food items female *T.jarbau* in the month of June-2011

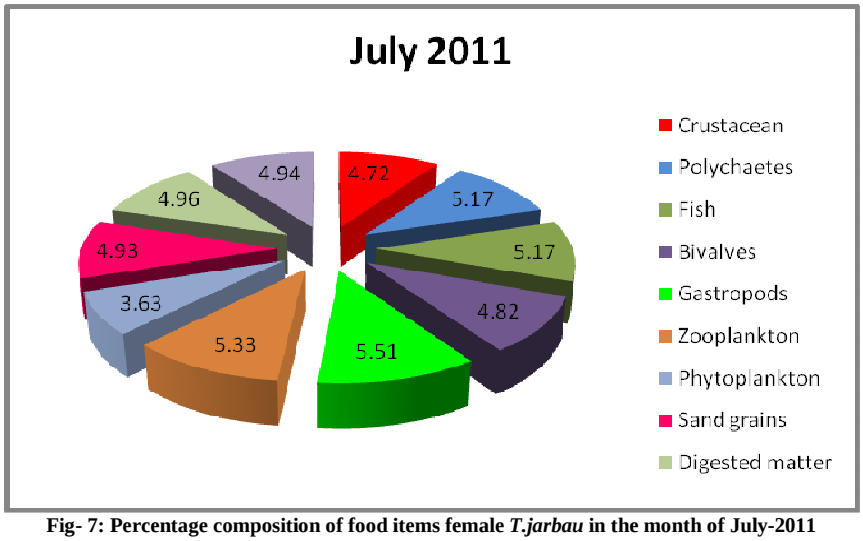

Fig- 7: Percentage composition of food items female *T.jarbau* in the month of July-2011

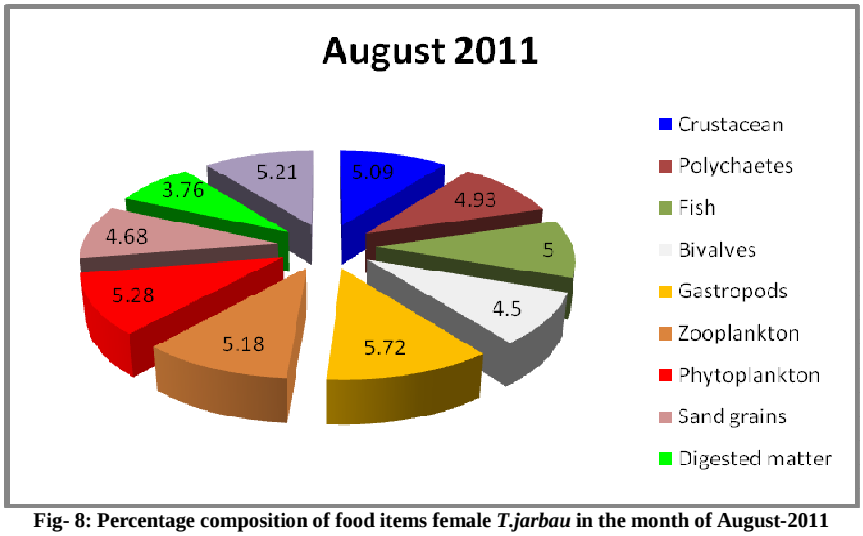

Fig- 8: Percentage composition of food items female *T.jarbau* in the month of August-2011

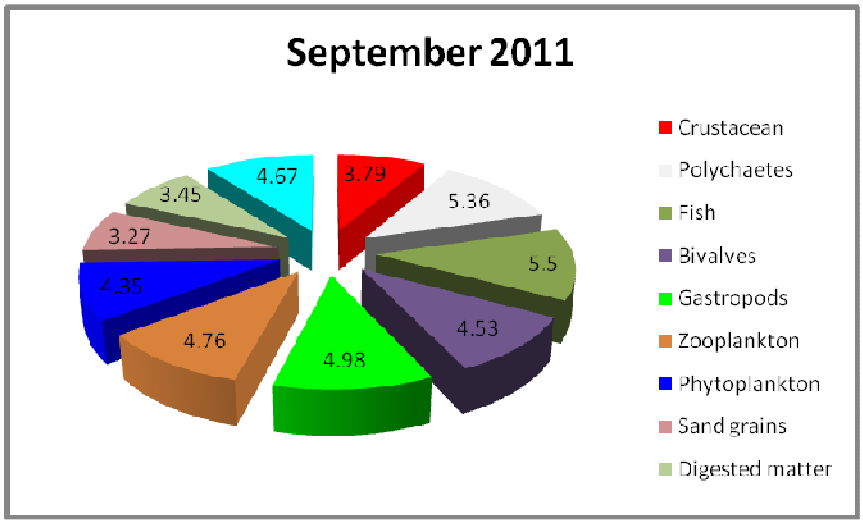

Fig- 9: Percentage composition of food items female *T.jarbau* in the month of September-2011

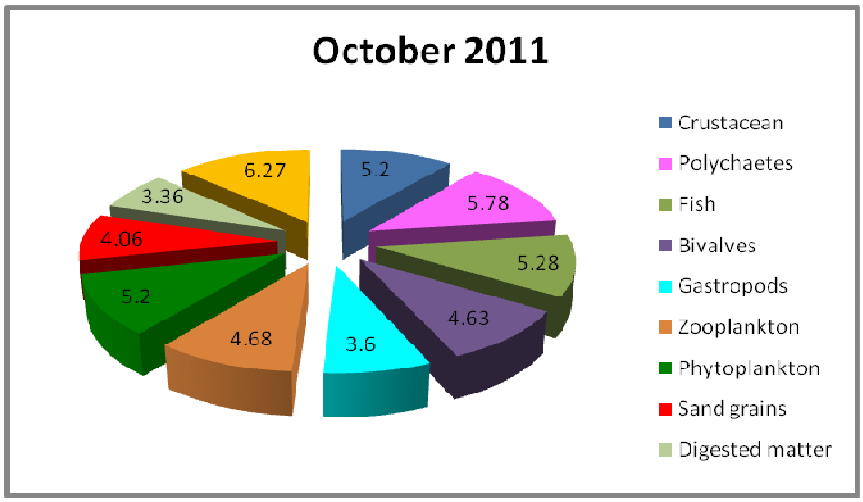

Fig- 10: Percentage composition of food items female *T.jarbau* in the month of October-2011

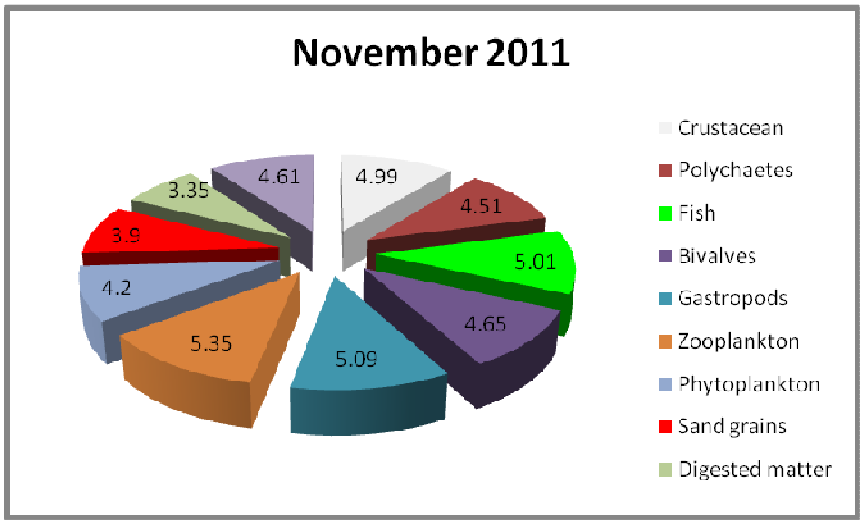

Fig- 11: Percentage composition of food items female *T.jarbau* in the month of November-2011

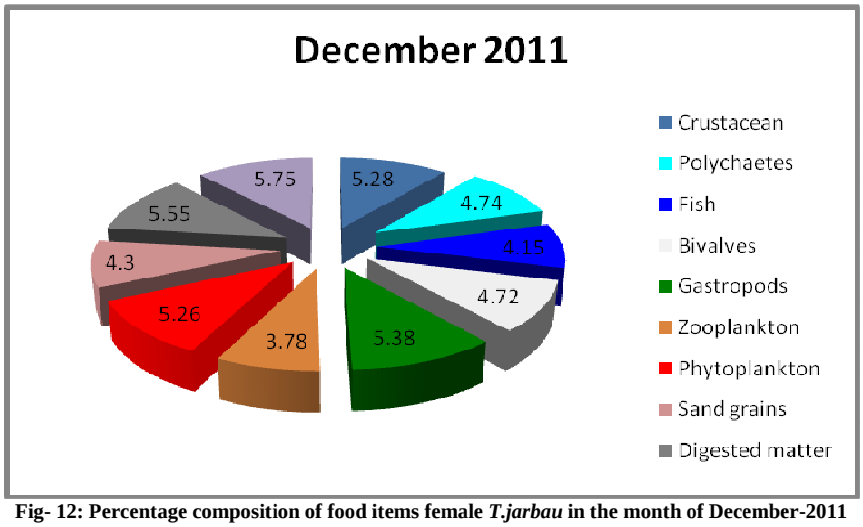

Fig- 12: Percentage composition of food items female *T.jarbau* in the month of December-2011

The various food items recorded from the stomach of *T. jarbua* during the study period are presented in Table.1. Generally, the food items found in the examined stomachs were grouped into ten categories namely Crustacean, Polychaetes, Fish, Bivalves, Gastropods, Zooplankton, Phytoplankton, Sand grains, Digested matter and Miscellaneous.

Crustacean

It forms the bulk of the fish diet. The male highest percentage recorded was 3.73 % in May followed by 3.59% in September and, the lowest percentage recorded was 2.21% in January. The female highest percentage recorded was 6.63 % in January followed by 5.28% in December and the lowest percentage recorded was 3.84% in February.

Polychaetes

Polychaetes formed most abundant item in the food of *T.jarbua*. They occur in high quantities throughout the year. The male maximum percentage occurrence of polychaetes recorded was 4.4% in November and 4% in December. The minimum percentage occurrence of polychaetes recorded was 2.7% in January and 3% in March. The female maximum percentage occurrence of polychaetes recorded was 5.78% in October and 5.53% in May. The minimum percentage occurrence of polychaetes recorded was 3.59% in February and 3.64% in March.

Fish

Fish formed the most abundant item in the food of *T.jarbua*. They occur in high quantities throughout the year. The male maximum percentage occurrence of fish recorded was 3.46% in April and 4.1% in December. The minimum percentage occurrence of fish recorded was 3% in January and 2.68% in February. The female maximum percentage occurrence of fish recorded was 5.74% in May and 5.85% in June. The minimum percentage occurrence of fish recorded was 3.76% in March and 4.15% in December.

Bivalves

Bivalves shells and larvae were found in the stomach contents of *T.jaruba*. The male average contribution was 2.99 % of the food composition. The maximum of 5.02% in January and minimum value of 1.3 % was recorded in May. The female *T.jaruba* average contribution was 4.57 % of the food composition. The maximum of 5.02% in January and minimum value of 3.4 % was recorded in May. The percentage occurrence analysis revealed that bivalves were present in most of the months except August, November and December.

Gastropods

Gastropods were encountered in small quantities in the diet of *T.jarbua*. The male percentage occurrence of this group was found to be high in January (3.94%) and August (3.72%) and low in May (1.83%). The female percentage occurrence of this group was found to be high in July (5.51%) and August (5.72%) and low in October (3.6%).

Zooplankton
Zooplankton formed most abundant item in the food of *T.jarbua*. They occur in high quantities throughout the year. The male maximum percentage occurrence of zooplankton recorded was 3.34% in November and 3.8% in December. The minimum percentage occurrence of zooplankton recorded was 2.17% in May and 1.19% in June. The female maximum percentage occurrence of zooplankton recorded was 5.33% in July and 5.35% in November. The minimum percentage occurrence of zooplankton recorded was 3.78% in December and 3.79% in June.

Phytoplankton
Phytoplankton formed most abundant item in the food of *T.jarbua*. They occur in high quantities throughout the year. The male *T.jarbua* maximum percentage occurrence of phytoplankton recorded was 4% in November and 3.65% in January. The minimum percentage occurrence of phytoplankton recorded was 2.07% in February and 2.4% in April. The female *T.jarbua* maximum percentage occurrence of phytoplankton recorded was 5.17% in June and 5.28% in August. The minimum percentage occurrence of phytoplankton recorded was 3.85% in January and 3.63% in July.

Sand grains
Sand grains were abundant throughout the year. The male percentage fluctuated between 2.51 % in January and 5.76 % in March. The female maximum percentage occurrence of phytoplankton recorded was 7.2 in April and 5.77% in March. The minimum percentage occurrence of phytoplankton recorded was 3.27% in September and 3.9% in November. Percentage occurrence of sand in the diet of *T.jarbua* was 25 % of the examined stomachs in November and December. Sand appeared average in male fish 3.47 % and female fish 4.86% of the total examined stomachs during the study period.

Digested matter
This group was also found throughout the year. The male *T.jarbua* lowest abundance of 2.5 % noticed in June and the highest of 4.83 % in March. The female *T. jarbua* maximum percentage occurrence of digested matter recorded was 6.54% in January and 6.84% in March. The minimum percentage occurrence of digested matter recorded was 3.36% in October and 3.35% in November.

Miscellaneous
The food items, which form a minute percentage of total food composition or accidentally taken by fish were group under this category. It included algal filaments and other animal, plants materials. This group was also found throughout the year. The male *T.jarbua* lowest abundance of 2.2 % noticed in June and the highest of 4.6 % in November. In addition to these items an average percentage of 3.24% of food items could not be identified due to advanced state of digestion. The female *T.jarbua* lowest abundance of 4.34 % noticed in June and the highest of 6.27 % in October. In addition to these items an average percentage of 5.09% of food items could not be identified due to advanced state of digestion.

DISCUSSION

Fishes being the main consumers in almost all aquatic ecosystems, knowledge of the food and feeding of every species in the habitat is a pre-requisite to understand the energy relationship in an ecosystem. Thus from the ecological point of view, a detailed study on the food and feeding habits is very valuable to analyse the relation between the concerned feeding on the fishes and there any formation of other organisms such as parasites and abnormal growth. Generally, the stomach is considered for evaluating the food and feeding, however in case of omnivorous fish the alimentary canal is very long and retain most of the food for prolonged period [15&16]. The *T.jarbua* can be classified as euryphagous carnivores, feeding on a wide range of food of planktonic and benthic organisms. The male fish of *Terapon jarbua* stomach contents as identified feed compositions in the following order; Digested matter < Sand grains< Polychaetes < Fish < Miscellaneous < Crustacean< Phytoplankton <Bivalves < Gastropods < Zooplankton. The female fish of *T.jarbua* stomach contents as identified feed compositions in the following order; Miscellaneous< Crustacean < Fish < Polychaetes < Sand grains < Digested matter < Zooplankton < Gastropods < Bivalves < Phytoplankton were recorded as respectively. *T. jarbua* with very broad feeding habits is much more apt to eat anything offered in captivity and their dietary requirements are easier to meet. This study agreed with previous studies [25, 26, 27, 28& 29].

In the present study there was little difference in the variety of dietary items in the stomach contents of the *T. jarbua* for the different month of the year [19] (Table 3). Among fish *T. jarbua*, the crustaceans were the most dominant food item in most of the months with peak occurrence in May, August, September, October and December in order of their abundance. [30, 31, 32, 33&34] have been observed crustaceans as one of the main food items of marine fishes. Polychaetes were the most dominant among food items and could be easily identified by presence of setae, jaws and occasional body segments. The polychaete worms which abound in the sandy and rocky habitats of the *T. jarbua* were the dominant food item of this species. The highest percentage of Polychaetes was during October, November and December and lowest during January, February and March. [35] reported that there was a rapid recolonisation of the inshore sea bottom by polychaetes the bottom fauna continued to be rich during November to April. Gastropods were in high proportions during February, while lowest was during April. This term agreement with earlier studies in different feeding habits of young size to adult fishes along the Indian coasts [36, 37& 38]. Large *T. jarbua* occasionally consume vertebrates other than fish and the fishes were found to be prominent food item during April, December and October. [39] has been reported the adult *Hemichromis fascinates,* the main food items of fish. Cephalopods are also common prey items [40&41], the sharks feed on squid [42] and octopus [43]. Gastropods were in highly presented during January, while minimum was during May. It was found maximum in the month of January with the minimum quantity being in May, August and July [44]. Thus the examination of the stomach contents showed the adult fishes to be mainly zooplankton feeder, copepods constituting the single largest item. Zooplankton most dominant food item the maximum in the month of November and December was observed and minimum was observed in the month of June [18]. [45] have been reported marine fish such as oil sardine feeds mainly on zooplankton. Another feed composition of phytoplankton were also an important food constituent, the common it was observed maximum January, June, August and November and minimum was recorded in the month of January, February, April and July. [46&47] observed that the fish stomachs occurrences in plankton almost throughout the year. The incidence of sand particles in the stomach may be due to accidental ingestion of the food items that have been picked up along with sand particles. It was abundant throughout the year, maximum was observed in the month of March and April. The minimum was recorded in the month of November and December. Digested matters also were occurrences throughout the year. The maximum was observed in the month of January, March and June and minimum was recorded in the month of October and November. Miscellaneous has formed predominant food item of adult almost throughout the year [19&48]. [49] indicated that the miscellaneous consists of all types of biogenic material in various stages of decomposition. It has been found to be consumed very often [49]. [50] reported on the food and feeding habits of fishes from the Chilka Lake. Mostly the food and feeding habits of fishes vary with the time of the day, size of fish, monthly, seasonally, different ecological factors and various feed materials present in the water ecosystems. The spawning time feeding activity very less until in feeding intensity with the onset of post spawning season can be ascribed to occurrence of high number of spent fishes, which feed actively.[51&52] has been reported as in ribbon fish, *Trichiurus Lepturus* feeding intensity from September to December from madras coast. In the present study the state of feeding observed in different months of the year, it can be deducted that intensive feeding occurs during the months of November and December the feeding is moderate. During the remaining period feeding appears to be poor. High values of percentage occurrence of empty stomachs during April - October with peaks in June and October indicates a period of poor feeding activity which also coincide with appearance of more number of mature fishes about to spawn [53]. A number of studies revealed that the highest percentage of empty stomachs occurs during reproduction, due to a decrease in food intake in reproduction period for Terapontidae. This study is agreed with previously observed on the food and feeding habits of a some marine fishes of *Sardinella longiceps* [54], *Sardinella gibbosa* [55], *Thrissocles mystax* [30], *Raconda russellina* [56], *Coilia* feorneenjij [57], *Katsuwonus pelamis* [58], *Mugil cephalus* [59], ribbon fish *Trichiurus haumeld* [60], sardines *Kowala coval* and *Sardinella longiceps* [61], Bombay duck *Harpodon nehereus* [62], the common anchovy [63&64] respectively.

Parasitism is the most highly evolved and by far the most common symbiotic relationship. The parasitic lives in the host for at least part of its life cycles and obtains food at the host expenses. For obvious reasons, parasites do not usually kill their host, but they can seriously affect the host organism by reducing its reproductive potential, lowering its resistance to diseases and sapping its energy. The host parasites relationship is finely balanced and extraordinarily delicate. The parasite must in some way be aware of the hosts physical condition to avoid weakening the host so much that it diets. On the other hand, the parasite must take as much energy from the host as possible to ensure its own success. All major phyla have parasitic marine representatives [65&66]. However, the most widely distributed and successful parasitic marine animals are the roundworms of the phylum nematode. Like nearly all parasites, nematodes have a species specific relationship with a host. Parasites can usually parasitize only one species of host. The reason for this interdependency is the delicacy of the biochemical feed back mechanisms

informing the parasite that its activity may be overstressing the host. The feedback responses are by necessity, tailored to specific host parasites pairs. The parasites will not usually survive if it settles in or on a host for which it is not specifically programmed. In the present study were considering about almost all groups of animals and plants contain at least a few parasites [67]. Parasites are a group of organisms that may or may not cause illness in pet fish, depending on a number of factors. The presence of parasites in fish *T. jarbua* is very common, but this study little concern with regard to food and feeding habits on fishes [68&69]. The parasites are better known as flukes or flatworms, which live as parasites on fish usually infesting the reproductive areas. The adult worms are small, flat, slender and measures from a few up to 21 mm in length and 3-5 mm at the widest area. If few parasites are present the *Terapon jarbua* is usually not visibly impaired and if large numbers are present the fish may killed. These parasites are named as pilametra due to their preference for migrating to the ovary and the whole reproductive areas [70]. They do not spread directly from stomachs to reproductive system but must pass through a number of intermediate hosts in their development. Its effect much mechanical damage by migrating through tissues and may also cause extensive tissues proliferation, which impairs growth and reproductive processes. In the present study strongly suggests that the feeding compositions of *T. jarbua* are analysed for every month of the year, nobody not observed or presented any parts of parasites as for live or death in the feeding way of stomach contents.

In the present investigation *T. jarbua* are the peak of the predatory prey moving within freshwater and marine water and therefore tend to be infected by a considerable range of parasites, which may occur in large numbers. This is the normal condition found in any natural environment [71]. However some unusual event occurs in the environment, of natural, the equilibrium between host and parasite may be disturbed and one or more species of parasites may occur. Regulating mechanisms in the environment soon come into play and a new equilibrium will be established, but in the intervening period, there may be a serious loss of fishes. A large variety of parasites have been reported in cultured marine fish. Philometrids parasites have caused serious disease outbreaks in farmed fish resulting in significant financial losses to fish farmers. It is thus important from an economic point of view, for fishing as an amenity or for fish farming, that we have knowledge of the occurrence of parasites on our freshwater and marine water. Once we have a sound background knowledge, it may at least be possible to avoid some undesirable human interference in natural waters and even to control some of the more harmful parasites. Unfortunately, for really effective control the fullest possible details of the biology or indeed of the occurrence of the parasites of both fresh and marine water. In present study of natural diets of *T. jarbua* is especially valuable approach for understanding aspect in biology and ecology of species and also need sustainable management, development of conservation measures.

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