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Growth and feeding ecology with prey preference of Longarm mullet, *Valamugil cunnesius* (Valenciennes, 1836) in brackishwater traditional impoundments of Sundarban, India

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Abstract
The present study was conducted to assess fish growth, feeding ecology with prey preferences of Longarm mullet (*Valamugil cunnesius*) in brackish water traditional impoundments for 8 months during July, 2015 to March, 2016. Estuarine brackish water (18.68 ppt) containing seeds were entered and water was exchanged (20-30%) every lunar cycle through bamboo screens. Mullets were grown from 1.27±0.99 g (4.8±0.51cm) to 58.50±3.95 g (16.8±0.75cm). The fishes showed isometric growth ($W=0.010TL^{3.025}$) and better Condition factor (K=1.07±0.05). Feeding intensity increased with increment of fish growth. Longarm mullet is an herbivorous fish grazing on phytoplankton and organic matter from the bottom sediment. According to the order of dominance, the major food items in stomach were Bacillariophyceae > Myxophyceae > Chlorophyceae > Dinoflagellets > Copepods > Polychaetes larvae > Crustacean larvae > Fish & prawn larvae. Prey preference analysis revealed that *V. cunnesius* actively selected Bacillariophyceae as most preferred food material followed by Myxophyceae > Chlorophyceae > Dinoflagellets.

Keywords: *Valamugil cunnesius*, growth, feeding ecology, prey selection, Sundarban

1. Introduction

The Mugilidae (or grey mullets) is a speciose family of Teleostean fishes, which has representatives in various coastal aquatic habitats of the world's tropical, subtropical and temperate regions [1]. Mullets are generally considered to be ecologically important and forms major food resource for human populations in certain parts of the world [2]. Longarm Mullet, *Valamugil cunnesius* (Valenciennes, 1836) is one of the grey mullet species (Family: Mugilidae) of major economic importance in fin fish fisheries of brackish water environments [3]. It occurs in shallow coastal waters, including estuaries and backwaters, frequently enters freshwater [4]. It is distributed from South Africa to Red Sea and in the west coast of India and Sri Lanka [5].

The study of food and feeding habits of fishes help in understanding various aspects of biology like migration, growth, maturation, spawning and seasonal variations in biochemical composition. It is desirable to study the food and feeding habits as a part of fish biology [6]. Tropic behavior of mullets has been expressed by different authors using extensive terminology which categorized feeding patterns of these species. Mullets are generally considered as herbivorous, omnivorous, plankton feeders, or even micro crustacean predators [7] and notable examples include algae feeders [8], micro and meio-benthos feeders [9], interface-feeders [10], deposit feeders [11], benthic microphagous omnivores [12] and limno-benthofagous [13]. Food and feeding habits of the fish vary with time of the day, season of the year, size of the fish, environmental condition and with different food substances present in the water body. Changes in feeding habits of a fish species are a function of the interactions among several environmental factors that influence the selection of food item [14]. Stomach content analysis and features of the alimentary system provide information on food, feeding behavior and selective feeding if any [15]. Food habit with prey preference has implications at the individual [16], population [17], and community levels [18].

There is scarcity of information on growth performances and feeding ecology with prey selectivity of Longarm mullet, *Valamugil cunnesius* (Valenciennes, 1836) in traditional brackish water impoundments of Sundarban, India.

This study aimed to assess growth performance, feeding ecology with prey selectivity of Longarm mullet in traditional brackish water impoundments of Sundarbans as representative of natural environment.

2. Materials and Methods

The Study was carried out at Paschim Dwarakapur village (21.754143–21.755640^{0}N, 88.325473–88.325563^{0}E) of Patharpratima block in South 24 Parganas district of West Bengal, India for the period of 8 months from July, 2015 to March, 2016. The study area is situated within the Hooghly-Matla estuarine complex popularly known as 'Sundarbans'. Three traditional brackish water tide-fed impoundments (0.2-0.4 ha) locally known as 'Bhery' situated at the bank of a creek of 'Saptamukhi' river were selected. Before the culture start, the impoundments were dewatered and sundried as per common practice. Lime stone powder was applied at 250 kg ha^{-1} during first week of June. During 2nd week of June, unfiltered saline tidal water (18.5 ppt) was allowed to let in and the ponds were filled up to 110 cm depth and bamboo screen were fitted at the inlet. The traditional bamboo screen at the inlet allows entry of fry of different others brackish water species during water exchanges but restricts exit of bigger individuals. The wild estuarine seeds of *V. cunnesius* were entered along with other fish species through the canal in the traditional 'Bhery' during July. About 20-30% water exchanged every lunar cycle depending on the tidal amplitude throughout the rearing period following common practice. Any commercial fish feed and fertilizers were not applied in the impoundments following traditional practice. Only Lime Stone Powder was applied at very poor rate 250 kg/ha during first week of every month. Samplings have carried out during early morning in between 8.00 am to 9.00 am. Fish samples and water were collected from three impoundments to eliminate any possible biasness. Both fish and water samples were preserved in ice and those were carried to laboratory for subsequent analysis.

Water quality parameters such as water temperature, pH, dissolved oxygen (DO), alkalinity, nitrite-nitrogen (NO_2-N), nitrate-nitrogen (NO_3-N), ammonia-nitrogen (NH_3-N) and phosphate-phosphorus (PO_4-P) were measured following standard methods [19]. Salinity was recorded using a refractometer (ATAGO, Japan). Plankton samples were collected monthly by filtering 50L of water through bolting silk plankton net (mesh size 64 µm). On monthly basis plankton samples were collected by filtering 50L of water through bolting silk plankton net (mesh size 64 µm). Plankton concentrates were immediately preserved in 5% buffered formalin and one ml aliquot were then placed in to Sedgwick-Rafter counting cell for number count. Plankton and suspended constituents were identified and counted following Jhingran *et al*. [20] and Prescott [21].

Ten fishes from each of three ponds were collected during the 1st week of each month i.e. 30 fish in a month and total 240 fish samples for three ponds were collected and analyzed during the 12 months of culture period. Gravimetric data, such as, total length (TL, cm) was measured using a slide caliper, while body weight (W, g) was measured using a digital electronic balance. Daily weight gain (DWG) was calculated following the formula:

$$DWG = \frac{W_f - W_i}{t}$$

Where W_f and W_i are the average final and initial weight at time t.

Specific growth rate (SGR) was calculated using the conventional equation:

$$SGR = \frac{lnw_f - ln\,w_i}{t} \times 100$$

Where W_f and W_i are the average final and initial weight at time t.

The mathematical relationship between length and weight was calculated using the conventional formula [22]:

$$W = a.TL^b$$

Where W is fish weight (g), TL is total length (cm), 'a' is the proportionality constant and 'b' is the isometric exponent. The parameters 'a' and 'b' were estimated by non-linear regression analysis.

Fulton's condition equation was used to find out the condition factor [23]:

$$K = \frac{\overline{w}}{(\overline{TL})^3} \times 10^2$$

Where K is the condition factor, $\overline{w}$ is the average weight (g) and $\overline{TL}$ is the average total length (cm).

After gravimetric measurements, the stomach of fishes were removed intact by cutting above the cardiac and below the pyloric sphincters and preserved in a vial with 4% formalin. The stomach fullness degree was assessed by visual estimation and classified as gorged, full, 3/4 full, 1/2 full, 1/4 full, little and empty [24].

The data have used to calculate the monthly fullness index (FI) to determine the percentage of feeding intensity:

$$FI = \frac{Numer\ of\ gut\ with\ same\ degree\ of\ fullness}{Total\ number\ of\ gut\ examined} \times 100$$

Then the stomach content was transferred into fixed volume of 4% formalin solution. From every vial one ml stomach contents were then placed in to Sedgwick-Rafter counting cell and plankton constituents were identified and counted [20, 21].

Stomach content was analyzed following two methods; namely percentage of occurrence [25] and Points method [26].

The dominant food items of water and stomachs were categorized as Bacillariophyceae, Myxophyceae, Chlorophyceae, Dinoflagellates, copepods, Crustacean larvae, Polychaetes, Parts of fish &shrimp and Debris, sand & mud. Numeric percentages of each group were evaluated.

To determine the dominant food items, results of the percentage of occurrence and mean of the points allotted to individual prey encountered in a group were combined to yield the Index of Preponderance (IP) proposed by the following equation [26]:

$$IP = \frac{V_1 O_1 \times 100}{\sum V_1 O_1}$$

Where, V_1 = Volume of the particular food item, O_1 = Occurrence of the particular food item IP = Index of Preponderance

The percentage compositions of food types in the stomach falling under different groups were then compared with that of fish impoundments to evaluate prey preferences. Prey preferences were determined by the Ivlev Electivity Index using the following formula [27]:

$$E = \frac{r - p}{r + p}$$

Where, r = percentage of dietary item in ingested food, p = percentage of prey in the environment.

Differences in final length, final weight, DWG, SGR and exponential value of LWR were determined by analysis of variance with the General Linear Model procedure using SPSS for Windows v.17.0 programmed (SPSS Inc Chicago IL USA). Duncan's Multiple Range Test [28] was used for comparison of impoundments. All data have been expressed as mean ± standard error (SE).

3. Results

The water quality parameters in three studied impoundments are presented in Table 1. Water temperature during the study period ranged between 14.7±1.2 ºC and 33.6±1.7 ºC. Highest temperature was recorded during the month of March (32.5 ^{0}C) and lowest during December (12.5 ^{0}C). Dissolved oxygen (DO) varied from 5.50±0.45 to 9.50± 0.58 mg L^{-1}. Surface water pH remained almost steady and slightly alkaline throughout the study period and it varied between 7.92±0.35 to 8.85±0.47. Dissolved oxygen and pH were almost similar in impoundment 2 and impoundment 3 but those were significantly (p<0.05) higher in impoundment 1. Wide variations of salinity fluctuation were occurred in three impoundments throughout the rearing period. Salinity ranged between 8.50±1.25 in August (monsoon) to 25.50±3.45 in March (summer). Concentration of nitrogenous metabolites like Nitrite-nitrogen (NO_2-N) and total ammonia nitrogen (NH_3-N) were recorded between 9.53±2.5 to 24.58±5.8 µg L^{-1}, and 21.55±5.7 to 44.58±5.4 µg L^{-1} respectively. Concentration of water nutrients like nitrate-nitrogen (NO_3-N) and phosphate-phosphorous (PO_4-P) ranged between 69.65±6.9 to 111.04±9.8 and 21.58±5.8 to 43.27±6.5 µg L^{-1} respectively. Nitrate-nitrogen and phosphate-phosphorous concentration of water showed higher in impoundment 1. So, Phytoplankton and zooplankton concentration were significantly higher (p<0.05) in impoundment 1.

Table 1: Water quality and biological parameters of three traditional brackish water impoundments used in the present culture.

Water parameters	Impoundment 1	Impoundment 2	Impoundment 3
Water temperature (ºC)	29.9±1.72	29.9±1.73	29.7±1.94
pH	8.04±0.23^a	7.78±0.31^c	7.92±0.25^b
DO (mg L^{-1})	6.06±0.42^a	5.99±0.52^b	5.69±0.52^c
Salinity	18.89±5.19	18.33±4.45	19.87±5.34
Alkalinity	168.9±4.25^a	165.9±3.51^b	160.00±5.23^c
NO_2-N (µg L^{-l})	16.55±5.83	15.91±5.62	16.91±6.63
NH_4-N (µg L^{-l})	30.76±5.61	31.19±7.91	34.89±6.27
NO_3-N (µg L^{-l})	93.12±15.41	92.66±11.14	92.97±8.94
PO_4-P (µg L^{-l})	32.07±13.43	31.98±11.98	31.97±12.74
phytoplankton (numbers/L^{-1} ×10^3)	15.88±1.62^a	15.11±1.94^b	14.02±1.73^c
Zooplankton (numbers/L^{-1}×10^3)	3.49±0.25^a	2.98±0.23^b	2.88±0.17^c

Means bearing different superscripts indicate statistically significant differences in a row (p<0.05); Values are expressed as mean ± SE (n=10 for each impoundments every month)

Percentage occurrences of Planktonic and other suspended food components in water are showed in Figure 1. According to the order of dominance, the most abundant phytoplankton groups in three impoundments were Bacillariophyceae> Chlorophyceae > Myxophyceae.

3.1 Bacillariophyceae

Coscinodiscus, Navicula, Nitzschia, Basilaria, Cyclotella, Diatoma and *Melosira.* the most abundant genera. *Cymbella, Gyrosigma, cyclotella and Melosira* were also counted as less abundant genera. Numeric percentage of Bacillariophyceae ranged between 12.00 and 35.56% (24.55±2.50%) of Planktonic forms.

3.2 Chlorophyceae

The most abundant genera found under Chlorophyceae were *Enteromorpha, Tetraedron Pediastrum, Chlorella, ulothrix, volvox, Cladophora and Coelastrum*. The other less abundant genera of Chlorophyceae were *Ankistrodesmus, Crucigenia, Scenedesmus, Pandorina, spirogyra and chaetomorpha.* Numeric percentage of Chlorophyceae ranged between 8.00% to 25.20% (average 15.80±2.25%).

3.3 Myxophyceae

Among Myxophyceae, *Anabaena, Nostoc*, and *Spirulina* were the most dominant genera. *Chroococcus, Gloeocapsa, Oscillatoria* and *Merismopedia* were also recorded the other genera of Myxophyceae. The percentage composition of Myxophyceae constituted between 8.51% to 18.00 % (average 12.33±1.02%).

On other hand the dominant zooplankton groups in three impoundments were Crustacean larvae > Polychaetes larvae > Copepods > Dinoflagellates > Fish & prawn larvae.

a) Crustacean larvae

Crustacean larvae mainly Nauplius and Cypris were found in water. The percentage composition of Crustacean larvae ranged between 2.04% to 18.90% (average 11.26±1.22%).

b) Polychaetes larvae

Mitraria, polynoid, Pectinaria and *Magellonid* were dominant genera. Percentage composition of Polychaete larvae were varied from 5.00% to 16.00% (average 10.66±1.34%).

c) Copepods

Among Copepods, *Calanus, Eucalanus, Paracalanus* and

Cyclops were dominant genera. Percentage composition of Copepods ranged between 2.95% to 15.20% (average 8.97±1.40%).

d) Dinoflagellets

Peridinium, Ceratium and *Gymnodinium* were the main genera. Percentage composition of Dinoflagellates ranged between 6.18 % to 12.76 % (average 8.62±0.87%).

e) Fish & prawn larvae

Percentage composition of Fish & prawn larvae ranged between 2.00% to 12.90 % (7.92±1.17%).

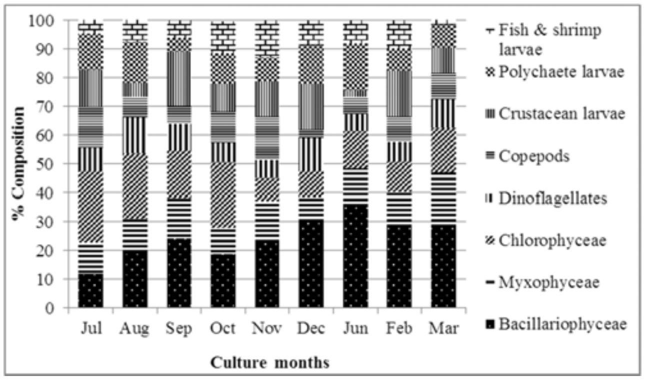

Fig 1: Numeric percentage occurrences of suspended food materials present in traditional brackish water impoundments of Sundarban.

Monthly growth increment of Longarm mullet, *V. cunnesius* is presented in Figure 2. After 240 days of rearing, Longarm mullets were grown from 1.27±0.99 g (4.8±0.51cm) to 58.50±3.95 g (16.8±0.75cm). Average daily weight gain (DWG) calculated was 0.24± 0.04 g day^{-1} which ranged between 0.09 in July to 0.42 g day^{-1} in March. Average Specific growth rate (SGR) calculated was 1.60±0.48 % day^{-1} which ranged between 4.51 during July to 0.76 % day^{-1} during January. Fulton's condition factor (K) of mullet was 1.07±0.05 (Figure 3). Exponential value (b) of Length-Weight Relationship (LWR) was 3.025 indicating isometric growth for this species (Figure 4). When the exponent value (b) is equal to 3, the fish growth is called isometric and when it is lesser or greater than 3, it is called allometric [29].

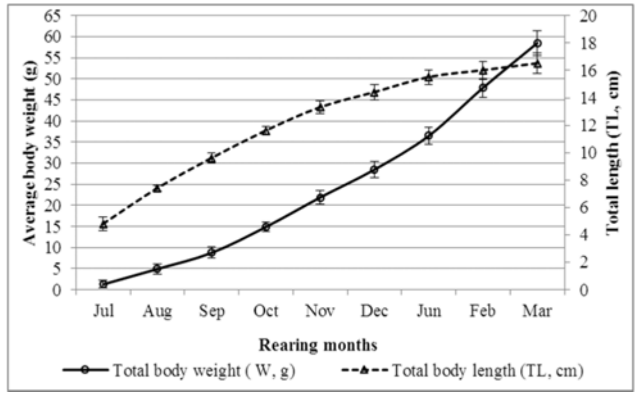

Fig 2: Growth increments of Longarm mullet, *V. cunnesius* reared in traditional brackish water impoundments of Sundarban.

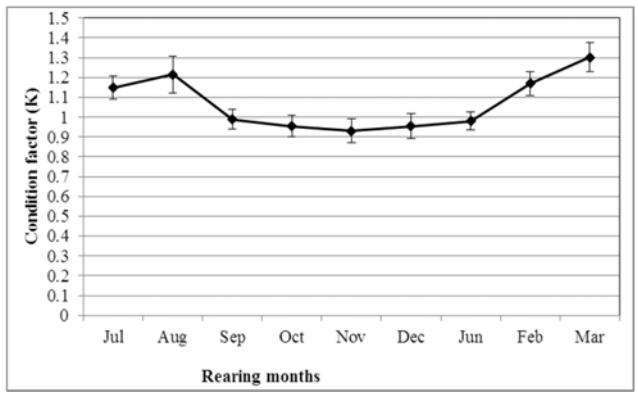

Fig 3: Fulton's condition factor (K) of Longarm mullet, *V. cunnesius* reared in studied brackish water impoundments of Sundarban.

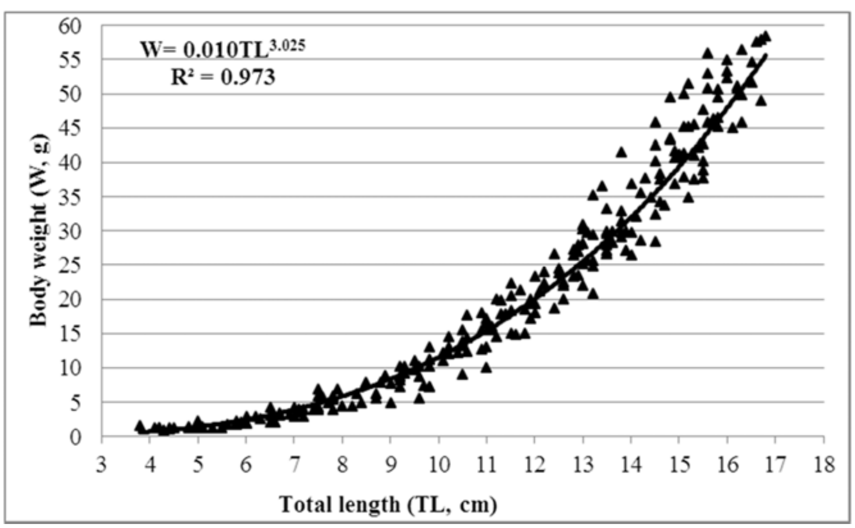

Fig 4: Length-weight relationships of Longarm mullet, *V. cunnesius* cultured in traditional brackish water impoundments of Sundarban.

Feeding intensity of Longarm mullet in terms of stomach fullness is presented in Table 2. Overall 92.95 % with food stomach and 6.89% without food stomach were found in the trial. Poor feeding intensity was found during the initial months of rearing characterized with higher number of empty stomachs.

Table 2: Feeding intensity of Longarm mullet, *V. cunnesius* during the study period.

Months	Gorged	Full	3/4 Full	1/2 Full	1/4 Full	Little	Empty
Jul	8.52	8.15	19	13	27	10.5	13.5
Aug	20	5.5	20	20	19	5.5	10.0
Sep	9	10.53	31	15.59	16.8	6.5	10.53
Oct	14.5	15.2	23.3	20.5	0	16	10
Nov	22.2	16.7	12.1	16.7	21.2	0	11.0
Dec	26.5	9.99	13	16.35	6.66	24.5	2.5
Jun	12.6	14.32	20	25	26.6	0	1.5
Feb	21.2	10.7	24	11.8	11.3	19	2.0
Mar	13.0	20	20	20	10	16	1.0
Average	16.39	12.34	20.27	17.66	15.40	10.89	6.89

Monthly data of stomach content analysis following percentage of occurrence method has been represented in Figure 5 and Figure 6. The dominant phytoplankton groups in the fish stomach according to the order of dominance were Bacillariophyceae (19.95% in August– 49.82% in March; average 37.49±3.1%) > Myxophyceae (11.48% in July– 24.91% in January; average 18.17±1.57%) > Chlorophyceae (2.58% in February–20.89%in July; average 10.03±1.77%).

The dominant Zooplankton groups in the fish stomach according to the order of dominance were Dinoflagellates (5.99% in October –11.49% in November; average 7.92±0.65%) > Copepods (0.24% in March – 4.71% in January; average 1.63%) > Polychaete larvae (0.44% in November – 3.34% in January; average 1.44±0.3%) > Crustacean larvae (01.36 % in March – 2.22 % in October; average 1.42±0.2%) > Fish & prawn larvae (0.08% in October – 3.02 % in December; average 1.10±0.3%). The percentage of Debris, sand & mud was recorded 11.04% in March to 28.71 % in September (average 20.82±2.68%).

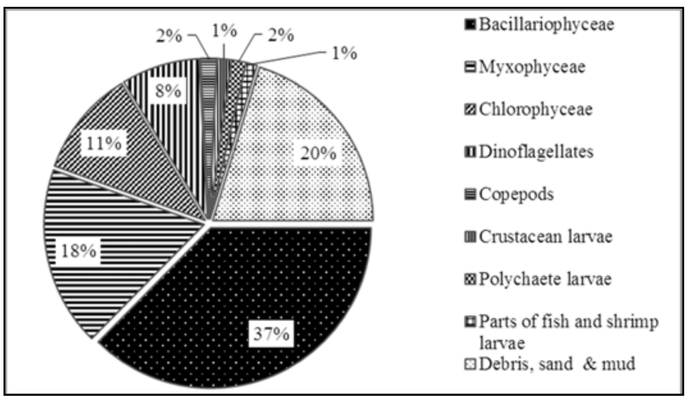

Fig 5: Proportions of food items in stomach of Longarm mullet, *V. cunnesius*.

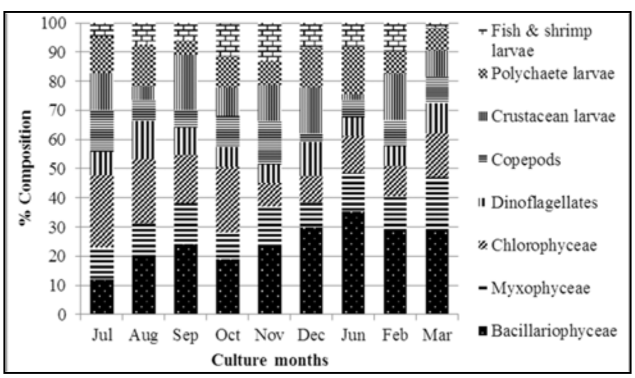

Fig 6: Numeric percentage occurrences of food items in Longarm mullet, *V. cunnesius* stomach.

Results of monthly analysis of gut content following percentage of point's method have been represented in Figure 7

On the basis of points, the main food items in the stomach according to the order of dominance were Bacillariophyceae (average 34.33±2.06%) > Myxophyceae (average 16.37±1.78%) > Chlorophyceae (average 13.34±1.38%) >Copepods (average 9.44±1.89%) > Dinoflagellates (average 7.74±1.04%) > fish and shrimp larvae(average 6.84±0.98) > Crustacean larvae (average 6.64±1.15%) >Polychaete larvae (average 5.54±1.50%).

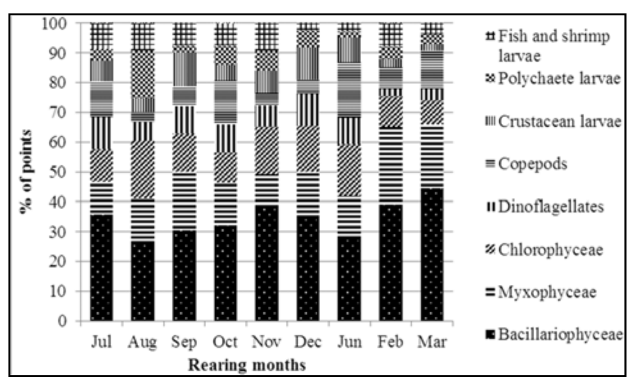

Fig 7: Percentage of points of food items in Longarm mullet, *V. cunnesius* stomach.

Index of preponderance (IP) following point volumetric method [26] is presented in Table 3.

Table 3: Index of preponderance (IP) of food items in the gut content of Longarm mullet, *V. cunnesius*

Food class	Total points (V), %	Occurrence (O), %	V×O	∑VO	IP	Grade
Bacillariophyceae	34.33	37.49	1286.98	1829.77	70.34	I
Myxophyceae	16.37	18.17	297.43		16.26	II
Chlorophyceae	13.34	10.77	143.74		7.86	III
Dinoflagellates	7.74	7.92	61.29		3.35	1V
Copepods	9.44	1.63	15.40		0.84	V
Crustacean larvae	6.64	1.42	9.40		0.51	VI
Polychaete larvae	5.54	1.44	7.97		0.44	VII
Fish and shrimp larvae	6.84	1.10	7.55		0.41	VIII

According to Ivlev's equation [30], the values of electivity index (E) are between +1 and −1. Positive value indicates a positive selectivity of a type of food while negative value ones indicates a negative selectivity. Electivity index (E) of different food constituents is presented in Figure 8.

Among Phytoplankton groups, E value for Bacillariophyceae ranged was between + 0.13 and+0.57 with lower during January and higher during July. The average E value of Bacillariophyceae was +0.32±0.05. Electivity index value of Myxophyceae varied between+0.20 and +0.41 with lowest value during September and highest value during October. The mean E value of Myxophyceae was +0.30±0.08. E for Chlorophyceae ranged –0.20 to +0.16 with lowest during October and highest during December. The average E value of Chlorophyceae was +0.01±0.09. All Phytoplankton groups were positively selected.

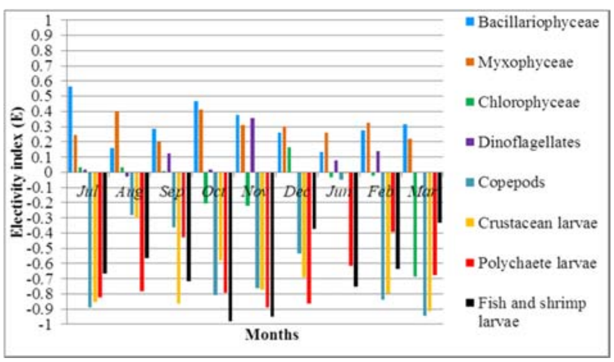

Fig 8: Prey electivity index (E) of suspended food materials consumed by Longarm mullet, *V. cunnesius.*

Among zooplankton groups, E value for Dinoflagellates ranged was between – 0.03 and+0.36 with lower during August and higher during November. Mean E value of Dinoflagellates was +0.08±0.04. Electivity index value of Copepods resulted from –0.94 during March to −0.05 August (average –0.61±0.11).E value for Crustacean larvae ranged between –0.91 and −0.01 with minimum during March and maximum range during January. The average E value of Crustacean larvae was –0.64±0.11. The Electivity value for Fish & shrimp larvae was observed from –0.98 in October to –0.33 in March (average –0.66±0.08). Mean E value of Parts of fish and shrimp larvae was –0.66±0.08.E value for Polychaetes larvae ranged between –0.89 and −0.39 with minimum during November and maximum range during February. The average E value of Polychaetes larvae was –0.70±0.06.

4. Discussion

Maintenance of good water quality is very essential to maintain optimum growth and survival of aquatic organism under the culture. Recorded water quality parameters were within optimum ranges for brackish water aquaculture and differed significantly ($P<0.05$) with time in present study [31]. In Hooghly-Matla estuarine system, salinity and temperature have been found to be the most significant abiotic factors determining the fishery resources of this system [32]. Concentrations of toxic metabolites like nitrite-nitrogen (NO2-N) and ammonia-nitrogen (NH4-N) remained lower than the critical level and concentrations of nutrients like nitrate-nitrogen (NO3-N) and phosphate-phosphorous (PO4-P) was much lower than fertilized ponds reported from Sundarban [33]. In the present study, water quality parameter of extensive polyculture farm corroborated with those reported from Sundarban of West Bengal, India [34]. Being non-fed extensive farming system depends only on the natural productivity and no feed or fertilizer is provided, such non-fed farming system can be considered as representative of the natural environment and co-existence of Planktonic community structure resembling the natural environment is expected.

Feeding habits of a species are significant in relation to their growth and propagation under specific biological conditions. At Madras, in brackish water polyculture experiments with *M. cephalus*, *L. macrolepis* and *L. cunnesius* at the stocking density of 2500 to 5000 nos/ha the monthly average growth was 17.0 − 40.1 mm/ 8.2 − 29.3 g for *M. cephalus*; 16.1-23.4 mm/4.9-12.2 g for *L. macrolepis* and 10.3-15.8 mm / 2:9-6.8 g for *L. cunnesius* [35]. The fish growth was might be good than earlier investigation. When the b parameter is equal to 3, growth is isometric and when it is less than or greater than 3, it is allometric [29]. More specifically, growth is positive allometric when organism weight increases more than length ($b>3$), and negative allometric when length increases more than weight ($b<3$) [36]. The isometric exponent (b) of length weight relationship in the present study indicated isometric growth of Longarm mullet.

Higher feeding frequency in bigger fishes than smaller ones may be attributed to the fear of potential predators by the smaller fishes while feeding as they are more vulnerable and would rather feed more cautiously than their bigger counterpart [37]. Big fish may require more food to obtain the necessary more energy for reproductive activity than smaller ones require for growth. Moreover, a wider mouth opening in larger fish helps to ingest relatively large quantity food items at a time [38].

Investigation cum report on feeding ecology of Longarm mullet is very scarce, feeding ecology of other related grey mullets have been studied many authors [39]. Mullets is a as plankton feeders, herbivores, omnivores, slime feeders, foul feeders, bottom Feeders fish [40, 41]. Bacillariophyceae followed by Myxophyceae and Chlorophyceae as most dominant food constituents of *M. cephalus* in brackish water environments has been reported from various parts of Indian subcontinent [42, 43, 34]. Chlorophyceae followed by Myxophyceae and Bacillariophyceae as most dominant prey items of *Liza tade* in extensive brackish water impoundments has been reported from Sundarban of Indian subcontinent [34]. The diet of *V. cunnesius* consisted of diatoms, green algae, blue green algae, Dinoflagellates, crustaceans, serpulid polychaetes, detritus and sand particles and detritus and plant matter in the diet were found to increase significantly with size [3]. In the present study, Phytoplankton groups in stomach content of Longarm mullet *V. cunnesius* according to the order of dominance were Bacillariophyceae>Myxophyceae >Chlorophyceae. Zooplankton groups were Dinoflagellates >copepods>Crustacean larvae >Fish and shrimp larvae > Polychaetes larvae to the order of dominance in fish stomach content.

Regarding the complex nature feeding ecology of *V. cunnesius* in brackish water impoundments, electivity index (E) analysis is essential to throw some light on fish's food preference. According to Ivlev's equation [30] E values ranged from -1 to+1, where -1 to 0 stands for negative selection, while values 0 to +1can be indicate as positive selection of that prey item. In Subsequent investigation Lazzaro [44] has suggested that a true positive or negative prey selection can be interpreted only at values >+0.3 or <-0.3 respectively. In present observation Bacillariophyceae, Myxophyceae and Chlorophyceae were positively selected to the fish. True positive selection (significant >+0.30) of Bacillariophyceae and Myxophyceae was found. Selection of Chlorophyceae was non- significant (< +0.30). Among zooplankton, Dinoflagellates was only positively selected but non-significant ((< +0.30). Copepods, Crustacean larvae, Fish and shrimp larvae and Polychaetes larvae were negatively selected.

5. Conclusion
Feeding ecology study suggests that Longarm mullet has good growth potential and performs mainly an herbivorous fish which grazes on phytoplankton in the water column and consumes debris, sand & mud from the bottom sediment. According to the order of dominance, the major food items in stomach were Bacillariophyceae >Myxophyceae >Chlorophyceae > Dinoflagellets >Copepods >Polychaetes larvae >Crustacean larvae >Fish & prawn larvae. Longarm mullet showed preference Bacillariophyceae followed by Myxophyceae > Chlorophyceae > Dinoflagellets.

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