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CONTRIBUTION OF ZOOPLANKTON TO THE FISHERY OF DHARAMTAR CREEK, ADJOINING BOMBAY HARBOUR

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ABSTRACT

The rich zooplankton standing stock of Dharamtar creek showed a variation of 8 to 5261 (av.1032) mg C/100 m³/d which led to a turn over of 29 tonnes C/km²/y. The estimated fishery potential from zooplankton production was 0.079 tones C/ km² or 29.00 tonnes/km²/y. The worked out yield in terms of wet weight of fish was 0.059 tonnes /km²/d. Experimental trawling within the creek showed a potential of 0.19 tonnes /km² /d suggesting a transfer coefficient of only 31. 4% from secondary to tertiary level. Fish eggs and larvae were very common in the area but contributed collectively only 1% to the total zooplankton population. On an average the outer zone sustained relatively higher population of fish eggs and larvae than the interior zone. The mean population density of larvae (334/100 m³) was 3.5 times higher than fish eggs (93/100 m³) suggesting the good survival rate and a congenial environment for larvae to thrive.

INTRODUCTION

In an estuarine habitat plankton production, particularly zooplankton does not cope up with the magnitude of the fishery of the area (Nair, 1977). But such a sheltered fertile environment forms an ideal nursery ground for a wide variety of fish and shell fish. Hence, all the creek systems adjacent to the coastal zone will play a major role in the production potential of the area. Though Dharamtar creek is one of the major system adjoining the Bombay harbour, its contribtion in terms of zooplankton to the biological production potential has never been attempted. The Dharamtar creek is the lower reaches of Amba river, lying in the northern part of Raigarh district of Maharashtra State. The creek is a fishing ground for sciaenids, clupeids, catfish, engraulids, shrimps and prawns. The present paper attempts to quantify secondary production to assess the fertility of this vital creek system. The rate of zooplankton production was utilised to estimate the exploitable fish stock while the population density of fish eggs/larvae provided an index to define the breeding ground.

MATERIAL AND METHODS

Five locations were selected along a stretch of about 30 km from Bombay harbour up to Dharamtar between lat. 18°42 -18°52" N and long. 72°'5'0 29" - 73° 01042" E. Stns 1 and 2 were located towards the open sea off the creek considered as the outer zone while stns 3, 4 & 5 were within the upper reaches of the creek representing the interior zone (Fig. 1). The average depth of the water column at outer zone was 8-11 m and that of the interior zone was 5-7 m. Zooplankton samples were collected by oblique hauls using a HT net (mesh 0. 3 mm, mouth area 0.25m²) attached with a calibrated T. S. K. flow meter. Monthly sampling was done during September 1984 to November 1985 covering intermediate phases of the tide to avoid tidal effect if any. Zooplankton biomass (ml /100 m³) was estimated adopting volume displacement method while population density (no/ 100m³) was determined by analysing aliquots of 25-50% of the samples for common forms and the entire sample for rare groups. Separate hauls were made from stns 1, 3 & 5, for estimation of organic carbon (El Wakeel and Riley, 1957) and the data were utilised for obtaining rate of production (Selvakumar *et al.*,1980). Experimental trawling done during different seasons were utilized for comparison of fishery potential with that of estimated tertiary potential.

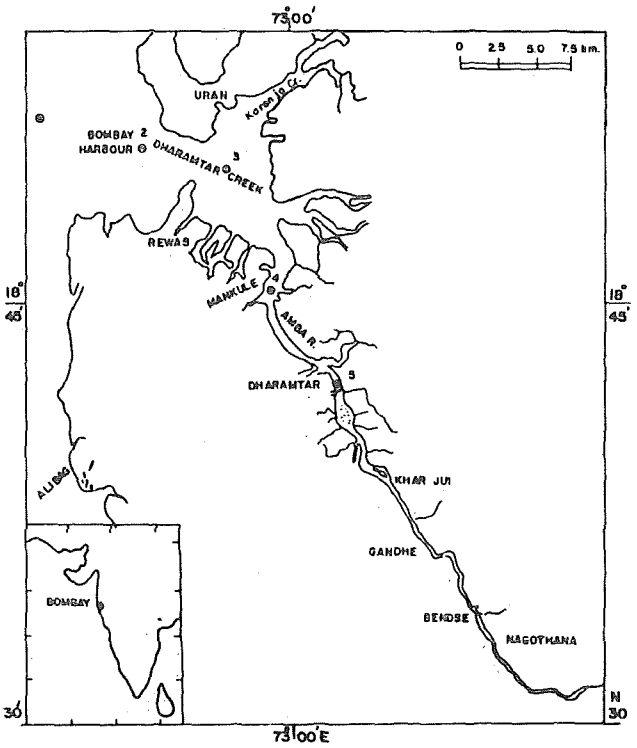

Fig 1: *Dharamtar creek showing location of stations.*

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Table I : *Distribution of zooplankton biomass (ml. /100m³) and rate of secondary production (mg C/ 100 m³/day) at different stations. Production rate given in parenthesis*

Month	Stations				
	1	2	3	4	5
Sep. 1984	9.9	23.3	11.9	8.0	10.7
	(242)	(901)	(458)	(174)	(233)
Oct.	40.1	29.5	24.2	81.7	46.2
	(726)	(991)	(812)	(3731)	(2109)
Nov.	38.9	33.5	32.6	10.5	37.9
	(1640)	(1108)	(1047)	(108)	(389)
Dec.	4.9	4.2	1.5	6.3	10.3
	(104)	(14)	(43)	(111)	(181)
Jan. 1985	1.3	1.1	3.2	8.2	3.0
	(12)	(15)	(44)	(200)	(74)
Feb.	7.6	26.0	8.3	14.4	24.1
	(103)	(858)	(274)	(336)	(360)
March	2.8	1.4	8.1	2.2	3.7
	(70)	(33)	(189)	(62)	(105)
April	13.2	5.3	24.9	20.4	26.6
	(231)	(104)	(491)	(515)	(673)
May	11.2	7.7	13.5	16.3	24.5
	(434)	(148)	(258)	(270)	(406)
June	8.1	4.6	55.7	4.9	5.7
	(317)	(171)	(2049)	(161)	(187)
July	5.6	8.8	16.5	1.2	1.3
	(369)	(213)	(402)	(8)	(9)
Aug.	36.6	25.8	86.7	126	32.5
	(842)	(866)	(2913)	(2932)	(757)
Sept.	33.0	103.9	76.1	82	135.3
	(872)	(5261)	(3853)	(2588)	(4274)
Oct.	84.59	72.5	72.3	81	80.0
	(2165)	(3646)	(3638)	(3969)	(3922)
Nov.	51.82	51.8	70.64	55.6	56.0
	(2864)	(2062)	(2812)	(783)	(789)

Table II : *Distribution of fish eggs* and larvae** (no/100 m^3) at different stations; values in parenthsis indicate percentage contribution.*

Stations	Sept '84	Oct.	Nov.	Dec.	Jan. '85	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.
1	51	139	20	21	19	-	7	-	-	-	104	59	182	85	363
	(0.09)	(0.07)	(0.04)	(0.07)	(0.61)		(0.08)				(0.45)	(0.05)	(0.21)	(0.08)	(0.19)
	382	208	80	4	41	61	213	53	664	82	793	264	-	85	450
	(0.70)	(0.10)	(0.15)	(0.01)	(1.33)	(0.25)	(1.16)	(0.19)	(0.58)	(0.31)	(3.42)	(0.22)		(0.08)	(0.50)
2	-	-	-	226	58	-	35	64	103	333	637	186	361	207	186
				(0.93)	(1.33)		(0.5)	(0.40)	(0.40)	(2.91)	(1.03)	(0.37)	(0.08)	(0.12)	(0.34)
	972	94	113	15	9	235	82	91	763	30	3631	124	217	31	269
	(0.67)	(0.04)	(0.19)	(0.06)	(0.21)	(0.42)	(1.32)	(0.57)	(2.94)	(0.26)	(5.88)	(0.25)	(0.05)	(2.02)	(0.49)
3	29	-	110	739	98	-	86	80	321	108	66	-	152	500	63
	(0.04)		(0.4)	(8051)	(0.46)		(0.25)	(0.11)	(0.78)	(0.11)	(0.11)		(0.04)	(0.27)	(0.10)
	701	138	14	-	36	166	194	133	1039	135	364	-	1066	-	126
	(0.95)	(0.09)	(0.03)		(0.17)	(0.30)	(0.57)	(0.19)	(2.54)	(0.14)	(0.60)		(0.25)		(0.20)
4	182	40	-	47	123	-	504	96	83	32	14	-	-	39	31
	(0.29)	(0.02)		(0.08)	(0.15)		(7.52)	(0.27)	(0.32)	(0.13)	(0.11)			(0.03)	(0.07)
	304	20	-	47	78	106	92	-	138	32	56	20	225	39	77
	(0.49)	(0.01)		(0.08)	(0.09)	(0.56)	(1.37)		(0.53)	(0.13)	(0.45)	(0.003)	(0.04)	(0.03)	(0.17)
5	-	-	-	-	10	-	-	-	35	5	52	-	-	-	31
					(0.07)				(0.15)	(0.04)	(0.45)				(0.04)
	430	21	-	79	10	59	868	317	17	-	10	6031	251	116	46
	(0.19)	(0.04)		(0.16)	(0.07)	(0.22)	(2.38)	(0.78)	(0.07)		(0.09)	(0.55)	(0.01)	(0.13)	(0.06)

* First set of values for each station.

** Second set of values for each station.

RESULTS AND DISCUSSION

Variations in different water quality parameters were normal for a tropical estuarine system without any environmental stress (Tiwari,1990). During the monsoon period (June-August) the fresh water influx from Amba river brought drastic changes in salinity which resulted in vertical stratification. During the postmonsoon season (October - January) the stratification was broken as the creek came under the influence of seawater and the homogeneous condition of the premonsoon period was restored (February -May). DO levels were fairly high at the interior as well as outer zones while the concentration of nutrients was more at the interior part of the creek.

Biomass and rate of production : Zooplankton biomass varied from 1.12 to 135.3 ml/100 m^3 with a peak in September (Table I). There was well defined increase in zooplankton standing stock from the outer to the inner zone and the respective average values were 24.97 and 33.84 ml/100 m^3. A major share of the zooplankton population (av. 126986/100 m^3) was contributed by copepods (71. 9%) decapods (11.4%) and chaetognaths (8.3%). Fish eggs and larvae collectively contributed only 1% of the population. Variations in organic carbon content of zooplankton were from 21.4 to 37.8% (Tiwari, 1990). Relatively higher values of organic carbon were recorded in zooplankton from the interior (av.31.2%) than the outer zone (av.29.4%). Seasonally the monsoon period showed maximum values for organic carbon (av. 32%) than premonsoon (av. 30.1%) and postmonsoon (av. 29.2%) periods. The estimated rate of secondary production ranged from 8.3 to 5260.6 mg C/100 m^3/day. In general, rate of secondary production was very high from August to November. Rate of production was low in January and March. In June low production was observed at stns 4&5. The rate of secondary production for stations 1-5 were respectively 733, 1000, 1286, 1063 and 978 mg C/100 m^3/day. Low rate of secondary production was invariably observed for the premonsoon period whereas, monsoon and postmonsoon seasons showed higher rate with marginal increase during the latter season. On an average, the interior zone showed an enhanced rate of secondary production to the order of 1.2 times than that of the outer zone.

Fishery potential : The average standing stock of zooplankton for the Dharamtar creek was 30.3 ml/100 m^3 and the production rate was 1032mg C/100 m^3/ d. This value is comparable to that reported (Lodh, 1990) for Thana creek (1052 mg C/100 m^3/d) but much more than the recorded value for Bassein creek (519 mg C/100 m^3/d). The total production for Dharamtar creek was 0.079 tonnes C/km^2 or 29.0 tonnes C/km^2/y. Assuming a 10% conversion efficiency and raising the value using a factor of 7.47 for obtaining the wet weight of fish, the yield would be 0.059 tonnes km^2/d or 21.68 tonnes/ km^2/y. Experimental trawling done at the creek gave a catch rate of 3-17 kg/h (av. 7 kg/h) which indicated a fishery potential of 0.188 tonnes /km^2 /d. The transfer coefficient is only 31.4% from secondary to tertiary level indicating the limited contribution of zooplankton to the fishery of the creek environment.

Fish eggs : They were common at all stations and occasionally observed in large numbers. Their frequency of occurrence at stn. 5 was less as compared to other stations (Table II). The highest population (739/10 m^3) was observed at stn. 3 in December coinciding with the maximum percentage contribution (8.51). During monsoon and postmonsoon periods fish eggs were more abundant at stns. 1 and 2 as compared to premonsoon period. The creek as a whole recorded an average count of 71 (0.54%) 102 (0.26%) and 105/100 m^3 (0.46%) respectively for premonsoon, monsoon and postmonsoon seasons. The mean population density for the outer zone (115/100m^3) was higher than that for the interior zone (82/100 m^3) though the percentage contribution for the outer zone (0.34) was lower than that for the interior zone (0.46).

Fish larvae : The maximum population density of fish larvae (6031/100m^3) was recorded at stn. 5 in August whereas the maximum percentage contribution (5.88) was recorded at stn 2 (Table II) during July forming the second largest group of zooplankton. Seasonal fluctuations indicated highest population density during monsoon season and the lowest during postmonsoon period. The mean seasonal values of fish larvae were 265 (0.85%), 645 (0.63%) and 91/100 m^3 (0.15%) respectively for premonsoon, monsoon and postmonsoon seasons. On an average the outer zone sustained relatively higher populations of fish larvae (351/100 m^3) than the interior zone (300/100m^3) which was comparable with the distribution pattern of fish eggs. The interior zone

supported a sizeable population of carnivores and hence the possibility of predation of fish eggs and larvae by carnivores like medusae can not be ruled out (Tiwari, 1990). The highest record of medusae at stn 4 (av.1849/100 m^3) coinciding with the lowest density of fish larvae (av. 82/100/m^3) was significant. The incidence of fish eggs and larvae within the creek in fairly good numbers suggests the existence of breeding grounds in the vicinity of the creek. On an average basis the population density of fish eggs and larvae were 93 and 334/100m^3 respectively. The higher incidence of fish larvae by a factor of 3.5 than the eggs indicated the good survival rate possibly due to the congenial environment for the larvae to thrive. The prevailing water quality and plankton characteristics (Tiwari, 1990) show that Dharamtar creek has the potential to support a good fishery.

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