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Study of Growth And Survival Rate of Fresh Water Crab With Water Quality Parameters of Gopalwadi Tq. Kannad

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Abstract

For the present work the area of Gopalwadi i.e. station S_1 is selected and the study is carried in the year June-2012 to May-2013. The study covers the physico-chemical parameters of water as well as the diversity of crab barytelphousa cunicularies was carried out. The study reveals that the water parameters are within permissible limit. The correlation study between water parameters and crab also carried out**.**

Key words: Crabs, Marathwada, Size, Male and Female.

1. Introduction

The blue swimmer crab, *Portunus pelagicus*, is the major marine crab landed from bottom trawl nets and set gill nets in India. Moreover, in recent years shrimp culture has encountered heavy losses due to disease outbreaks in Asia, which warrants the need to diversify culture operations in order to utilize the farm and to include other biologically suitable and economically viable crustaceans in the production process. The best way of describing the growth of many crustacean species is by observing their moulting pattern. Crustacean growth is dependent upon the duration of the intermoult (moult interval) and size increase at each moult moult increment[1]. Along the southern-Atlantic coast of Canada, two of the most common predators of mussels are the green crab (Carcinus maenas) and the dogwhelk (Nucella lapillus).

These species interact negatively through inter- and intra-specific interference competition, exploitative competition, intra-guild predation of dogwhelks by crabs, and various trait-mediated indirect interactions driven by chemical risk cues. Agonistic behavior is common among green crabs, which can lead to changes in prey choice and feeding behavior. However, whelk presence is known to increase foraging rates in crabs, possibly through the use of chemical cues and kleptoparasitic feeding. Thus, when whelks are present together with multiple crabs they may mitigate. One of the negative effects on crab foraging rates that result from conspecific interactions.

Both crabs and whelks prefer a restricted size range of mussels based on their body size and foraging techniques differ significantly between these two species. To feed on bivalve prey, crabs typically chip or crush the shell, with larger crabs capable of feeding on larger prey items. Whelks feed on bivalves by boring a hole through the shell, injecting digestive enzymes inside, and extending their proboscis through the hole to ingest the digested tissue. Crabs forage during

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high tide, finding shelter at low tide to avoid desiccation. For crabs, the amount of time required to consume a prey item varies with size of predator and prey, but is typically <1 h. Conversely, whelks typically remain firmly attached to their prey during the entire length of prey consumption (through both high and low tide), which for mussels can take 3–4 days[2]. The androgenic gland (AG), a male-specific endocrine gland in crustaceans, was first discovered in the blue crab, Callinectes sapidus. More and more researches have focused on AG since Charniaux-Cotton reported its influence on male sexual differentiation[3-10]. Protein, as the main constituent of feed material cost, plays an important role in the growth of aquaculture animal.

2.Material and Method:

1. **pH:** pH was determined by pH meter model SL-70 Elico made.
2. **Temperature:** Temperature of water was recorded by using zeal thermometer with ± 0.1 ^{0}C.
3. **Turbidity:** To measure the turbidity of the water sample Equip-Tronics Turbidometer model E9-811 is used.
4. **Conductivity:** Conductivity is the capacity of water to carry an electrical current and varies both with number and types of ions in the solution contain, which in turn is related to the concentration of ionized substances in the water.
5. **Total dissolved solids:** Filtered a suitable aliquot of sample through a tared gooch crucible ignited to constant weight or a glass fiber filter paper washed with 100 ml of distilled water dried at 105 ^{0}C and weighed. Washed the residue three times with about 5 to 10 ml of water allowing it to drain free from water after each wash. Carefully removed the crucible and dried in an oven at 105^0 C for one hour. Cooled in desiccators and weighed. The crucible is ignited for 15-20 minutes in a muffle furnace maintained at 550^0 C ± 50^0 C. Cooled the dish partially in air until most of heat has been dissipated and then in desictor and recorded final weight. The difference between total solids and suspended solids gives the amount of dissolved solids.
6. **Dissolved Oxygen:** Winkler's Iodometric method was followed to determine dissolved oxygen.. The calculation was done by the following working formula;

$$DO\,(mg/l) = \frac{(ml \times N)\ of\ sodium\ thiosulphate \times 8 \times 1000}{V_2 \times \frac{(V_1 - V)}{V_1}}$$

Where V_1 = Volume of sample after placing the stopper (250 ml)

V_2 = Volume of the part of the content titrated (50 ml)

V = Volume of $MnSO_4$ and KI added.

7. **Free Carbon dioxide:** Free carbon dioxide can be determined by titrating the sample using a strong alkali to pH 8.3. At this pH all free carbon dioxide is converted into bicarbonates. To estimate amount of free carbon dioxide a sample aliquot is taken in a conical flask to it phenolphthalein is added and titrated against a known concentration of sodium hydroxide. If the colour of the solution turned to pink, free carbon dioxide is absent. If the sample remains colourless after titrating with alkali and at the end point a pink colour appears.

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Calculation free CO_2, mg/l

$$= \frac{(mlXN)\,X\,1000\,X\,44}{sample}$$

8. **A1kalinity:** Most of the water are rich in carbonates and bicarbonates with a little concentration of other alkalinity been determined by titrating the samples with standard hydrochloric acid. Phenolphthalein and methyl orange were used as indicators. In the case of the use of phenolphthalein alkalinity (PA) and in case of methyl orange it is called as total alkalinity (TA). From the neutral point obtained by the two indicators, alkalinity expressed as $CaCO_3$ and as CO_3 and HCO_3 was calculated. The results have been expressed in ppm and as individual ion in mg/L. PA and TA have been calculated as follows

$$\text{PA as } CaCO_3, \text{mg/L} = \frac{(A \times \text{Normality}) \text{of HCl} \times 100 \times 50}{\text{m1 of sample}}$$

$$\text{TA as } CaCO_3, \text{mg/L} = \frac{(B \times \text{Normality}) \text{of HCl} \times 1000 \times 50}{\text{m1 of sample}}$$

Where
A = ml of HCl with only phenolphthalein
B = ml of total HCl used with phenolphthalein and methyl orange
PA = Phenolphthalein alkalinity
TA = Total alkalinity

9. **Bicarbonate:**Total, alkalinity, carbonates and bicarbonates can be estimated by titrating the sample, with a strong acid (HCI or HSO), first to pH 8.3 using phenolphthalein as an indicator and then, further to pH between 4.2 and 5.4 with methyl orange or mixed indicator. In first case, the value is called as phenolphthalein alkalinity (PA), and in second case, it is total alkalinity (TA). Values of carbonates, bicarbonates and hydroxyl, ions can be computed from these two types of alkalinities.

$$\text{PA as } CaCO_3 \text{ mg/l} = \frac{(A \times \text{Normality}) \text{of HCl} \times 1000 \times 50}{\text{ml of sample}}$$

$$\text{TA as } CaCO_3 \text{ mg/l} = \frac{(B \times \text{Normality}) \text{of HCl} \times 1000 \times 50}{\text{ml of sample}}$$

Where, A = ml, of HCl used with only phenolphthalein

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B = ml of total HCl used with phenolphthalein and methyl orange
PA = phenolphthalein alkalinity
TA = total alkalinity

Concentration of, carbonates, bicarbonates and hydroxyl ions can be determined from the Table of carbonate using data of PA and TA.

10. Carbonate:

Values of Hydroxyl ions, carbonates and bicarbonates from the values of phenolphthalein and total alkalinities

Result of titration	OH alkalinity as $CaCO_3$	CO_3 alkalinity as $CaCO_3$	HCO_3 alkalinity as $CaCO_3$
P = 0	0	0	T
P < 1/2 T	0	2 P	T – 2P
P = 1/2 T	0	2 P	0
P > 1/2 T	2P – T	2 (T – P)	0
P = T	T	0	0

11. Phosphate: The water sample is digested in H_2SO_4-K_2SO_4 mixture and taken from it a specified quantity, diluted with distilled water. Neutralized by sodium hydroxide solution, followed by ammonium molybdate and few drops of $SnCl_2$ solution. The amount of phosphate is obtained from the calibration curve of blue colour produced

12. Nitrate: The nitrate concentration was determined by using UV-Visible spectrophotometer Elico make (model SL-159) at 220 nm and 275 nm. Since dissolved organic matter absorbed at 220 nm and NO_3 does not absorb at 275 nm. The following formula was used to calculated NO_3 from groundwater

= O.D. at 220 nm – (2 X O.D. at 275 nm)

13. Hardness: To 50 ml of well mixed sample in porcelain dish added 1 to 2 ml of buffer solution followed by a 1 ml of inhibitor. A pinch of EBT indicator is mixed and titrated with standard EDTA solution till wine red colour changes to blue. In the similar fashion a blank titration is carried out. From the difference of the sample and blank the Hardness of water is calculated.

14. Calcium Hardness: Many indicators such as ammonium purporate, calcon etc. form a complex with only calcium but not with magnesium at higher pH. As EDTA is having a higher affinity towards calcium; the former complex is broken down and a new complex is formed. However, EDTA has property to combine with both Ca^{++} and Mg^{++}, therefore, magnesium is largely precipitated as its hydroxide at sufficiently higher pH. The calcium present in water was determined using EDTA titration as described in litrature[73].

$$\text{Calcium mg/1} = \frac{x \times 400.8}{\text{ml of sample}}$$

Where x = Volume of EDTA used.

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15. Magnesium Hardness: Calcium and magnesium form a complex of wine red colour with Eriochrome Black at pH 10.0 the EDTA has got a stronger affinity for Ca^{++} and Mg^{++} the former complex is broken down and a new complex of blue colour is formed. The value of Mg^{++} can be obtained by subtracting the value of calcium from the total of $Ca^{++} + Mg^{++}$.

a)

$$Mg^{++}, mg/l = \frac{y - x \times 400.8}{\text{Volume of sample} \times 1.645}$$

Where, y = EDTA used in hardness determination

x = EDTA used in calcium determination for the same volume of the sample.

b) Mg^{++}, mg/l = Total hardness (as mg/l $CaCO_3$) - calcium hardness (as mg/l $CaCO_3$) x 0.244

Where, Calcium hardness (as mg/l $CaCO_3$) = Ca, mg/l X 2.497

16. Chloride: Taken 100 ml of the sample and adjusted the pH between 7.0 and 8.0 to this solution 1 ml of potassium chromate is added. The solution is titrated with standard silver nitrate till silver chromate starts precipitating. Similarly a blank sample also run with same quantity of distilled water. From the burette reading the amount of chloride is calculated[11-15].

17. Length, Breadth and Weight of Crabs: All these parameters were measured at the site by carrying calibrated balance, Verneir caliper etc.

Result and Discussion:-

a. Physico-Chemical Parameters: Crabs were collected from June 2012 to May 2013 and simultaneously water samples also collected at the site only. During the study Air temperature was checked at site only and it was recorded. It was observed that average temperature was 21.7 ^{0}C with maximum 26.4 ^{0}C & minimum 15 ^{0}C. The water temperature was varies from 18.6 ^{0}C to 26.2 ^{0}C with an average of 22.35 ^{0}C. pH was checked with Elico made meter it was slightly alkaline may be due to domestic waste or fertilizers used in agriculture. pH was in the range of 7.8 to 8.5 with an average of 8.14. The ions present water contributes the conductivity, if more ions are present the conductivity increases and vice versa. The average conductivity was 276.8 mS, and varies from 320 to 240 mS. The transparency of the water sample depends on the suspended particles in the water. Since it was an open the contamination may occur, due to such reason the turbidity was little high it was 44 NTU to 132 NTU with an average of 100.87 NTU. Dissolved oxygen was found to be 5.2 mg/L in average and with maximum 6.8 mg/L & minimum 3.1 mg/L. Total hardness is due to carbonates and bicarbonates present in the water. During the course of study it is in the permissible limit and calcium hardness and magnesium hardness also. The phosphate content was recorded in the range of 0.3 mg/L to 0.48 ppm with an average of 0.37 mg/L.

b. Diversity of Crab Barytelphousa cunicularies: The male and female crabs were collected at the site in the years and their body weight, length, width measured in the laboratory and colour of ovary for female was recorded. It was observed that in the month of june the average body weight of male crabs were 97 gm to 170 gm with body length 6.63 cm to 8.2 cm and width 5.4 cm to 6.5 cm. In case of female average body weight was 76 gm to 126 gm, body length was 6.3 cm to 7.53 cm and width was 5 cm to 5.65 cm.

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Table No.1 Physico-Chemical parameters at station S1 Gopalwadi

PARAMETERS	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13
Atm Temp ^{o}C	26.2	25	22	23	20.2	19.3	15	16	16.3	25	26	26.4
water temp ^{o}C	26	26.2	21.5	23.2	20.4	20.8	19	18.6	19.6	22	25	26
Humidity	52.3	75	78	79	52	54	50	53	40	32	28	34
pH	7.9	8.2	8.3	7.8	8	8	8.2	8.2	8.2	8.2	8.2	8.5
Turbidity	90	44	60	74	80	114	118.2	126.3	132	128	124	120
Conductivity (mS)	284	270	260	296	240	246	260	258	300	320	320	268
TDS (ppm)	192	182	202	196	150	158	164	176	192	200	208	216
D.O. (ppm)	3.1	6	6	5.8	5	6	6.8	4.6	3.2	4.8	5.48	5.54
Free CO_2 (ppm)	6.5	5	4.6	4.2	2.4	4.6	6.8	7	5	0	0	0
Phe. Alka (ppm)	0	0	0	0	0	0	0	0	0	9.8	4.8	9.8
Total Alka (ppm)	144	124	122	120	88	108	146	132	134	146	150	162
CO_3 (ppm)	0	0	0	0	0	0	0	0	0	19	11	22
HCO_3 (ppm)	144	126	122	121	88	108	148	134	134	124	146	147
T. H. (ppm)	82	84	85	94	70	82	84	78	80	82	90	82
Calcium (ppm)	22.4	24.66	27.46	35.42	22	30.24	25.42	24.2	23.4	24.68	30.28	27.48
Mg (ppm)	6	5.8	6.12	8.16	5	3.8	4.3	4.4	6.3	5	6	6.38
Chloride (ppm)	32.48	27	26.94	25.1	13	20	17.4	16.1	18.54	24.1	27	32.6
Phosphates (ppm)	0.48	0.3	0.46	0.38	0.38	0.36	0.34	0.4	0.38	0.36	0.38	0.3
Nitrates (ppm)	0.14	0.3	0.4	0.3	0.36	0.3	0.2	0.24	0.1	0.1	0.28	0.34

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Table No. 2 Diversity of Crab Barytelphousa cunicularies from S1 Site in the month of June-2012 to May-2013

Sr. No.	Date	Male/ Female	Wt. Of Body(gm)	Length of carapase(cm)	Width of Carapase(cm)
1	12-June	Male	116	7	5.6
2		Male	108	7	6
3		Male	206	9	7
4		Male	100	7	5.6
5	12-July	Male	201	9	7
6		Male	90	7	5
7		Male	94	6.6	5
8		Male	200	8.6	6.6
9	12-August	Male	161	8.8	5.5
10		Male	280	10.1	7.1
11		Male	100	7	5.6
12		Male	89	6.3	5.3
13		Male	62	5.3	4.8
14	12-September	Male	94	6.6	5
15		Male	116	7	5.6
16		Male	206	9	7
17		Male	280	10.1	7.1
18		Male	89	6.3	5.3
19	12-October	Male	200	8.6	6.6
20		Male	90	7	5
21		Male	108	7	6
22		Male	62	5.3	4.8
23		Male	200	8.6	6.6
24	12-November	Male	94	6.6	5
25		Male	116	7	5.6
26		Male	220	9	7
27		Male	108	7	6
28		Male	161	8.8	5.5
29	12-December	Male	62	5.3	4.8
30		Male	100	7	5.6
31		Male	133	7.3	5.8
32	13-January	Male	220	9	7
33		Male	94	6.6	5
34		Male	90	7	5
35		Male	206	9	7
36		Male	116	7	5.6
37	Febraury-13	Male	280	10	7
38		Male	133	7.3	5.8
39		Male	161	8.8	5.5
40		Male	62	5.3	4.8
41	March-13	Male	94	6.6	5
42		Male	108	7	6
43		Male	89	6.3	5.3
44	April-13	Male	206	9	7
45		Male	104	7	5.6
46		Male	200	8.6	6.6
47	May-13	Male	94	6.6	5
48		Male	206	9	7
49		Male	116	7	5.6

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Table: 3 Diversity of Crab Barytelphousa cunicularies from S1 Site in the month of June 2012 to May-2013 (Female)

Sr. No.	Date	Male/ Female	Wt. Of Body(gm)	Length of carapase(cm)	Width of Carapase(cm)	Colour of ovary
1	June-12	Female	166	8	6	Dark
2		Female	92	7	5	Dark
3		Female	170	8.6	6	Dark
4		Female	66	6	5	Dark
5	July-12	Female	170	8.6	7	Dark
6		Female	92	6.6	5	Dark
7		Female	78	6.6	5	Dark
8		Female	104	7	5.6	Dark
9		Female	166	8	6	Dark
10		Female	70	6	5	Dark
11	August-12	Female	186	7.8	6.3	Yellow
12		Female	66	6	5	Yellow
13		Female	166	8	6	Yellow
14		Female	104	7	5.6	Yellow
15		Female	88	6.6	5	Yellow
16	Sept-12	Female	166	8	6	Brownish Yellow
17		Female	102	7	5.6	Brownish Yellow
18		Female	186	7.8	6.3	Brownish Yellow
19		Female	66	6	5	Brownish Yellow
20		Female	86	6.6	5	Brownish Yellow
21	Oct-12	Female	74	6	5	Brownish Yellow
22		Female	96	7	5	Brownish Yellow
23		Female	170	8.6	7	Brownish Yellow
24		Female	105	6.8	5.3	Brownish Yellow
25	Nov-12	Female	66	6	5.6	Yellowish Brown
26		Female	92	6.6	5	Yellowish Brown
27	Dec-12	Female	66	6	5	white as pale yellow
28		Female	86	6.6	5	white as pale yellow
29	Jan-13	Female	200	9	7	white as pale yellow
30		Female	78	6.6	5	white as pale yellow
31		Female	116	7	5.6	White as pale yellow
32		Female	78	6.6	5	White as pale yellow
33	Feb-13	Female	86	6.6	5	Yellowish White
34		Female	70	6	5	Yellowish White
35		Female	86	6.6	5	Yellowish White
36	March-13	Female	100	7	5	Yellow
37		Female	70	6	5	Yellow

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38	April-13	Female	170	8.6	7	Yellow
39		Female	104	7	5.6	Yellow
40		Female	102	7	5.6	Yellow
41	May-13	Female	186	7.8	6.3	Yellowish Brown
42		Female	66	6	5	Yellowish Brown

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