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# A report on the mass mortality of farmed shrimp due to the blooming of *Chattonella marina* along Vypin coast

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*Chattonella marina* which blooms regularly along the Calicut coast bloomed for the first time in the coastal region along Vypin, Cochin in September 2003. The bloom extended to a distance of about 1km from the coastline covering a distance of 3km from Puthuvypin to Malipuram. The greenish brown coloured bloom was noticed in the second week of August in the coastal waters and adjacent farms of the area. Bloom subsided in the coastal waters on the third day itself, but in nearby fish ponds it remained in the bloom condition till the end of the month. Sampling was done on alternate days, from the day the bloom was observed at sea (19/9/03) till the end of the following month until the normal flora was restored.

The phytoplankton collected from the sea was dominated by *C.marina* on the 1<sup>st</sup> and 3<sup>rd</sup> day after which the diatom *Coscinodiscus* sp. became dominant. Count of *C.marina* on 1<sup>st</sup> day was 2,40,000 cells l<sup>-1</sup> which decreased to 17000 cells l<sup>-1</sup> on the 3<sup>rd</sup> day and was absent in the subsequent samplings. *Coscinodiscus* sp. present at 98 cells l<sup>-1</sup> on the 1<sup>st</sup>

day, increased to a density of 137 cells l<sup>-1</sup> by 23<sup>rd</sup> day. A higher density was noted in the farm when compared to that of sea. The density which was 4,68,000 cells l<sup>-1</sup>, on the 1<sup>st</sup> day decreased to 40,000 cells l<sup>-1</sup> by the 3<sup>rd</sup> day. On the 5<sup>th</sup> day, it again increased to 2,00,000 cells l<sup>-1</sup> but there were isolated patches in the ponds which received bright sunlight where *C. marina* had concentrated in very high numbers. By the 7<sup>th</sup> day, *Peridinium* sp. had become dominant whose density increased to 1400 cells l<sup>-1</sup> by the 23<sup>rd</sup> day of the bloom.

Temperature seems to play an important role in retaining the bloom condition. The results of the analysis of physicochemical and biological parameters measured at the two sites is given in Table. Chl *a*, *b*, *c* and carotenoids values were higher at sea in the 1<sup>st</sup>, 3<sup>rd</sup> and 5<sup>th</sup> day and varied between 55.9 and 73.7 mg m<sup>-3</sup> for Chl *a*, 0 and 23.81 mg/m<sup>3</sup> for Chl *b* and between 5.89 and 21.58 mg m<sup>-3</sup> for chl *c* and between 0 and 1.244 mg m<sup>-3</sup> for carotenoids. On the 7<sup>th</sup>, 9<sup>th</sup> and 23<sup>rd</sup> day Chl *a* varied between 1.1 to 7.89 mg m<sup>-3</sup>. Chl *b* at the site varied between 0.61

and 6.13, Chl *c* between 0.36 and 0.381 and carotenoids between 0.019 and 0.14 mg m<sup>-3</sup>. In the farm site pigment values were comparatively higher throughout the bloom period. It varied between 14 and 48 for Chl *a* between 0 - 44.4 for Chl *b*, 3.6 - 16.5 for Chl *c* and 0.07 - 1 mg.m<sup>-3</sup> for carotenoids. Comparatively higher Chl *a* was recorded on the 3<sup>rd</sup> and 23<sup>rd</sup> day of the bloom. High Chl *b* and *c* of 44.4 and 16.5 mg.m<sup>-3</sup> was obtained in the 9<sup>th</sup> day of sampling. Chl *b* and carotenoids were lower of 14.37 and 1.01 mg.m<sup>-3</sup> on this day.

steadily from a value of 2.06 during the bloom to 4.38 mg l<sup>-1</sup> when the algae was absent from the phytoplankton community. In the farm, dissolved oxygen value was low in the initial phase and varied between 2.06 to 2.61 mg l<sup>-1</sup> and between 3.36 to 4.73 in the last phase.

The nutrient content was higher in the farm site when compared to that of the sea. Nitrate and nitrite values were high at sea on the 1<sup>st</sup> day with values of 4.48 and 0.101 µmol l<sup>-1</sup> respectively. Comparatively lower values were obtained in the subsequent

Table. Environmental parameters, cell density and diversity indices during the bloom of *Chattonella marina* at Narakkal

	Day 1		Day 3		Day 6		Day 8		Day 10		Day 23	
	Sea	Farm	Sea	Farm	Sea	Farm	Sea	Farm	Sea	Farm	Sea	Farm
AT (°C)	27	34	29	30	30	31.2	31.2	30.2	28.2	29.3	32	26
SST (°C)	29	33	29	30	27.3	35	26.2	30.3	29	30.3	29	30
Salinity (ppt)	30	26	30	26	35	25	31	27	33	26	34	26
Dissolved oxygen (mg/l)	2.06	2.61	2.12	2.4	2.28	2.06	3.68	4.73	4.12	3.36	4.38	3.88
pH	8.3	8.3	7.96	7.9	7.7	7.5	7.7	7.7	7.8	7.5	8.1	7.6
Ammonia (µmol l <sup>-1</sup> )	0.05	1.56	0.00	1.42	2.57	0.50	0.51	0.78	0.32	1.38	0.24	0.65
Nitrate (µmol l <sup>-1</sup> )	4.48	71.84	0.05	0.15	0.45	0.08	0.84	2.74	0.37	2.24	0.48	2.45
Nitrite (µmol l <sup>-1</sup> )	0.10	0.16	0.08	0.06	0.08	0.09	0.08	0.07	0.11	0.07	0.09	0.11
Phosphate (µmol l <sup>-1</sup> )	0.53	1.44	1.77	2.03	1.55	2.32	0.58	3.52	0.52	2.39	0.82	2.56
N:P	8.7	51.1	0.1	0.8	2.0	0.3	2.4	1.1	1.5	1.5	1.0	1.3
TSS	2.5	4	10.5	48.1	11.3	12.6	10.5	5.2	6.6	16.2	8.5	10.2
BOD	0.5	5.1	1.8	12.3	1.9	5.5	1.3	8.4	2.1	5.8	2.5	2.5
Chl <i>a</i> (mg/m <sup>3</sup> )	55.94	24.67	64.8	5.4	73.7	13.98	1.1	17.38	2.73	14.34	7.89	40.4
Chl <i>b</i> (mg/m <sup>3</sup> )	0	4.66	23.81	0	0	1.4	0.613	1.88	6.13	44.4	1.36	0.82
Chl <i>c</i> (mg/m <sup>3</sup> )	9.33	4.98	21.58	4.33	5.89	4.88	0.358	3.62	3.81	16.55	1.41	13.1
Carotenoids (mg/m <sup>3</sup> )	0	0.584	1.244	0.99	1.065	0.069	0.0193	0.44	0.115	1.013	0.142	0.92

### Environmental variations

The air temperature showed a general increasing trend from a low value of 27°C on the 1<sup>st</sup> day to 32°C on the 23<sup>rd</sup> day except a decrease from 31.2 to 28.2 °C on the 8<sup>th</sup> day of bloom. The SST stayed at a value of 29°C except a lower value of 27.3 and 26.2 °C on the 5<sup>th</sup> and 7<sup>th</sup> day of the bloom. Compared to sea, the AT and SST in the adjacent farm was higher. The temperature decreased steadily from a high value of 34 °C in the initial to 26°C in the last phase and SST decreased from 33 to 30 °C except a high value of 35°C on the 5<sup>th</sup> day. Salinity varied between 30 and 35 ppt in the sea and between 25 and 27 ppt in the farm. Dissolved oxygen content was found to increase

sampling which varied between 0.05 to 0.84 for nitrate and 0.09 to 0.1 µmol l<sup>-1</sup> for nitrite. Ammonia values showed a depletion in the first day and increased to 2.57 µmol l<sup>-1</sup> on the 5<sup>th</sup> day and thereafter again started decreasing. Phosphate which was low initially increased to values between 1.55, 1.77 and thereafter decreased to values below 0.8 µmol l<sup>-1</sup>. In the farm, the nitrate content of the water was very high, 71.84 µmol l<sup>-1</sup> on the 1<sup>st</sup> day. It sharply declined to 0.15 and 0.082 µmol l<sup>-1</sup> in the subsequent samplings and slightly increased thereafter. Phosphate values showed an increasing trend from 1.44 in the beginning to values between 2.03 and 3.52 µmol l<sup>-1</sup> in the subsequent samplings. Ammonia values showed

frequent fall and rise at the site. It was higher on the 1<sup>st</sup> and 3<sup>rd</sup> day with values of 1.56 and 1.42  $\mu\text{mol l}^{-1}$  and varied between 0.5 and 1.38 in the subsequent ones. Nitrite which was slightly high with a value of 0.157  $\mu\text{mol l}^{-1}$  in the first sampling showed lower values in the subsequent samplings.

### Impacts

Heavy mortality of shrimps and fishes were noticed in the shrimp ponds at Narakkal and nearby villages like Valappu, Elakkunnapuzha and Nayarambalam where there was a direct intake of water from the sea. Though *C. marina* remained in the bloom condition only for a short period of about three days in the sea, the algae that had entered the coastal farms during tidal exchange and remained in the ponds for a longer period which led to mass

mortality of fishes and prawns in these ponds. The fishes which were killed were mainly *Chanos chanos*, *Mugil cephalus* and *Etroplus maculatus*. Farmers faced heavy financial losses as fishes of all size groups from 100 to 600 mm were killed due to the bloom. Heavy mortality (>90%) of penaeid shrimps like *Penaeus monodon* and *P. indicus* and non penaeid shrimps like *Metapenaeus dobsoni* and *M. affinis* were observed. An unusual catch of catfishes were obtained by fishermen during the bloom period. Catfishes which appeared in large numbers seemed to be in a disoriented condition and so could be easily caught. The fish and water samples were analysed for paralytic and diarrhetic shell fish poisoning at CIFT. The mouse bioassay showed the presence of a lipid soluble toxin.