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Abundance of *Vibrio* bacteria in the near shore waters of Visakhapatnam coast before and after 'Hudhud' cyclone

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Short Communication

Abstract

The mean abundance of *Vibrio* bacteria in the near shore waters of Visakhapatnam coast was slightly higher before Hudhud cyclone (4 to1.53x10^3 cfu/ml) than after Hudhud cyclone (3 to 1.32x10^3 cfu/ml). Stations 6, 1,10 and 7 recorded high values of Total *Vibrio* Count (TVC) before the cyclone. Stations 20 (1.37x10^3 cfu/ml) and 25 (1.32x10^3 cfu/ml) showed high values of TVC after the cyclone. The observed temperature, salinity, dissolved oxygen and pH of surface seawater did not show marked fluctuations before and after cyclone. *Vibrio* bacteria density data indicate the negative impact of Hudhud cyclone on *Vibrio* bacteria of near shore waters. Salinity showed insignificant negative correlations before and after cyclone. Temperature and pH revealed insignificant positive correlations before and after cyclone.

Keywords: *Vibrio bacteria, near shore waters, Hudhud cyclone, Visakhapatnam coast.*

Introduction

During the routine studies of bacteria distribution in the near shore waters along Visakhapatnam coast, an attempt has been made to investigate the *Vibrio* bacteria abundance on 20.09.2014. The Hudhud cyclone struck the Visakhapatnam coast on 12.10.2014. Hence to assess the impact of the Hudhud cyclone on *Vibrio* bacteria abundance, another study on the *Vibrio* bacteria abundance in near shore waters along Visakhapatnam coast was undertaken on 01.11. 2014. Several investigators studied the distribution of bacteria from marine sediment habitats (Nair *et al.,* 1978; Ramaiah *et al.,*1996; Surajit *et al.,*2007; Raghavendrudu and Kondalarao, 2008) and water bodies (Vasantha and Kannan, 1987; Alavandi, 1989; Palaniappan and Krishnamurty, 1985; Prabhu *et al.,* 1991; Mogal and Dube, 1995; Sreedevi and Kondalarao, 2006). Data on the impact of cyclones on bacteria of coastal waters are meager. The present study reports the impact of Hudhud cyclone on the abundance of *Vibrio* bacteria in near shore waters of Visakhapatnam

Material and methods

The shore between Visakhapatnam and Bhimili is mainly sandy shore. Here and there, rocky shores are present.

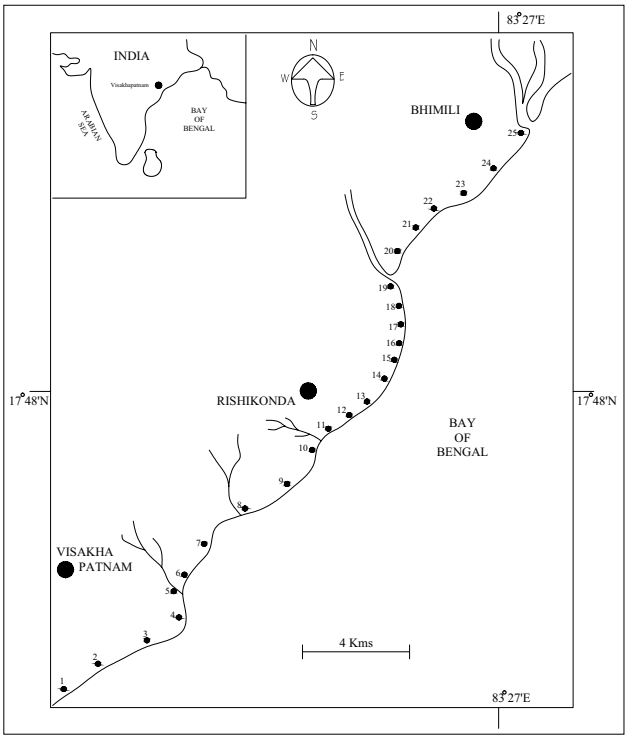

Fig. 1. Map showing sampling locations.

Twenty five stations between Visakhapatnam and Bhimili were selected on sandy shores for sampling (Fig. 1). Stn. 1 is located adjacent to Visakhapatnam Fishing Harbour. At Stns. 1 and 5, small domestic waste water drains enter the Bay. Stns. 2, 3, 4, 6, 7 and 10 experience regular visitors flow as they are the tourist spots. Stn. 10 is also used as bathing point by tourists. At Stn 17, the Bay waters enter the land as a small channel. At Stn. 25, the River Gosthani (a small seasonal river with Flood Period between July and September months) merges with Bay of Bengal. Water samples were collected from near shore waters during low tide time. The near shore waters of these twenty five stations were aseptically sampled, in duplicate, for the abundance of *Vibrio* bacteria. At each station, temperature of air and near shore seawater was recorded using a hand-held mercury thermometer. Shore water samples were collected, in duplicate, for salinity and dissolved oxygen at each station. Salinity was determined by Knudsen method. Dissolved oxygen was determined by Winklers method. At each station, pH of seawater was determined, in duplicate, by using digital pH meter. *Vibrio* bacteria were cultured aseptically on TCBS agar (HIMEDIA) in the laboratory using a bacteriological incubator. All the bacterial colonies, grown on the culture plates, were examined for their cultural, morphological, staining and biochemical characteristics

Table 1. Mean (n=2) distribution of temperature (WT), salinity (WS), dissolved oxygen (DO) and pH of surface seawater at different stations, before and after Hudhud cyclone.

		WT °C		WS ‰		DO (mg/l)		pH
S NO	Before	After	Before	After	Before	After	Before	After
1	31	31.2	34.2	34.2	5.4	5.3	7.8	7.4
2	31.3	28.2	35.9	33.1	5.3	5.3	7.7	7.3
3	31.2	30.1	33.1	32.9	5.3	5.3	7.4	7.6
4	31.8	30.0	34.1	34.2	5.3	5.3	7.6	7.4
5	32.8	29.1	39.9	34.9	5.3	5.2	7.5	7.5
6	31.5	30.4	33.1	34.8	5.4	5.2	7.6	7.4
7	31.8	31.0	35.9	35.8	5.4	5.2	7.9	7.4
8	31	30.8	36.9	35.1	5.3	5.3	7.8	7.3
9	31	30.1	35.9	32.9	5.3	5.3	7.6	7.5
10	30.2	30.2	34.1	35.1	5.4	5.3	7.4	7.4
11	30.2	29.6	34.2	34.1	5.2	5.3	7.5	7.6
12	31	30.4	34.9	35.9	5.3	5.3	7.8	7.4
13	30.9	30.9	37.9	34.1	5.3	5.2	7.6	7.5
14	31.4	29.4	36.1	34.1	5.4	5.3	7.9	7.6
15	31.1	29.4	34.1	35.9	5.2	5.3	7.7	7.3
16	30.9	30.4	38.9	35.9	5.3	5.2	7.4	7.5
17	32	29.8	35	35.8	5.3	5.2	7.3	7.5
18	31.2	31.4	36.9	36.0	5.3	5.3	7.8	7.5
19	31.2	30.9	36.8	36.1	5.2	5.2	7.3	7.6
20	30.9	31.1	36.0	36.0	5.4	5.2	7.6	7.4
21	30.2	30.4	35.1	35.1	5.4	5.2	7.4	7.5
22	31.1	31.1	34.9	34.9	5.3	5.2	7.8	7.6
23	31.2	30.4	35.1	34.9	5.3	5.2	7.4	7.5
24	30.9	30.2	35.9	35.1	5.3	5.2	7.4	7.4
25	31.1	31.1	34.1	34.9	5.3	5.4	7.5	7.6

using Bergey's manual (Bergey 1994). Pearson correlation coefficients were calculated between *Vibrio* abundance and different physico-chemical parameters.

Results and discussion

The mean (n=2) distribution of temperature, salinity, dissolved oxygen and pH of surface water, before and after Hudhud cyclone, are presented in Table 1. All the bacterial colonies, grown on the TCBS media, exhibited yellow, bluish green and greenish yellow colours with dominance of yellow colonies. The cultural, morphological, staining and biochemical characteristics of these bacteria confirm that they belong to the Genus *Vibrio*. The abundance of *Vibrio* bacteria and its correlation with physico-chemical parameters before and after cyclone are presented in Tables 2 and 3 respectively. Physico-chemical parameters did not show marked fluctuations before and after Hudhud cyclone (Table 1). The abundance of *Vibrio* bacteria revealed high densities at Stations 6 ($1.53x10^3$ cfu/ml), 1 ($1.39x10^3$ cfu/ml), 10 ($1.13x10^3$ cfu/ml) and 7 ($1.08x10^3$ cfu/ml) before Hudhud cyclone, while the remaining stations recorded low values. The high *Vibrio* count recorded in these stations may be due to tourist inflow (at Stns. 6, 7 and 10) and local land drainage (Stn. 1). After Hudhud cyclone, the abundance of *Vibrio* bacteria was high at Stations 20 ($1.37x10^3$ cfu/ml) and 25 ($1.32x10^3$ cfu/ml); while at the remaining stations, *Vibrio* bacteria were recorded in low densities. These data indicate that the Hudhud cyclone showed a negative impact on the abundance of *Vibrio* bacteria through excessive freshwater run off into the coastal waters during cyclone time. The relatively high abundance of *Vibrio* bacteria at Station 25 after Hudhud cyclone may be due to its close vicinity to Gosthani estuary. The recorded physico-chemical parameters and the observed physiographical features at St. 20 are insufficient to offer an explanation for the high abundance of *Vibrio* bacteria recorded at St.

Table 2. Abundance (x10 CFU /ml) of *Vibrio* Bacteria in the eulittoral waters along Visakhapatnam coast, before and after Hudhud cyclone.

	Before Cyclone			After Cyclone		
S.NO	Sample I	Sample II	T V C	Sample I	Sample II	T V C
1	130	148	139 ±12.72	17	17	17±0
2	63	45	54±12.72	9	5	7±2.82
3	48	24	36±16.97	15	13	14±1.41
4	57	25	41±22.62	20	30	25±7.07
5	80	90	85±7.07	4	6	5±1.41
6	130	176	153±32.52	3	5	4±1.41
7	134	82	108±36.76	7	7	7±0
8	49	31	40±12.72	17	19	18±1.41
9	58	76	67±17.72	14	16	15±1.41
10	104	122	113±12.72	13	17	15±2.82
11	8	14	11±4.24	22	20	21±1.41
12	7	11	9±2.82	20	18	19±1.41
13	14	20	17±4.24	6	10	8±2.82
14	30	18	24±8.48	13	15	14±1.41
15	45	43	44±1.41	25	21	23±2.82
16	8	6	7±1.41	16	12	14±2.82
17	2	10	6±5.65	8	16	12±5.65
18	3	7	5±2.82	10	10	10±0
19	24	6	15±12.72	6	4	5±1.41
20	3	5	4±1.41	8	18	137.07
21	10	14	12±2.82	5	5	5±0
22	26	14	20±8.48	2	4	3±0.70
23	6	10	8±2.82	10	10	10±0
24	9	9	9±0	10	12	11±1.41
25	9	15	12±4.24	132	132	132±0

Table 3. Pearson correlation coefficients between physico-chemical parameters and *Vibrio* bacteria, before and after Hudhud cyclone (*Significatnt at p=0.05).

	Water Temperature	Salinity	Dissolved Oxygen	pH
Before	0.211.	-0.2241.	0.4517.*	0.2515.
After	0.1761.	-0.015.	0.645.*	0.2026.

20. Chen *et al.,* 2011 reported 2.5x10^3 cfu/ml of *Vibrio* bacteria in the Schenzen coastal waters of China during September 2011, which was relatively higher than the abundance of *Vibrio* bacteria recorded in the present study. An analysis of correlations indicated insignificant (p=0.05) negative correlations between surface salinity and *Vibrio* bacteria abundance. Temperature and pH of surface seawater revealed insignificant (p=0.05) positive correlations with *Vibrio* bacteria abundance.

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