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## Pathogenic vibrio spp in the cultured and wild *Penaeus monodon* (Fab)

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**Abstract**

Pathogenic *Vibrio spp* associated with wild and cultured *Penaeus monodon* were analysed. The survey along the South East Coast revealed that in the wild *P.monodon* was affected by predominantly by *V. parahaemolyticus* (20.93%). But in cultured *P.monodon*, *V. harveyi* was found to be the predominant pathogen (20%). Among the region surveyed for the wild *P.monodon*. Thirumullaivasal showed the highest rate of infection. But in cultured *P.monodon* Mallipattinum showed the highest rate of infection.

**Keywords:** shrimp, vibrio spp, black spot electron microscope

**Introduction**

Aquaculture has been a tradition in several parts of Asia. At present aquaculture is the world's fastest growing food production sector, with cultured shrimp and prawn as sub sector at an annual rate of 16.8% between 1984 and 1995 (Subasinghe *et al.*, 1998) [14]. *Penaeus monodon* is the most widely cultivated species due to its fairly fast growth rate under various pond management systems. It tolerates wide salinity level fluctuation environment lends itself domestication (Boonyarath, 1998) [3]. The most disease problems are caused by opportunistic pathogens which are present in environment and invade the immune compromised host, high bacterial loads noted in semintensive ponds prior to crop harvest are found to be associated with poor water quality, exaggerated by high ammonia, algal blooms and organic content in the bottom (Janakiram *et al.*, 2000). Most bacterial isolate from diseased Penaeid shrimp were *V.alginolyticus*, *V.parahaemolyticus*, *V.harveyi*, *V.splendidus*, *V.vulnificus* and *V. damsela* (Lightner, 1996) [11]. Numerous *Vibrio spp* have been reported as a causal agent of disease in various penaeid shrimp infection in *P.indicus* larvae (Prayitno and Latchford, 1995). Otta *et al.*, (1999) [12] studied the bacterial flora associated with shrimp culture ponds growing *P.monodon* in India. Rajeshwarishome and Soundararajani (1999) reported that the presence of luminous *V.harveyi* from *P.monodon* larvae reared hatcheries of Andaman. Kasornchandra *et al.*, (1998) used electron microscope and polymerase chain reaction in cultured Penaeid shrimp. Hence a survey has been made in the natural coastal system and cultured ponds of *P.monodon* along the South East Coast of Tamil Nadu.

**Materials & Methods**

The diseased *Penaeus monodon* were collected from the culture ponds and coastal system of South East Coast (Rameshwaram 9.17°N; 79.22° E to Cuddalore 11.43°N; 79.49°E) of Bay of Bengal. The samples were collected from the outbreak ponds. The samples were collected aseptically and were brought to the laboratory. In coastal system the samples were collected throughout the year (Jan 2016- Dec2016). But in culture ponds the samples were collected from 2 crop season (April- August 2016, October 201 to Dec 2016). The swab of exoskeleton were plated on Thiosulphate Citrate Bile Salt Sucrose (TCBS; Himedia; Mumbai pH 8.5 ± 0.2) agar and incubated at 37° C for 24hrs. After incubation the colour and morphology of the colony was observed. The isolates were subjected to Gram's staining and series of Biochemical batteries (Aneja, 1994) [2]. The results of biochemical tests were compared with Bergey's Manual of determinative Bacteriology (Holt *et al.*, 1994) and a set of keys for biochemical identification of environmental *Vibrios* (Alsina and Blanch, 1994) [1].

## Results

In the present analysis following observations were recorded. Survey along the coastal system showed that Thirumullaivasal region was found to be the highest rate of infected shrimp (Table I). The results of biochemical tests were compared with Bergey's manual of determinative Bacteriology (Holt *et al.*, 1994) [6] and a set of keys for Biochemical identification of environmental *Vibrio* spp (Alsina & Blanch 1994) [1] the isolates were characterized. The study revealed that *V.diazotrophicus* was found to be the predominant pathogen (20.93%) (Table II) and was following by *V.paraahaemolyticus* (18.6%). But the survey of the culture ponds revealed that Mallipattinum region (Table III) were severely affected by *Vibrio* spp which showed black spots on the ear space (fig 1). Among the isolates *V.harveyi* (Non luminous and luminous) was found to be the predominant pathogen (20.0%) and was followed by *V. cholerae* (13.6%) (Table IV). The study revealed that in the wild *P.monodon* *V.diazotrophicus* was the predominant pathogen but in the domestic system *V. harveyi* acted as the predominant pathogen. The Transmission electron microscopy revealed that the cytoplasm of the infected cell showed the presence of comma (rod) shaped bacteria (Fig2) with polar flagellum was observed.

**Table I:** Percentage of Infected Wild *P.monodon*.

Place	No. of animals observed	No. of bacteria infected animals	%
Adirampattinum	26	11	46.31
Cinnangudi	30	13	43.33
Maillipattinum	27	19	33.33
Nagapattinum	26	18	30.78
Nagore	28	14	50.00
Poombuhar	23	11	47.83
Rameshwaram	34	18	25.83
Tharangambadi	31	17	22.58
Thirumullaivasal	29	16	55.17
Velanganni	32	12	37.5

**Table 2:** Percentage of *Vibrio* Sp Isolated from *P.monodon* along the East Coast

<i>Vibrio</i> sp	Isolates	%
<i>V.alginolyticus</i>	2	4.65
<i>V.anguillarum</i>	4	9.30
<i>V.cholerae</i>	6	13.95
<i>V.diazotrophicus</i>	9	20.93
<i>V.fluvialis</i>	4	9.30
<i>V.furnissi</i>	2	4.65
<i>V.harveyi</i> (NL)	3	6.98
<i>V.mimicus</i>	5	11.63
<i>V.paraahaemolyticus</i>	8	18.6

**Table 3:** Percentage of infected Cultured *Penaeus monodon*

Place	No. of animals observed	No. of infected	%
Nagapattinum	27	11	40.7
Adirampattinum	30	12	40
Kattumavadi	35	13	37.1
Peravurani	37	13	35.1
Mallipattinum	45	38	84.44
Muthuoettai	37	24	64.86
Sethubavasathiram	35	23	65.71
Manora	32	16	50.00
Kottaipattinum	44	12	27.27
Nagore	34	10	29.41

**Table 4:** Percentage of *Vibrio* sp isolated from diseased *P.monodon* of Culture ponds

<i>Vibrio</i> sp	Isolate	%
<i>V.alginolyticus</i>	3	2.7
<i>V.anguillarum</i>	3	2.7
<i>V.campebelli</i>	1	0.9
<i>V.costicola</i>	5	4.5
<i>V.cholerae</i>	15	13.6
<i>V.diazotrophicus</i>	3	2.7
<i>V.fischeri</i> (Non luminous & luminous)	2	1.8
<i>V.fluvialis</i>	4	3.6
<i>V.furnissi</i>	6	5.4
<i>V.harveyi</i> (Luminous & non luminous)	22	20.0
<i>V.mediterranei</i>	6	5.4
<i>V.mimicus</i>	4	3.6
<i>V.ordalli</i>	4	3.6
<i>V.orientalis</i>	10	9.0
<i>V.paraahaemolyticus</i>	12	10.9
<i>V.salmonicida</i>	2	1.8
<i>V.splendidus</i> I	6	5.4
<i>V.splendidus</i> II	2	1.8
<i>V.vulnificus</i>	2	1.8

## Discussion

The results obtained from the present study showed that the *Vibrio* spp acting as an opportunistic and predominant pathogen. Otta *et al* (1999) [12] reported that the samples of East and West Coast of India showed the *Vibrio* count ranging from  $3.2 \times 10^2$  to  $7.0 \times 10^2$  cfu/ml. The luminescent count ranging from  $1.0 \times 10^1$  to  $7.0 \times 10^1$  cfu/ml in various samples. The water sample from West Coast showed the *Vibrio* count ranging from  $5 \times 10^1$  to  $2.8 \times 10^2$  and luminescent bacteria count ranging from undetectable levels to  $1.9 \times 10^2$  cfu/ml. *Vibrio* spp accounting more than 50% of the flora. In the present investigation on culture ponds showed that *V.harveyi* was found to be the predominant pathogen. Similar observation were recorded by Vanderberghe *et al* (1998) & Karunasagar *et al* (1996) [8]. Felix (2000) reported that *V.harveyi* appeared to be the major species isolated from Vibriosis in Thailand and Taiwan. In the *Vibrio* infected Chinese shrimp hatcheries out of 186 isolates of gram negative, 72 isolates were identified as *Vibrio* spp namely *V.alginolyticus* (32 strains) *V.harveyi* (21 strains), *V.inchlyoenterii* (1 strain) seven other vibrio groups were isolated and labeled according to the reference strain of cluster. The luminous bacteria dominate the *Vibrio* population of the shrimps hepatopancreas affected with disease (Leano *et al* 1998) [10].

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