

Fecal Coliform Bacteria Distribution in the Coastal Waters of Port Dickson

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Key words: Fecal coliform bacteria; Port Dickson; Malaysia.

ABSTRAK

Kajian tentang pengedaran bakteria koliforma najis di dalam air laut persisir Port Dickson telah dijalankan antara bulan Mac dan Ogos, 1984. Tujuh belas pusat yang jaraknya 17 km di antara pekan Port Dickson dan Blue Lagoon telah dipilih. Bilangan bakteria di kawasan dekat pekan adalah sangat tinggi, manakala di kawasan persisir iaitu 5-6 km dari pekan ini juga didapati agak tinggi. Pusat-pusat lain mempunyai bilangan bakteria kurang daripada 1000 MPN/100 ml semasa air pasang. Di antaranya, adalah kawasan-kawasan yang mempunyai bilangan bakteria yang sangat rendah dan kawasan-kawasan ini dijangkakan masih selamat untuk tujuan rekreasi.

ABSTRACT

The distribution of fecal coliform bacteria in the coastal waters of Port Dickson was studied between March and August, 1984. Seventeen sampling stations were selected between Port Dickson town and Blue Lagoon, which covered a distance of 17 km. Very high counts of the bacteria were detected closer to the town area and high counts were found up to 5-6 km along the coast from the town. The rest of the stations had counts below 1000 MPN/100 ml during high tide. Some of the areas contained very low counts and can be considered safe for recreational purposes.

INTRODUCTION

Sewage pollution is one of the major forms of pollution in Malaysia, especially along the coastal areas where the towns are located. It has been estimated that there are approximately one million pounds of BOD, derived from domestic sewage, discharged into the rivers and coastal waters daily (Maheswaran, 1982). High fecal coliform counts, detected in some areas, have rendered the water unsuitable for aquaculture and recreation (Owens, 1978; Law, 1980; Maheswaran, 1982; Law, 1983).

The beach along the coast of Port Dickson is a well known recreation beach in the west of Peninsular Malaya. It has been suspected that, besides oil pollution, the coastal waters of Port

Dickson are also vulnerable to sewage pollution. This is because, there is no proper sewage treatment system in this area as a result of which there are more than fifteen sewage pipes discharging directly into the coastal waters. Recently, numerous housing development projects along this coast have drawn public attention to the problem of contamination of the coastal waters with pathogenic bacteria through the increased discharge of sewage into the sea.

An investigation of the distribution of fecal coliform bacteria in the coastal waters of Port Dickson was initiated in early 1984 at the Faculty of Fisheries and Marine Science, Universiti Pertanian Malaysia. The aims of this study are to assess the level of sewage pollution and to establish a baseline level of fecal coliform bacteria in

the coastal waters of Port Dickson prior to the operation of the newly built hotels and condominiums in this area.

MATERIALS AND METHODS

Study Area

Seventeen sampling stations, which covered a distance of 17 km of the coast of Port Dickson, were established for this study (Fig. 1). They were visited four times between March and August 1984. There were more than fifteen sewage outfalls along this coastal area. Only those outfalls which were close to the sampling stations are shown in Fig. 1.

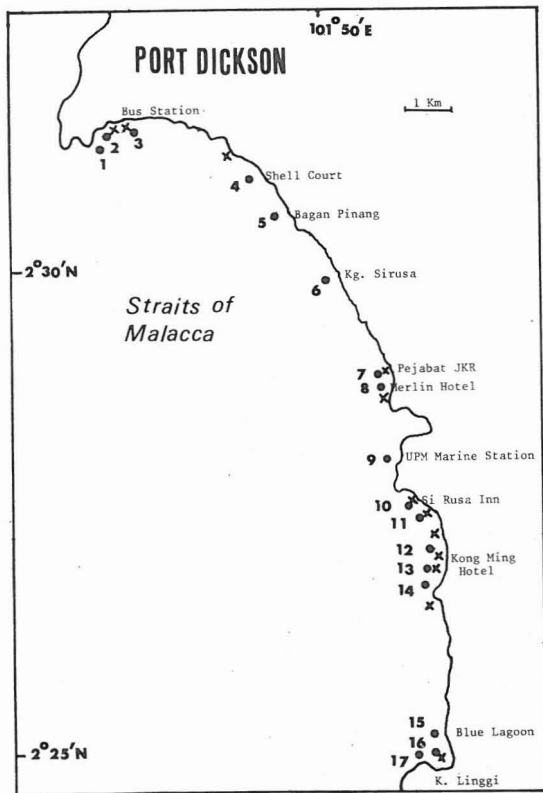


Fig. 1. Map showing the sampling stations (●) and the sewage outfalls (×) along the coast of Port Dickson.

Collection of Samples

At each station, a sampling point was established at a water depth of one meter. Water samples were taken at half a meter depth with a sterile 500 c.c. ZoBell sampler. At stations 7, 10, 11, 13 and 16, water samples were taken at about 3 meters from the sewage pipe outlet. All the samplings were done during high tide and all samples from the different stations were collected within an hour.

Fecal Coliform Enumeration

The five-tube most-probable number method (MPN) as described in WHO (1977) with incubation at 44.0°C was employed for the determination of fecal coliform levels in the water. Dilution and inoculation of water samples were performed at the field within two hours of sampling. Incubation was carried out at Universiti Pertanian Malaysia, Serdang, within three hours following inoculation.

RESULTS AND DISCUSSION

The most-probable number (MPN) of fecal coliform bacteria along the coastal water of Port Dickson on different sampling dates are shown in Table 1. The results showed very high fecal coliform counts in the harbour area (Station 1); the mean and range were 44,000 and 16,000 – 92,000 MPN/100 ml respectively. At the new bus station (Station 3), the counts were in the range of 2,400 – 3,400 MPN/100 ml. At stations 4 and 5, the counts were in the ranges of 200 – 800 MNP/100 ml and 200 – 1,100 MPN/100 ml respectively. Thereafter, low counts were detected in all the stations except for the coastal waters near Si Rusa Inn (Stations 10 and 11) and near Kong Ming Hotel (Stations 12, 13 and 14) where the counts ranged between 90 – 340 MPN/100 ml and 70 – 800 MPN/100 ml respectively. Very low counts of fecal coliform bacteria were found in the waters of Blue Lagoon (Stations 15, 16 and 17) where the counts were between < 20 and 130 MPN/100 ml.

The levels of fecal coliform bacteria in the waters of Port Dickson indicate a high level of

FECAL COLIFORM BACTERIA DISTRIBUTION IN THE COASTAL WATERS OF PORT DICKSON

TABLE 1
Distribution of fecal coliform bacteria (MPN/100 ml) in Port Dickson Coastal Waters
between March and August 1984

Station	Date	12/3/84	19/6/84	24/7/84	11/8/84
1		24,000	16,000	92,000	— ¹
2		1,700	1,400	—	—
3		2,400	3,300	3,400	—
4		800	790	200	—
5		1,100	200	230	—
6		200	—	<20	—
7		<20	<20	<20	—
8		<20	<20	<20	—
9		<20	<20	<20	20
10		200	330	270	—
11		130	340	90	—
12		—	270	200	—
13		630	800	200	200
14		—	450	70	—
15		<20	<20	130	<20
16		<20	<20	20	40
17		<20	<20	130	<20

	Time (hr)	Height (m)	Time (hr)	Height (m)	Time (hr)	Height (m)	Time (hr)	Height (m)
Tidal condition	0103	1.9	0407	1.0	0235	1.8	0130	0.9
	0716	1.2	1009	2.3	0907	0.9	0648	2.5
	1231	1.5	1635	0.7	1541	2.2	1318	0.4
	1950	0.7	2233	2.2	2226	1.2	1907	2.5

Sampling time (hr)	1200 – 1300	1000 – 1100	1300 – 1400	1450 – 1550
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¹Not determined.

sewage pollution in the town area extending to about 5 – 6 km down to the recreational beach (at Station 5). The MPN fecal coliform counts in this area were greater than the safety level of 1000 MPN/100 ml for swimming as recommended by WHO (1977). The rest of the beaches (Stations 6 to 17) are fairly safe for swimming during high tide, except that one should not swim too near a sewage outfall pipe where the

fecal coliform counts can be expected to be high from time to time.

High fecal coliform counts in the coastal waters of Port Dickson have been reported recently in the local press (The New Straits Times, 23rd, 24th and 25th May, 1984). However, these reports were mainly based on a limited number of assessments of fecal coliform levels

near the sewage outfall pipes during low tide. Obviously, much higher counts would be expected at low tide as there has been no dilution or inactivation of the sewage by the sea water. In the present study, however water samples were taken at about 3 meters from the sewage outfall during high tide. The levels of fecal coliform bacteria recorded in the samples would therefore reflect more accurately the impact of sewage in the immediate vicinity of the sewage outfall.

The waters between Stations 6 and 9, and also those of Blue Lagoon contained very low levels of fecal coliform bacteria. Presently the beaches at these points are the best for recreational purposes in Port Dickson. However, with rapid housing development in these areas, it will not be long before these beaches are also polluted by sewage. It is therefore necessary that the disposal of sewage in this recreation area be properly managed with sewer systems and careful selection of a point along the coast for the discharge of the treated sewage.

ACKNOWLEDGEMENT

We would like to express our thanks to the Faculty of Fisheries and Marine Science, Universiti Pertanian Malaysia for supporting this study. We also wish to express our thanks to Dr. Ian G. Anderson for his comments and suggestion, Encik Hashim Nazir for his technical help and Puan Badariah Mohd. Yusof for typing the manuscript.

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(Received 9 October, 1984)