

A COMPARATIVE STUDY ON SEWAGE POLLUTION IN
THE COASTAL WATERS OF PORT DICKSON, STRAITS
OF MALACCA AND TERENGGANU, SOUTH CHINA SEA

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THE COASTAL WATERS OF PORT DICKSON, STRAITS
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BY

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ABSTRACT

Recent active coastal zone development in Port Dickson and Terengganu may lead to some degree of sewage pollution in the aquatic environment.

Fourteen sampling stations were established for this study (4 stations in both Port Dickson and Terengganu coastal waters and 6 stations in Terengganu River estuary). In addition, three transects (beach, nearshore, offshore) were also established along the sampling stations in Port Dickson. There were three times visit to Port Dickson and Terengganu coastal stations and four times visit to Terengganu River estuary stations.

Fecal coliform bacterial counts in water and sediment, BOD₃, detergent, phosphate, alkalinity, total suspended solids and some hydrological parameters such as temperature, dissolved oxygen, pH and salinity in-situ were studied.

The mean fecal coliform bacterial counts were 11,924 MPN/100 ml, 213 MPN/100 ml, and 22 MPN/100 ml in Terengganu River estuary, Terengganu and Port Dickson coastal waters respectively. In sediments, the count in Port Dickson and Terengganu coastal waters were 0.30 MPN/gram and 2.65 MPN/gram respectively. The interim marine standard for fecal coliform bacterial count is 100 MPN/100 ml. Therefore, Terengganu River estuary water is grossly polluted by sewage. Dilution factor in the coastal waters has a significant influence on the bacterial count as well as on other pollutants such as detergent and BOD₃.

For the biodegradable organic pollution, the BOD values in Port Dickson and Terengganu coastal waters were 0.66 mg/L and 0.74 mg/L respectively if compared to the Terengganu River estuary, which had a mean value of 1.04 mg/L.

The mean detergent level detected in Port Dickson coastal waters was 0.044 ppm LAS. A mean value of 0.035 ppm LAS and 0.067 ppm LAS were found in the Terengganu coastal and Terengganu River estuary waters respectively.

The hydrological parameters data showed a very little fluctuation in all the study sites. The mean alkalinity level detected in the coastal waters of Port Dickson and Terengganu were 116.81 mg CaCO₃/L and 102.36 mg CaCO₃/L. Meanwhile, a mean alkalinity value of 16.67 mg CaCO₃/L was found in the Terengganu River estuary waters.

The levels of total phosphate in the coastal waters of Port Dickson and Terengganu were 0.577 µg-at P/l and 0.749 µg-at P/l respectively. In the Terengganu River estuary, the mean phosphate concentration was 0.849 µg-at P/l. The mean of dissolved organic phosphate in Terengganu River estuary, Port Dickson and Terengganu coastal waters were 0.718 µg-at P/l, 0.335 µg-at P/l, and 0.627 µg-at P/l respectively. These values were higher than the mean inorganic phosphate found in the same study area (0.131 µg-at P/l, 0.242 µg-at P/l, and 0.122 µg-at P/l respectively).

The total suspended solids (TSS) in the Terengganu River estuary ranged between 3.3 mg/L to 47.8 mg/L.

There was no correlation between the fecal coliform bacterial counts and the detergent, the total phosphate and the BOD₃ level. Similar phenomena were found between detergent and BOD₃ level, total phosphate and BOD₃ level, and detergent and total phosphate.

ABSTRAK

Pembangunan yang pesat di kawasan persisiran pantai Port Dickson dan Terengganu telah membawa kepada kesan pencemaran kumbahan dalam persekitaran akuatik.

Sebanyak empat belas stesen persampelan telah dikaji (4 stesen di kawasan persisiran Port Dickson dan Terengganu serta 6 stesen lagi di kawasan muara sungai Terengganu. Tambahan pula, tiga transek (pantai, tepi pantai, luar pantai) juga telah dikaji pada semua stesen kajian di Port Dickson. Sebanyak tiga kali penyampelan telah dilakukan di kawasan persisiran Port Dickson dan Terengganu. Sementara itu, empat kali penyampelan telah dibuat di kawasan sepanjang muara Sungai Terengganu.

Kelimpahan bakteria fecal coliform dalam air dan sedimen, BOD₃, detergent, fosfat, alkaliniti, bahan-bahan terampai dan beberapa parameter air seperti suhu, oksigen terlarut, pH dan saliniti in-situ telah dijalankan.

Nilai min untuk kelimpahan bakteria fecal coliform di muara sungai Terengganu, persisiran pantai Terengganu dan Port Dickson masing-masing adalah 11,924 MPN/100 ml, 213 MPN/100 ml, dan 22 MPN/100 ml. Sementara itu, nilai min untuk bakteria fecal coliform dalam sediment di kawasan persisiran Port Dickson dan Terengganu masing-masing adalah 0.30 MPN/gram and 2.65 MPN/gram. Nilai piawai untuk interim marin untuk kelimpahn bakteria fecal coliform ialah 100 MPN/100ml. Oleh itu, sungai

Terengganu mempunyai tahap pencemaran kumbahan yang paling teruk. Faktor pencairan di kawasan perairan persisiran pantai mempunyai kesan secara langsung terhadap kelimpahan bakteria fecal coliform dan juga bahan-bahan pencemar yang lain seperti detergen dan BOD₃.

Untuk pencemaran bahan-bahan organik, nilai BOD di kawasan perairan persisiran pantai Port Dickson dan Terengganu masing-masing adalah 0.66 mg/L dan 0.74 mg/L dan nilai di muara sungai Terengganu telah mencapai nilai setinggi 1.04 mg/L.

Nilai Min untuk detergent di kawasan perairan persisiran pantai Port Dickson adalah 0.044 ppm LAS dan kawasan perairan persisiran Terengganu dan muara sungai Terengganu masing-masing telah mencatatkan nilai 0.035 ppm LAS dan 0.067 ppm LAS.

Terdapat hanya sedikit perubahan pada parameter-parameter air dalam semua stesen kajian. Nilai min untuk paras alkaliniti di kawasan perairan persisiran Port Dickson dan Terengganu adalah 116.81 mg CaCO₃/L dan 102.36 mg CaCO₃/L. Di samping itu, nilai min adalah 16.67 mg CaCO₃/L di kawasan muara Sungai Terengganu.

Paras jumlah fosfat di kawasan perairan Port Dickson dan Terengganu masing-masing adalah 0.577 µg-at P/l and 0.749 µg-at P/l. Kepekatan jumlah fosfat di kawasan muara sungai Terengganu telah mencapai nilai 0.849 µg-at P/l. Untuk fosfat organik, kepekataannya di kawasan muara sungai Terengganu, persisiran Port Dickson dan Terengganu masing-masing mencatatkan nilai sebanyak 0.718 µg-at P/l, 0.335 µg-at P/l,

dan 0.627 $\mu\text{g-at P/l}$. Nilai-nilai ini adalah lebih tinggi daripada nilai min kepekatan fosfat bukan organik yang dikesan di kawasan kajian yang sama iaitu masing-masing adalah 0.131 $\mu\text{g-at P/l}$, 0.242 $\mu\text{g-at P/l}$, dan 0.122 $\mu\text{g-at P/l}$.

Jumlah bahan-bahan terampai di kawasan muara sungai Terengganu adalah berjangka dari 3.3 mg/L ke 47.8 mg/L.

Tiada korelasi antara kelimpahan bakteria fecal coliform dan detergen, jumlah fosfat dan paras BOD₃. Fenomena yang sama boleh diperolehi antara detergen dan paras BOD₃, jumlah fosfat dan paras BOD₃, detergen dan jumlah fosfat.