DISTRIBUTION OF FECAL COLIFORM AND *Escherichia coli (E. coli)* IN THE ESTUARIES AND COASTAL WATER OF KUALA TERENGGANU AND KUALA IBAI, TERENGGANU

NURUL SYAZANA BINTI YAHAYA

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NURUL SYAZANA BINTI YAHAYA

April 2013

Main Supervisor : **Assoc. Prof. Mohamed Kamil Bin Abdul Rashid, Ph.D.**

Co - Supervisor : **Ahmad Shamsudin Bin Ahmad, Ph.D.**

Mr. Yong Jaw Chuen, M. Sc.

Faculty : **Maritime Studies and Marine Science**

This study is conducted to evaluate the distribution of fecal bacteria counts including total coliform, fecal coliform and *E. coli* in the water, sediments and fishes of Kuala Terengganu, Kuala Ibai and coastal areas of Kuala Terengganu. Four sampling trips were conducted during July 2009, November 2009, December 2009 and May 2010 at 20 sampling stations. Fecal bacteria counts were estimated by using Multiple Test Tube Fermentation Analysis. Results of this study showed that during the second sampling (November 2009), 75% of the samples showed fecal bacteria counts exceeding the standard followed by 70% during first sampling, 50% during third sampling and lowest during fourth sampling with 40% of the samples exceeding the bacteria standard based on Water Quality Standards from Department of Environment Malaysia (DOE). Rainfall and tidal flow were the main factors affecting counts of fecal bacteria in ambient environment. Fecal bacteria counts in

water decreased during the high tide because of the effect of salinity. High fecal bacteria counts were detected during or after rainfall events. Fecal bacteria counts always peak after rainfall event, probably correlated with surface runoff. Moreover, survival of fecal bacteria including *E. coli* were much longer in estuarine sediments containing higher proportions of clay, organic matter, and nutrients compared to sandy sediment and seawater with low nutrient levels. High density of fecal coliform bacteria in water and sediments are responsible for higher density of these bacteria in fish guts. Based on the results from this study, three species of demersal fishes; *Arius maculates* (catfish), *Leiognathus sp.* (ponyfish) and *Lutjanus lutjanus* (big-eye snapper) and three species of benthopelagic fishes; *Osteochilus sp.* (bonylip barb), *Mene sp.* (moon fish) and *Mulloidichthys sp.* (goatfish) were recommended as fecal pollution indicator because fecal bacteria counts in stomach contents were correlated strongly with fecal bacteria counts in water and sediments. Based on water quality standard set by the DOE Malaysia, mean total coliform, fecal coliform and *E. coli* counts during all sampling periods exceeded the water quality standards. Hence, strict enforcement should be taken to prevent further deterioration in the water quality off these areas.

**TABURAN BAKTERIA KOLIFOM DAN *Escherichia coli (E. coli)* DI
KAWASAN PERAIRAN MUARA DAN PESISIR PANTAI KUALA
TERENGGANU DAN KUALA IBAI, TERENGGANU.**

NURUL SYAZANA BINTI YAHAYA

April 2013

Penyelia Utama : **Prof. Madya Mohamed Kamil Bin Abdul Rashid, Ph.D.**

Penyelia Bersama : **Ahmad Shamsudin Bin Ahmad, Ph.D.**

Mr. Yong Jaw Chuen, M. Sc

Fakulti : **Pengajian Maritim dan Sains Marin**

Kajian ini dijalankan untuk menilai tahap pencemaran bakteria najis termasuk
jumlah koliform, fecal koliform dan *E. coli* dalam air, tanah dan ikan di kawasan
Kuala Terengganu, Kuala Ibai dan perairan pantai Kuala Terengganu. Persampelan
telah dijalankan pada Julai 2009, November 2009, Disember 2009 dan Mei 2010
melibatkan 20 stesen persampelan. Tahap pencemaran bakteria najis telah
dianggarkan dengan menggunakan 'Multiple Test Tube Fermentation Analysis'.
Hasil kajian ini menunjukkan bahawa pada persampelan kedua (Nov 2009), 75%
daripada sampel melebihi piawai bakteria diikuti dengan 70% pada persampelan
pertama, 50% pada pensampelan ketiga dan terendah pada pensampelan keempat
dengan 40% daripada sampel melebihi piawai bakteria berdasarkan piawai kualiti air
dari Jabatan Alam Sekitar Malaysia (JAS). Jumlah bakteria najis di dalam air dan

tanah sentiasa tinggi semasa kejadian air pasang dan hujan. Jumlah bakteria najis menurun semasa kejadian air pasang yang mungkin disebabkan oleh pengaruh kemasinan. Jumlah bakteria tinggi semasa atau selepas kejadian hujan dan ia mungkin berhubung kait dengan air larian tanah. Selain itu, kemandirian hidup bakteria najis termasuk *E. coli* lebih tinggi di dalam tanah di perairan muara yang mengandungi perkadaran tanah liat, bahan organik, dan nutrien yang lebih tinggi berbanding dengan tanah berpasir dari perairan pantai dengan tahap nutrien yang lebih rendah. Kepadatan tinggi bakteria najis di dalam air dan tanah akan menyebabkan kepadatan yang tinggi juga di dalam ikan. Di dalam kajian ini, tiga spesis ikan demersal; *Arius maculates* (ikan duri), *Leiognathus sp.* (ikan kekek) dan *Lutjanus lutjanus* (ikan merah) dan tiga spesis ikan bentopelagik; *Osteochilus sp.* (ikan terbol), *Mene sp.* (ikan cermin) dan *Mulloidichthys sp.* (ikan biji nangka) dipilih sebagai penanda bakteria najis disebabkan hubungkait antara bakteria najis di dalam air dan tanah adalah kuat. Berdasarkan piawai daripada Jabatan Alam Sekitar Malaysia (JAS), jumlah koliform, koliform najis dan *E. coli* dalam semua tempoh persampelan melebihi piawai kualiti air. Oleh itu, penguatkuasaan yang ketat perlu dijalankan untuk mengelakkan kawasan ini bertambah buruk dengan pencemaran najis.

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