

THE EFFECT OF MONSOON ON THE DISTRIBUTION OF FECAL
COLIFORM AND *Escherichia coli* (*E. coli*) IN CULTURED OYSTERS
(*Crassostrea iridalei*), SURROUNDING WATERS AND SEDIMENTS
OF SETIU LAGOON, TERENGGANU,
SOUTH CHINA SEA

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FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU
2008

**THE EFFECT OF MONSOON ON THE DISTRIBUTION OF FECAL
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OF SETIU LAGOON, TERENGGANU,
SOUTH CHINA SEA.**

**By
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Dedicate this work to:

*My Beloved Father and Mother
Thank you for everything*



**JABATAN SAINS MARIN
FAKULTI PENGAJIAN MARITIM DAN SAINS MARIN
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PROJEK PENYELIDIKAN I DAN II**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: **The effect of monsoon on distribution of fecal coliform and *Escherichia Coli* (*E. coli*) in cultured oysters (*Crassostrea Iredalei*), surrounding waters and sediments of Setiu Lagoon, Terengganu, South China Sea** oleh **Mohd Sobri Amri Bin Mohd Noor**, bernombor matrik **UK12168** telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Marin sebagai memenuhi sebahagian daripada keperluan memperoleh Ijazah Sarjana Muda (Sains Samudera), Fakulti Pengajian Maritim dan Sains Marin, Universiti Malaysia Terengganu.

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LIST OF ABBREVIATIONS

AC	-	Activated Carbon
ANOVA	-	Analysis of Variance
APHA	-	American Public Health Association
CS	-	Chromogenic Substrate
DO	-	Dissolved Oxygen
DOE	-	Department of Environment
DOM	-	Dissolved Organic Material
<i>E. Coli</i>	-	<i>Escherichia coli</i>
EC	-	Enterococci
FC	-	Fecal Coliform
g	-	Gram
GAD	-	Glutamate Decarboxylase
GPS	-	Global Positional System
ha	-	Hectare
H ₃ PO ₄	-	Phosphoric Acid
INWQS	-	Interim National Water Quality Standard
KH ₂ PO ₄	-	Potassium Dehydrogenate Phosphate
MF	-	Membrane Filtration
mg.L ⁻¹	-	Milligram per liter
mL	-	Milliliter
MPN	-	Most Probable Number

NaCl	-	Sodium Chloride
ONPG	-	Positive Beta-galactosidase Reaction
pH	-	Potential of Hydrogen
ppt	-	Part per Thousand
PSP	-	Paralytic Shellfish Poisoning
spp.	-	Species
TC	-	Total Coliform
Triton X-100	-	T-octylphenoxypoly-ethoxyethanol
WHO	-	World Health Organization
WQI	-	Water Quality Index
°C	-	Degree Celsius
°F	-	Degree Fahrenheit
%	-	Percentage

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ABSTRACT

This study was carried out to study the levels of fecal contamination in Setiu Lagoon and the monsoon effects as well as to determine whether the cultured oysters in the lagoon are safe for human consumption. Three sampling trips were conducted which were on 8th September 2007 (Southwest Monsoon), 21st October 2007 (Inter-Monsoon) and 29th December 2007 (Northeast Monsoon). Six sampling stations were established around the oyster cages in the lagoon. Total coliform, fecal coliform and *Escherichia coli* (*E. coli*) counts in surrounding waters, sediments and cultured oysters (*Crassostrea iredalei*) were estimated by using Multiple Test Tube Fermentation Method. The enumeration of positive fecal coliform bacteria was made by referring to the Most Probable Number (MPN) chart. Mean for the total coliform, fecal coliform and *E. coli* counts in the surrounding waters of Setiu Lagoon were 30.667 MPN.100mL⁻¹, 165.167 MPN.100mL⁻¹ and 90.167 MPN.100mL⁻¹ respectively. The mean of total coliform, fecal coliform and *E. coli* counts in the sediments were 1.072 MPN.g⁻¹, 9.472 MPN.g⁻¹ and 5.044 MPN.g⁻¹ respectively. Then, mean for the total coliform, fecal coliform and *E. coli* counts in the oysters were 8.511 MPN.g⁻¹, 14.572 MPN.g⁻¹ and 7.317 MPN.g⁻¹ respectively. The presence of total coliform, fecal coliform and *E. coli* in the surrounding waters and sediments around oyster cages of Setiu Lagoon indicates that the lagoon has been contaminated by domestic sewage effluent but these current study shows that, the level of *E. coli* are still within the safety level for aquaculture and safe for human consumption. Even then, a proper management should be taken to maintain a healthy environment quality for future use.

ABSTRAK

Kajian ini dijalankan bertujuan untuk menilai tahap pencemaran bahan buangan najis ke dalam lagun Setiu mengikut monsun dan juga ingin menentukan sama ada tiram yang ditenak di lagun itu adalah selamat untuk dimakan. Kerja persampelan dilakukan sebanyak tiga kali iaitu pada 8 September 2007 (Monsun barat daya), 21 Oktober 2007 (Pertengahan monsun) and 29 Disember 2007 (Monsun timur laut). Enam stesen telah dipilih di sekeliling sangkar tiram. "Multiple Test Tube Fermentation Method" telah digunakan untuk menentukan bilangan coliform, fecal coliform dan bakteria *Escherichia coli* (*E. coli*) ke atas sampel air sekitar sangkar, sampel sedimen dan tiram (*Crassostrea iredalei*) di lagun tersebut. Bagi penentuan bilangan coliform, fecal coliform dan bakteria *E. coli* yang positif, keputusan ini akan dirujuk kepada carta MPN. Nilai purata untuk bilangan coliform, fecal coliform dan bakteria *E. coli* dalam air untuk ketiga-tiga penyampelan ialah $30.667 \text{ MPN.100mL}^{-1}$, $165.167 \text{ MPN.100mL}^{-1}$ dan $90.167 \text{ MPN.100mL}^{-1}$. Selain itu, bagi penyampelan sadimen, nilai purata untuk bilangan coliform, fecal coliform dan bakteria *E. coli* ialah 1.072 MPN.g^{-1} , 9.472 MPN.g^{-1} dan 5.044 MPN.g^{-1} . Nilai purata untuk bilangan coliform, fecal coliform dan bakteria *E. coli* bagi tiram ialah 8.511 MPN.g^{-1} , $14.572 \text{ MPN.g}^{-1}$ dan 7.317 MPN.g^{-1} . Kesimpulannya, kehadiran bilangan coliform, fecal coliform dan bakteria *E. coli* di dalam sampel air dan sedimen yang berhampiran sangkar tiram menunjukkan bahawa lagun Setiu telah dicemari oleh sisa-sisa kumbahan. Walau bagaimana pun, kajian ini telah membuktikan bahawa tahap bilangan coliform untuk aktiviti-aktiviti akuakultur serta tahap bakteria *E. coli* masih lagi dibawah tahap selamat dan tiram di lagun Setiu masih lagi selamat untuk dimakan.