

**SPECTRAL DISCRIMINATION OF CORAL REEF BENTHIC
COMMUNITIES IN BIDONG ISLAND**

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**SCHOOL OF MARINE SCIENCE AND ENVIRONMENT
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Spectral discrimination of coral reef benthic communities in Bidong Island

By

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**Research Report submitted in partial fulfillment of
the requirements for the degree of
Bachelor of Science (Marine Biology)**

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DECLARATION AND VERIFICATION REPORT

FINAL YEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled Spectral discrimination of coral reef benthic communities in Bidong Island by Mohamad Abdul Wafi Bin Selamat Matric No. UK25170 have been examined and all errors identified have been corrected. This report is submitted to the School of Marine Science and Environment as partial fulfillment towards obtaining the Degree Marine Biology, School of Marine Science and Environment, Universiti Malaysia Terengganu.

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LIST OF ABBREVIATIONS

Rrs	-	remote- sensing reflectance
R	-	spectral reflectance
Ed	-	downwelling irradiance
Lu	-	upwelling radiance
Hz	-	hertz
m	-	meter
nm	-	nanometer
DFA	-	discriminant function analysis

ABSTRACT

Coral reefs are the marine ecosystems that important in world's ocean. Coral reefs are under risk rate due to increasing of environmental and anthropogenic stress. Determining a subset of wavelength that best discriminate benthic communities is important for the development of remote sensing. The spectral reflectance data has the potential to be applied in remote sensing imagery and for mapping properties. The spectral reflectance of coral reef benthic communities was recorded using the underwater hyperspectral instrument of Satlantic HyperOCR. In- situ upwelling and downwelling data were collected for four substrates of Bidong Island benthic communities. Underwater spectral measurement ranging from 350 to 800 nm were taken at 1 meter above the substrate using a underwater hyperspectral (satlantic hyperOCR spectroradiometer). Spectral reflectance and derivative dataset were process using a stepwise discriminant function analysis to determine the best discriminating wavelength for each substrate. The green visible wavelength (520-560 nm) has the potential for discriminating the benthic communities because it exhibits the spectral reflectance with greater differences in magnitude. Results showed that major reflectance features of benthic types can be identified by two distinctive peaks at 551 and 585nm. Stepwise wavelength selection shows that benthic communities can be well-distinguished using the derivative dataset as compared to their spectral reflectance characteristic. The data also can be used to compare with other studies that measure the spectral reflectance of same type of benthics.

Diskriminasi panjang gelombang pada kumpulan bentik batu karang di Pulau Bidong

ABSTRAK

Terumbu karang adalah ekosistem marin yang penting di laut dunia. Terumbu karang berada dalam keadaan berisiko disebabkan peningkatan tekanan daripada alam semula jadi dan kegiatan manusia. Penilaian untuk panjang gelombang bagi setiap bentik adalah penting untuk digunakan dalam “remote sensing”. Data untuk setiap spectrum boleh digunakan untuk pemetaan sesuatu objek atau perubahan. Penilaian pantulan spektrum antara komuniti bentik terumbu karang telah direkodkan menggunakan pengukuran Hiperspektra. In- situ “Upwelling” and “downwelling” dikumpul untuk empat contoh bentik di Pulau Bidong. Ukuran untuk pantulan spectrum adalah dalam kadar 350-800 dimana bacaan diambil daripada 1 meter di atas substrat menggunakan Hiperspektra air (satlantic hyperOCR spectroradiometer). Pantulan spektrum dan dataset untuk derivatif adalah proses yang menggunakan fungsi analisis diskriminasi (DFA) langkah demi langkah untuk menentukan panjang gelombang yang terbaik untuk membezakan setiap substrat Pulau Bidong, Terengganu. Panjang gelombang dikawasan hijau (520-560 nm) berupaya untuk membezakan kumpulan bentik kerana ia menunjukkan pantulan cahaya yang mempunyai magnitud paling tinggi. Keputusan menunjukkan semua ciri-ciri pantulan pada semua jenis bentik boleh diketahui dengan dua puncak yang tersendiri pada 551 dan 585 nm. Langkah demi langkah dalam pemilihan panjang gelombang menunjukkan kumpulan bentik boleh dibezakan dengan baik menggunakan data terbitan (derivative) berbanding data pantulan spectrum. Data yang diambil boleh digunakan untuk perbandingan dengan kajian yang lain pada bentik yang sama.