CORAL ECOLOGY OF A UNIQUE CONTINENTAL ISLAND OF PULAU PERAK, KEDAH, MALAYSIA

AFFENDI YANG AMRI

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Abstract

Coral reef research in Peninsular Malaysia has mainly been concentrated on the east coast with little emphasis on the Straits of Malacca (SOM) in the west coast. The coral reefs in SOM are extremely important, more so than their east coast counterparts due to the fact that they are only a few viable coral reef ecosystems in SOM. In the northern part of SOM stands Pulau Perak, an island which has underwater vertical reef walls. Pulau Perak reef walls are unique compared to other continental islands in Peninsular Malaysia which have typical fringing reefs. In addition the scientific knowledge of reef wall coral ecology is scarce. Therefore the present study had two objectives aimed to address this knowledge gap. For the first objective a belt-quadrat method on vertical transects with 5m intervals was used from 0 - 45 m depth. The results showed significant differences between East and West reef wall benthic community substrate cover and their coral growth-forms along the depth gradient. On the East Wall similar 'Live Coral' cover and coral growth-forms indicated that the this wall had an analogous environment from the surface of the water until to the depths of 45 m. Whereas for the West Wall, 'Live Coral' cover was found to be less in deeper depths of 30-45m ($p<0.001$) and dominance of coral growth-forms changed with depth. These differences are speculated to be due to the orientation of the wall to sunlight and its quality.

For the second objective, a modified Reef Check method with horizontal transects were used to document the benthic community substrate cover at Shallow (10 m) and Deep (20 m) depths for six distinct facing reef walls. Pulau Perak is found to be pristine as 7 out of 12 reef areas surveyed (1 Shallow and 6 Deep) were above the mean coral cover value of 42.2% for islands on the east coast of Peninsular Malaysia. Nevertheless Shallow area coral cover ranged from 'poor'(23.8%) to 'good' (56.9%) and for Deep areas they ranged from 'poor' (16.9%) to 'good' (64.4%). The results also show significant differences between the six walls around the island with regards to their

orientation to sunlight and depths. Three reef walls (East, West and North Walls) have significantly different substrate cover between Shallow and Deep areas. The reason for this is uncertain but the orientation of the walls to available sunlight is hypothesized to be an important factor. Only the West Wall has a ‘Hard Coral’ cover difference ($p<0.01$) where the Shallow area having a lower percentage cover which could have been caused by physical damage from constructing a jetty. Cluster dendrograms using ‘Hard Coral’ cover shows that the Shallow reef wall areas are divided into North and South groups whereas the Deep reef wall areas were divided into three groups which are firstly East Wall and South-east Wall, secondly North Wall and thirdly North-west Wall and West Wall. The grouping shows similar results from Objective 1 where there is a difference between East and West Walls and it is hypothesised that the shadow of the island itself cuts off the high quality light of the morning sunlight which leads to the differences in their light quality. Possible reasons for the differences between reef walls which included several physical factors such as sea water temperature, hydrodynamics, upwelling and in particular light quality are discussed. The hypothesis that the orientation of the reef walls to sunlight is the main factor affecting their substrate cover is to be tested in future studies. A comprehensive sustainable development plan to conserve the island reef walls is recommended.

Abstrak

Kajian terumbu karang di Semenanjung Malaysia tertumpu kepada perairan pantai timur berbanding kepada Selat Melaka (SM) di pantai barat. Walau bagaimanpun terumbu karang di SM lebih penting dari terumbu di pantai timur kerana hanya terdapat beberapa kawasan terumbu karang yang masih baik di sini. Di bahagian utara SM terdapat sebuah pulau yang dinamakan Pulau Perak yang sekelilingnya terdiri dari dinding tegak dibawah air. Dinding ini membentuk formasi terumbu 'reef walls'. Dimana 'Reef walls' Pulau Perak unik berbanding terumbu biasa 'fringing reefs' di pulau-pulau Semenanjung Malaysia yang lain. Tambahan pula, pengetahuan mengenai ekologi batu karang pada 'reef wall' amat sedikit di dalam penulisan saintifik. Untuk mengisi sebahagian dari ruang pengetahuan tersebut, kajian ini mempunyai dua objektif. Objektif pertama adalah mengkaji litupan komuniti substrat bentik pada dinding Timur dan Barat mengikut profil kedalaman dari 0 m hingga 45 m. Kaedah yang digunakan adalah kaedah 'belt-quadrat' diatas transek menegak bagi setiap 5m. Zonasi komuniti bentik dan morfologi batu karang di sepanjang gradien kedalaman 'reef walls' didapati berbeza diantara dinding Timur dan Barat. Dinding Timur mempunyai litupan 'Live Coral' dan morfologi batu karang yang hampir sama dari 0 - 45 m dan ini menunjukkan tiada perubahan signifikan pada keadaan persekitarannya walaupun sehingga kedalaman 45 m. Manakala bagi dinding Barat, litupan 'Live Coral' didapati semakin berkurangan terutama pada kedalaman 30 - 45m ($p<0.001$) dan kedominan morfologi karang berubah mengikut kedalaman. Pelbagai perbezaan antara dinding ini mungkin kerana orientasi dinding kepada cahaya matahari dan juga kualiti cahaya. Bagi objektif kedua, transek melintang digunakan untuk melihat perbezaan (jika ada) pada litupan komuniti bentik diantara kedalaman 'Shallow' (10 m) dan 'Deep' (20 m) pada enam dinding yang mempunyai orientasi berbeza disekeliling pulau. Kualiti terumbu karang Pulau Perak didapati amat baik dimana 7 dari 12 kawasan yang dikaji (1 'Shallow' dan 6 'Deep')

melebihi purata litupan batu karang 42.2% bagi pulau-pulau di pantai timur Semanjung Malaysia. Walau bagaimanapun litupan batu karang bagi kawasan ‘Shallow’ adalah dari ‘poor’ (23.8%) ke ‘good’ (56.9%) manakala bagi kawasan ‘Deep’ ianya dari ‘poor’ (16.9%) ke ‘good’ (64.4%). Hasil kajian menunjukkan pelbagai perbezaan signifikan antara keenam-enam dinding pulau jika orientasi kepada chaya matahari dan kedalaman di ambil kira. Tiga ‘reef walls’ (Timur, Barat dan Utara) mempunyai litupan substrat yang berbeza mengikut kawasan ‘Shallow’ dan ‘Deep’. Faktor penyebab tidak diketahui tetapi orientasi dinding kepada cahaya matahari mungkin menjadi faktor utama. Hanya dinding Barat mempunyai perbezaan litupan ‘Hard Coral’ ($p<0.01$) dimana kawasan ‘Shallow’ mempunyai peratusan litupan yang lebih rendah yang mungkin kerana kerosakan dari pembinaan sebuah jeti. Menggunakan litupan ‘Hard Coral’, cluster dendrograms menunjukkan bahawa kawasan ‘Shallow reef wall’ terbahagi secara umumnya kepada kumpulan Utara dan Selatan manakala bagi kawasan ‘Deep reef wall’ ianya terbahagi kepada tiga kumpulan iaitu pertamanya dinding Timur dan dinding Tenggara, keduanya dinding Utara dan ketiga adalah dinding Barat Laut dan dinding Barat. Kumpulan kawasan ini adalah mirip keputusan Objektif 1 dimana terdapat perbezaan antara dinding Timur dan Barat. Ini mungkin disebabkan oleh bayang dari pulau sendiri yang mengurangkan kualiti cahaya matahari waktu pagi dan seterusnya menyebabkan perbezaan kualiti cahaya antara dinding. Perbezaan di antara ‘reef walls’ mungkin disebabkan oleh beberapa faktor termasuk faktor fizikal seperti suhu air laut, hidrodinamik, ‘upwelling’ dan terutama sekali kualiti cahaya. Semua faktor ini diteliti dan dibincangkan. Hipotesis orientasi ‘reef walls’ kepada cahaya matahari sebagai faktor utama mempengaruhi litupan substratnya perlu diuji didalam kajian dimasa hadapan. Satu pelan komprehensif pembangunan mampan untuk memelihara ‘reef wall’ pulau adalah dicadangkan.

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