THE IMPACT OF MARINE PROTECTED AREAS TO THE FISH STOCK: CASE STUDY IN PULAU PAYAR, KEDAH

By

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ABSTRACT

Malaysia has established Marine Protected Area or Marine Parks since 1984 to alleviate the problem of low fishery catches due to overfishing. Since its establishment, it is not known whether the marine parks are performing as expected, as there were lack of information available on the productivity status of fish and coral reef in the MPAs. One of the main concerns regarding MPAs are their effectiveness on preventing the ongoing loss of biodiversity. Thus, the study sought to identify the impact of MPAs in increasing the fish stock in Pulau Payar. This study also want to identify the relationship between the independent variables that impact the total fish stock. Secondary data was collected from the Fisheries Department of Kedah and Department of Marine Park Kedah. The method of analysis using the Ordinary Least Square (OLS) criterion to estimate the parameters of the total fish stock in Pulau Payar. Regression results showed that variables such as number of violators getting caught, number of visitors, number of visitors doing scuba diving and government allocation had significant effect to the total fish stock. Policy implication such as implementing more education and awareness programme, enforcing Marine Park regulations, establishing monitoring and evaluation programmes were proposed.

ABSTRAK

Malaysia telah menubuhkan Kawasan Perlindungan Marin atau Taman Laut sejak tahun 1984 untuk mengurangkan masalah jumlah tangkapan ikan yang rendah kerana penangkapan ikan yang berlebihan. Sejak penubuhannya, ia tidak diketahui sama ada MPAs dapat melaksanakan fungsinya seperti yang dijangkakan, kerana terdapat kekurangan maklumat mengenai status produktiviti ikan dan batu karang di kawasan MPAs. Salah satu daripada kebimbangan utama mengenai MPAs ialah keberkesanannya mencegah kehilangan biodiversiti yang berterusan. Oleh itu, kajian ini bertujuan untuk mengenal pasti kesan MPAs dalam meningkatkan stok ikan di Pulau Payar. Kajian ini juga ingin mengenal pasti hubungan antara pembolehubah bebas yang memberi kesan kepada jumlah stok ikan. Data sekunder dikumpulkan dari Jabatan Perikanan Kedah dan Jabatan Taman Laut Kedah. Kaedah analisis Kuasa Dua Terkecil (OLS) digunakan untuk menganggarkan parameter jumlah stok ikan di Pulau Payar. Keputusan regresi menunjukkan bahawa pembolehubah seperti jumlah penceroboh yang ditangkap, jumlah pengunjung, jumlah pelawat yang menjalankan aktiviti menyelam dan peruntukan kerajaan mempunyai kesan yang besar kepada jumlah stok ikan. Implikasi polisi seperti melaksanakan lebih banyak program pendidikan dan kesedaran, menguatkuasakan peraturan-peraturan Taman Laut, mewujudkan program-program pemantauan dan penilaian telah dicadangkan.

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CHAPTER 1

INTRODUCTION

1.0 Background

Marine Protected Areas (MPAs) are essential for biodiversity conservation. They are areas set aside to maintain the functioning of natural ecosystems, to act as refuges for marine species and to maintain ecological processes that cannot survive in most intensely managed landscapes and seascapes.

A marine park is a sea area zoned as a sanctuary for the protection of marine ecosystems especially coral reef and its associated flora and fauna, like the sea grass bed, mangrove and the seashore (Hiew, 2000). Protecting special biological and environment values have been the main objectives behind the establishment of marine parks in the country. However, due to open access to marine park resources and failure of the market system in restricting their use, over-used and environmental degradation have resulted. The degradation of marine parks might affect the sustainability of ecotourism in the future while the market failure is associated with users not paying the full costs of using the natural resources in the marine parks. Thus it is possible that the park may be subjected to excessive use, overcrowding and biological degradation. The high level of usage may result in conflicts between users, the social and biological carrying capacity, limits of acceptable changes and potential environmental degradation.

In the long run, Malaysia has committed itself into transforming 10percent of its marine areas into marine parks by the year of 2020 (Malaysian Marine Park Unit,

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REFERENCES

Adjaye, A.J., and Tapsuwan, S. (2008). "A contingent valuation study of scuba diving benefits: case study in Mu Ko Similan Marine National park, Thailand". Tourism Management, doi:10.1016/j.tourman.2008.02.005.

Ahmad, S. A. (2009). Visitors willingness to pay for an entrance fee: a case study of marine parks in Malaysia. *Retrieved from PHD Thesis*. Department of Economics Faculty of Law, Business and Social Science. University of Glasgow.

Aikanathan, S. & Wong, E. (1994). Marine park island management conceptual plan for Peninsular Malaysia. *WWF Project Report*. Department of Fisheries Malaysia and the World Wide Fund for Nature (WWF) Malaysia, Kuala Lumpur.

Balmford, A., Gravestock, P., Hockley, N., McClean, C. J. & Roberts, C. M. (2004). The worldwide costs of marine protected areas. *PNAS* 101(26): 9694-9697.

Barker N.H.L. & C.M. Roberts. (2004). Scuba diver behavior and the management of diving impacts on coral reefs. *Biological Conservation*. 120:481-489.

Bigot. L, Chabanet. P, Charpy.L, Conand.C, Quod J.P, Tessier.E. (2000). Definition and distribution of the coral reefs. Chantal Conand, *ECOMAR*.

Bryant, D., Burke, L., McManus, J., & Spalding, M. (1998). Reefs at risk: A map-based indicator of threats to the world's coral reefs. *World Resource institute.* Washington.

Chadwick, D. (1999). Coral in Peril. *National Geographic*, 196(1), 30-38.

Christie, P. (2004). Marine Protected Areas as biological successes and social failures in Southeast Asia. *American Fisheries Society Symposium*. 42:155-164.

Costanza, R. & C. Folke. (1997). Valuing ecosystem services with efficiency, fairness and sustainability as goals. *In: Nature's Services: Societal Dependence on Natural Ecosystems, G.C. Daily (ed.).* 49-68. Washington.

Coral Reef Information System, CoRis (2005). What are corals and coral reefs. /http://www.coris.noaa.gov/about/what_are/S; accessed June 2004.

Crowder, L.B., Lyman, S.J., Figueira, W.F., Priddy, J. (2000). Source-sink population dynamics and the problem of sitting marine reserves. *Bulleti of Marine Science*. 66 (3): 799-820.

Davis, B., & Moretti, G. (2005). Enforcing United States Marine Protected Areas: Synthesis Report. *National Marine Protected Area Center*.

De Silva, M.W.R.N. & Rahman, R.A. (1982). Coral reef of Pulau Payar/Segantang group of islands, Kedah, Malaysia. Universiti Pertanian Malaysia.

Department of Fisheries Malaysia. (2000). " Pulau Payar Marine Park," Ministry of Agriculture, Malaysia. Kuala Lumpur.

Dunlop, E.S., Baskett, M.L., Heino, M., & Dieckmann, U. (2009). Propensity of marine reserves to reduce the evolutionary effects of fishing in a migratoryspecies. *Evolutionary Applications* 2: 371-393.

Garrabou, J. Sala, E., Arcas, A., Zabal, M. (1998). "The impact of diving on rocky sublittoral communities: a case study of a bryozoan population". *Conservation Biology*. 12 (2), 302-312.

Gell, F.R. and C.M. Roberts. (2003). Benefits beyond boundaries: the fishery effects of marine reserves. *Trends in Ecology and Evolution*. 18: 448-455.

Gjertsen, H. (2005). Can habitat protection lead to improvements in human well-being: evidence from marine protected areas in the philippines. *World Development.* Vol. *33*, No. 2, pp. 199–217.

Goreau, T.F. Goreau, N. I. & Goreau, T. J. (1979). Corals and coral reefs. *Scientific American*.124-136.

Hawkins, J.P. & C. Roberts (1993). Effects of recreational diving on coral reefs. *Journal of Biological Conservation*. Cited in Wells & Price.

Harriot, V.J., Davis, D., Simon.A., (1997). recreational diving and its impact in Marine Protected Areas in Easthern Australia. *Royal Swedish Academy of Sciences.*

Hiew, K. (1996). The Marine Parks of Malaysia: objectives, current issues and initiatives (draft). *Paper presented at the Workshop on Impact Management in Marine Parks*, 13 & 14 August 1996, Kuala Lumpur.

IUCN (1997). Economic values of protected areas: guidelines for protected area managers. *WPCA, IUCN*.Gland, Switzerland.

Inglis, Graeme J., Johnson, Victoria I., & Ponte, F. (1999). "Crowding norms in marine settings: a case study of snorkeling on the great barrier reef".*Journal of Environmental management*. 369 – 381.

Johnson, D.R., Funicelli, N.A., & Bohnsack, J.A. (1999). Effectiveness of an existing estuarine no-take fish sanctuary within the Kennedy space center, Florida. *North American Journal of Fisheries Management*. 19: 436-453.

Jones, J.B. (1992). Environmental impact of trawling on the seabed: A review. *N.Z. J. Mar. Fresh. Res.* 26:59-67.

Kenchington, R., Ward, T., and Hegerl, E. (2003). The benefit of Marine Protected Areas. *Commonwealth Department of Environment and Heritage*. Australia.

Laurel, B. & Bradbury, I.(2006). Big concerns with high-latitude MPAs: Trends in connectivity and MPA size. *Canadian Journal of Fisheries and Aquatic Science* 63 (12): 2603-2607.

Lesser, M. P. (2004). "Experimental biology of coral reef ecosystems". *Journal Of Experimental Marine Biology and Ecology*. 217-252.

Lim, L.C. (1996). "Tourism, pollution and the marine environment in Malaysia". *WWF Project Report*. WWF Malaysia , Petaling Jaya.

Lim, L.C. (1997) "Carrying capacity assessment of pulau payar marine park". *WWF Project Report* MYS341/96, WWF Malaysia, Kuala Lumpur.

Lundquist, C.J, & Granek, E.F. (2005). Strategies for successful marine conservation: integrating socioeconomic, political, and scientific factors. Conservation Biology. 19 (6): 1771-1778.

Kolm, N., & Berglund, A. (2003). "Wild populations of a reef fishsufferfrom the "nondestructive" aquarium trade fishery".*Conservation Biology* 17(3), 910-914.

Malaysian Marine Park Unit. (2011). Laporan Tahunan Jabatan Taman Laut Malaysia. Creative Energy. Department of Marine Park Malaysia. Putrajaya.

Man, Alias (2008). Assessment of coral reef fish population at Pulau Payar Marine Park and adjacent waters [QH541.5.C7 A398 2008 f rb]. *PhD thesis*,. Universiti Sains Malaysia.

Markham, A., N. Dudley & Stolton, S. (1993). Some like it hot. *WWF International*.

Najib. (2002). "Marine Parks Malaysia: Current status and prospect of marine protected areas in peninsular malaysia". *Proceedings of IUCN/WCPA-EA-4 Taipei Conference*. March 18-23, 2002, Taipei, Taiwan.

Plathong, S., Graeme, J., Inglis, & Michael, E. (2000). Effect of self-guided snirkeling trails on corals in a tropical marine park. *Department of tropical Environment Studies and Geography*. James Cook University, Townsville. Australia.

Planter, M. & Pina, C.M. (2008). Fees for Reefs: Economic instruments to protect Mexico's Marine Natural Areas. *Current Issues in Tourism*. 8:2-3, 195-213.

Polunin, N.V.C. & Roberts, C.M.(1993). Greater biomass and value of target coral-reef fishes in two small Caribbean marine reserves. *Marine EcologyProgress Series*.100: 167-176.

Quinn, R.J.,Almeda, L., Guymer, G., Hooper, J.N.A. (2002). "australia biodiversity via its plants and marineorganisms: a high-throughput screening approach to drug discovery". *Pure Applied Chemistry*, 74, 519 – 526.

Roberts, C.M. & N.V.C. Polunin. (1992). Effects Of Marine Reserve protection on northern red sea fish populations. *Proceedings of the Seventh International Coral Reef Symposium. Vol. 2*.

Robert, C.M, Bohnsack, J.A, Gell, F., Hawkins, J.P., & Goodridge, R. (2001). Effects of Marine Reserves on adjacent fisheries. *Science Journal*. 294:1920-1923.

Roberts, C.M., Mason, L., & Hawkins, J.P. (2006). Roadmap to recovery: A global network of marine reserves. University of York.

Roberts, C.M. & Hawkin, J.P. (2000). Fully-protected marine reserves: A Guide, Washington: *WWF*.

Rogers, C.S., Garrison, G., McLain, L., & Zullo, E. (1988). Damage to coral reefs in Virgin Island National Park and Biosfere Reserve from recreational Activities. *Proceedings of the VI International Coral Reef Symposium. Townsville (U.H. Choat, eds)*. International Coral Reef Symposium Executive Commitee, Townsville, pp: 405-441

Rouphael, A.B. & Inglis, G.J. (2001). "Take only photographs and leaveonly footprints?: an experimental study of the impacts of underwater photographers on coral reef dive sites". *Biological Conservation,* 100, 281-287.

Russ, G.R. & Alcala, A. C. (1996). Marine reserves: rates and patterns of recovery and decline of large predatory fish. *Ecological Applications* 6(3): 947-961.

Selig E.R., Bruno J.F. (2010). A global analysis of the effectiveness of marine protected areas in preventing coral loss. *PLoS ONE* 5(2): 1-7.

Schmidt, K.F. (1997). 'No-Take' zones spark fisheries debate. *Science Journal*. 277: 489-491.

Sorokin, Y.I. (1993).Coral reef ecology, *Springer-Verlag*.New York.

Sumaila, U.R., Guénette, S., Alder, J., & Chuenpagdee. R. (2000). Addressing ecosystem effects of fishing using marine protected areas. *ICES Journal of Marine Science*. 57: 752-760.

United Nation Environment Programme, (UNEP), (2001), *Annual Evaluation Report.* Evaluation and Oversight Unit. Washington.

Walters, C. (2000). Impacts of dispersal, ecological interactions, and fishing effort dynamics on efficiency of marine protected areas. *Bulletin of Marine Science*. 66(3): 745-757.

Wells, S.M., & Price, A.R.G. (1992). Coral reefs - valuable but vulnerable.*WWF International Discussion Paper.*

White, A.T., Vogt, H.P, & Arin, T. (2000). Philippine coral reef under threat: the economic looses caused by reef destruction. *Marine Pollution Bulletin*. 40(7), 598-605.

Williams. (1998). Carrying capacity management in tourism settings: *a tourism growth management process*. Simon Fraser University.

Woodman, George H. Willson, S.C., Li, V. Y., Renneberg, R. (2003). "Acoustic characteristics of fish bombing:potential todevelop an automated blast detector".*Marine Pollution Bulletin*. 99 – 106.

Worm, B., Barbier, E.B. N., Beaumont, J.E., Duffy, C., Folke, B.S., Halpern, J.B.C., Jackson, H.K., Lotze, F., Micheli, S.R., Palumbi, E., Sala, K.A., Selkoe, J.J., Stachowicz, & Watson, R. (2006). Impacts of biodiversity loss on ocean ecosystem services. *Science* 214: 787-790.

Zaidnuddin, I. & Forbes, R.(2000). Sea cucumbers Of Pulau Payar, Kedah Marine Park Islands. *In Proceedings of National Symposium on Pulau Payar MarinePark.*

http://www.dmpm.nre.gov.my/