

**ENVIRONMENTAL AND RESOURCE
MANAGEMENT PLAN FOR THE PROPOSED
TUN MUSTAPHA PARK (TMP),
SABAH, MALAYSIA**



ROBECCA JUMIN

UMS
UNIVERSITI MALAYSIA SABAH

**BORNEO MARINE RESEARCH INSTITUTE
UNIVERSITI MALAYSIA SABAH
2015**

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MANAGEMENT PLAN FOR THE PROPOSED
TUN MUSTAPHA PARK (TMP),
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ROBECCA JUMIN



**THIS IS SUBMITTED IN FULFILLMENT FOR
THE DEGREE OF DOCTOR OF
PHILOSOPHY**

**BORNEO MARINE RESEARCH INSTITUTE
UNIVERSITI MALAYSIA SABAH
2015**

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DECLARATION

I hereby declare that the material in this thesis is my own except for quotations, excerpts, equations, summaries and references, which have been duly acknowledged.

22 March 2015

Robecca Jumin
P020088364



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CERTIFICATION

NAME : **ROBECCA JUMIN**

MATRIC NO : **P020088364**

TITLE : **ENVIRONMENTAL AND RESOURCE MANAGEMENT
PLAN FOR THE PROPOSED TUN MUSTAPHA PARK
(TMP), SABAH, MALAYSIA**

DEGREE : **DOCTOR OF PHILOSOPHY (MARINE SCIENCE)**

VIVA DATE : **10 JULY 2015**

DECLARED BY;



1. SUPERVISOR

Professor Dr. Saleem Mustafa

Signature

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2. CO-SUPERVISOR

Dr. Ramzah Dambul

ACKNOWLEDGEMENTS

My PH.D. journey has been an interesting one, and as I conclude this journey, I would like to express my sincere gratitude to the following organisations and people:

My employer, WWF-Malaysia, for allowing me the use of data obtained from the Kudat PCA/TMP Project, which has been the basis of this thesis, and to Sabah Parks for sharing the additional data for this study. WWF-US Russell E. Train Fellowship for the funding support for my training and research. The University of Queensland Decision Team and extended members, who has been very generous with their knowledge, expertise, time and support, throughout the long TMP planning process.

My supervisors: Prof. Dr. Saleem, I am indebted to you for your willingness to come in as my supervisor half-way through, for your support, and encouragement to complete this thesis on time. Dr. Mabel Manjaji-Matsumoto, and Dr. Ramzah Dambul – thank you for your continued support despite being out of the country. It truly is a digital world now. Dr. Mabel, I appreciate working with you on fisheries in TMP. Dr. Carissa Klein, it is a privilege working with you on ocean zoning for TMP. I have learned so much and am inspired to continue learning and improved in this field through applied application.

The University of Queensland's team, Prof. Hugh Possingham, Dr. Carissa Klein, Dr. Maria Berger, Jennifer McGowan, Dr. Chris Brown, Dr. Hedley Grantham, Matthew Watts. It is indeed a privilege working with all of you.

To my colleagues at WWF-Malaysia, I appreciate all the encouragement and support. I would like to particularly thank Sikula Magupin - you are the GIS guru and now the Marxan guru as well, I truly appreciate working with you on zoning for TMP. To my Sabah Parks colleague, Augustine Binson, thank you for sharing your knowledge and hope for TMP.

To my family, thank you for understanding that sometimes I have to prioritise this over family commitment. I am blessed to have you as my support team.

Rebecca Jumin
22 March 2015

ABSTRACT

The proposed Tun Mustapha Park (TMP) is located in the northern region of Sabah, Malaysia. The intention to gazette TMP was approved by the Sabah State Government in March 2003 with three management goals: i) to conserve marine biodiversity; ii) to enable sustainable development; and iii) to alleviate poverty of coastal villagers. The ecosystem approach used in the management of the proposed TMP will require the development of an integrated management plan that will be able to fulfill multiple management objectives. The process to design the zoning plan for the proposed TMP forms the basis of this Ph.D. study. The overall aim of this study is to assess the conservation planning process and the use of numerical optimization tool to achieve two Marine Protected Area (MPA) objectives, i.e. biodiversity conservation and fisheries management objectives, in a stakeholder driven MPA design process. This is achieved through four main group of work: i) analysis and synthesis of data from a community survey conducted in 2006-2007; ii) identify and map key habitats that form the key conservation features of- TMP through review and verification of existing information; iii) analyse and synthesise fisheries data to establish status of fisheries, management issues and important fishing areas, and iv) design and develop draft zoning plan for the proposed TMP. The design process combined both use of systematic conservation planning tool, Marxan with Zones, and stakeholder consultation to design and revise the draft zoning plan. A suite of biophysical and socioeconomic decision principles were developed by multiple stakeholders in order to help address the more general management goals of TMP. Where possible, these goals were used to guide the Marxan with Zones analysis, to identify priority areas for four different zones: i) Preservation, ii) Community-use, iii) Multiple-use, and iv) Commercial fishing. Two main types of data were collected from scientific surveys and local knowledge and used in Marxan with Zones: i) conservation features, including habitat and species data; and ii) cost features, including the location of villages and fishing effort. TMP was divided into four regions to address the biophysical design principles, and a target of at least 30% of each habitat in each region was represented in the preservation zone. Fishing is an important component of TMP. A large number of its communities depend on coastal fisheries for their subsistence and small scale operation for livelihood. Impacts on the fishing community of TMP were minimized through maintenance of access to fishing grounds. A target of at least 70% of small scale fishermen's fishing grounds (within 3 nautical miles from the shore) in either Community Use (CU) or Multiple Use (MU) zones was set to ensure that traditional and non-destructive fishing practices could continue. The output of this process is a draft zoning plan for TMP that was used in the consultation process for stakeholder input into the designing process.

ABSTRAK

PENGURUSAN ALAM SEKITAR BAGI TAMAN CADANGAN TAMAN TUN MUSTAPHA (TTM), SABAH, MALAYSIA

Taman Cadangan Taman Tun Mustapha (TTM) terletak di kawasan wilayah utara Sabah, Malaysia. Niat untuk mewartakan TTM telah diluluskan oleh Kerajaan Negeri Sabah pada Mac 2003 dengan tiga objektif pengurusan iaitu: i) untuk memulihara kepelbagaian hidupan marin; ii) untuk membolehkan pembangunan sumber yang mapan; dan iii) untuk mengurangkan kemiskinan di kalangan penduduk persisir pantai. Pendekatan secara ekosistem yang akan digunakan dalam pengurusan TTM akan memerlukan pembentukan pelan pengurusan terintegrasi yang akan dapat memenuhi pelbagai objektif pengurusan di TTM. Proses untuk merekabentuk pelan penzonan TTM membentuk asas kepada kajian Ph.D. ini. Matlamat utama kajian ini adalah untuk menilai proses perancangan pemuliharaan dan penggunaan alat pengoptimuman berangka untuk mencapai dua objektif kawasan perlindungan marin, iaitu objektif untuk pemuliharaan kepelbagaian hidupan dan juga objektif pengurusan perikanan, di dalam proses rekabentuk yang didorong oleh pihak berkepentingan. Ini akan dicapai melalui empat kumpulan kerja: i) analisa dan sintesis data dari kajian komuniti yang dijalankan pada tahun 2006-2007; ii) mengenalpasti dan membentuk peta habitat utama yang membentuk fitur pemuliharaan utama bagi TTM melalui ulasan dan pengesahan data sedia ada; iii) analisa dan sintesis data perikanan untuk menubuhkan status perikanan, isu-isu perikanan serta kawasan perikanan yang penting; dan iv) merekabentuk dan menubuhkan draf pelan penzonan untuk taman cadangan TTM. Proses untuk merekabentuk TTM menggabungkan penggunaan kaedah perancangan pemuliharaan sistematik, Marxan with Zones, dan konsultasi dengan pihak berkepentingan, untuk merekabentuk draf pelan penzonan TTM. Prinsip-prinsip biofizikal dan sosio-ekonomi dibentuk oleh pihak berkepentingan untuk membantu pencapaian matlamat am TTM. Di mana yang mungkin, matlamat-matlamat ini digunakan untuk memandu analisa Marxan with Zones, untuk mengenalpasti kawasan keutamaan untuk empat kawasan zon yang berlainan: i) Perlindungan, ii) Kegunaan komuniti, iii) Pelbagai kegunaan, dan iv) perikanan komersil. Dua jenis data telah dikumpulkan melalui kajian saintifik dan pengetahuan tempatan, dan digunakan dalam proses Marxan with Zones : i) ciri-ciri konservasi, termasuk data habitat dan spesies, dan ii) fitur kos, termasuklah kedudukan kampung serta usaha perikanan. TTM telah dibahagikan kepada empat kawasan untuk mencapai prinsip-prinsip rekabentuk biofizikal, dan sasaran 30% bagi setiap habitat termasuk dalam kawasan zon perlindungan. Perikanan merupakan satu komponen yang penting di TTM. Sebahagian besar penduduknya bergantung kepada perikanan persisir pantai untuk kegunaan sendiri dan sebagai sumber pendapatan. Kesan kepada nelayan di TTM diminimakan melalui pengendalian akses kawasan perikanan. Sasaran 70% kawasan perikanan nelayan kecil (di dalam kawasan 3 batu notika dari persisir pantai) di dalam zon Penggunaan Komuniti dan Zon pelbagai guna telah ditetapkan untuk memastikan amalan perikanan tradisi dan perikanan mesra alam boleh diteruskan. Hasil daripada proses ini merupakan draf pelan penzonan untuk TTM yang digunakan diteruskannya dalam proses konsultasi dengan pihak berkepentingan untuk mendapatkan input kepada draf sistem zon TTM.

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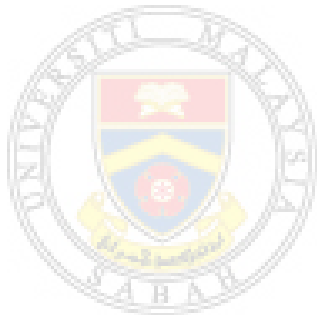


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LIST OF ABBREVIATION

ADB	-	Asian Development Bank
CBD	-	Convention on Biological Diversity
CF	-	Commercial Fishing
CM	-	Community Managed
COP	-	Conference of Party
CPUE	-	catch per unit of effort
CTI-CFF	-	Coral Triangle Initiative for Coral Reef, Fisheries and Food security
CTMPAS	-	Coral Triangle Marine Protected System
CU	-	Community Use
DOF	-	Department of Fisheries
ECFZ	-	East Coast Fishing Zone
FAD	-	Fish Aggregation Device
FAO	-	Fisheries and Agriculture Organisation
GIS	-	Geographical Information System
GPS	-	Geographical Positioning System
GRT	-	Gross Registered Tonnage
ICJ	-	International Court of Justice
ISC	-	Interim Steering committee
IUCN	-	International Union for Conservation of Nature
KDM	-	Kadazan Dusun Murut
MarZone	-	Marxan with Zone
MPA	-	Marine Protected Area
MU	-	Multiple Use
NTZ	-	No Take Zone
PCA	-	Priority Conservation Area
PZ	-	Preservation Zone
RRA	-	Rapid Rural Appraisal
SCTR	-	State of the Coral Triangle Report
SIMCA	-	Sugud Islands Marine Conservation Area

SSME	-	Sulu Sulawesi Marine Ecoregion
TIHPA	-	Turtle Islands Heritage Protected Area
TSMP	-	Tun Sakaran Marine Park
TWG	-	Technical Working Group
TWG3	-	Technical Working Group 3
UMS	-	Universiti Malaysia Sabah
UN	-	United Nations
UNCED	-	United Nations Conference on Environment and Development
UNCLOS	-	United Nations Convention on the Law of the Sea
UNEP	-	United Nations Environment Programme
WSSD	-	World Summit on Sustainable Development



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CHAPTER 1

ENVIRONMENTAL MANAGEMENT AND MARINE PROTECTED AREA

1.1 Introduction

Marine ecosystems are threatened by human activities on the land and the sea (Halpern *et al.*, 2008). Coupled with growing human populations and economies, these activities are causing increasing amounts of overfishing (Jackson *et al.*, 2001; Lotze *et al.*, 2006; Worm *et al.*, 2009), pollution (Vitousek *et al.*, 1997, Syvitski, *et al.*, 2005), habitat modification and degradation (Halpern *et al.*, 2008; Burke, *et al.*, 2011). Fishing is currently the most important threats at the global level affecting marine biodiversity. Fishing activities lead to species loss through targeted catch, by-catch and habitat degradation due to use of destructive fishing methods (e.g. trawler, fish bombing). Further, climate change is negatively impacting marine ecosystems through changes in sea level and temperature (Jackson *et al.*, 2001 Hughes *et al.*, 2003; Hoegh-guldberg *et al.*, 2007), and increasing uptake of carbon dioxide (CO₂) by seawater that leads to ocean acidification (Hoegh-Guldberg *et al.*, 2007; Anthony *et al.*, 2008; Fabry *et al.*, 2008). Protection of marine and coastal resources is urgently required, especially in places that rely on marine and coastal natural resources for their livelihoods.

In response to the growing threats to marine ecosystems, numerous local, national, and international initiatives have been set up to establish Marine Protected Areas (MPAs). For example, the Convention on Biological Diversity (CBD) set a target of representing 10% of marine areas in a protected area by 2020 (United Nations, 1992). Marine Protected Area is gaining importance as a tool to provide protection from important threats such as fishing and habitat degradation (Russ *et al.*, 2004; Selig and Bruno, 2010). However, fishing and other uses of marine resources are also often seen as a conflict to MPAs (Oracion, Miller, and Christie, 2005). This is

especially when the MPA is designated as a fully protected area where no extractive activities are allowed. However, MPAs are also evolving and there are various categories of MPAs (Day *et al.*, 2012) including multiple use MPA (IUCN Category VI). Network of MPAs are also being established to address threats to biodiversity (IUCN-WCPA, 2008). Ocean zoning, a component of marine spatial planning, is also being used to accommodate multiple conflicting and compatible uses of the ocean, including conservation (Crowder *et al.*, 2006). Therefore, this can be an approach for an MPA to be able to achieve multiple objectives, including biodiversity conservation, fisheries resource management and sustainable development.

1.2 Marine Management through Marine Protected Area

The concerns for the increasing threats to the marine ecosystem and the declining quality of biodiversity and marine resources have led to the political initiatives for the development of MPA. It started in the 70's when in 1972, the Stockholm declaration was achieved where the United Nations Conference on the Human Environment pledged to protect representative examples of major terrestrial, marine and freshwater ecosystems (UNEP, 2015a). Subsequently, in 1982, the United Nations General Assembly adopted the World Charter for Nature, which adopted principles to protect nature and promote international cooperation in this field (United Nations, 1982).

In 1992, at the UN Conference on Environment and Development (UNCED), held in Rio de Janeiro, the CBD was signed (and was ratified in 1993) where the principle of *in situ* conservation through systems of protected areas in order to protect ecosystems and habitats, and maintain viable populations of species, was adopted. However, at this stage the reference to systems of protected areas was not specific to marine biodiversity (UNEP, 2015b). The Agenda 21 for Sustainable Development was also introduced and adopted at the UNCED 1992.

At the CBD second Conference of Party (COP2) meeting in Jakarta, in 1995, the Jakarta mandate was declared which include a mandate on the conservation and sustainable use of marine and coastal biological diversity (UNEP, 1997). This mandate on conservation of marine biodiversity focused on commitment to develop a global