ASSESSMENT OF INVERTEBRATES AS ECOTOURISM PRODUCT FOR TABIN WILDLIFE RESERVE, SABAH

AK. MOHD RAFIQ BIN AK. MATUSIN

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INSTITUTE FOR TROPICAL BIOLOGY AND CONSERVATION
UNIVERSITI MALAYSIA SABAH
2015

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THESIS SUBMITTED IN PARTIAL FULFILLMENT
FOR THE DEGREE OF MASTER OF SCIENCE

INSTITUTE FOR TROPICAL BIOLOGY AND CONSERVATION
UNIVERSITI MALAYSIA SABAH
2015

DECLARATION

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

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ACKNOWLEDGEMENT

Assalamua'laikum W.B.T. A blessing gratitude to the Almighty Allah for His great favours and blessings bestowed upon me spiritually and physically to finish my master study and thesis writing successfully. Empower me when the moment I fell down and guiding me whenever I lost.

Foremost, I would like to express my sincere gratitude to my supervisor Dr. Fiffy Hanisdah Saikim for the continuous support of my master degree research, for her patience, motivation, enthusiasm and immense knowledge. Her guidance helped me in all the time of research and writing of this thesis. I could not have imagined having a better supervisor and mentor for my master research.

My sincere thanks also go to Assoc. Prof. Dr. Norazah Mohd Suki, one of the supervisory committee member of my research for her encouragement, insightful comments and leading me working on diverse exciting research.

I would like to thank to Dr. Mahadimenakbar Mohammed Dawood, my supervisory committee member and ITBC Postgraduate coordinator for inspiring guidance, constructive criticism and advice during the research work.

Furthermore, I would also like to acknowledge with much appreciation the crucial role of the staffs of Tabin Wildlife Resort that give permission to complete my research sampling and data collection, Institute for Tropical Biology and Conservation and Labuan Faculty of International Finance for help me to use all required equipment and necessary materials to complete my research analysis and thesis writing.

A special thanks to my beloved family, to my father Mr. AK. Matusin Bin AK. Ibrahim and to my mother, Mdm Rositah Binti Asman which both of them have spent such uncountable effort and support for my study and for all of the sacrifices that they have made on my behalf. Your prayer have sustained me so far. I would also like to thank all my friends, especially Mr. Noor Aliff Yasser, who always supporting me and incentive me to strive towards my goal.

AK. Mohd Rafiq Bin AK. Matusin
September 2015

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ABSTRACT

This study was conducted in Tabin Wildlife Reserve (TWR), Lahad Datu, Sabah with a general objective to urge effective ways to increase invertebrate's conservation effort through ecotourism activity. Specifically, three objectives were posited in this study, namely, to determine the response of tourist to the concept of including such invertebrates information in current ecotourism activities, to obtain an overview of the current levels of the inclusion of invertebrates information in certain types of ecotourism activities and to provide recommendations on how to address the lack of invertebrate information in ecotourism. Therefore, mixed methods approaches were applied which comprised Participation and Observation of TWR guided walk, Invertebrate's Record and Preliminary Entotourism Course and Survey. Alternately, a conceptual framework was proposed in this study which comprised five variables overall (Activity, Information, Willingness, Interest and Ecotourism). SPSS and AMOS analysis utilising Structural Equation Modelling (SEM) were used for quantitative data analysis, while Leximancer was used to analyse the qualitative data. SEM analysis of the questionnaire survey divulged that 65% variance of *Ecotourism* was well expounded by all four exogenous variables. Meanwhile, Leximancer analysis revealed six dominant themes which representing the perceptions of tourists to the inclusion of invertebrate in the ecotourism activities, in turn, this Leximancer finding used to support and strengthen the SEM findings. Consequently, the findings of this study are important to contribute to the literature of species conservation awareness in Sabah in which there are only few researches conducted specifically on the entotourism field. It would also contribute to the management and policy making of Sabah's tourism master plan in terms of introducing a new tourism product for Sabah as well as enhance the sustainability of ecotourism operators and encourage the competitiveness in the tourism industry. Lastly, these research findings are able to broaden the scope of ecotourism activities that would help to minimize the negative impacts of tourism that stressing more on the already endangered species.

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ABSTRAK

PENILAIAN TERHADAP INVERTEBRATA SEBAGAI PRODUK EKOPELANCONGAN UNTUK RIZAB HIDUPAN LIAR TABIN, SABAH

Kajian ini dijalankan di kawasan Rizab Hidupan Liar Tabin, Lahad Datu, Sabah dengan objektif umum untuk mencadangkan kaedah yang efektif untuk meningkatkan usaha pemuliharaan invertebrata melalui aktiviti ekopelancongan. Terdapat tiga spesifik objektif iaitu: untuk mengenalpasti respon pelancong terhadap konsep melibatkan informasi invertebrata di dalam aktiviti semasa ekopelancongan, untuk mengetahui secara menyeluruh tahap aktiviti semasa yang melibatkan informasi invertebrata di dalam aktiviti ekopelancongan tertentu dan untuk menyediakan pelan cadangan untuk mengatasi masalah kekurangan informasi invertebrata di dalam ekopelancongan. Kaedah gabungan digunakan untuk mendapatkan maklumat yang penting di dalam kajian ini iaitu, Penyertaan dan Pemerhatian aktiviti berjalan kaki yang ditawarkan oleh Resort Hidupan Liar Tabin, Merekod Senarai Invertebrata dan Aktiviti Entopelancongan dan Kaji Selidik (soal selidik dan temubual). Oleh itu, satu set konsep rangka kerja telah dicadangkan yang dilaksanakan berdasarkan paradigma pragmatisme. Perisian SPSS dan AMOS yang melibatkan Structural Equation Modelling (SEM) digunakan untuk analisis data kuantitatif, manakala perisian Leximancer digunakan untuk analisis data kualitatif. Analisis SEM bagi kajian soal selidik menunjukkan empat pemboleh ubah tidak bersandar mempengaruhi varians ekopelancongan sebanyak 65%, manakala, analisis Leximancer mempamerkan enam tema dominan yang mewakili respon pelancong terhadap konsep entopelancongan yang mana keenam-enam tema ini digunakan untuk menyokong dan menguatkan hasil dapatan analisis SEM. Hasil dapatan dari kajian ini adalah penting untuk menyumbangkan literasi kesedaran spesies pemuliharaan di Sabah yang mana hanya sebilangan kecil kajian yang memfokuskan bidang entopelancongan telah dilaksanakan. Selain itu, hasil dapatan kajian ini turut memberi sumbangan kepada pengurusan dan pembuatan kebijakan pelan induk pelancongan Sabah dari aspek pengenalan produk pelancongan baru di Sabah serta meningkatkan kelangsungan pengendali ekopelancongan dan menggalakkan daya saing di dalam industri pelancongan. Akhir sekali, dapatan kajian ini mampu memperluaskan skop aktiviti ekopelancongan yang mana dapat mengurangkan impak negatif pelacongan yang memberi tekanan terhadap spesies yang terancam.

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LIST OF ABBREVIATIONS

AMOS	-	Analysis of Moment Structure
AVE	-	Average Variance Extracted
CFA	-	Confirmatory Factor Analysis
CFI	-	Comparative Fit Index
CR	-	Composite Reliability
CR	-	Critical Ratio
EFA	-	Exploratory Factor Analysis
IUCN	-	International Union for Conservation Nation
NFI	-	Normed Fit Index
PCFI	-	Parsimony Comparative Fit Index
PNFI	-	Parsimony Normed Fit Index
RMSEA	-	Root Mean Square of Error Approximation
SE	-	Standard Error
SEM	-	Structural Equation Modelling
SPSS	-	Statistical Package for Social Sciences
TWR	-	Tabin Wildlife Reserve

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LIST OF SYMBOLS

R^2	-	Squared Multiple Correlations
β	-	Beta Coefficient
P	-	Significant Value
km	-	Kilometre
am	-	Ante Meridiem
pm	-	Post Meridiem
%	-	Percentage
st	-	First
A$	-	Australia Dollar
US$	-	United State Dollar
X^2	-	Mean
df	-	Degree of Freedom

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CHAPTER 1

INTRODUCTION

1. 1 Background of Study

Generally, this study was conducted in order to make an assessment of invertebrates as ecotourism product for Tabin Wildlife Reserve, Lahad Datu, Sabah with the main aim to urge effective ways to encourage invertebrate conservation effort especially through ecotourism activity.

At first, Hambler and Canney (2013: 46) defined conservation as a protection of wildlife from irreversible harm. This wildlife includes all non-domestic species and populations of plants, microorganisms and animals including invertebrates. In addition, the fundamental goal of conservation is to save species and this requires a comprehensive understanding of what species are, thus, it will affects the way we manage and conserve it (Rojas, 1995: 35), which in practice, this study was mainly focusing on invertebrates species.

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Invertebrates are generally known to be a dominant group of animals on Earth today. They are enormously outnumbered to all other terrestrial animals and also occurred practically everywhere (Triplehorn and Johnson, 2005: 23). Indeed, Kumar and Asija (2004: 29) suggested that every species of invertebrate has their own importance in the ecosystem and extremely valuable to humans welfare. Hence, it brings the idea and opportunity in this study to raise the invertebrate species in term of its importance in ecosystem functioning and conservation into ecotourism field.

The term ecotourism was emerged in the late 1980s as a direct result of the world's acknowledgement of sustainable and global ecological practices (Diamantis, 1999: 93). Importantly, ecotourism has been embraced by many developing

countries which are home to many of the world's rare and threatened species (Brooks, Franzen, Holmes, Grote and Borgerhoff, 2006: 1528). Indeed, many of the protected areas are overwhelmingly dominant setting for ecotourism activity recently (Weaver, 2008: 8) including Malaysia.

Geographically, Malaysia possessed approximately 15,000 biodiversity of floras and faunas which boasts abundant of ecotourism products (Johanna, Abang, Jati, Lenny and Zubaidah, 2014: 39), in which the main attractions of Malaysia to visitors are including wildlife, scenery, forest and beaches (Hossain, Siwar, Ismail and Islam, 2011: 561).

Besides that, ecotourism sectors in Malaysia are mostly oriented based on the rainforests and reefs which most of the attentions are focus on Sabah and Sarawak. Biophysically, Sabah and Sarawak are advantaged by the presence of superlative natural attractions such as Orang Utan, Rafflesia flower, Mount Kinabalu, Sipadan Island and Mulu Cave System (Weaver, 2008: 281).

Alternately, the state government of Sabah applied conservation efforts and programs on biodiversity very seriously. There are more than 50% of the state's lands are under natural forest and more than 10% areas are gazetted and protected as parks, sanctuaries and reserves such as Kinabalu Park, Danum Valley Conservation Area, Maliau Basin, Lower Kinabatangan Wildlife Sanctuary and Tabin Wildlife Reserve (Chong, 2004: 39).

Specifically, Tabin Wildlife Reserve (TWR) was gazetted in 1984 under the Forest Enactment 1968 and classified as a Class VII Forest Reserve. This reserve is rich with biodiversity and TWR existence is part of the Sabah State Government's effort to protect and preserve wildlife especially large mammals such as Sumatran Rhinoceros (Sabah Wildlife Department, 2015). Besides that, TWR is also popular with ecotourism activities such as viewing Borneo Pygmy elephants, Tembadau and birds (Sabah Tourism, 2015).

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Therefore, it raises a new opportunity and challenges in this study to augment invertebrates as new ecotourism product especially in Tabin Wildlife Reserve that currently only focusing on mammals and birds, in turn, this concept would encouraging the invertebrate conservation effort generally.

1.2 Problem Statement

The main problem embraced in this study suspecting that there was no inclusion of invertebrate information in current ecotourism activity especially in Tabin Wildlife Reserve (TWR) since this reserve only focusing on mammals and birds. In fact, this phenomenon not just occurred in TWR but prevalent to ecotourism industry in which wildlife such as mammals and birds were become main attraction in most places of ecotourism venues around the world (Ponder and Lumney, 1999: 224).

This invertebrates exclusion then will affect their conservation efforts overall, at the same time, stressing more on already endangered animals. Nevertheless, invertebrate conservation is hard to justify when many people see each insect as a potential of pest or health threat. Without the dissemination of right information, people tend to disregard invertebrates as important for ecosystem functioning or as in need of protection (Martín-López, Montes and Benayas, 2007: 67).

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Therefore, this study was carried out in order to assess the invertebrates as a new ecotourism product for TWR, consequently, help to disseminate the crucial invertebrate information especially their roles in ecosystem functioning to the tourists and public generally. Thus, it will justify the reasons of invertebrate conservation strategies (Matthews and Boltz, 2012: 107).

In addition, this study was executed empirically by applying the ecotourism as the platform and means to increase the awareness to comply the invertebrate conservation efforts. In fact, the aim to raise tourist's awareness on conservation have been made as the main theme in many ecotourism activities in order to encourage tourists to comply with the pro-conservation practices while participating in the experience (Ballantyne, Packer and Hughes, 2009: 659).

Besides that, the enrolments of invertebrate in ecotourism have been described in many entomological fields (Hutchins, 2003: 133). For instance, there is ecotourism activity in Mexico which offering a tour to view the spectacle of the annual migration of millions of Monarch Butterflies (Bohm, Kemp, Baillie and Collen, 2012: 16). Thus, this type of holistic thinking suggests the inclusion of invertebrate information in ecotourism activities, in turn, increase the support of invertebrate conservation (Huntly, Noort and Hamer, 2005: 54).

Henceforth, the role ecotourism plays in encouraging the invertebrate conservation elucidates a strong support and potential to include the invertebrate information in ecotourism activity especially in TWR. Alternately, this study also triggered some questions that crucial to justify, such as:

What are the response of tourists towards the concept of including the invertebrate information in the TWR ecotourism activities?, Second, what is the current levels of the inclusion of invertebrates information in ecotourism activities?, and how to address the lack of invertebrate information in ecotourism activities?. Thus, these questions driven the overall objectives and focus in this study.

1.3 Research Objectives

Generally, the main objective of this study was to enhance the invertebrate conservation effort through the ecotourism activity by assessing the invertebrate as ecotourism product in Tabin Wildlife Reserve (TWR). In doing so, there were three specific objectives in this study that needed to be examined, namely:

a. To determine the response of tourist to the concept of including the invertebrate information in current ecotourism activities.
b. To obtain an overview of the current levels for the inclusion of invertebrate information in ecotourism activities.
c. To provide recommendations on how to address the lack of invertebrate information in ecotourism activities.

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1.4 Research Hypothesis

This study conjectured a main hypothesis which stated that: *There are significant responses on the inclusion of invertebrate information in the ecotourism activity of Tabin Wildlife Reserve as to urge effective ways to increase invertebrate conservation.* This main hypothesis was posited as continuity to the assessment of invertebrates as the ecotourism product for TWR by determining the response of tourists toward the concept of including the invertebrate information in the ecotourism activity.

Nonetheless, this main hypothesis augur-well the recognition to the concept of the including invertebrate information in the ecotourism activity, in turn, advocated this concept to be an admissible ecotourism product especially in TWR, at the same time, improve the invertebrate conservation action. Specifically, there were five minor hypotheses posited in the proposed conceptual framework that detailed in Chapter 3.

1.5 Research Scope

This study was conducted utilising the explanatory sequential mixed method which quantitative approach firstly executed followed by qualitative approach for data collection, analysis and interpretation in order to obtain the crucial information needed to answer the objectives in this study. Practically, this study was mainly targeting the tourists that visited TWR and participated in the preliminary entotourism course to be appointed as the respondents of the surveys.

There were three data collection methods applied namely, (1) Participation and Observation, (2) Invertebrates Record and (3) Preliminary Entotourism Course and Survey. The data collected were analysed utilising Statistical Package for Social Science (SPSS), Analysis of Moment Structure (AMOS) and Leximancer.

In addition, this study comprised a proposed conceptual framework that aimed to increase the value of invertebrates through ecotourism. The variables posited in the conceptual framework included the *Interest, Willingness, Activity,*

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Information and *Ecotourism* which were specifically selected based on the literature review of previous studies.

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CHAPTER 2

LITERATURE REVIEW

2.1 Invertebrates Importance and Its Conservation Issues

Invertebrate was allocated as the main species subjected in this research. Hence, it is very important to detail the invertebrate philosophy at first in order to obtain more understanding about this group of invertebrate.

Pechenik (2010: 6) detailed invertebrate as a fascinating and enormous animal which dominating more than 98% of all known animal species and this proportion are increasing with time as more species will be described. In fact, invertebrates are distributed among at least 35 phyla with enormous number of classes, subclasses, orders and families.

In addition, invertebrates provide a bewildering array of goods and services to the people and economies of the world. Indeed, they are an integral to the Earth yet much ignored in part of our natural capital (Collen, Bohm, Kemp and Baillie, 2012: 60). Wilson (1992: 20) quoted that "the important insects and other land-dwelling arthropods are if all were to disappear, humanity probably could not last more than a few months. Most of the amphibians, reptiles, birds and mammals would crash to extinction at the same time ".

An important service afforded by invertebrate is waste recycling. They are making the minerals and organic material available again for plants and other animals through the decomposition of dead plants and animals (Srivastava and Saxena, 2007: 97). Besides that, many plants especially flowering plants rely on insects to pollinate their flowers in order to complete their reproductive cycle (Gallai, Salles, Settele and Vaissiere, 2008: 810).

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Invertebrates are also used by most environment agencies to test the toxicity of chemicals through the assessments of aquatic invertebrate diversity that exist alongside of the chemical analyses (Losey and Vaughan, 2006: 311). However, invertebrates are not escaping from the threats that detriment their population which lead to extinction, albeit their importance are known. There are some causes and scientific proves of invertebrates threatened had revealed globally which mainly due to the human activities.

First and foremost, there are increases in the rate of conversion of nature land to cropland, while freshwater ecosystems are increasingly degraded by the duel impacts of damming and water extraction. Coral reefs by far the most diverse marine habitat that now underwent severe degradation over the past decades through coral bleaching (Collen, Loh, Whitmee, McRa, Amin and Ballie, 2009: 317).

Besides that, pollinators decline have made the news in the past years due to the obvious effects on ecosystem stability, crop production and food security which suggesting to the global declines in pollinators (Potts, Biesmeijer, Kremen, Neumann, Schweiger and Kunin, 2010: 345). The impacts of climate change remain complex, though an increase of understanding on the species biology of invertebrates may provide us some clues (Foden, Mace, Vie, Angulo, Butchart, DeVantier, Dublin, Gurtsche, Stuart and Turak, 2009:77).

In turn, the issues of invertebrates threatened reported have bring to the need of invertebrates conservation and protection action due to their importance in the ecosystem functioning as well as to human welfare. Maybe people will come out with a question why should we care whether a few more species of invertebrates are going to extinct. First and foremost, human as the main causal agent of modern extinctions and because of the intrinsic value of invertebrates species, we are morally obliged to avert human mediated extinction (Sagoff, 2009: 643).

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Secondly, invertebrate species also have instrumental value via the use of organisms for human benefit and this often provides us with the best reason for justifying their conservation actions (Justus, Colyvan, Regan and Maguire, 2009: 187). The role of invertebrates are playing in ecosystem functioning may provide us with a wide range of benefits in which if the ecosystem function is compromised through the loss of species, it could incur high economic costs to human society (Losey and Vaughan, 2006: 312).

Nonetheless, some practical conservation of most invertebrate species has spatially explicit actions upon in which we may or may not superimpose the consideration of specific species especially for management of threatened species (Cardoso, Erwin, Borges and New, 2011: 2647). The invertebrate impediment in conservation issues are very crucial to study which it may provide us the understanding of management errors, in turn, help to manage the invertebrate conservation effectively.

Invertebrate conservation is hard to justify when many people see each insect as a potential of pest or as a potential health threat. The public is unaware of invertebrate roles in ecosystems and their conservation threat that they are facing on. Without such information, people tend to disregard invertebrates as important for ecosystem functioning or as in need of protection (Martín-López *et al.*, 2007: 67). Indeed, public support is a fundamental in reducing the current extinction rates (Ladle and Jepson, 2008: 111).

Alternately, policymakers and stakeholders usually assume that protection of large animals will serve as "umbrella" species which will protect all other species occupying the same habitats (Simberloff, 1998: 247). However, this view is largely unsupported and untested. In the vast majority of cases it is simply assumed (Cabeza, Arponen and Van, 2008: 976). When tested, the concept often failed (Schuldt and Assmann, 2010: 2747). Misconceptions regarding the effectiveness of umbrella species have been detrimental to possible invertebrate conservation by limiting the amount of available funding (Collen *et al.*, 2012: 69).

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