

## UNIVERSITI MALAYSIA SABAH

## BORANG PENGESAHAN STATUS TESIS@

JUDUL: RELATIONSHIP BETWEEN DENSITY OF VARANUSSALVATOR AND THE CONSERVATION KNOWLEDGE OF  
SAPI ISLAND TOURISTS' ON REPTILESIjazah: SARJANA MUDASESI PENGAJIAN: 2004-2007Saya MURUL'AIN MOHAMED

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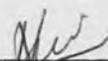
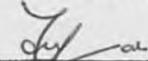
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**RELATIONSHIP BETWEEN DENSITY OF  
*VARANUS SALVATOR* AND THE CONSERVATION  
KNOWLEDGE OF SAPI ISLAND'S TOURISTS ON  
REPTILES**

**NURUL 'AIN MOHAMED**

**THIS DISSERTATION IS PROPOSED TO FULFILL  
PART OF THE REQUIREMENT OF OBTAINING  
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## DECLARATION

I declare that this research work is performed by myself effort the summary and creation which I have mentioned the resources.

26<sup>th</sup> April 2007



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**NURUL 'AIN MOHAMED**

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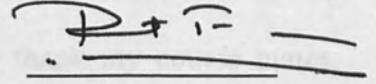
ACKNOWLEDGEMENT

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## ABSTRAK

Eko-pelancongan merupakan satu cabang pelancongan yang semakin popular dan mendapat minat dikalangan mereka yang gemarkan percutian yang melibatkan alam semula jadi. Eko-pelancongan tertumpu kepada tarikan flora, fauna dan juga warisan kebudayaan . Di Sabah, banyak aktiviti eko-pelancongan yang dijalankan di kawasan pulau. Namun, kehadiran pelancong yang ramai ini mungkin akan secara tidak langsung menjejaskan habitat semula jadi hidupan yang terdapat di kawasan tersebut. Maka adalah penting untuk pelancong-pelancong dididik dan diberi pengetahuan tentang pemuliharaan agar impak eko-pelancongan dapat dikurangkan dan mencapai matlamat eko-pelancongan itu sendiri. Kajian ini telah dijalankan untuk mengkaji sama ada wujud hubungan antara kepadatan spesis reptilia *Varanus salvator* yang terdapat di Pulau Sapi dengan pengetahuan pemuliharaan para pelancong yang berkunjung ke sana. Kepadatan *V.salvator* telah dikira untuk enam minggu di tiga tempat yang dipilih di sekitar Pulau Sapi. Tinjauan ke atas 50 orang pelancong yang sedang berada atau pernah mengunjungi Pulau Sapi juga telah dijalankan. Data yang diperolehi melalui kiraan dan tinjauan telah dikaji dan dianalisis bagi mendapatkan keputusan akhir dan kesimpulan bagi kajian ini. Setelah kajian ini dijalankan, saya dapati bahawa tiada hubungan antara kepadatan *V.salvator* di Pulau Sapi dengan pengetahuan pemuliharaan pelancong yang berkunjung ke sana.



## ABSTARCT

Ecotourism is a part of tourism that has become more popular and well accepted from those who prefer and enjoy vacation involving nature. Main attractions of ecotourism are flora, fauna and cultural heritage. In Sabah, there are many ecotourism activities going on on the islands. But, the presence of huge numbers of tourists might also indirectly disturb the habitat of the living creatures on those areas. Thus, it is very important to educate and deliver conservation knowledge to the tourists so that the impact of can be reduced and achieve the purposes of ecotourism itself. This research was conducted to examine whether relation exists between the density of the reptile species *Varanus salvator* that present on Sapi Island with the conservation knowledge of tourists who visit the island. The density of *V.salvator* was counted for six weeks at three different areas on the island. Surveys upon 50 respondents that were present on the island or had been to the island before were also conducted. Collected data through counting and surveys were examined and analyzed to obtained final result and conclusion for this research. After conducting the research, I found out that there is no relationship between the density of *V.salvator* on Sapi Island with the conservation knowledge of tourists that visit the island



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## CHAPTER 1

### INTRODUCTION

#### 1.1 Research Background

The presence of ecotourism in islands has grown rapidly during the last 30 years, in concert with the progression of the field and the explosive growth of tourism (Halpenny, 2001). Sabah, as part of the island of Borneo, experienced the same progress as many other countries that exist as an island. Besides being a part of an island, Sabah itself has owned some of the beautiful, exotic and potential small islands. Most of these islands have been focused on the development of ecotourism with the help from the local government and non-government organizations.

Among many small islands that surrounded Sabah, there are a few that are most well-known around the area of the capital Kota Kinabalu. There are Pulau Gaya, Pulau Manukan, Pulau Mamutik, Pulau Sulug and Pulau Sapi, which made up the Tunku Abdul Rahman Park. These islands beside located near with the town (only a 15 minutes speed boat ride), they also possess very beautiful scenery and clear water with lots of small



fishes and coral reefs. With accommodations, facilities and a lot of fun water activities, making these islands the centre of attraction for locals and foreigners.

Traveling agencies that promote Sapi Island are making effort to make tourists, especially foreigners, to believe that Sapi Island is a very interesting island to visit. Promoting the clear blue sea, white sandy beach, colorful fishes, corals, water activities and facilities; they also include the animal species that inhabit the island as part of attractions. The main animals that present on the island are monkeys and water monitors. As this research is focused on the species of *Varamus salvator*, a family of monitor lizard, putting aside the monkey, water monitor being a part of tourist's attractions is really depending on individual perception. While the agencies promoting water monitors, which might caused interest in some tourists, especially foreigners and those living in big urbanized cities, on the other hand, for some tourists, especially locals, it is not such a big deal to see a water monitor. From what I observed and casual chatting with the foreigners, I found out that water monitors have the potential being a tourist attraction, just that they are not being commercialized to the extend of becoming an icon, like Orang Utans do.

As we known, an island possesses a limited space with fewer ecosystems and species diversity than mainlands. However, it has a high degree of endemism due to isolation (Hall, 1993). Same goes with the diversity of reptiles, there might be various or differences in the species compare to the species on mainlands. Hence, a better conservation work needs to be prepared and done to protect the ecosystems from being destroyed by human activities.



A good conservation work that needs to be done requires a lot of attentions and cooperation from different parties. In this research, I only focused on the participation of tourists of Sapi Island on their conservation knowledge and awareness. Determination was done whether these tourists' conservation knowledge has any relationship with the density of water monitors on the island. Four major threats to biodiversity have been stated out which are habitat destruction, introduced species, overexploitation, and food chain disruption (Campbell, Reece, 2002). An actively developing island with a lot of people coming for recreation purpose is prone to above threats.

This research actually has its own importance and play a role in biology conservation. Generally, the presence of human beings and different activities carry out on an island will either directly or indirectly affect the density of any kind of species. So, in a way to conserve the density, we can look for other alternatives such as what this research is all about. If the conservation knowledge of tourists has some or any effect on the reptile's density, then conservation work can be planned at a better level which tourists will be included. If tourists with better knowledge of conservation will indirectly help maintaining the density, then more knowledge and understanding should be taught and delivered to them. Thus, plans need to be carried out if there is a connection between the conservation knowledge of the tourists so that recreational activities that are going on won't be a threat to the density of any species.

The density of a species relates and depends a lot on the effort of conservation works. A decline population needs attention of conservationists to stop the reduction of



individuals and making effort of increasing the numbers. A successful conservation work can maintain the density and population of a species and avoid the possibility of extinction. Conservation works can help observe the necessity of exploitation on certain species occurs in legal, sustainable and organized procedure.

A case that showed the connection and importance of conservation works and species density was the rhinoceros. These creatures are facing threats and a few species have been listed as critically endangered because of overexploitation for their valuable horns. Poaching of rhinos had once lead to dramatic decline in number of individuals. Numbers of black rhinos were 65 000 in 1970 but dropped till only 2 000 in 1996; and 95% of African black rhinos were killed for the past 20 years (Cherrington, 1996). Meanwhile, Sumatran rhinos were threatened until the population dropped till around 200 in 2002. The Northern White rhinos were as low as 15 individuals in 1980s.

The decline of rhinos in huge numbers has finally opened up public awareness towards those mammals. People don't really know or care about the population of species until they are left with only a few countable numbers. A lot of efforts on conserving the rhinos were made up such as captive breeding to increase their numbers. An example of a successful effort in conserving rhinos was the success of stopping poachers of Sumatran rhinos with the last killed in 2002.

Though water monitors have a huge population and density, it is not possible in 30 years time that they will face threats and dramatic decline in number. As they are hunted



for few different purposes, if a group of people hunt them just for the meat, and another group hunt them for skin and another group hunt for medical purposes, there is a high possibility that the density and population of water monitors will be affected.

## 1.2 Objectives

The main objective of the research is of course to find out the relationship between the density of *Varanus salvator* species (commonly known as water monitor) and the conservation knowledge of Sapi Island's tourists on reptiles. There are also a few other objectives why this research was being conducted.

- I To determine the impacts of ecotourism on the island upon the density of water monitor
- II To examine the conservation knowledge of tourists on reptiles on the island

## 1.3 Research Scope

This research was focused only on the species of monitor lizard, *Varanus salvator*, as it is the only recorded reptile species on the island. Research was conducted on Sapi Island around areas that covered the cafeteria, the shallow puddle near the barbeque pit and also the trail. These areas were chosen based on the information given by workers on the island, where these are the places where the water monitors are usually been seen or appear. A 10m x 10m quadrat was set at each of these areas to monitor and count the presence of water monitors. As for the surveys, aim was on the tourists, regardless locals

or foreigners, which have been to Sapi Island, and those that were on the island itself on the day where the counting was conducted.

#### 1.4 Problem Statement

During this research, a few problems came across me as some factors were beyond my control. One of the main obstacles was the limitation to get all the sample of reptiles' species from all over the island because there is only a part of the island that is being used for recreation purpose. Even though they do have hiking trail on the island, but it was impossible to get in through all the area which is inhibited by macaques for sampling. Furthermore, I was disallowed to use any cage or trap to catch specimen of the water monitor for marking. It is part of the rules of the park, though I had made application letter for that purpose. Thus, I could only set up quadrates on areas that are known to be centre of the appearance of the lizards. Because it is an island with no people living on it and the activities are only held in the day time, even the workers there don't know much about the diversity of reptiles on the island. And there is also no previous record on the density of the water monitor by the authority, Sabah Park.



## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

In this chapter, discussion will be done upon some previous researches that have connection with this research and some definitions of terms that are related.

#### 2.2 Ecotourism

There is no universally accepted definition of ecotourism because it is more to a concept (Evans-Pritchard and Salazar, 1992). But theoretically, ecotourism can be defined as ecological tourism, where ecological has both environmental and social connotations. It is defined both as a concept-tourism movement and as a tourism (specifically sustainable tourism) section. Ecotourism can serve as an incentive for nature conservation and improves well-being of locals. In practice, the term 'ecotourism' is often used by tour operators as a marketing tool to promote any form of tourism that is related to nature. According to Wight (1994), "There seem to be two prevailing views of ecotourism: one



envisages that public interest in the environment may be used to market a product; the other sees that this same interest may be used to conserve the resources upon which this product is based. These views need not be mutually exclusive". Although no precise figures exist, it has been estimated that probably around 15% or 20% of all international tourism is ecotourism. The rate of growth of ecotourism and other nature-based tourism activities seems to be the highest of all tourism segments, maybe around 15% per year (Ceballos-Lascurain, 2000). Main attractions of ecotourism have been listed down as flora, fauna and cultural heritage (Hall, 1993). A few aspects will be focused such as local cultures, adventures, wilderness, personal growth and learning new ways to live on planet.

Criteria for a true ecotourism includes conservation of biology diversity and cultural diversity through ecosystem protection, provide jobs, increase environmental and cultural knowledge, minimize impacts on "environment", affordability and lack of waste in form of luxury, sharing of sosio-economic benefits and local participation which will directly affect the other two criteria (economic benefits and minimize negative impact on the place).



### 2.3 Island

An island or isle (from Spanish word isla) is any piece of land that is completely surrounded by water. Strictly speaking, we are all islands as every continent is surrounded by water. There are mainly three types of islands, continental islands, river islands and volcanic islands. Continental islands are bodies of land that lie upon the continental shelf of a continent. Examples include Greenland, Barbados and Trinidad of South America, Sumatra and Java of Asia, New Guinea and Tasmania of Australia. Microcontinental island is a subtype which results when a continent is rifted. The best example is Madagascar of Africa. Another subtype is the barrier island which is an accumulation of sand on the continental shelf. River islands occur in river deltas and in large rivers. They are caused by deposition of sediment at points in the flow where the current loses some of its carrying capacity. In essence, they are river bars, isolated in the stream. While some are ephemeral, and may disappear if the river's water volume or speed changes, others are stable and long-lived.

Volcanic islands are built by volcanoes. One type of volcanic island is found in a volcanic island arc. These islands arise from volcanoes where the subduction of one plate under another is occurring. Examples include the Mariana Islands, the Aleutian Islands, and Republic of Mauritius. Another type of volcanic island occurs where an oceanic rift reaches the surface. There are two examples: Iceland, which is the world's largest volcanic island, and Jan Mayen—both are in the Atlantic.



A third type of volcanic island is those formed over volcanic hotspots. A hotspot is more or less stationary relative to the moving tectonic plate above it, so a chain of islands results as the plate drifts. Over long periods of time, this type of island is eventually eroded down and "drowned" by isostatic adjustment, becoming a seamount. Plate movement across a hot-spot produces a line of islands oriented in the direction of the plate movement. An example is the Hawaiian Islands, from Hawaii to Kure, which then extends beneath the sea surface in a more northerly direction as the Emperor Seamounts. Tristan da Cunha and the island of Surtsey are examples of hotspot volcano in the Atlantic Ocean. Same with coastal, they shared a few characteristics. They both are maritime traditions and affected most by the sea (ocean), coastal estuary or large inland lake. They are labeled as critical, vulnerable environment. They prone to the depletion of surface and underground sources. But different with coastal areas, islands face a greater threat than the coasts as they have generally more limited resources in number and size (Stonehouse, 1994). Same goes with their limited space. Isolation has made islands places where endemism degree is higher than the mainlands (Hall, 1993). As in Galapagos, there are 95% of the reptiles, 50% of the birds, 47% of the land plants and 75% of the insects found nowhere else in the world (Honey, 1999). Nowadays, it is very common that small islands being used for ecotourism or recreational purposes because there is so much to offer to the tourists that appreciate beauty. But since it is a very vulnerable area with a lot of precious species, proper care and attention should be given to lessen the damage that might occur.

An island has its own unique attraction and definitely has the potential of conducting ecotourism. Offering beautiful scenery, beaches, interesting activities, and its diversity of species, no doubt that it can attract people that enjoy nature. These factors of attraction should also be protected and conserved as one of the objectives of ecotourism is sustainable development.

### **2.3.1 Sapi Island**

Sapi Island literally known as “Cow Island” in Malay, is one of the islands that made up Tunku Abdul Rahman National Park. It is just off south-western tip of Pulau Gaya. The 25 acre (10 ha) island features one of the nicest beaches in the park and most popular with tourists for snorkeling and scuba diving. It is developed with tourists’ facilities that include a jetty, picnic shelters, barbeque pits, tables, changing rooms and toilets. The forest is inhabited by macaques. Camping is allowed with the permission from the Park Warden. Sapi Island is administered by Sabah Park and was gazetted in 1974.

### **2.4 Reptiles**

Reptiles have been believed to be the earliest vertebrates to invade upland habitats (Bellairs, 1970). Besides amphibians, they are also known as “cold-blooded” because they do not generate enough heat to maintain a constant body temperature. Instead they rely on gathering and losing heat from the environment to regulate their internal



temperature, by moving between sun and shade, or by preferential circulation — moving warmed blood into the body core, while pushing cool blood to the periphery. Reptiles are able to tolerate with extremely high temperature with their thermoregulatory mechanism (Cowles and Bogert , 1944).

Different from amphibians, these cold-blooded creatures have several adaptations for terrestrial living such as waterproof scales with protein keratin, respiratory system of lungs and being one of the amniotes. Most reptile species are oviparous (egg-laying). Many species of squamates, however, are capable of giving live birth. This is achieved, either through ovoviviparity (egg retention), or viviparity (babies born without use of calcified eggs). Many of the viviparous species feed their fetuses through various forms of placenta analogous to those of mammals (Pianka & Vitt, 2003). They often provide considerable initial care for their hatchlings.

There are about 6,500 species of extant reptiles and been classified into four groups: Crocodylia; Sphenodontia; Squamata and Testudines. Common reptiles that we usually know and can be seen are snakes, lizards, geckos, crocodiles, and tortoises.

An example of the importance and connection between reptiles with ecotourism and island is clearly shown by The Galapagos Islands. Galapagos consists of 13 large islands and 6 smaller islands. It is a world heritage site and its main attraction is its diversity of reptiles. Having over 90% of endemic reptiles' species, this has become the main tourist attraction to the islands. It has the world renowned Galapagos Giant Tortoise



that evolved into 14 different races, the only marine iguana, lave lizards, snakes and geckos that can not be found at other place. These reptiles are protected as they are restricted on Galapagos only and have caused major interests in people who willing to go there and see it all. This shows how existence of reptiles on island plays a role in attracting tourists and strengthens the ecotourism itself.

#### 2.4.1 Water Monitor

Water monitor, *Varanus salvator*, is a member of the monitor lizard family (Bennett, 1995). It is one of the most intelligent of the lizards. It has a massive distribution around Asia, from India to Indonesia, via Bangladesh, Burma, the foothills of Himalayas, southern China, Vietnam, Laos, Cambodia, Philippines, Thailand and Malaysia. Water monitor is a widespread animal commonly used for its skin and meat (Bennett, 1995). It is one of the most heavily exploited lizards in the world and the number of water monitor has declined sharply over the last hundred years. Water monitor is frequently attaining a length of 2 meters and can grow up to 9 feet. Large water monitors can weigh over 25kg (Jasmi, 1988). They are usually dark brown or blackish in color with yellow spots on the under part.

*V.salvator* is semi aquatic reptile and rarely found far from water, either fresh or saline. They are frequently seen on river banks and in mangroves, but also inhabit farmland, grasslands, forests, river deltas, swamps and beaches. Indeed, this type of lizard will live wherever there are permanent or temporary water bodies, providing food I

available and they are not exterminated by mankind. Their strong adeptness in the water has enabled them to spread to many islands. They are strong swimmers by keeping their limbs to the side of the body and propelling themselves through sinuous undulations of the flattened tails. They can remain submerged underwater for a considerable time. They were probably the first large vertebrates to colonize the newly formed islands of the Krakatoa after the volcanic destruction in 1883 (Rawlinson *et al.*, 1990). Water monitor is also an agile climber and raider of a bird's nest.

Water monitors are extreme carnivores and their diet indicates that they are well adapted for surviving in hostile environments. They will eat anything that they are able to swallow or that they believed they can consume. Some of the common preys are birds and their eggs, small mammals, fishes, lizards, frogs, snakes, juvenile crocodiles, spiders, crabs, and even human feces. Like Komodo dragon, water monitor are also scavengers where in some places they disinter human corpses and will feed from coffins placed on top of trees.

## 2.5 Conservation Knowledge

As ecotourism emphasize on the concept of joining conservation and tourism industry, it is vital for tourists that participate in this form of tourism to some how have some knowledge on conservation. In the principles of an ideal ecotourism , the final principle to which ecotourism should adhere is that of education which should involve among all parties – local communities, government, non-governmental organizations,



industry and tourists (before, during and after the trip) (Wight, 1994). Guides should therefore have been taught conservation issues and the tourists should be told about local conservation efforts and why they are deemed important.

Tourists should be made aware of the damaging potential of their stay and should be properly informed on “ecotourism etiquette” and how to behave to reduce any negative impacts they might have (Cater, 1994). Therefore, to have a better educated tourists in conservation, government, non-government organizations (tourism/traveling agencies) and the locals must first being thought to have a better conservation understanding and awareness on their own places.

## 2.6 Density of Reptiles and Conservation Works

*Gavialis gangeticus*, commonly known as gharial or gavial, is the most long-snouted and together with the saltwater crocodile the largest of the living crocodylians (males up to 6–7m). Gharials are restricted to the northern part of the Indian subcontinent where they were found in four river systems: the Indus (Pakistan), the Ganges (India and Nepal), the Mahanadi (India) and the Brahmaputra (Bangladesh, India and Bhutan). The presence of the species in the Kaladan and Irrawaddy Rivers in Burma has also been reported (Smith 1931). But their distributions are causing anxiety with Bhutan’s and Myanmar’s population possibly extinct, Bangladesh’s, Nepal’s and Pakistan’s are close to extinction while India’s gharials populations present in small numbers.



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