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**POTENTIAL OF ANURANS (FROGS AND TOADS) IN SABAH AS A NEW  
NATURE TOURISM PRODUCT**

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**DISSERTATION SUBMITTED IN FULFILLMENT OF THE REQUIREMENT  
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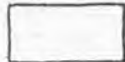
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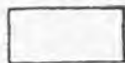
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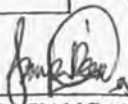
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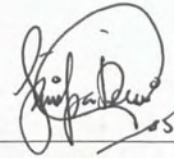
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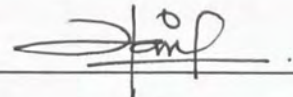
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## ABSTRACT

This research is to propose a new nature tourism product by introducing 'Anurans Tourism'. The main objective of this research is to determine the potential of anurans as a new nature tourism product through three criteria, which are morphological gorgeousness, reliability of sightings and linkage to local cultures. The three sampling areas are Bavanggazo, Bongawan and Telupid. Two different sets of questionnaires were prepared and distributed to tourists and local people. Interviews were also held with the village headmen or 'Tok Penghulu'. The total number of respondents was 141. About 85.1% of respondents agreed that anurans of Sabah have the potential to be introduced as a new nature tourism product. Morphological gorgeousness is measured by attractiveness of anurans and feelings of tourists and local people towards anurans. Many respondents agreed that anurans look attractive and some feels mesmerized and interested towards anurans. Majority of the respondents felt nothing towards anuran. Reliability of sightings for anurans is quite high as local people could spot many anurans (11 to 15 anurans per day) at night and indicated its presence through voice. Linkage to local cultures is indicated through anurans consumption among the local people as well as beliefs and local literatures related to anurans. Local people that consume anurans rated the meat from average to tasty (scale 3 to 5). Most of the local people does not believe in any belief related to anurans because they regard it as nonsense. This study proves that anurans fulfill the three criteria. Species such as *Limnonectes leporinus*, *Rana erythraea*, *Hoplobatrachus rugulosus*, *Kaloula baleata*, *Kaloula pulchra*, *Rana chalconota* and species from genus *Megophrys* can be introduced under 'Anurans Tourism'.



## ABSTRAK

Kajian ini bertujuan untuk memperkenalkan satu produk pelancongan alam semulajadi yang baru menerusi 'Pelancongan Anuran'. Objektif utama kajian ini adalah untuk menentukan potensi anuran sebagai satu produk pelancongan alam semulajadi yang baru menerusi tiga kriteria iaitu tarikan morfologi, kebolehnampakan dan hubungkait dengan kebudayaan tempatan. Tiga kawasan persampelan adalah Bavanggazo, Bongawan dan Telupid. Kajian ini dijalankan dengan menyediakan dua jenis borang soal selidik iaitu dalam Bahasa Melayu untuk penduduk tempatan dan Bahasa Inggeris untuk pelancong. Temuduga turut dibuat dengan Ketua kampung atau Tok Penghulu. Jumlah keseluruhan responden adalah seramai 141 orang. Seramai 85.1% responden menyokong cadangan untuk memperkenalkan anuran Sabah sebagai satu produk pelancongan yang baru. Tarikan morfologi diukur menerusi tarikan anuran serta perasaan responden terhadap anuran. Sebahagian besar responden berpendapat bahawa anuran kelihatan menarik dan berasa terpegun serta berminat terhadap anuran. Kebanyakan daripada responden tidak mempunyai sebarang perasaan terhadap anuran. Kebolehnampakan anuran adalah agak tinggi disebabkan ramai responden boleh nampak anuran dalam bilangan yang banyak (skala 11 hingga 15 ekor anuran setiap hari) pada waktu malam melalui suara yang dihasilkan olehnya. Hubungkait dengan kebudayaan tempatan pula boleh diukur melalui amalan pemakanan serta kepercayaan dan sastera tempatan tentang anuran di kalangan penduduk tempatan. Penduduk tempatan yang memakan anuran menilai rasa daging anuran di antara sederhana sedap dan sedap (skala di antara 3 dan 5). Kebanyakan penduduk tempatan tidak mempercayai sebarang kepercayaan tentang anuran kerana



menganggap ia sebagai karut. Hasil kajian ini membuktikan anuran telah memenuhi ketiga-tiga criteria yang dinyatakan. Spesies-spesies seperti *Limnonectes leporinus*, *Rana erythraea*, *Hoplobatrachus rugulosus*, *Kaloula baleata*, *Kaloula pulchra*, *Rana chalconota* dan spesies dari genus *Megophrys* boleh diperkenalkan di bawah ‘Pelancongan Anuran’.





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**LIST OF SYMBOLS**

%	Percentage
km <sup>2</sup>	kilometre per square



## CHAPTER 1

### INTRODUCTION

#### 1.1 Nature Tourism

The term 'tourism' means impermanent movements by humans to different destinations, their activities at the destinations, and the facilities offered to satisfy their needs there (Abdul Kadir, 1991). Tourism is the world's largest industry in terms of economic gain and employment generating (Chew, 2003). It's the fastest growing industry due to high purchasing power and income level as well as appreciation for outdoor activities and natural environment. Tourism is valued highly by many countries and often holds a very prominent position in development strategies (Wearing & Neil, 1999)

'Nature tourism', the fastest growing sector of the tourism industry can be defined as travel to natural areas and participation in nature-related activities without degrading the environment (Chan & Yeoh, 2001). It provides the will to travel, in seeking knowledge and experiences while going through a process of learning to admire and appreciate nature's gift (Chew, 2003).



Mankind's exploitation of natural resources has accelerated worldwide in recent years. Conservation of biodiversity and ecosystems has taken many forms in which nature tourism is one of the concepts readily accepted by most governments in developing countries. This is because nature tourism is a blooming industry bringing about local economic development through foreign currency exchange (Noraini & Maryati, 2003).

Nature Tourism is one of the industries which brings high profit to the country. It is known to be a perfect step to minimize the deterioration of the environment and arouse interest in people from all over the world to appreciate the environment. This will initiate conservation efforts of the ailing environment and propel economic development at the same time (Kueh, 2003c).

Nature tourism is the main focus of Sabah's tourism industry due to the wide range of forest habitats and wildlife species of Sabah. Foreigners regard Sabah as an international model for developing nature tourism. The Sabah Tourism Promotion Corporation (STPC) has outlined promotional activities for nature tourism to attract tourists to Sabah. Touristic spots in Sabah which have been known to have potential as nature tourism sites are Kinabalu Park, Tunku Abdul Rahman Park, Danum Valley Conservation Area and Sepilok Orangutan Rehabilitation Centre. Currently, Tabin Wildlife Reserve (TWR) is in the process to be introduced to the global market as a nature tourism destination. TWR has a great potential to be a new nature tourism destination (Noraini & Maryati, 2003).



Nature tourism products in Sabah have not changed over the past two decades. Sabah is known for its orangutans, Proboscis monkeys, Sumatran rhinoceroses, Bornean elephants and Rafflesias. New products have yet to be brought into this industry. New nature tourism products are imperative to attract more nature tourists as well as ensure re-visitations of nature tourists to Sabah.

## 1.2 Anurans Tourism

In nature tourism industry, the most important thing is the products. The products must fulfill the needs of nature tourists (i.e., conservation, wildlife, flora and fauna, environment and local cultures) (Noraini & Maryati, 2003). Anurans are regarded to hold potential as a new nature tourism product through 'Anurans Tourism'. 'Anurans Tourism' is defined as 'responsible travel to relatively undisturbed natural areas with the intension to see, admire, enjoy and learn about anurans, including their relationship with humans, that eventually conserves anurans and the environment' (Kueh, 2003c).

Anurans Tourism probably can be the way to educate and make the general public aware of the enticing facts and importance of anurans. Promoting them as a new nature tourism product is important as these organisms should not be neglected. They have the potential to complement and strengthen current products and once it has been established, it will surely become the most awaited boon of the nature tourism industry.



The potential of anurans can be measured through seven criteria which govern the success of the current nature tourism products. The criteria are endemism, rarity, reliability of sighting, behavioral enticement, morphological gorgeousness, safety and linkage to local cultures.

### 1.3 Objectives

The aim of this study entitled ‘The Potential of Anurans in Sabah as a New Nature Tourism Product’ is to propose a new nature tourism product in Sabah by introducing ‘Anurans Tourism’. The objectives in detail are:-

- a) to determine the potential of anurans as a new nature tourism product through three criteria, which are morphological gorgeousness, linkage to local cultures and reliability of sightings,
- b) to identify species of anurans that are suitable to be introduced under ‘Anurans Tourism’.



## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Classification of anurans

There are 25 families (Caldwell, 2002) and more than 4,000 species of frogs and toads in the Order Anura. These frogs and toads are also known as anurans (Herrington, 2002). Anurans account for approximately 88% of all living amphibians (Caldwell, 2002). Six families and 150 species of them are in Borneo. As of 1997, there were about 99 species of anurans in Sabah and this number is expected to grow (Inger & Stuebing, 1997).

Families in Borneo are namely Bombinatoridae (Flat-headed Frog), Ranidae (True Frogs), Bufonidae (True Toads), Megophryidae, Microhylidae (Narrow-mouth Frogs) and Rhacophoridae (Tree Frogs). Families that are found in Sabah are Megophryidae, Bufonidae, Microhylidae, Ranidae and Rhacophoridae.



Species which are found in Sabah are exemplified by *Megophrys baluensis* (Horned Frogs), *Chaperina fusca* (Saffron-Bellied Frog), *Rhacophorus nigropalmatus* (Wallace's Flying Frog), *Bufo juxtasper* (Giant River Toad), *Limnonectes cancrivorus* (Mangrove Frog) and many more.

## 2.2 Anatomy of anurans

Anurans are tailless amphibians. The largest body length is about 300 mm and the smallest is less than 10 mm (Caldwell, 2002). The adults are invariably four-limbed and completely lack tails. The head is dominated by the large mouth which extends nearly along the entire width of the skull. The tongue is attached to the front of the mouth and flipped forward to capture preys (Alford *et al.*, 2002). It is very broad and soft unlike the tongues of mammals and birds (Inger & Stuebing, 1997). The lightweight skulls are largely relative to their body sizes and lack many bones (Alford *et al.*, 2002).

The most conspicuous skeletal feature of anurans is the specialization of the body for jumping. Their eyes are large and placed forward on the head (Pough *et al.*, 2002). Many anurans have webbing between their fingers and toes (Inger & Stuebing 1997). Their hind-limbs are greatly elongated and they generate the power to propel the anurans into the air.





## REFERENCES

- Ahmad, A.H. and Wong, Anna, 1998. The amphibian fauna of the Maliau Basin. In Maryati Mohamed, Waidi Sinun, Ann Anton, Mohd. Noh Dalimin & Abdul Hamid Ahmad (eds.). *Maliau Basin Scientific Expedition*, 12<sup>th</sup> – 26<sup>th</sup> May 1996: 133-137. Kota Kinabalu: Universiti Malaysia Sabah.
- Abdul Kadir Hj. Din (ptrj.), 1991. *Pelancongan: Impak Ekonomi dan Sosial*. Kuala Lumpur: Dewan Bahasa dan Pustaka.
- Alford, R.A., Richards, S.J. and McDonald, K.R., 2001. *Biodiversity Of Amphibians, Volume 1*. Queensland : Academic Press.
- Bo, Shi-Yun, 2000. *Amphibian Metamorphosis, From Morphology To Molecular Biology*. New York : A John Wiley & Sons, Inc.
- Boland, C.R.J, 2004. Introduced cane toads *Bufo marinus* are active nest predators and competitors of rainbow bee-eaters *Merops ornatus*: observational and experimental evidence. *Biological Conservation* **120** (2004), 53-62.
- Bridges, C.M. and Boone, M.D., 2002. The interactive effects of UV-B and insecticide exposure on tadpole survival, growth and development. *Biological Conservation* **111**, 49-54.
- Bulger, J.B., Scott Jr., N.J. and Seymour, R.B., 2002. Terrestrial activity and conservation of adult California red-legged frogs *Rana aurora draytonii* in coastal forests and grasslands. *Biological Conservation* **110** (2003), 85-95.



- Caldwell, J.P., 2002. *Magill's Encyclopedia Of Science : Animal Life, Volume 2 : Frogs And Toads*. California : Salem Press Inc.
- Chan, Jennifer K.L. and Yeoh, E.L., 2001. *A Monograph: Marketing And Positioning Sabah As Tourist Destination*. Kota Kinabalu : Universiti Malaysia Sabah.
- Chew, Danny T.W., 2003. *Herpetology and Nature Tourism: A paper presented at the 'International Conference on Bornean Herpetology 2003', Sabah, Malaysia, December 2003*.
- Cloudsley-Thompson, J.L. 1999. *The Diversity Of Amphibians And Reptiles, An Introduction*. Heidelberg : Springer-Verlag Press.
- Funk, C.W. and Mills, S.L., 2002. Potential causes of population declines in forest fragments in an Amazonian frog. *Biological Conservation* **111**, 205-214.
- Green, D.M., 2002. The ecology of extinction: Population fluctuation and decline in amphibians. *Biological Conservation* **111**, 331-343.
- Hanselmann, R., Rodriguez, A.L., Ramos, L.J., Alonso, A.A., Kilpatrick, M.A., Rodriguez, J.P. and Daszak, P., 2004. Presence of an emerging pathogen of amphibians in introduced bullfrogs *Rana Catesbeiana* in Venezuela. *Biological Conservation* **120** (2004), 115-119.
- Hazell, D., Osborne, W., and Lindenmayer, D., 2003. Impact of post-European stream change on frog habitat: Southeastern Australia. *Biodiversity and Conservation* **12**, 301-320.
- Herrington, R.E., 2002. *Magill's Encyclopedia Of Science: Animal Life, Volume 1: Amphibians*. California: Salem Press Inc.



- Heyer, R.W., Donnelly, M.A., McDiarmid, R.W., Lee-Ann, H.C., and Foster, M.S., 1994. *Measuring And Monitoring Biological Diversity, Standard Methods for Amphibians*. Smithsonian Institution Press.
- Inger, R.F. and Tan, F.L., 1996. *The Natural History Of Amphibians & Reptiles In Sabah*. Kota Kinabalu: Natural History Publications (Borneo) Sdn.Bhd.
- Inger, R.F. and Stuebing, R.B., 1997. *A Field Guide To The Frogs Of Borneo*. Kota Kinabalu: Natural History Publications (Borneo) Sdn.Bhd.
- Jansen, A. and Healey, M., 2002. Frog communities and wetland condition: Relationships with grazing by domestic livestock along an Australian floodplain river. *Biological Conservation* **109**, 207-219.
- Kueh, B.H., 2003a. *Ain't I Gorgeous?* Newsletter of Institute for Tropical Biology & Conservation, Universiti Malaysia Sabah, 11 December 2003.
- Kueh, B.H., 2003b. *Application of Biogeographical Data of Frogs to Prioritize Conservation Areas in Borneo*. Universiti Malaysia Sabah : MSc. Thesis.
- Kueh, B.H., 2003c. *The new marketable face of nature tourism : Anurans : A paper presented at the 'Institute for Biology and Conservation (ITBC) Research Seminar : Sabah, Malaysia, 27 January 2003*.
- Lips, K.R., Mendelson III, J.R., Antonio, M.A., Luis, C.M. and Mulcahy, D.G., 2004. Amphibian population declines in montane southern Mexico: resurveys of historical localities. *Biological Conservation* **119** (2004), 555-564.



- Miller, S.A. and Harley, J.P., 2002. *Zoology: 5<sup>th</sup> Edition*. New York : Mc.Graw-Hill Companies Inc.
- Noraini Nasaruddin & Maryati Mohamed, 2003. *Nature Attractions In Tabin Wildlife Reserve, Lahad Datu, Sabah*. Newsletter of Institute for Tropical Biology & Conservation, Universiti Malaysia Sabah, 11 December 2003.
- Porej, D., Micacchion, M. and Hetherington, T.E., 2004. Core terrestrial habitat for conservation of local populations of salamanders and wood frogs in agricultural landscapes. *Biological Conservation* **120** (2004), 399-409.
- Pough, F.H., Janis, C.M. and Heiser, J.B., 2002. *Vertebrate: Sixth Edition*. New Jersey: Prentice Hall Publication.
- Richter, S.C., Young, J.E., Johnson, G.N. and Seigel, R.A., 2002. Stochastic variation in reproductive success of rare frog, *Rana Sevosa*: implications for conservation and for monitoring amphibian populations. *Biological Conservation* **111** (2003), 171-177.
- Selvino, N.O., 2003. Effects of landscape change on clutches of *Phyllomedusa tarsius*, a neotropical treefrog. *Biological Conservation* **118** (2004), 109-116.
- W.C. Sun, Jennifer and M.Narins, P., 2004. Anthropogenic sounds differentially affect amphibian call rate. *Biological Conservation* **121**, 419-427.
- Wearing, S. & Neil, J., 1999. *Ecotourism: Impacts, Potentials And Possibilities*. Oxford: Reed Educational and Professional Publishing Ltd.



Weyrauch, S.L. and Grubb Jr., T.C., 2003. Patch and landscape characteristic associated with the distribution of woodland amphibians in an agricultural fragmented landscape: An information–theoretic approach. *Biological Conservation* **115**, 443-450.

Zug, G.R., Vitt, L.J., and Caldwell, J.P., 2001. *Herpetology, An Introductory Biology Of Amphibians Reptiles: 2<sup>nd</sup> Edition*. San Diego: Academic Press.

