

# **‘Anurans Tourism’ in Crocker Range Park: Convergence of Research and Local People Involvement Towards Conservation**

**KUEH Boon Hee**

**Institute for Tropical Biology and Conservation,  
Universiti Malaysia Sabah,  
Locked Bag 2073,  
88999 Kota Kinabalu,  
Sabah, Malaysia.  
E-mail: kbhkelvin@hotmail.com**

## **ABSTRACT**

Nature tourism is a blooming industry synergizing environmental conservation and economic development. ‘Anurans Tourism’, an innovative nature tourism product on frogs and toads, shall preponderate the boons from nature tourism through magnification of environmental conservation, intensification of education and awareness on the environment, enhancement of local people involvement in conservation and nature tourism, revenue generation for local and national economies as well as improvement on the quality of nature tourism industry. Crocker Range Park is the largest protected area in Sabah yet with an area of 1,399.19 km<sup>2</sup> and most probably, one of the most diverse parks as well. Anuran collections carried out between 1989 – 2002 by three groups of herpetologists recorded 63 species representing all five families in Sabah. The potential of ‘Anurans Tourism’ is measured through seven criteria: endemism, rarity, reliability of sightings, morphological attractiveness, behavioural enticement, safety and linkage to local cultures. Anurans in Crocker Range Park fulfil the criteria. However, the materialization and sustainability of ‘Anurans Tourism’ depends on continuous input of information pertaining to the ever-growing diversity of anurans, and on the participation of local people as custodians. Hence, this knowledge-driven and local people-based nature tourism product converges scientific research and local people involvement towards feasible conservation.

**Key words:** Anurans, nature tourism, conservation, research, local people, Crocker Range Park

## **PREAMBLE**

### **Nature Tourism**

Nature tourism involves responsible travel to relatively undisturbed natural areas or related venues with the objectives of seeing, admiring, enjoying and learning about the environment and its flora and fauna, as well as any local cultures (past and present) found in the areas without causing perilous disturbances and destruction, for environmental conservation and the well-being of local people. Butler (1992) estimated that there exists approximately 35 terms pertinent to nature tourism. These are exemplified by ecotourism, green tourism, rural tourism, conservation tourism, low-impact tourism, soft tourism, sustainable tourism, appropriate tourism, responsible tourism, ethical tourism, scientific tourism and study tourism. In order to elucidate the discrepancy of the abovementioned terms with the traditional genre of tourism: mass (conventional) tourism, the term 'alternative tourism' was introduced too and is rather well received. Some also proposed that nature tourism and ecotourism which are two most widely referred terms, to be clustered under nature-based tourism. Even though the terms vary, the fundamental attributes of indulgence in excursions to the nature and its vicinity (including local community settlements) to achieve conservation, education, local people well-being enhancement, tourists satisfaction and industry sustainability, are shared. In this paper, the term 'nature tourism' is used as it captures the emphasis on ecological and human components better.

Nature tourism concept was first advocated by Hetzer (1965) and recorded its genesis in mid-1970s at the height of environmental movements (Honey, 1999), emerging discontent with mass tourism (Glasson *et al.*, 1995; Weaver, 1998), and realization that nature tourism assimilates environmental conservation with monetary returns as opposed to logging and agriculture (Orams, 1995; Honey, 1999). Since then, the industry has been blooming and expanding into every country, both developed and developing nations. Fillion *et al.* (1992) reported that nature tourism accounted for 40 – 60% of global tourism. Ceballos-Lascuráin (1996) postulated the worth of nature tourism to be RM 12.5 billion annually.

### **Nature Tourism in Sabah**

Nature tourism is not too new to Sabah with its birth in early 1980s. As one of the mega biodiversity hotspots of the world, blessed with rich legacies of terrestrial and marine flora and fauna as well as habitats ranging from coral reefs and mangroves to the only alpine surroundings in Malaysia and Borneo, it is only right for Sabah to strike a chord with nature tourism. Besides, the equally diverse cultures of the local communities, freedom from natural catastrophes, emancipation from political turmoil, as well as consolidated espousal from State Government and tourism agencies add to the appeal of Sabah as a showpiece of Malaysia's nature tourism industry.

Over the past two decades, a few faces have been synonymous to nature tourism in Sabah. These famous faces are of the Orangutans, Proboscis Monkeys, Sumatran Rhinoceroses, Bornean Pygmy Elephants, Rafflesias, sea turtles and corals. Indeed, these attractions are still pulling in nature tourists, but the industry needs a new marketable face to ensure re-visitations and enhance visitations in order to

achieve the target of receiving 2.7 million tourists in 2007 and 4.0 million by 2010 (Chin, 2005).

### **‘ANURANS TOURISM’**

The chief aim of this paper is to reveal an innovative nature tourism product: ‘Anurans Tourism’. ‘Anurans Tourism’ was coined by the author during a seminar at Institute for Tropical Biology and Conservation (ITBC), Universiti Malaysia Sabah (UMS) on 27 January 2003 and hereafter re-defined as ‘responsible travel to relatively undisturbed natural areas or related venues with the intentions to see, admire, enjoy and learn about anurans, including their relationships with humans in the past and at present, that eventually conserves anurans and the environment, as well as sustains the well-being of local people’ (Kueh, 2003a).

Anurans are frogs and toads (Amphibia: Anura) which represents tailless amphibians. There are about 5,743 species of anurans worldwide (Fagan, 2005) with about 150 species from six families: Bombinatoridae, Bufonidae, Megophryidae, Microhylidae, Ranidae and Rhacophoridae, in Borneo. Close to 100 described species representing families except Bombinatoridae, dwell in Sabah. Many of these species are endemic to Borneo and even Sabah, and highly rare. BORNEENSIS, reference collection centre of ITBC, houses specimens for more than 85 species. Active collections are being undertaken by ITBC herpetologists and staff at i.e., Tabin Wildlife Reserve (Kueh & Maryati, 2003), Agathis Camp at Maliau Basin Conservation Area (Kueh & Maryati, 2005), Trus Madi (Kueh, 2004), Crocker Range Park (Kueh *et al.*, 2004), Pulau Banggi, Lower Segama, as well as populated areas in West Coast and Kudat Divisions. Inevitably, collections for the ecologically and culturally important, gorgeously coloured, mesmerizingly sounded, intriguingly behaved and still darkly mysterious anurans shall be preponderated.

### **CROCKER RANGE PARK (CRP)**

Crocker Range Park becomes the chosen site to scrutinize the potential of ‘Anurans Tourism’ in Sabah due to its distinctive characteristics. CRP was gazetted in 1984 under the Parks Enactment, 1984, and is being managed by Sabah Parks. CRP is the largest protected area in Sabah yet that spans eight districts: Tuaran, Ranau, Penampang and Papar in the West Coast Division as well as Tambunan, Keningau, Beaufort and Tenom in the Interior Division, covering an area of 1,399.19 km<sup>2</sup>. CRP is a populated protected area with local communities living inside and adjacent to the park who are engaged in agriculture (mainly paddy planting), shifting cultivation and non-timber forest product gathering. The park protects the watersheds of 12 main rivers in the West Coast and Interior Divisions that contribute one third of the total water supply for Sabah, and the habitat of the largest flowers in the world: *Rafflesia* spp. (Regis, 2000). CRP is clothed with primary and secondary lowland to upper montane forests. The elevations vary between 200 m to over 2,000 m above sea level with the highest peak at Gunung Minduksirung (2,076 m above sea level). Such variety of forest types and elevations proffer myriad of habitats and microhabitats to hordes of fauna, including anurans.

## Anuran Diversity at CRP

For this paper, anuran diversity at CRP was based on anuran collections carried out between 1989 – 2002 by three groups of herpetologists. Data were compiled from Inger *et al.* (2000), Ramlah *et al.* (2001) and Kueh *et al.* (2004). Data from Inger *et al.* (2000) were from Sungai Purulon, Sungai Kilampon (15 June – 16 July 1989 and 5 – 25 September 1990), Sungai Malutut (22 November – 9 December 1988) and near the Sunsuron Pass on the Kota Kinabalu – Tambunan Road (9 – 24 January 1989, 6 – 23 September 1989 and 30 August – 12 September 1992). Data from Ramlah *et al.* (2001) encompassed data from Sunsuron (1989), the vicinity of CRP Headquarter and near the road to Keningau and Mahua Waterfall (October 1999). On the other hand, Kueh *et al.* (2004) recorded data collected at Sungai Kimanis, near the Keningau – Kimanis Road, Trail 5, Trail 7 and Trail 11 on 26 August – 12 September 2002.

A total of 63 anuran species representing all five families in Sabah were recorded at CRP (Table 1). Ten species were from Bufonidae, eight species from Megophryidae, seven species from Microhylidae, 23 species from Ranidae and 15 species from Rhacophoridae. The species are dwellers of primary and secondary forests, slightly disturbed habitats and man-made surroundings. The primary forest specialists are exemplified by *Ansonia spinulifer*, *Pedostibes rugosus*, *Kalophrynus baluensis*, *Kalophrynus pleurostigma*, *Metaphrynella sundana*, *Microhyla borneensis*, *Huia cavitympanum*, *Limnonectes palavanensis*, *Staurois natator*, *Staurois tuberilinguis*, *Rhacophorus angulirostris*, *Rhacophorus everetti* and *Rhacophorus gauni*. The slightly disturbed habitat dwellers are *Limnonectes ingeri*, *Limnonectes leporinus*, *Rana chalconota*, *Rana hosii*, *Rana picturata*, *Rana signata*, *Polypedates macrotis* and *Polypedates otitophus*. Species that live in man-made surroundings or commensal species were sampled in CRP as well. The species are *Fejervarya limnocharis*, *Rana erythraea* and *Polypedates leucomystax*.

**Table 1.** Anuran species recorded at Crocker Range Park (CRP).

[References: (1) Inger *et al.* (2000), (2) Ramlah *et al.* (2001), (3) Kueh *et al.* (2004). Keys: \* - endemic to Borneo, \*\* - endemic to Sabah. Endemism follows Inger & Stuebing (2005) and Malkmus *et al.* (2002).]

Family	Species	Reference
BUFONIDAE	(1.) <i>Ansonia hanitschi</i> Inger *	1, 2, 3
	(2.) <i>Ansonia leptopus</i> (Günther)	2
	(3.) <i>Ansonia longidigita</i> Inger *	1, 2, 3
	(4.) <i>Ansonia platysoma</i> Inger *	1, 3
	(5.) <i>Ansonia spinulifer</i> (Mocquard) *	3
	(6.) <i>Bufo asper</i> Gravenhorst	1
	(7.) <i>Bufo juxtasper</i> Inger *	1, 2, 3
	(8.) <i>Leptophryne borbonica</i> (Tschudi)	3
	(9.) <i>Pedostibes maculatus</i> (Mocquard) **	3
	(10.) <i>Pedostibes rugosus</i> Inger *	1
MEGOPHRYIDAE	(11.) <i>Leptobranchella baluensis</i> Smith *	1, 3
	(12.) <i>Leptobranchella parva</i> Dring *	1, 3
	(13.) <i>Leptobranchium abbotti</i> Cochran *	1
	(14.) <i>Leptobranchium montanum</i> Fischer *	1, 2, 3
	(15.) <i>Leptolalax dringi</i> Dubois *	1, 3
	(16.) <i>Leptolalax gracilis</i> (Günther)	2

	(17.) <i>Leptolalax pictus</i> Malkmus **	1, 2
	(18.) <i>Megophrys nasuta</i> (Schlegel)	1, 2, 3
MICROHYLIDAE	(19.) <i>Chaperina fusca</i> Mocquard	1, 3
	(20.) <i>Kalophrynus baluensis</i> Kiew **	1
	(21.) <i>Kalophrynus heterochirus</i> Boulenger *	1, 3
	(22.) <i>Kalophrynus pleurostigma</i> Tschudi	1, 2, 3
	(23.) <i>Kalophrynus subterrestris</i> Inger *	1
	(24.) <i>Metaphrynella sundana</i> (Peters) *	3
	(25.) <i>Microhyla borneensis</i> Parker *	3
RANIDAE	(26.) <i>Fejervarya limnocharis</i> (Boie)	1, 2, 3
	(27.) <i>Huia cavitympanum</i> (Boulenger) *	1
	(28.) <i>Ingerana baluensis</i> (Boulenger) *	1, 3
	(29.) <i>Limnonectes finchi</i> (Inger) **	1, 2, 3
	(30.) <i>Limnonectes ingeri</i> (Kiew) *	3
	(31.) <i>Limnonectes kuhlii</i> (Tschudi)	1, 2, 3
	(32.) <i>Limnonectes leporinus</i> (Andersson) *	1, 3
	(33.) <i>Limnonectes palavanensis</i> (Boulenger)	1, 3
	(34.) <i>Meristogenys amoropalamus</i> (Matsui) *	1
	(35.) <i>Meristogenys kinabaluensis</i> (Inger) *	1, 2, 3
	(36.) <i>Meristogenys orphnocnemis</i> (Matsui) *	1, 3
	(37.) <i>Meristogenys poecilus</i> (Inger & Gritis) *	2
	(38.) <i>Meristogenys whiteheadi</i> (Boulenger) *	1
	(39.) <i>Occidozyga baluensis</i> (Boulenger) *	1, 2, 3
	(40.) <i>Rana chalconota</i> (Schlegel)	1, 3
	(41.) <i>Rana erythraea</i> (Schlegel)	3
	(42.) <i>Rana hosii</i> Boulenger	1
	(43.) <i>Rana luctuosa</i> (Peters)	3
	(44.) <i>Rana picturata</i> Boulenger	1
	(45.) <i>Rana signata</i> (Günther)	1
	(46.) <i>Staurois latopalmatus</i> (Boulenger) *	1, 3
	(47.) <i>Staurois natator</i> (Günther)	1, 2, 3
	(48.) <i>Staurois tuberilinguis</i> Boulenger *	1, 2, 3
RHACOPHORIDAE	(49.) <i>Nyctixalus pictus</i> (Peters)	1, 3
	(50.) <i>Philautus aurantium</i> Inger **	3
	(51.) <i>Philautus bunitus</i> Inger, Stuebing & Tan **	1, 3
	(52.) <i>Philautus hosii</i> (Boulenger) *	3
	(53.) <i>Philautus longicrus</i> (Boulenger)	1
	(54.) <i>Philautus mjobergi</i> Smith *	3
	(55.) <i>Philautus petersi</i> (Boulenger) *	1, 3
	(56.) <i>Polypedates leucomystax</i> (Gravenhorst)	1, 3
	(57.) <i>Polypedates macrotis</i> (Boulenger)	1, 2, 3
	(58.) <i>Polypedates otitophus</i> (Boulenger)	1, 3
	(59.) <i>Rhacophorus angulirostris</i> Ahl **	1, 3
	(60.) <i>Rhacophorus baluensis</i> Inger *	1
	(61.) <i>Rhacophorus everetti</i> Boulenger	1, 3
	(62.) <i>Rhacophorus gauni</i> (Inger) *	1, 3
	(63.) <i>Rhacophorus pardalis</i> Günther	3

## EVALUATION OF THE POTENTIAL OF 'ANURANS TOURISM' IN CRP

As for any nature tourism product, the potential of 'Anurans Tourism' is not propagated in arbitrariness. Burger (1996) articulated well when he pointed out the many examples of herpetofauna as successful nature tourism attractions in reply to the doubt of whether herpetofauna can really serve as draw-cards when most people view the organisms with abhorrence. There are the enormous Komodo Dragons in Indonesia, Orange-golden Mantela Frogs and Parson's Chameleons (one of the largest chameleons) at Analamazaotra Reserve, Madagascar (Hutchings, 1997), endemic and endangered Ploughshare Tortoises, endemic Side-necked Turtles, endangered Flat-tailed Geckos, Fish-scaled Geckos and Oustalet's Chameleons at Ampijoroa Forest Reserve, Madagascar (Hutchings, 1999), as well as nesting turtles all around the world.

The potential of 'Anurans Tourism' in CRP is measured through seven criteria: endemism, rarity, reliability of sightings, morphological attractiveness, behavioural enticement, safety, and linkage to local cultures. The criteria are the governing factors behind the success of the current nature tourism attractions.

### Criterion I: Endemism

Endemism is always the most effective attractant for nature tourism products to be sold because nature tourists are very willing to spend money just to glimpse and take photographs of flora and fauna that are confined to a specific area not of their origin. This is an assurance of marketability due to low competition as compared to generic products. For instance are the very popular *Rafflesia keithii* and *Rafflesia tengku-adlinii* which are endemic to Sabah. The other species, *Rafflesia pricei*, is sought after too, even though it can be found throughout Borneo (Nais, 2001).

Of the 63 anuran species recorded at CRP, 33 and seven species are endemic to Borneo and Sabah respectively (Table 1). Endemism at 61.9% is high and consistent with the role of CRP as a Pleistocene refugium that retains environmental conditions which were widespread during the glacial period about 1.6 million years before present (Kueh, 2003b).

### Criterion II: Rarity

Rarity is another criterion that determines the marketability of a nature tourism product. Organisms can be endemic and abundant at the same time. However, nature tourists do also seek organisms which are seldom seen to boost their satisfaction over a product. Current nature tourism attractions that are soaring in popularity due to rarity are Sumatran Rhinoceroses, Orangutans and Proboscis Monkeys, just to name a few. Anurans are not lacking in rare species as well. *Pedostibes maculatus*, *Kalophrynus baluensis*, *Leptolalax pictus*, *Philautus aurantium*, *Philautus bunitus* and *Rhacophorus angulirostris* have only been reported so far at mountainous western Sabah that includes CRP and Gunung Kinabalu.

### **Criterion III: Reliability of Sightings**

Reliability of sightings is a manifestation of trust and satisfaction in nature tourism. Satisfaction guarantees re-visitations and galvanizes visitations by new nature tourists via mouth-to-mouth promotion. Some big mammals can be very difficult to spot and even harder to feel and touch. However, anurans are much easier to be seen and captured for close encounter before releasing the anurans back to the environment. High endemism and rarity for anurans do not imply obscurity. Anurans are almost everywhere from primary forests to man-made surroundings. Habitats are such as puddles, temporary ponds and pools, seepages, rivulets, streams, tree stumps, rotten logs, leaf litters, and muddy paths. Besides, frogging at night caters fun physical and educational activity for nature tourists who demand hands-on experiences.

### **Criterion IV: Morphological Attractiveness**

Morphological attractiveness is imperative to win the heart of nature tourists. Nature tourists find it effortless to fall head over heels for the beige-furred Proboscis Monkeys, gentle and cuddlable looking Orangutans, bright red-coloured Rafflesias and odd pot-shaped Nepenthes.

For anurans, the quality comes in vibrant colours and combinations, adorable appearances and special features. Certainly all species are gorgeous, but there are several species in CRP that deserve to be highlighted. *Megophrys nasuta* are unique looking anurans each with sharp-edged skin projections from its eyelids and snout resembling 'horns'. The 'horns' are used for defence, but not to fence off predators like the rhinoceroses do. Instead, the 'horns' are to remarkably camouflage *Megophrys nasuta* as dead leaves amidst which the anurans live in. *Chaperina fusca* are tiny anurans measuring 15 – 20 mm. The distinctive ventral surface of the anurans is black and scattered with saffron-coloured spots. *Kalophrynus* spp. look like crabs from one angle and peanuts from another, but hop like no crab and peanut ever can. The anurans mysteriously exude sticky mucus from the skin. *Limnonectes kuhlii* are cuddlable looking anurans with short and stocky bodies, and muscular legs for extremely powerful hops. Another species with brilliant combination of hues is *Rana erythraea*. The anurans are bright to dark green with yellowish or whitish stripes running from behind the eyes to the vents. *Philautus aurantium* are the 'golden anurans' of Borneo. These tiny anurans (24 – 27 mm) are pale sandy with the hidden thighs golden yellow or orange. *Polypedates otilophus* are successful to stay close to the heart of many herpetologists as its pictures have graced books and journals. Hence, the species should be easy to find its way to the preference of nature tourists. The anurans are large and exhibit bony appearance with saw-edged bony ridges over the eardrums. Colour wise, the anurans are tan with subtle dark lines from the heads to the vents. The legs are white and marked with several conspicuous dark bars.

### **Criterion V: Behavioural Enticement**

Nature tourists adore flora and fauna that are able to provide enticement through various behaviours. For instance, Orangutans which walk on two feet and clap, big *Nepenthes fusca* which trap pot-full of insects, cicadas which shriek when 'love' is in the air, and gentle sea turtles which gracefully swim in the sea.

Anurans display enticing behaviours too. Anurans emit distinctive calls during mating season. The males usually have vocal sacs in the throats which are inflated with air to form resonating chambers for calling. Some calls resemble the chirps of birds and night insects (*Fejervarya limnocharis*, *Rana erythraea* and *Rana hosii*) while some even sound like the short and rapid high-pitched signal tones of cell phones (*Philautus aurantium*). Anurans are also able to paraglide from forest canopy to the ground. *Rhacophorus pardalis* are epitomes of such anurans in CRP. The ability is accomplished by having extensive webbing and dermal flaps along the outer edges of the forearms, hands, heels and tarsi. The enlarged surface area decelerates the fall.

### **Criterion VI: Safety**

Safety is utmost crucial in nature tourism. As much as nature tourists want to enjoy and learn during tours, they want to be safe from mishaps too, including those directly inflicted by the flora and fauna they are admiring. Anurans are far from being dangerous to nature tourists. Anurans have no teeth. *Limnonectes kuhlii* and *Limnonectes leporinus* have tooth-like projections from the jaws. The projections are used in courtship battles and definitely never in hunting and biting people. Despite general assumption, anurans are not lethally poisonous to humans. Naturally, anurans secrete substances from the skin for protection merely against predators and sometimes, other anurans. The rule of thumb is to neatly dress any wound before handling anurans and thoroughly wash hands after doing so.

### **Criterion VII: Linkage to Local Cultures**

It is always an added advantage for a nature tourism product to be linked to local cultures for captivating interpretations. Linkage to local cultures includes via folklores, local beliefs, traditional medication, and in local food. *Megophrys* spp. can sense barometric changes in the ambience rather accurately. Therefore, the anurans always call prior to heavy downpours and subsequently are regarded as having the supernatural ability to summon rain. Species such as *Limnonectes ingeri*, *Limnonectes kuhlii* and *Limnonectes leporinus* yield high demand as food by local people.

## **RESEARCH AND LOCAL PEOPLE INVOLVEMENT IN ‘ANURANS TOURISM’**

Indeed, anurans in CRP fulfil the seven criteria evaluating the potential of ‘Anurans Tourism’. This necessitates quantitative researches to be undertaken on the materialization and sustainability of the product. Knowledge from researches are required to determine holistic implementation strategies and management, as well as comprehensive sustainability framework for ‘Anurans Tourism’ to ensure that the product is able to denote its boons in magnifying environmental conservation, intensifying education and awareness on the environment, enhancing local people involvement in conservation and nature tourism, generating revenue for local and national economies, and improving the quality of nature tourism industry.

‘Anurans Tourism’ is a dynamic nature tourism product. The diversity of anurans is ever expanding with new species continue to be discovered. Averagely, three new species are described in five years in Borneo (Inger & Stuebing, 2005).



Two new species described within the last five years were *Ansonia anotis* (Inger *et al.*, 2001) and *Rhacophorus erythrophthalmus* (Stuebing & Wong, 2000). Constantly added new species enrich 'Anurans Tourism' with more species to fascinate nature tourists perennially. Thus, continuous inventory-based and taxonomical studies covering each and every locality in CRP, in particular, and Sabah and Borneo, in general, become of high priority.

Besides for discovering new species, researches on ecology to understand intra- and interspecific relationships of anurans are important as well. Knowledge on habitats and microhabitats preferred is needed for locality prospecting. Ethological researches are also required to gain comprehension on various behaviours such as calling, foot flagging display and paragliding. Researches on ethnozoology to gather and document information on the utilization of anurans as food, traditional medicines, in rituals and in indigenous folklores (local beliefs and tales), are equally essential to substantiate 'Anurans Tourism'.

As 'Anurans Tourism' is knowledge-driven, it prescribes proper and sufficient trainings for the frontliners of the product too. These frontliners are tour guides, product marketeers and even frontdesk personnel of hotels, resorts and hostels who make first contact with tourists who check in to accommodations. Full and responsible information translate to satisfaction for tourists and sustainability of the product. Proper and sufficient trainings are feasible through smart partnerships between tourism agencies and companies with universities and research institutions.

Another extremely necessary component apart from research is local people involvement to carry out and sustain 'Anurans Tourism'. CRP is a populated protected area. Hence, local people are the custodians of the environment, including the anurans. Knowledge on anurans and pertaining to 'Anurans Tourism' must be shared with local people so that they fully perceive the importance and merits of 'Anurans Tourism' in providing alternative livelihood to planting and shifting cultivation and at the same time, conserving the environment for the future generations. Direct use values for anurans and 'Anurans Tourism' can be revealed to local people as have been done in other countries like for viewing value of elephants in Kenya at USD 25 million per year, viewing value of elephants and other species in Thailand at USD 4.7 million per year, nature tourism value in Costa Rica at USD 1,250 per hectare, and nature tourism value in Cameroon at USD 19 per hectare (Barbier, 1992).

The involvement of local people in 'Anurans Tourism' is multitudinous and not just confined to being custodians of the environment. Local people are also information resource personnel, tour guides, incidental services providers and local managers of the product.

## **CONCLUSION**

'Anurans Tourism' is an innovative nature tourism product on frogs and toads that diversifies nature tourism industry in Sabah and preponderates the boons of the industry. CRP is an ideal site for 'Anurans Tourism' as the park shows high anuran species diversity and endemism. Anurans in CRP fulfil the seven criteria to measure the potential of 'Anurans Tourism', namely endemism, rarity, reliability of sightings,

morphological attractiveness, behavioural enticement, safety and linkage to local cultures. However, the materialization and sustainability of 'Anurans Tourism' depends on continuous input and sharing of knowledge from researches, and fervent participation of local people. Therefore, this knowledge-driven and local people-based nature tourism product converges scientific researches and local people involvement, all towards conservation of the environment.

## ACKNOWLEDGEMENTS

The author thanks Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah for permitting this paper to be presented in '10<sup>th</sup> Sabah Inter-agency Tropical Ecosystems (SITE) Research Seminar'.

## LITERATURE CITED

- Barbier, E.B. (1992). Economics for the wilds. Pp. 15 – 33 In Swanson, T.M. and Barbier, E.B. (eds.). *Economics For The Wilds: Wildlife, Diversity, And Development*. Island Press, Washington D.C.
- Burger, M. (1996). The reptiles and frogs of Madagascar. *Environment & Wildlife*, November/December 1996 Issue.
- Butler, J.R. (1992). Ecotourism: Its changing face and evolving philosophy. *Paper presented at IV World Congress on National Parks and Protected Areas, Caracas, Venezuela, 10 – 21 February 1992*.
- Ceballos-Lascuráin, H. (1996). *Tourism, Ecotourism And Protected Areas: The State Of Nature-Based Tourism Around The World And Guidelines For Its Development*. IUCN, Gland.
- Chin, M. (2005). Using RM 20 million to make RM 2 billion. *Daily Express*, 10 April 2005.
- Fagan, G. (2005). Silence of the frogs. *Asian Geographic*, 2/2005 Issue: 52 – 63.
- Filion, F.L., Foley, J.P. and Jacquemot, A.J. (1992). The economics of global ecotourism. *Paper presented at IV World Congress on National Parks and Protected Areas, Caracas, Venezuela, 10 – 21 February 1992*.
- Glasson, J., Godfrey, K. and Goodey, B. (1995). *Towards Visitor Impact Management*. Ashgate Publishing, Aldershot.
- Hetzer, W. (1965). Environment, tourism, culture. *Links*. July: 1 – 3.
- Honey, M. (1999). *Ecotourism And Sustainable Development: Who Owns Paradise?* Island Press, Washington D.C.
- Hutchings, C. (1997). The pirate coast. *The Geographical Magazine*, March Issue: 34 – 37.
- Hutchings, C. (1999). Red eye at night. *The Geographical Magazine*, March Issue: 34 – 39.
- Inger, R.F. and Stuebing, R.B. (2005). *A Field Guide To The Frogs Of Borneo*. (2<sup>nd</sup> Edition). Natural History Publications (Borneo) Sdn. Bhd., Kota Kinabalu.
- Inger, R.F., Tan F.L. and Yambun, P. (2000). The frog fauna of three parks in Sabah, Malaysia – Kinabalu Park, Crocker Range Park, and Tawau Hills Park. *Sabah Parks Nature Journal*. 3: 7 – 28.
- Inger, R.F., Tan F.L. and Yambun, P. (2001). A new species of toad of the Genus *Ansonia* (Anura: Bufonidae) from Borneo. *The Raffles Bulletin of Zoology*. 49(1): 35 – 37.

- Kueh B.H. (2003a). The new marketable face of nature tourism: Anurans. *Paper presented at ITBC Research Seminar, UMS, Kota Kinabalu, Sabah, 27 January 2003.*
- Kueh B.H. (2003b). Application of biogeographical data of frogs to prioritize conservation areas in Borneo. M.Sc. Thesis. Unpublished.
- Kueh B.H. (2004). Diversity of anurans at Trus Madi, Sabah. Pp. 26 – 29 In Maryati M., Matsui, M. and Kueh B.H. (eds.). *Herpetology And The Future: Proceedings Of The 'International Conference On Bornean Herpetology 2003'*. Institute for Tropical Biology and Conservation, Kota Kinabalu.
- Kueh B.H., Ahmad S., Matsui, M. and Maryati M. (2004). Notes on the anurans of Crocker Range Park. Pp. 103 – 112 In Maryati M., Zulhazman H., Tachi, T. and Nais, J. (eds.). *Crocker Range Scientific Expedition 2002*. Universiti Malaysia Sabah, Kota Kinabalu.
- Kueh B.H. and Maryati M. (2003). Notes on the anurans of north-eastern Tabin Wildlife Reserve. Pp. 139 – 143 In Maryati M., Schilthuizen, M. and Mahedi A. (eds.). *Tabin Limestone Scientific Expedition 2000*. Universiti Malaysia Sabah, Kota Kinabalu.
- Kueh B.H. and Maryati M. (2005). Anurans of protected areas in Sabah: Tabin Wildlife Reserve, Crocker Range Park and Maliau Basin Conservation Area. Pp. 182 – 187 In Tuen, A.A. and Das, I. (eds.). *Wallace In Sarawak – 150 Years Later: Proceedings Of An International Conference On Biogeography And Biodiversity*. Institute of Biodiversity and Environmental Conservation, Kota Samarahan.
- Malkmus, R., Manthey, U., Vogel, G., Hoffmann, P. and Kosuch, J. (2002). *Amphibians & Reptiles Of Mount Kinabalu (North Borneo)*. A.R.G. Gantner Verlag K.G., Ruggell.
- Nais, J. (2001). *Rafflesia Of The World*. Sabah Parks, Kota Kinabalu.
- Orams, M.B. (1995). Towards a more desirable form of ecotourism. *Tourism Mgt.* 16(1): 3 – 8.
- Ramlah Z., Lizanah W. and Haidar A. (2001). An account of anuran at Crocker Range National Park, Sabah. Pp. 137 – 146 In Ismail, G. and Ali, L. (eds.). *A Scientific Journey Through Borneo: The Crocker Range National Park, Sabah. Vol. 1: Natural Ecosystem And Species Components*. ASEAN Academic Press, London.
- Regis, P. (2000). The management of protected areas in Sabah. *Paper presented at International Conference on In-Situ and Ex-Situ Biodiversity Conservation in the New Millennium, Kota Kinabalu, Sabah, 19 – 22 June 2000.*
- Stuebing, R.B. and Wong, A. (2000). A new species of frog, *Philautus erythrophthalmus* (Rhacophoridae) from southwestern Sabah, Malaysia. *The Raffles Bulletin of Zoology*. 48(2): 293 – 296.
- Weaver, D.B. (1998). *Ecotourism In The Less Developed World*. CAB International, Wallingford.