

**ANURANS (FROGS AND TOADS):
NEW NATURE TOURISM PRODUCT FOR
CONSERVATION AND LOCAL PEOPLE WELL-BEING**

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ABSTRACT. *Nature tourism is a pragmatic synergy between environmental conservation and local people well-being enhancement under contemporary context. ‘Anurans Tourism’, a new nature tourism product on frogs and toads, proffers a new attraction to augment the current products in Sabah, Malaysia. This paper aims to scrutinize the potential of ‘Anurans Tourism’. Four criteria: endemism, reliability of sightings, morphological attractiveness and linkage to local cultures, were analysed. The degree of anuran endemism recorded at Tabin Wildlife Reserve (2000), Bavanggazo (2001) and Crocker Range Park (2002) was 56.9%. Preliminary questionnaire survey conducted at Bavanggazo revealed 47.2% sightings of 11 – 15 individuals per night. Preliminary questionnaire survey on the morphological attractiveness of anurans carried out on international tourists from Asia, Australasia, Europe and North America, showed 67.8% of affirmation. Interviews with local people documented various traditional knowledge pertaining to anurans. Indeed, ‘Anurans Tourism’ fulfils the criteria and possesses notable potential.*

Key words: Anurans, nature tourism, conservation, local people

INTRODUCTION

Modern global tourism has grown steadily since 1950 with a record of international tourist arrival of merely 25.3 million then (UNWTO, 2005) to 763 million and worldwide growth of 10.7%, as well as an all time high of 808 million and worldwide growth of 5.5% for 2004 and 2005 respectively (UNWTO, 2006). The average annual growth of global tourism for both

periods of 1950 – 2004 and 1950 – 2005 stands at approximately 6.5% which exceeds the forecast long-term average annual growth of 4.1%, despite several catastrophes hitting the industry such as terrorism, diseases (SARS and avian flu), and price hike in fuel that is altering international economy. These issues are expected to continue affecting global tourism in 2006 with estimated international tourist arrival of 845 million and worldwide growth of 4.5% (UNWTO, 2006). International tourist arrival of 763 million for 2004 contributed a whopping USD 622.7 billion of international tourism receipts (UNWTO, 2005).

Nature tourism that accounted for 40 – 60% of global tourism (Filion *et al.*, 1992), had its concept originally promulgated by Hetzer (1965) in *Links*. The concept recorded its genesis in mid-1970s at the height of environmental movements which recognized the threats pressurizing the environment and paramount need to undertake environmental conservation (Honey, 1999), emerging discontent with mass (conventional) tourism that advocates maximization of profit over the fragile environment and delicate local cultures (Glasson *et al.*, 1995; Weaver, 1998), as well as realization that nature tourism assimilates environmental conservation with monetary gains as opposed to logging and agriculture (Orams, 1995; Honey, 1999). These factors still secure the success of nature tourism. On the other hand, Whelan (1991) noted four other rationales behind the continuing success of nature tourism, namely man's desire to return to the nature, escapism from hectic urban daily life, urge to view biodiversity in the actual habitat before it is too late, and impulse to satisfy specific interests regarding the environment. The rationales signify growing understanding of the general population pertaining to the role of natural environment as a divine sanctuary for soul healing and rejuvenating, as well as increasing thirst of the general population for knowledge on the environment from about the conspicuous large mammals and Dipterocarp to subtle amphibians, insects and herbs.

Nature tourism has been defined as responsible travel to relatively undisturbed natural areas or related venues to see, admire, enjoy and learn about the environment and its flora and fauna, as well as any local culture (past and present) found in and adjacent to the areas without creating grave disturbances and destruction, all for sustainable environmental conservation and local people well-being enhancement. There are approximately 35 terms relevant to nature tourism such as ecotourism, green tourism, nature-based tourism, wilderness tourism, rural tourism, conservation tourism, alternative tourism, ethical tourism, responsible tourism, soft tourism, low-impact tourism and study tourism (Butler, 1992). Although the terms vary, the fundamental attribute of indulgence in trips to nature and its vicinity (including local community settlements and environment-related venues) to converge

environmental conservation, economic development, education, tourists satisfaction, local people well-being enhancement, culture preservation and industry sustainability under contemporary context, are shared. In this paper, the term 'nature tourism' is used as it captures the emphases on ecology and human component better.

In Sabah, Malaysia, nature tourism recorded its birth in early 1980s. Situated at the north-east of Borneo, the world's third largest island after Greenland and New Guinea, Sabah is encompassed between latitudes 4° 10' N and 7° 40' N, and longitudes 115° 10' E and 119° 20' E. Covering an area of 74,500 km², Sabah is blessed with intriguing natural topographic features: Gunung Kinabalu, Malaysia's highest mountain (4,095.2 m above sea level), Sungai Kinabatangan, Malaysia's second longest river (560 km long), limestone caves and stretched coastline, rich legacies of terrestrial and marine flora and fauna, as well as ecosystems ranging from coral reefs and mangroves to the oldest tropical rainforest in the world and on to the only alpine surroundings in Malaysia and Borneo. The abovementioned qualities together with the equally varied cultures of the indigenous people, freedom from natural catastrophes, emancipation from political turmoil and espousal from the government, firmly assure Sabah's position in Malaysian nature tourism industry.

For more than two decades, nature tourism products in Sabah have been exemplified by Bornean Orangutans, Proboscis Monkeys, Sumatran Rhinoceroses, Bornean Pygmy Elephants and turtles. These products have been well promoted and are still pulling in nature tourists. Tourist arrival to Sabah for 2005 tallied to 1,828,771 or 3.1% growth as compared to 2004 (1,773,271) (Sabah Tourism Board, 2006). However, even the most saleable product succumbs to popularity deterioration over time due to competition from other states and countries, and evolving tourist predilection. Hence, nature tourism industry in Sabah requires a new attraction to ensure re-visitations and magnify visitations of nature tourists towards achieving the target of 2.7 million tourists in 2007 and 4.0 million by 2010 (Chin, 2005).

The new attraction of nature tourism proposed by this paper is 'Anurans Tourism'. The term 'Anurans Tourism' was coined and defined by the first author in a research seminar at the Institute for Tropical Biology and Conservation (ITBC), Universiti Malaysia Sabah (UMS), Kota Kinabalu, Sabah, Malaysia on 27 January 2003, and re-defined in the '10th Sabah Inter-agency Tropical Ecosystem (SITE) Research Seminar', Kota Kinabalu, Sabah, Malaysia on 17 November 2005. The definition encompasses the descriptive and prescriptive components which comply with the definitions of pertinent tourism genre by World Tourism Organization (UNWTO) and The International Ecotourism Society (TIES). **'Anurans Tourism'** is **responsible travel to relatively undisturbed natural areas or related venues**

with the intensions 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.

‘Anurans Tourism’, a new market image of nature tourism either as an independent or complementary product, promotes anurans or frogs and toads (Amphibia: Anura) as novel marketable faces. Anurans are tailless amphibians from Order Anura. AmphibiaWeb (2005) listed 5,284 species of anurans from 29 families worldwide, that represent 88% of all amphibian species. Borneo houses approximately 150 species from six families, namely Bombinatoridae, Bufonidae, Megophryidae, Microhylidae, Ranidae and Rhacophoridae. Ranidae, Bufonidae, Microhylidae and Rhacophoridae are some of the most diverse anuran families which accommodate 37.3% of the world’s anuran species. Close to 100 species representing families except Bombinatoridae, dwell in Sabah.

ITBC, UMS possesses specimens for about 90 anuran species of Borneo in BORNEENSIS, ITBC’s reference collection centre for Bornean flora and fauna. Anuran specimens were acquired through active collections undertaken by ITBC herpetologists and staff since 2000 at Tabin Wildlife Reserve, Agathis Camp at Maliau Basin Conservation Area (Kueh & Maryati, 2005a; 2005b), Trus Madi (Kueh, 2004; Kueh & Maryati, 2005b), Crocker Range Park, Pulau Banggi, Lower Segama, as well as populated localities in West Coast and Kudat Divisions (Kueh, 2006). Inexorably, more collections shall be done throughout Sabah to progressively augment anuran specimens in BORNEENSIS, and continuously update anuran inventory of Sabah and Borneo.

‘Anurans Tourism’ is not propagated in arbitrariness, but based on criteria which are the governing factors behind the success of the current nature tourism products in Sabah, Malaysia. These criteria are endemism, rarity, reliability of sightings, morphological attractiveness, behavioural enticement, safety, and linkage to local cultures. For this paper, four criteria: endemism, reliability of sightings, morphological attractiveness, and linkage to local cultures, were analysed to divulge the potentiality of ‘Anurans Tourism’ as a new nature tourism product.

METHODS

(A) Inventory-Based Studies for the Degree of Anuran Endemism

The degree of anuran endemism was based on inventories of anurans at three nature tourism related areas in Sabah which also epitomize different levels of environmental conservation. The areas were Tabin Wildlife Reserve (TWR), Bavanggazo, and Crocker Range Park (CRP). TWR was gazetted under the Forestry Enactment, 1968, in 1984. The wildlife reserve is currently being managed by Sabah Forestry Department and Sabah Wildlife Department. The 1,205.2 km² wildlife reserve which is situated in Kinabatangan District of Sandakan Division, and Lahad Datu District of Tawau Division, was gazetted for the protection of the last remaining lowland Dipterocarp forest and its high biodiversity. On the other hand, Bavanggazo is a human settlements area in Kudat District of Kudat Division. The area is mainly populated by the Rungus, and has been identified as a touristic site to promote local cultures. A prominent touristic site is Bavanggazo Longhouse which is a homestay project initiated by Sabah Tourism Board under the 'One Village, One Product' Programme. Lastly, CRP was gazetted under the Parks Enactment, 1984, in 1984, and is presently being administered by Sabah Parks. The largest protected area in Sabah yet (1,399.2 km²) spans eight districts: Tuaran, Ranau, Penampang and Papar in West Coast Division, as well as Tambunan, Keningau, Beaufort and Tenom in Interior Division. The purposes of CRP are to protect the watersheds of 12 main rivers in West Coast and Interior Divisions, and the habitats of *Rafflesia* spp.

For this paper, anuran inventory for TWR was yielded from seven nights of collection conducted on 16 - 22 October 2000 at the limestone area of north-eastern TWR during the wet season (Kueh & Maryati, 2003; 2005a; 2005b). The collection was done during the 'Tabin Limestone Expedition 2000' jointly organized by ITBC (UMS) and Sabah Wildlife Department, with the sponsorship of the Danish Cooperation for Environment and Development (DANCED). Anuran inventory for Bavanggazo was from collection carried out on 9 - 12 March 2001 around Bavanggazo Longhouse (Kueh, 2006). Anuran inventory for CRP was the outcome from collection done on 26 August - 12 September 2002 at Sungai Kimanis, the vicinity of the Keningau-Kimanis Road, Trail 5, Trail 7, and Trail 11 (Kueh *et al.*, 2004; Kueh & Maryati, 2005a; 2005b). The collection was carried out during the 'Crocker Range Scientific Expedition 2002' jointly organized by ITBC (UMS) and Sabah Parks, with the financial support of the Japan International Cooperation Agency (JICA).

The same sampling procedure was employed for all collections. Samplings were carried out at night for four hours from 2000h. Anurans were located through opportunistic examination on sampling sites, anuran calls, and anuran eye shines due to reflection from torchlights and headlamps. Such sampling procedure ensures holistic collection of arboreal, terrestrial and riparian anurans (e.g., Inger, 1980; Andreone *et al.*, 1998; Klemens, 1998; Kueh, 2006). Anurans were captured by hand, and each was put into a separate, clean and transparent plastic bag to be kept overnight.

On the following day, the anurans were identified by using the keys of Inger & Stuebing (2005). Next, the anurans were recorded (anurans observed but not sampled were recorded too) and photographed. The anurans were then killed in a chlorobutanol solution. Data: snout-vent length (SVL) and weight of the specimens, were garnered and recorded. The specimens were assigned BORNEENSIS numbers, properly set and left overnight in aluminium trays that were layered with tissue paper soaked with 10% formalin. Hardened specimens were fixed in 10% formalin for at least a week.

Upon returning to the laboratory, the specimens were rinsed and stored in 70% ethanol in air tight specimen jars for long term preservation. All specimens were deposited at BORNEENSIS, ITBC's reference collection centre. Collection data on the specimens (both text and multimedia data) were digitalized into MUSEBASE, ITBC's collection data management system (Kueh & Maryati, 2005b; Kueh *et al.*, 2006).

Endemism of anurans followed Inger & Stuebing (2005), and Malkmus *et al.* (2002). The degree of anuran endemism was calculated as the percentage of endemic species over the total number of species, n:

$$\text{Degree of Endemism} = \frac{\text{No. of Endemic Species}}{\text{Total No. of Species, n}} \times 100\%$$

(B) Preliminary Questionnaire Surveys for Reliability of Sightings and Morphological Attractiveness of Anurans

Preliminary questionnaire surveys were conducted to quantify two criteria of 'Anurans Tourism' potentiality: reliability of sightings and morphological attractiveness of anurans. Structured questionnaires consisting of open format and closed format questions, were distributed to respective targeted informants. The questionnaires were also used to gather data pertaining to the profile of the informants.

Preliminary questionnaire survey for the reliability of sightings of anurans was carried out on local residents of Bavanggazo. The different magnitudes of sightings were quantitatively categorized as ‘very few’ (1 – 5 individuals sighted per night), ‘few’ (6 – 10 individuals sighted per night), ‘many’ (11 – 15 individuals sighted per night), and ‘too many’ (>16 individuals sighted per night). Conversely, survey for the morphological attractiveness of anurans was performed on international tourists in Kota Kinabalu, Sabah. The latter survey was done at Kota Kinabalu Jetty and shopping complexes such as CentrePoint, Wisma Merdeka, Karamunsing Complex, and KK Plaza. Questionnaires distributed to both local residents of Bavanggazo and international tourists, were collected immediately after the questionnaires had been filled up.

(C) Interviews for the Linkage (of Anurans) to Local Cultures

Personal interviews were conducted on local residents of Bavanggazo to determine the linkage of anurans to local cultures. The interviews were done with selected informants for specific information. The interviews were recorded using Panasonic Mini Cassette Recorder (RQ-L11) for reference.

RESULTS AND DISCUSSION

Endemism is always the most effective attractant for an organism-based nature tourism product. Endemism of an organism group helps tour operators to market a product, and almost guarantees its saleability knowing that nature tourists are easily attracted by organisms (plants or animals) that are geographically confined to an area not of the nature tourists’ origin. Bornean Orangutans (*Pongo pygmaeus*) and Proboscis Monkeys (*Nasalis larvatus*) which are endemic to Borneo, as well as Bornean Pygmy Elephants (*Elephas maximus borneensis*) and certain rafflesias (*Rafflesia keithii* and *Rafflesia tengku-adlinii*) which are endemic to Sabah, are just a few examples of the current organism-based nature tourism products enjoying high popularity among nature tourists due to endemism.

The degree of endemism for the 51 anuran species recorded at TWR, Bavanggazo and CRP was 56.9%. A total of 29 endemic species were recorded, with 24 species are endemic to Borneo and five, namely *Pedostibes maculatus* (Bufonidae), *Limnonectes finchi* (Ranidae), *Philautus aurantium*, *Philautus bunitus* and *Rhacophorus angulirostris* (Rhacophoridae), are endemic to Sabah (Table 1). Other than *Limnonectes finchi*, the species endemic to Sabah are

dwellers of the highlands at elevation of 700 – 1,800 m above sea level. All five endemic species inhabit primary or at least old secondary forests. The degree of anuran endemism for the three areas is high in comparison with, for instance, 41.7% for Batu Apoi lowland forest in Brunei Darussalam (Das, 1995), and 34.3% for Labang Forest Reserve (freshwater swamp forest) in Sarawak as reported in Inger *et al.* (2005).

Individually, CRP had the highest degree of anuran endemism at 61.9%. A total of 28 out of the 46 species recorded for CRP were endemic to Borneo. The finding is consistent to the endemism analysis using WORLDMAP Programme conducted on anuran species throughout Borneo in 2000 – 2002 (Kueh, 2003). The research recognized CRP as one of the anuran endemism hotspots in Borneo, alongside Kinabalu National Park, Poring, Gunung Alab, Rafflesia Forest Reserve and Mendolong. TWR had lower anuran endemism of 21.4%, which is possibly attributed to the fact that TWR provides stable and diverse habitats to support common and widely distributed anuran species. Even Bavanggazo, a populated touristic area, had 14.3% of anuran endemism. *Rhacophorus angulirostris* was recorded at Bavanggazo although the species was previously only known from primary highland and submontane forests (Kueh, 2006). *Rhacophorus angulirostris* is a morphologically attractive species as the small anuran (30 – 55 mm) has short pointed snout with sharp edges. The sides are yellow with black spots, and the upper part of the eyes is distinctively blue.

Reliability of sightings is an important criterion for nature tourism products too. It is the manifestation of trust and satisfaction between tour operators and nature tourists. Trust and satisfaction are of utmost significance in ensuring the survivability of tourism products, and consequently, the industry (Deng *et al.*, 2002). The questionnaire survey on reliability of sightings indicated the highest percentage of 47.2% from 36 informants for sightings of 11 – 15 individuals per night. That was followed by 41.7% sightings of 6 – 10 individuals per night, 8.3% sightings of more than 16 individuals per night, as well as 2.8% sightings of 1 – 5 individuals per nights. Besides visual sightings, the informants also stated the unfailing aural indication of anuran presence at Bavanggazo. Indeed, acoustic display is an attraction of anurans related to another ‘Anurans Tourism’ potentiality criterion: behavioural enticement.

Of the 36 informants at Bavanggazo, 75% was older than 30 years old. A total of 25% was between the age of 11 – 30 years old. No informant was aged 10 years and below. Education level wise, 22.2% had SPM qualification, 27.8% had PMR qualification, and 13.9% had UPSR qualification. One informant received education up to Primary Five while 12 informants (33.3%) had no formal education. The latter are the village elders, mostly aged

over 40 years old. Age groups and education levels are imperative to corroborate the credibility of the data pertaining to the reliability of sightings yielded.

Morphological attractiveness is another principal criterion for organism-based nature tourism products. Morphologically attractive organisms tend to effortlessly captivate the fancy of nature tourists, and secure acceptability by nature tourists as a feasible nature tourism product. The questionnaire survey on morphological attractiveness of anurans that was carried out on international tourists, showed 67.8% of affirmation. A total of 59 international tourists from four continents, namely Asia (Japan), Australasia (Australia and New Zealand), Europe (Finland, Sweden, Norway, Poland, Germany, Luxembourg, the Netherlands, the United Kingdom, Ireland and Portugal), and North America (the United States of America and Canada), were surveyed. The pool of informants represented tourists from some of the most essential overseas tourism markets of Sabah. Japan was the third country in Asia with the most number of tourists who visited Sabah in 2005 of 32,379, behind Indonesia and Taiwan (Sabah Tourism Board, 2006). European nations such as the United Kingdom, Ireland, Sweden, Finland, Germany, the Netherlands, Norway and Luxembourg, recorded rather satisfactory numbers of tourists to Sabah in 2005 with the United Kingdom and Ireland contributed 25,014 tourists or 57.6% of the total number of tourists from Europe who visited Sabah (Sabah Tourism Board, 2006).

Although 19 informants responded that anurans were neither attractive nor could be introduced as a new nature tourism product, 36.8% (7 of the 19 informants) was still willing to spend money 'to see, admire, enjoy and learn about anurans'. Six informants from Japan, Sweden and the United Kingdom would spend RM 100 or less (\leq USD 27) for the product if it was offered. One informant from Sweden would even spend up to RM 200 (\approx USD 55).

Added to the number of informants who replied in affirmation, by and large 58.5% concurred to the price of 'Anurans Tourism' at RM 100 or less, 24.4% agreed with the price at RM 101 – 200, 7.3% agreed with RM 201 – 300, and 9.8% agreed with the price at more than RM 300 (\approx > USD 82). Undeniably, the data are intriguing and encouraging to ascertain the direct use values of anurans and 'Anurans Tourism' for a full comprehension of the importance and merits of the new nature tourism product in creating alternative livelihood for the local people, and concurrently, conserving the natural environment for the future. Determination of direct use values for organism groups and nature tourism products have been done in other countries such as the 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).

Linkage to local cultures is always a bonus for an organism-based nature tourism product. It spawns attention-grabbing interpretations of the product. Linkage to local cultures include through folklore, local beliefs, traditional health practices, and local food.

In Rungus folklore at Bavanggazo, there is a famous short poem related to anurans that reads:

*'Pucuk pauk selaras pauh,
Masak sebiji gugur ke tanah,
Sana pun jauh, sini pun jauh,
Badan mati di tengah-tengah'*

Literally, the poem narrates a tale of a group of anurans which migrated from one place to another by crossing rivers. At a point, the anurans became stranded on a high ground in the middle of a river. Due to extreme fatigue from constant migration that prevented the anurans from moving forward or going back, the anurans died on the high ground. Metaphorically, the poem reminds the local people of the menace of fickleness in faith, thoughts, actions and words in daily life. Fickleness is portrayed to bring on poignant outcomes on oneself, and the surrounding community. Hence, the virtues of confidence and certainty could have elucidated the strong upholding of indigenous traditions and local beliefs by the Rungus at Bavanggazo.

As for other native communities, the Rungus community at Bavanggazo believes that anurans possess almost magical ability to summon rain. Such a local belief has been prompted by the observation that anurans always call prior to downpours. Scientifically, the highly permeable skin of anurans enable the organisms to rather accurately sense barometric changes in the atmosphere that precede downpours. As the mating of anurans requires aqueous surroundings, vigorous callings before downpours are important for the mere survival of anurans in nature.

Other than folklore and local beliefs, anurans are also a source of local food. For the residents of Bavanggazo who consume anurans, 69.6% started consuming anurans regularly after tasting anuran meat for the first time due to curiosity. The tastiness of anuran meat is evident when 26.1% of the residents deemed the meat as 'very tasty' (scale 1 – 2), 30.4% deemed the meat as 'tasty' (scale 3 – 4), and 39.1% deemed the meat as 'average' (scale 5). The recipes to cook anuran meat are as varied as the health benefits believed by the local people to derive from the consumption of the meat. The benefits consist of 'blood

purification', 'complexion cleansing', 'body cooling', as well as 'bone strengthening' for children.

'Anurans Tourism' is a vibrant nature tourism product that is not just knowledge-driven, but local people-based too. Local people involvement is vital in the execution of 'Anurans Tourism' as local people are the rightful custodians of the environment. Scientific knowledge must be synergized with traditional knowledge on anurans which is already in the possession of the local people. Traditional knowledge relates to knowing the availability of anurans in any given area in Sabah, and ethnozoology of anurans (anurans in folklore, local beliefs, traditional health practices, and local food). Besides, local people involvement in 'Anurans Tourism' provides a lucrative alternative livelihood to agriculture and forest produce harvesting. Local people can be tourist guides, incidental service providers and even, local managers of 'Anurans Tourism'. Once the boons of 'Anurans Tourism' in uplifting local people well-being is recognized, sustainability of 'Anurans Tourism' becomes much achievable and perpetual.

CONCLUSION

Nature tourism is a significant component of modern global tourism. In Sabah, Malaysia, nature tourism has been blossoming since its onset in 1980s. After two decades, 'Anurans Tourism', a novel nature tourism product on frogs and toads, proffers a new market image. Adhering to the definition, 'Anurans Tourism' aims to conserve the natural environment, including anurans, as well as enhance the well-being of the local people involved. Empirical data obtained from inventory-based studies and questionnaire surveys, and descriptive information gathered from interviews proved that 'Anurans Tourism' fulfils the four potentiality criteria: endemism, reliability of sightings, morphological attractiveness, and linkage to local cultures. Besides continuous research, local people involvement is also crucial to the implementation and sustainability of the product for conservation and local people well-being enhancement.

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TABLE 1. Anurans recorded at Tabin Wildlife Reserve (TWR), Bavanggazo, and Crocker Range Park (CRP).

[Keys: * - endemic to Borneo; ** - endemic to Sabah. Endemism follows Inger & Stuebing (2005), and Malkmus *et al.* (2002).]

	TWR	Bavanggazo	CRP
<u>(I)</u> <u>Family BUFONIDAE</u>			
(1.) <i>Ansonia hanitschi</i> Inger *			✓
(2.) <i>Ansonia longidigita</i> Inger *			✓
(3.) <i>Ansonia platysoma</i> Inger *			✓
(4.) <i>Ansonia spinulifer</i> (Mocquard) *			✓
(5.) <i>Bufo juxtasper</i> Inger *			✓
(6.) <i>Leptophryne borbonica</i> (Tschudi)			✓
(7.) <i>Pedostibes hosii</i> (Boulenger)	✓		
(8.) <i>Pedostibes maculatus</i> (Mocquard) **			✓
<u>(II)</u> <u>Family MEGOPHRYIDAE</u>			
(9.) <i>Leptobranchella baluensis</i> Smith *			✓
(10.) <i>Leptobranchella parva</i> Dring *			✓
(11.) <i>Leptobranchium montanum</i> Fischer *			✓
(12.) <i>Leptolalax dringi</i> Dubois *			✓
(13.) <i>Megophrys nasuta</i> (Schlegel)			✓
<u>(III)</u> <u>Family MICROHYLIDAE</u>			
(14.) <i>Chaperina fusca</i> Mocquard	✓		✓
(15.) <i>Kalophrynus heterochirus</i> Boulenger*			✓
(16.) <i>Kalophrynus pleurostigma</i> Tschudi			✓
(17.) <i>Metaphrynella sundana</i> (Peters) *	✓		✓
(18.) <i>Microhyla borneensis</i> Parker *			✓
<u>(IV)</u> <u>Family RANIDAE</u>			
(19.) <i>Fejervarya limnocharis</i> (Boie)	✓	✓	✓
		(Observed)	

(20.)	<i>Ingerana baluensis</i> (Boulenger) *			✓
(21.)	<i>Limnonectes finchi</i> (Inger) **			✓
(22.)	<i>Limnonectes ingeri</i> (Kiew) *	✓		✓
(23.)	<i>Limnonectes kuhlii</i> (Tschudi)	✓	✓	✓
(24.)	<i>Limnonectes leporinus</i> (Andersson) *			✓
(25.)	<i>Limnonectes malesianus</i> (Kiew)	✓		
(26.)	<i>Limnonectes palavanensis</i> (Boulenger)			✓
(27.)	<i>Meristogenys kinabaluensis</i> (Inger) *			✓
(28.)	<i>Meristogenys orpnochemis</i> (Matsui) *			✓
(29.)	<i>Occidozyga baluensis</i> (Boulenger) *	✓		✓
(30.)	<i>Occidozyga laevis</i> (Günther)	✓		
(31.)	<i>Rana chalconota</i> (Schlegel)	✓	✓	✓
			(Observed)	
(32.)	<i>Rana erythraea</i> (Schlegel)		✓	✓
			(Observed)	
(33.)	<i>Rana luctuosa</i> (Peters)			✓
(34.)	<i>Rana nicobariensis</i> (Stoliczka)	✓		
(35.)	<i>Staurois latopalmatum</i> (Boulenger) *			✓
(36.)	<i>Staurois natator</i> (Günther)			✓
(37.)	<i>Staurois tuberilinguis</i> Boulenger *			✓
(V)	<u>Family RHACOPHORIDAE</u>			
(38.)	<i>Nyctixalus pictus</i> (Peters)			✓
(39.)	<i>Philautus aurantium</i> Inger **			✓
(40.)	<i>Philautus bunitus</i> Inger, Stuebing & Tan **			✓
(41.)	<i>Philautus hosii</i> (Boulenger) *			✓
(42.)	<i>Philautus mjobergi</i> Smith *			✓
(43.)	<i>Philautus petersi</i> (Boulenger) *			✓
(44.)	<i>Polypedates leucomystax</i> (Gravenhorst)		✓	✓
(45.)	<i>Polypedates macrotis</i> (Boulenger)			✓
(46.)	<i>Polypedates otilophus</i> (Boulenger)	✓	✓	✓

(47.)	<i>Rhacophorus angulirostris</i> Ahl **		✓	✓
			(Observed)	
(48.)	<i>Rhacophorus dulitensis</i> Boulenger	✓		
(49.)	<i>Rhacophorus everetti</i> Boulenger			✓
(50.)	<i>Rhacophorus gauni</i> (Inger) *			✓
(51.)	<i>Rhacophorus pardalis</i> Günther	✓		✓
