

**Education for Sustainable Development (ESD)  
for Environmental and Biodiversity Conservation:  
The case of 'ITBC Frog Museum'**

**KUEH Boon-Hee\* & MARYATI Mohamed**

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

**Thematic Workshop: Higher Education for Sustainable Development**

**ABSTRACT.** The Institute for Tropical Biology and Conservation (ITBC), Universiti Malaysia Sabah has always been fully aware of the importance of then, Environmental Education (EE) and now, Education for Sustainable Development (ESD) for perpetual environmental and biodiversity conservation. One of the most feasible strategies for environmental and biodiversity conservation is through the implementation of ESD that prompts people to collectively envisage a sustainable future, realize the effects of individual actions on the environment and biodiversity, assume responsibility, and forge continual partnerships among stakeholders. The 'ITBC Frog Museum' epitomizes an ESD project undertaken by ITBC aimed to (i) instil the concept of environmental and biodiversity conservation, and its imperativeness into people's minds, and (ii) instigate people to bear higher conscience in their daily undertakings, all using frogs and toads (Amphibia: Anura) or anurans as a model of the environment and biodiversity. The museum highlights various facts on frogs and toads, in the form of posters, reading materials (journals, books, proceedings and magazines), documentaries, (wet and dry) specimens, and tailor-made replicas. The museum also proffers activities for young children to better understand and subsequently, appreciate the uniqueness and richness of frogs and toads found in Sabah and Borneo, in particular and Malaysia and the world, in general, as well as the relatedness to the daily life and survivability of humans. As a complementary arm of the National Technical Sub-Committee of Faunal Biodiversity (Amphibia) Malaysia being led by ITBC, 'ITBC Frog Museum' also assembles relevant governmental agencies, other higher learning institutions and NGOs in realizing the intentions of the museum. In order to integrate mass media into the mechanism to achieve the ultimate aims of 'ITBC Frog Museum', the museum works closely with a local newspaper for wider dissemination of information and knowledge via the fortnightly publication of 'BORNEENSIS Corner' in *New Sabah Times*. Other mass media used are the Internet and several locally well distributed magazines. Last but not the least, 'ITBC Frog Museum' includes the participation of the private sector, namely tour operators, through the running of two tourism products incorporating the museum: 'Anurans Tourism' and Campus Tourism. Hence, the private sector is provided a much needed avenue to also contribute, as other stakeholders, towards conservation by encouraging more people, both local and international tourists, to learn about and value the environment and biodiversity. Thus far, 'ITBC Frog Museum' has received favourable response from various stakeholders. ITBC strives to further enhance the participation and collaboration of the stakeholders in creating a sustainable future for all.

Keywords: environment, biodiversity, conservation, Education for Sustainable Development (ESD), Environmental Education (EE), higher education, frogs and toads, anurans, museum, Sabah, Borneo.

## **INTRODUCTION**

The Institute for Tropical Biology and Conservation (ITBC) being a centre of excellence for terrestrial tropical biology and conservation in Universiti Malaysia Sabah, Sabah State, Malaysia, has always been fully aware of the importance of then, Environmental Education (EE) and now, Education for Sustainable Development (ESD) for perpetual environmental and biodiversity conservation. Initially, ITBC was set up as a unit in June 1996 to spearhead research, development and commercialization (R, D & C) of natural resources pertaining to terrestrial biodiversity: floral, faunal and microbial genetic, species and ecosystem richness, with sustainable development as the underlying principle. In corroboration of the abovementioned onus, ITBC provides teaching and training at the undergraduate and postgraduate levels, as well as for relevant personnel from various agencies and departments throughout Malaysia and even, Asian region and the world. Realizing the equally imperative necessity to crystallize scientific information for knowledge enhancement of the general public to better understand about the environment and biodiversity, and the relatedness with human actions, ITBC has been actively involved in numerous ESD undertakings under the Information Networking (IN) Division, too, since her establishment. The undertakings are thoroughly planned and implemented towards achieving the goals of prompting people to collectively envisage and believe in a sustainable future which propels each and every individual to assume responsibility, and forge continual partnerships among the individuals as stakeholders of the common environment and biodiversity. Hence, the impacts can easily snow-ball into a national, regional and global aspiration to safeguard the environment and biodiversity for the future generations, while fulfilling the needs and ensuring the survivability of the present one. An ESD project currently being undertaken is the 'ITBC Frog Museum'.

## **'ITBC FROG MUSEUM': THE GENESIS**

The idea of establishing 'ITBC Frog Museum' was mooted by the second author in 2002, and prompted by the mere fact that much about the environment and biodiversity, especially of Sabah in northern Borneo that is one of the world's 12 mega biodiversity hotspots, has been discussed by various cohorts, in numerous occasions, and at different levels (Maryati, 2004). However, the absence of a model organism group representing the environment and

biodiversity, more than often dilutes the aspiration for vigorous and rigorous conservation efforts. Popularization of an apt model organism group converges and retains focus and determination towards environmental and biodiversity conservation. Hence, frogs and toads (anurans) had been pinpointed primarily based on the multiple and vital ecological functions and economical importance of frogs and toads, as well as high availability of frog and toad specimens and data in ITBC (Maryati, 2004; Kueh & Maryati, 2005; Kueh, 2006; Kueh *et al.*, 2006a).

Frogs and toads are crucial in maintaining environmental equilibrium as an essential part of the environmental food web, fulfilling the niches of being primary users as tadpoles, and secondary and tertiary users as adults. Frogs and toads are also recognized as excellent environmental health indicators, particularly for chemical and biological pollutions, due to its extremely permeable skin, and semi-aquatic existence. In agriculture, frogs and toads have long been utilized as biological control agents for pests such as insects and snails. Frogs and toads are a source of alternative protein and medicines for certain communities too. More recently, in order to espouse nature tourism as a feasible tool for conservation, frogs and toads are being promoted as a new nature tourism product named 'Anurans Tourism', in Sabah State, Malaysia by ITBC and several local industry players (Kueh, 2006; Kueh *et al.*, 2006a).

ITBC houses approximately 2,000 specimens of frogs and toads, representing 90 of the 104 species in Sabah State (86.54%), and 150 species throughout Borneo (60%). The specimens are preserved in 70% ethanol and thus, known as wet specimens. ITBC also possesses skeletal specimens of frogs and toads (dry specimens), that are decidedly intricate to prepare and therefore, unavailable to many other institutions. The specimens are well kept in a state-of-the-art compactor with regulated temperature and humidity for long-term preservation (Kueh & Maryati, 2005). Collection data are managed using an avant-garde system: MUSEBASE. MUSEBASE is a tailor-made collection data management system developed for ITBC to store large sets of collection data as text, numerical data, audio recordings, videos, pictures, and diagrams. MUSEBASE also has the capability for efficient and effective dissemination of data worldwide via its automatically generated web site in the Internet (Kueh *et al.*, 2006b). The collection of frog and toad specimens and data is constantly being increased, and the management systems being perfected, among others to further enhance the efficacy of 'ITBC Frog Museum' as the ESD arm of ITBC.

## **‘ITBC FROG MUSEUM’: OBJECTIVES**

‘ITBC Frog Museum’, which was successfully launched in December 2003 under the co-organization of ITBC and the Japan International Cooperation Agency (JICA), upholds a couple of objectives:

- (1) To instil the concept of environmental and biodiversity conservation, and its imperativeness into people’s minds,
- (2) To instigate people to bear higher conscience in their daily undertakings.

The objectives adhere to the goals of the Millennium Development Goals (MDGs), which was officially adopted in the Millennium Summit in September 2000 by 189 world leaders. The Millennium Summit endorsed the United Nations Millennium Declaration that promotes eight goals under the MDGs as its action plan. Among others, MDGs advocate ‘to ensure environmental sustainability’, and ‘develop a global partnership for development’ (UN Millennium Development Goals, 2005). Indeed, sustainable development that weaves environmental and biodiversity conservation together with economic growth into a contemporary balance representing both necessities, is no longer a luxury but tacit obligation of all. Sustainable development addresses a holistic approach: environmental and biodiversity conservation to conserve natural resources and minimize environmental deterioration, economic growth to elevate the standard of living through increased economic yields for prosperity and harmony, as well as social development to ensure that every stratum of any society receives adequate basic requirements of food, water, energy, shelter, sanitation, health care and education. Inevitably, the fundamental step towards achieving sustainable development is to empower people with sufficient knowledge and awareness, and at the same time, motivate people to take up respective responsibility towards making sustainable development a reality (Maryati *et al.*, 2007; UN Division for Sustainable Development, 2007). These are the gist of ESD as proposed during the Rio+10 World Summit on Sustainable Development (WSSD) in 2002 in Johannesburg, South Africa, and manifested as the United Nations Decade of Education for Sustainable Development (DESD) that runs from 2005 to 2014 (Omar & Zainal Abidin, 2005).

The adherence to the goals of MDGs and the essence of ESD, differentiates ‘ITBC Frog Museum’ from other such museums around the world, for example ‘The Frog Museum’ in Estavayer-le-Lac, Fribourg, Switzerland, ‘Frog Museum’ in Münchenstein, Basel-Country, Switzerland, ‘Frog Fantasies: Museum & Gift Shop’ in Eureka Springs, Arkansas, USA,

‘FrogGalore Museum’ in Britain, and even visual frog museum like ‘FrogPool’, Austria’s online frog museum, or the ‘Frog City’ in Rayne, Louisiana, USA. ‘ITBC Frog Museum’ assimilates scientific knowledge with enjoyable learning and memorable experiences, and proffers strategic avenue for focal networking among various stakeholders.

### **‘ITBC FROG MUSEUM’: CONCEPT**

The concept of ‘ITBC Frog Museum’, being managed by the first author, is an assortment of displays and exhibits to highlight various facts on frogs and toads, that aims at providing information and knowledge, as well as inspiring understanding and appreciation towards frogs and toads as a component of the environment and biodiversity. Subsequently, information, knowledge, understanding, and appreciation galvanize joint participation in the conservation of the environment and biodiversity (Moktar Yassin & Mohd. Nazri Iguchi, 2003).

The displays and exhibits in ‘ITBC Frog Museum’ are in the form of posters, reading materials, documentaries, specimens, and tailor-made replicas of frogs and toads. Posters in the frog museum are divisible into two genres, namely on scientific findings, and general knowledge regarding the frogs and toads in Sabah and Borneo. The posters on scientific findings cater for visitors who wish to gather more comprehensive information on up-to-date scientific works on frogs and toads, exemplified by inventory-based and ecological studies, biogeographical researches, distribution mapping using WORLDMAP Programme for the prioritization of conservation areas, ‘Anurans Tourism’ researches, ethnozoological surveys, agricultural studies, and molecular and nutrition composition analyses conducted by ITBC herpetologists and respective research collaborators from within Malaysia and abroad. At the same time, visitors are also able to view posters on various facets of the general biology of frogs and toads. These posters are on the morphology, taxonomy and classification, diversity, life cycle, habitation, diet, importance and functions, as well as threats and conservation of frogs and toads, for visitors who prefer light materials. However, the shared attribute between the two contrasting types of posters is that all the posters are designed by using many clear and captivating pictures, coupled with concise text to ease viewing for long-lasting impression.

Reading materials such as journals, books, proceedings and magazines on frogs and toads are rightfully exhibited and provided for the reading pleasure of visitors too. The

reading materials are publications either by ITBC herpetologists, or other writers from all over the globe. A reading corner with a sofa set and coffee table is also made available for visitors to read comfortably and even just to relax and enjoy the ambience inside the frog museum.

Documentaries on frogs and toads are screened in 'ITBC Frog Museum' for the enjoyment of visitors. The documentaries are on either the general biology of frogs and toads, or the diversity at any specific locality in Sabah or Borneo. Documentaries as such are always able to motivate visitors, especially the young ones, to have a better perspective on nature, and the works carried out in relation to the environment and biodiversity.

'ITBC Frog Museum' also provides the golden opportunity for visitors to view wet and dry specimens of frogs and toads. The wet and dry specimens on display epitomize just a fraction of the total collection deposited in BORNEENSIS, the reference collection centre in ITBC. Hence, 'ITBC Frog Museum' acts as a 'window' to BORNEENSIS, for other herpetologists, biologists, and visitors with avid interest on frogs and toads.

Tailor-made replicas to depict actual colouration, size, shape and posture of certain intriguing frog and toad species, are exhibited in 'ITBC Frog Museum'. These include the replicas of the Golden-legged Bush Frog (*Philautus aurantium*) with golden-yellow armpits and inner thighs, Bornean Horned Frog (*Megophrys nasuta*) with dermal projections from the eyelids and snout, Saffron-bellied Frog (*Chaperina fusca*) with bright yellow spots on the dark belly, Marbled Tree Toad (*Pedostibes rugosus*) with brown-spotted bright green back, and Mangrove Frog (*Fejervarya cancrivora*) with extremely coarse skin for a frog! Other replicas are simply to show exaggerated size and flamboyant colour combination, which never failed to fascinate visitors too.

### **'ITBC FROG MUSEUM': CHILDREN'S ACTIVITIES**

As the main target group of visitors for 'ITBC Frog Museum', children are always offered with fun and educational activities to bring about better understanding and eventually, appreciation towards the uniqueness and richness of frogs and toads in Sabah and Borneo, in particular and Malaysia and the world, in general, as well as the relatedness to the daily life and survivability of humans. Children's activities at a centre for ESD is a mainstream practice, for instance in Japan that has received wide acknowledgement for her efforts in the

culturalization of science among young children. Personal observation at centres such as the Lake Tanuki Nature School at Fuji-Hakone-Izu National Park (Shizuoka Prefecture), Asahidake Visitor Centre at Daisetsuzan National Park (Hokkaido Prefecture), Nopporo Forest Park Visitor Centre at Nopporo Forest Park (Hokkaido Prefecture), and Shirakami-Sanchi Visitor Centre at Shirakami-Sanchi World Heritage Site (Aomori Prefecture), revealed that the children's activities prepared at the centres have been utmost well-received that adults join in the fun. Some centres even provide accommodation for families which visit regularly for such activities.

Activities available at 'ITBC Frog Museum' are:

- Guess-The-Food-For-Frogs and Toads Game that involves children to guess the food for frogs and toads, and later find out for themselves by inserting their hands into the mouth of a huge frog figurine stuffed with replicas of the food for frogs and toads: ants, termites, beetles, flies, mosquitoes, and even other frogs and toads, small birds, and small mammals.
- Guess-The-Home Game that involves children to guess the natural habitats for frogs and toads by examining the limbs – webbing or without webbing between fingers and toes, the tips of digits are blunt, slightly dilated or expanded into pads (discs), and muscular or slender hind legs. Pictures of frogs and toads with different limb characteristics are given to be matched with the correct habitats for the species. Discussions with the children are held once the matching has been completed. The discussions also touch on the detrimental effects of unscrupulous human activities onto the habitats.
- Drawing of Frogs and Toads to discover children's creativity and interpretation of frogs and toads. Present experience with young visitors to 'ITBC Frog Museum' indicates that almost all children perceive frogs and toads as adorable and likeable.
- Story Writing that involves children to continue a story about frogs and toads from previous contributors, on the conditions of (i) not terminating any existing character, and (ii) not ending the story. Children, and even many adults, find it absolutely thrilling to personify frogs and toads, and other inhabitants of nature in continuing the never-ending story. Children who wish to contribute original stories are also welcomed.

- Handicraft and Souvenir Making that involves children to create handicrafts and souvenirs based on frogs and toads, from natural and recycled materials. Children paint frog and toad faces on flat-surfaced stones, make frog and toad puppets from paper bags, and make bookmarks from recycled papers. The handicrafts and souvenirs are either brought home by the children, or left at the frog museum to be displayed.

### **‘ITBC FROG MUSEUM’ AND THE POLICY-MAKERS**

‘ITBC Frog Museum’ has become a convergent point between a higher learning institution and policy-makers since the appointment of the second author, the Director of ITBC, as the Chairperson of the National Technical Sub-Committee of Faunal Biodiversity (Amphibia) Malaysia in November 2005, and subsequently, the frog museum has been recognized as a complementary arm of the technical sub-committee. The technical sub-committee is a part of the National Technical Committee of Faunal Biodiversity Malaysia headed by the Director-General of the Department of Wildlife and National Parks Peninsular Malaysia, which is under the National Biodiversity Inventory Committee led by the Secretary-General of the Ministry of Natural Resources and Environment, Malaysia. The abovementioned committees are all superintended by the National Biodiversity-Biotechnology Council chaired by The Right Honourable Prime Minister of Malaysia. Thus, ‘ITBC Frog Museum’ brings together the academics, policy-makers, as well as members of Non-Governmental Organizations (NGOs) who are also under the committees, in realizing the role of ESD for environmental and biodiversity conservation. Tight-knitted relationship as such eases multi-institutional cooperation in achieving the objectives specified for the frog museum.

### **‘ITBC FROG MUSEUM’ AND THE MASS MEDIA**

Wide and consistent dissemination of information pertaining to the frog museum is as important as for the knowledge on frogs and toads, in ensuring the efficacy of ‘ITBC Frog Museum’ being the ESD arm of ITBC towards environmental and biodiversity conservation. Mass media seems to be the best channel for the desired wideness and consistency of information and knowledge dissemination. ‘ITBC Frog Museum’ works closely with a local English newspaper: New Sabah Times, via the fortnightly publication of ‘BORNEENSIS Corner’ that highlights various biodiversity collections in BORNEENSIS, ITBC, and related researches. Although not every publication of ‘BORNEENSIS Corner’ is on ‘ITBC Frog



Museum' or frogs and toads, a total of three pertinent articles have been published. The newspaper articles were:

- Maryati M., B.H., Kueh and J., Petherine. 2007. Education for Sustainable Development. *New Sabah Times*. 15 April 2007: 9.
- Kueh B.H., M., Maryati and J., Petherine. 2007. Anuran collection hops into the big picture. *New Sabah Times*. 13 May 2007: 9.
- Kueh B.H., M., Maryati and J., Petherine. 2007. Amazing anurans in Sabah and Borneo. *New Sabah Times*. 27 May 2007: 9.

Other mass media utilized are the Internet: [www.researchsea.com](http://www.researchsea.com) (the web site for Asia's first research news portal – ResearchSEA) which contains an article related to 'ITBC Frog Museum', and also the frogs and toads in Sabah and Borneo. Several locally well distributed magazines are used as well.

#### **'ITBC FROG MUSEUM' AND THE PRIVATE SECTOR**

The private sector, with its financial ascendancy, is another crucial stakeholder not to be neglected in environmental and biodiversity conservation. Under the contemporary context, economic growth and social development must proceed simultaneously with conservation, for the much required perpetuation. Financial strength and societal stability fuel more fervent involvement from all parties concerned.

The private sector, namely tour operators, has participated in the outputs of 'ITBC Frog Museum' through the running of two tourism products incorporating the museum: 'Anurans Tourism' and Campus Tourism. 'Anurans Tourism' is 'the responsible travel to relatively undisturbed natural areas or related venues with the intensions to see, admire, enjoy and learn about anurans (frogs and toads), including the 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 & Maryati, 2005; Kueh, 2006; Kueh *et al.*, 2006a). Campus Tourism, which is another tourism product diversification by ITBC, is a product that displays the charm of Universiti Malaysia Sabah Campus to visitors. The campus is deemed as a landmark for Sabah State, conveniently accessible from airports, the city and major hotels, as well as has many complementary attractions to offer. The attractions include UMS Museum, Nobel Laureates Museum, Marine Aquarium, UMS Outdoor Development Centre

(ODEC), ITBC Public Gallery, ITBC Ex-Situ Valley and Nature Trail, and of course, 'ITBC Frog Museum'.

Tour operators associated with 'ITBC Frog Museum' encourage more people, both domestic and international tourists, to visit the frog museum. As a result, more people can learn about and value the environment and biodiversity. The symbiotic relationship benefits both parties as it assists 'ITBC Frog Museum' to fulfil her objectives, and presents a much needed avenue for the private sector to also contribute, as other stakeholders, towards environmental and biodiversity conservation.

## **CONCLUSION**

Thus far, 'ITBC Frog Museum' has received favourable response from various stakeholders: the general public (especially children), policy-makers at State and Federal levels, other higher learning institutions, NGOs, the mass media, and the private sector. On average, 100 people visit the frog museum every month. Nearly one-third of the visitors are from abroad due to the strong international linkage between ITBC and her foreign counterparts in Japan, the United Kingdom, Europe, the United States of America, Australia, and South-East Asia. Betterment and enhancement of the exhibition concept, activities, and networking with stakeholders, are incessant agenda of 'ITBC Frog Museum'. Exhibits and displays are being augmented. New activities are being innovated and implemented to include downstream outreach programmes that 'brings' 'ITBC Frog Museum' to the rural communities, and upstream outreach programmes that showcase 'ITBC Frog Museum' at the national and international levels through joint exhibitions, and conference and symposium participation. Fresh partnerships are being forged with more stakeholders to open up novel opportunities, and also secure sustainability of 'ITBC Frog Museum'. ITBC, via 'ITBC Frog Museum' as her ESD arm, strives to further enhance the participation and collaboration of stakeholders in creating a sustainable future for all.

## **ACKNOWLEDGEMENT**

The authors are grateful to Universiti Malaysia Sabah for allowing this paper to be presented at the '4<sup>th</sup> International Conference on Environmental Education' in Ahmedabad, India.

## REFERENCES

- Kueh B.H. 2006. Anurans Tourism in Crocker Range Park: Convergence of research and local people involvement towards conservation. In *Proceedings of the Tenth Sabah Inter-agency Tropical Ecosystem (SITE) Research Seminar: Towards Converging Community Involvement in Protected Areas Management in Sabah: Issues and Challenges* edited by Laurentius Nayan Ambu and Titol Peter Malim, pp. 58 – 68. Kota Kinabalu: Sabah Wildlife Department.
- Kueh B.H., L., Kiruba-Devi, D.T.W., Chew and M., Maryati. 2006a. Anurans (Frogs and Toads): New nature tourism product for conservation and local people well-being. In *Borneo in the New Century: Proceedings of the '8<sup>th</sup> Biennial International Conference of the Borneo Research Council*. Kuching: Universiti Malaysia Sarawak.
- Kueh B.H. and M., Maryati. 2005. Collection, management and utilization of anuran specimens and data for conservation. In *Achieving Environmental Sustainability in the 21<sup>st</sup> Century: Proceedings of the International Conference on Natural Resources and Environmental Management (NREM 2005)* edited by Lau Seng, pp. 439 – 450. Kuching: Institut Kimia Malaysia/Universiti Malaysia Sarawak/Natural Resources and Environmental Board/Sarawak Development Institute.
- Kueh B.H., M. Nakada, Y. Hashimoto and M., Maryati. 2006b. *MUSEBASE: Collection Data Management System for Comprehensive and Sustainable Conservation of Biodiversity and Ecosystems*. Kota Kinabalu: Universiti Malaysia Sabah.
- Maryati M. 2004. ITBC Frog Museum: For the people. In *Herpetology and The Future: Proceedings of the 'International Conference on Bornean Herpetology 2003'* edited by Maryati Mohamed, Masafumi Matsui and Kueh Boon Hee, pp. 21 – 25. Kota Kinabalu: Universiti Malaysia Sabah.
- Maryati M., B.H., Kueh and J., Petherine. 2007. Education for Sustainable Development. *New Sabah Times*. 15 April 2007:9.
- Moktar Yassin A. and A., Mohd. Nazri Iguchi (eds.). 2003. *Environmental Public Awareness Campaigns in Sabah: Case Studies, 2002*. Kota Kinabalu: Science and Technology Unit/Sabah State Government/Japan International Cooperation Agency.
- Omar O. and S., Zainal Abidin. 2005. Issues and approaches towards environmental sustainability – The case for education for sustainable development. In *Achieving Environmental Sustainability in the 21<sup>st</sup> Century: Proceedings of the International Conference on Natural Resources and Environmental Management (NREM 2005)* edited by Lau Seng, pp. 1 – 15. Kuching: Institut Kimia Malaysia / Universiti Malaysia Sarawak/Natural Resources& Environmental Board / Sarawak Development Institute.
- UN Division for Sustainable Development. 2007. <http://www.un.org/esa/sustdev/> as viewed in October 2007.

UN Millennium Development Goals. 2005. <http://www.un.org/millenniumgoals/> as viewed in October 2007.