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RAFFLES MUSEUM NEWSLETTER

The Museum That Almost Never Was

A scientist exploring the rich and diverse animal world of Southeast Asia will find a treasure trove at the Raffles Museum of Biodiversity Research. Housed in a three-storey building at The National University of Singapore, it has one of the largest collections of Southeast Asian animals in the world, with some 500,000 specimens collected over the last 150 years. Among these are 6,000 “type” specimens, each of which is an original specimen studied when the species was first discovered. Scientists doing research on these and related species have to refer to this “type” specimen to confirm the identities or make key inferences. These specimens are irreplaceable!

But just 30 years ago, the fate of the collection hung by a thread. It had no permanent home, and was shuttled from place to place like a pariah. Indeed, at one point, there were talks of it ending up in the



Raffles Museum at Stamford Road

dustbins. Why had things turned out this way?

The Golden Years

After all, the collection had a promising start. It was Sir Stamford Raffles, the founder of modern Singapore and a keen naturalist, who mooted the idea of establishing a natural history museum here in 1823. The Raffles Museum was set up in 1849. Over the next 100 years, it became effectively, a museum of Malaysian and Singapore zoology. Specimens from Singapore and the region poured in from an enthusiastic public and



Displays of Malayan wildlife



The memorable whale skeleton

distinguished personalities like Alfred Russell Wallace, Whampoa Hoo Ah Kay, as well as the Sultan of Singapore. In 1934, the museum started the *Bulletin of the Raffles Museum*, which quickly became one of the premier scholarly journals in its time, publishing many important papers on Southeast Asian zoology.



Southeast Asia, with its diversity of habitats, is internationally recognised as a biodiversity hotspot, with millions of undiscovered species. In the Raffles Museum, work is ongoing to study this spectacular diversity

The Tumultuous Decade

But in 1969, its fate took a sudden turn for the worse. The Singapore Science Centre was set up and it was decided that the Raffles Museum, then renamed the National Museum, should cater for only arts and anthropology. All the 126,000 animal specimens were moved to Singapore Science Centre. After a year, they were transferred to the then University of Singapore, and became known as the Zoological Reference Collection in 1972. The only catch was that the university at Bukit Timah could not find enough

space for the specimens, which were housed in bulky wooden crates. So, over the next 14 years, the crates trundled from five huts at Ayer Rajah, back to the Bukit Timah campus, where they were kept in different departments, and then to Nanyang University's library at Jurong. Mrs Yang Chang Man, chief curator and stoic custodian of the collection since 1972, recalled: "Every move took several months and required at least 40 lorries."



The old storage cases 1972-1998

Due to frequent transfers and bad storage conditions, some specimens were damaged. It was only through the curators' tremendous efforts that not more was lost! Despite the lack of working space, scientists, including the then Crown Prince Akihito of Japan, an expert in gobies, continued to visit the Raffles Museum. Other museums even offered to receive in part or even buy the entire collection outright.

A Full Circle

It seemed by sheer luck that the collection held out as long as it did. In 1986, it finally got a permanent home in the new campus of the National University of Singapore at Kent Ridge. Today, the 500,000 specimens are stored in specially-designed airtight storage compactor systems, with 24-hour air conditioning and controlled humidity. It has also incorporated the plant and fungi collections kept by the Herbarium of the former Department of Botany. But it is determined to be more than a "dumping ground" of dead plants and animals. In 1998, the university decided that the time was ripe for the

establishment of a research centre for biodiversity. The Zoological Reference Collection, together with its newly acquired collections, and a new mandate for



Modern storage facilities in the museum

research, publication and public education, was reorganised into the Raffles Museum of Biodiversity Research. The Bulletin of the Raffles Museum, which was restarted in 1987 as the Raffles Bulletin of Zoology, quickly regained its reputation as the premier journal for Southeast Asian biodiversity research. With the world in the grip of a biodiversity crisis, research in this area is of particular urgency, said Associate Professor Peter Ng, the museum's director and an international specialist in crabs. He pointed out that Southeast Asia is one of the world's biodiversity hotspots, though it has received much less attention compared to the Amazon, West Africa and the Great Barrier Reef. "But how can we protect the diversity of this region if we do not conduct the necessary research to understand it in the first place?" he asked.

The Public Gallery

One of Raffles' reasons for establishing a museum in 1823 was to have a public place to showcase the splendid diversity of Malayan wildlife. Education was a major role the museum performed eminently for over a century. The original display gallery at Stamford Road, with its rows of well displayed stuffed animals, was the mainstay of local biodiversity education until its closure in 1970. Since then, the collections have been used for research only, with very limited public access. With the opening of the new public gallery in June 2001, the Raffles Museum has come full cycle. It also signals a more active outreach program for the museum, to teach a new generation of students about the wonders of Southeast Asian biodiversity!



The modern public gallery — a showcase of Southeast Asia's biodiversity!

TALES FROM THE CRYPT

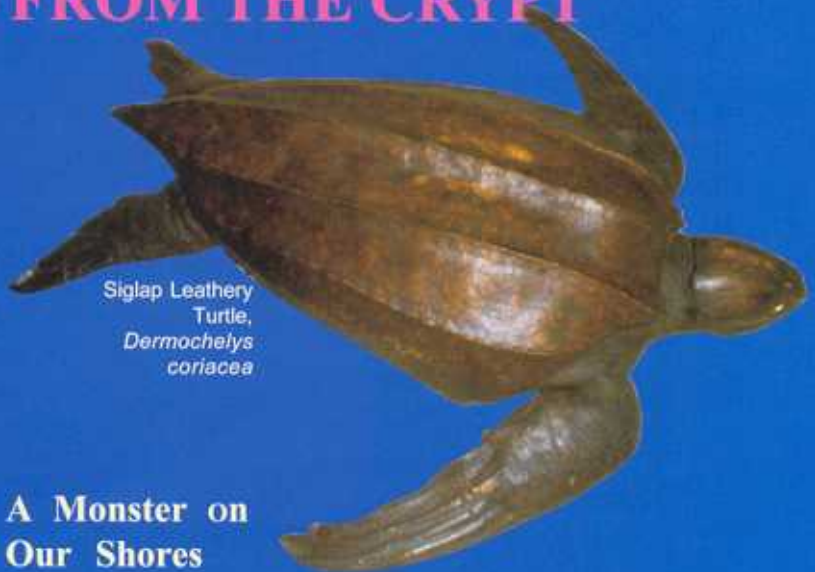
The Raffles Museum provides a rare chance to see up close many animals which can no longer be collected or seen here. Here is a sneak preview of some.



Is the Banded Leaf Monkey, *Presbytis femoralis femoralis*, doomed?

Last of Her Kind ...

Groups of 10 or more of these Banded Leaf Monkeys used to be common at Bukit Timah Nature Reserve. But when this particular female monkey was mauled to death by feral dogs when she climbed down from her tree in October 1987, she was all alone. She was the last of her kind at Bukit Timah. In recent years, a few Leaf Monkeys have been sighted in the Central Catchment. Today, the Leaf Monkey is one of Singapore's (and the world's) most endangered mammals, with possibly less than two dozen animals still alive. Whether it can survive into the future is a matter of some debate. This particular subspecies of leaf monkey was originally described from Singapore and, as far as is known, is found only in this country. The sad look on this dead female bears witness to the grim fate awaiting her species!



Siglap Leatherly Turtle, *Dermochelys coriacea*

A Monster on Our Shores

This giant Leatherly Turtle swam up Siglap beach in 1883. The Raffles Museum has a major role in the study of the biology of this turtle. Its ex-director, the late Michael Tweedie, was the first scientist to discover its nesting ground in Trengganu, Malaysia. This specimen measures more than a metre in length but is still regarded as a small one. It can grow much larger and is generally regarded as the heaviest reptile in the world. Sadly, this turtle faces extinction today because its nesting grounds are threatened and its eggs are overcollected for food. Many adults are also dying because of indigestion caused by eating plastic bags. Why? These gentle giants love to eat jellyfish... except that the "man-made versions" (the plastic bags) cannot be digested and get stuck in their digestive system!

Alfred's Catch

This is the Museum's only specimen from Alfred Wallace, author of the classic book, *The Malay Archipelago*, and one of the most famous natural historians in the world. Many credit him as the co-founder of modern evolutionary biology, an honour normally reserved for Charles Darwin. Wallace set the stage for modern explorations of Southeast Asian biodiversity through his exploits in Malaysia and Indonesia. In fact, Wallace spent a few days in Singapore collecting near what is today Bukit Timah Nature Reserve. This particular bird, a flycatcher, is kept in a special storage drawer. The specimen measures only about 11cm long and was collected by Wallace himself from Malacca. He donated it to the Raffles Museum in 1862.



Wallace's flycatcher, *Muscivora latirostris*

PROFILE

Small Is Beautiful – How A Muscologist Was Born

Associate Professor Benito Tan is a muscologist by training, but he seldom introduces himself as such. “I used to, but some people thought I am a specialist on the city affairs of Moscow,” he says, with a laugh. A Chinese Filipino, Benito, who joined the university in 1998, studies mosses, plants so tiny that most people do not bother to give a second look. As one of the few experts on East Asiatic mosses, he has left his footprints throughout Asia over the last 20 years while collecting these ancient plants. In his innumerable moss-hunting trips in Asia, the closest he came to losing his life was four years ago, when his boat capsized on a fast-flowing glacier-fed river in Siberia. Luckily, he managed to swim to shore. Not that the experience has deterred him. In June, he will lead an international team to go moss-hunting once again – to the Altai Mountain Range in Mongolia under a National Geographic Society grant.

Benito came to specialize in this obscure field by chance. His parents



Benito Tan with a visiting scientist at the Bukit Timah Nature Reserve

wanted him to be a medical doctor. “But I pass out when I see blood!” he says. Having nurtured a love for nature since he was young, he decided to study plants “since they don’t bleed if they are cut into pieces.” His first love was for ferns, but after graduating with a M.Sc. from the University of the Philippines in 1974, he decided to pursue his doctorate in the study of mosses as they were then unknown to many in the Philippines. After obtaining his doctorate from the University of British Columbia, he taught at the University of Philippines for eight years. In 1988, he decided to plunge into research full-time. He joined the New York Botanical

Garden as a curatorial assistant for two years. Then, for seven years, he conducted the moss research in preparation for the Flora of China mega-project at the Farlow Herbarium at Harvard University. But four years ago, the desire to teach re-surfaced and he took up a teaching position at NUS. In his first two years here, his warmth and patience have won over the students who voted him for the meritorious teaching award twice. In spite of his many teaching and administrative duties, he still finds time to devote to research. “Otherwise, I will have nothing new to tell the students!” he said.



Dawsonia is a giant among mosses, growing to more than 30 cm in height

WHAT ARE MOSSES?

Mosses are considered the simplest and most ancient group of land plants, but they are no less important. Together with other bryophytes, they control moisture levels in the forests and protect the topsoil from being washed away. They are the food sources and nesting sites of forest birds, insects, and the large grazing animals. For centuries, they have been used for medicinal purposes in China. They had been used for pillow fill in medieval times in

northern Europe and for decorative purposes by mountain tribes in Southeast Asia. Except for the marine environments, they are found everywhere, from the harsh winterland in Alaska to the dry deserts of Israel and Mongolia. There are about 14,000 species of mosses in the world today.



Hypopterygium looks like a tree

NEW DISCOVERIES

The Second Coelacanth

The discovery of the first coelacanth in 1938 from the Indian Ocean was a milestone because many people see it as a 'missing link' between fishes and amphibians. The fish, which has remained unchanged for 300-400 million years, is what biologists call a living fossil. Coelacanths are unusual among bony fishes in having lobed fins and an additional lobe on the tail. They are slow-moving nocturnal drift hunters of bottom-dwelling animals. They have been found in caves in groups of up to 14 individuals. Until JLB Smith, described *Latimeria chalumnae* in 1938, coelacanths were believed to have died out 70 million years ago. In 1997, University of California graduate student, Mark Erdmann, encountered at a market at Manado,

Sulawesi, a large fish which turned out to be the second coelacanth species, and the first from outside the Indian Ocean.

A specimen was eventually collected, and in 1998, Erdmann, Roy Caldwell and their Indonesian collaborator, Kasim Moosa, announced to the world that the coelacanth had been found 13,000 kilometres away from where it was supposed to be. As later work would show, the Indonesian coelacanth was a different species, with colour differences and a different genetic makeup.



K. Moosa holding a cast of *Latimeria menadoensis* at the museum

Refs: Erdmann, MV, RL Caldwell & MK Moosa, 1998. Indonesian 'king of the sea' discovered. *Nature*, 395: 335-335; Erdmann MV, RL Caldwell, SL Jewett & A Tjakrawidjaja, 1999. The second recorded living coelacanth from north Sulawesi. *Env. Biol. Fish.*, 54: 445-451; Pouyaud, L, S Wirjoatmodjo, I Rachmatika, A Tjakrawidjaja, R Hadiaty & R Hadie, 1999, A new species of coelacanth. *CR Acad. Sci. ser. III-Vie*, 322: 261-267.

Sex To Die For ...

Of all the living things on Earth, none rivals the beetles in diversity. It has been estimated that up to a quarter of all known organisms may be beetles. Discovering new beetle species is not exactly difficult, the challenge being to recognise them for what they are. Hundreds are described every year from the rich rainforests of Southeast Asia.

One of the most amazing beetles is the so-called trilobite beetle (Lycidae). The females never metamorphose into normal beetles but remain larvae-like. They never bear wings, and keep growing until maturity, reaching a length of 60 mm. This is a phenomenon known as neoteny. Adult males on the other hand, are normal beetles measuring only 1-2 mm in length.

When "it is time", the females exude sex hormones to attract the miniscule male. In what must be surely one of the most bizarre matings in the animal world, the almost tiny male fertilises a gargantuan female, and dies shortly after. The female then lays her eggs, and also dies! Surely sex is worth dying for ...

Refs: Wong, ATC, 1995. Trilobite larvae. A new understanding. *Nature Malaysiana*, 20: 24-29; Wong, ATC, 1996. A new species of neotenuous lycid beetle *Duliticola hoiseni* (Coleoptera: Catharoidea: Lycidae) from Peninsular Malaysia and Singapore. *Raffles Bull. Zool.*, 44: 173-187.

The female trilobite larvae (*Duliticola* sp.) can best be described as "an overgrown baby" – she never sprouts wings and grows to 60 mm in length

The male of *Duliticola* (inset) is a tiny 2 mm long normal beetle – why males and females of these insects are so different is still not known for certain



Life in the Netherworld

Caves are very hostile habitats – devoid of light, often even without a reliable food source. And they are extreme habitats to explore. Scientists who dare to venture into this netherworld to brave the lightless caverns and narrow tunnels are called speleologists, and they are a very special (and very courageous) breed indeed! Some of the cave animals being discovered are

strange beyond measure. In 1998, Louis Deharveng, a French entomologist exploring caves in central Laos, came across a bizarre-looking crab with extremely long legs and greatly reduced eyes. Former NUS graduate student, Darren Yeo, who studied these specimens, confirmed that Deharveng had stumbled onto an animal so extraordinary that it was not only a new species but deserving a new genus as well! It was also the first true cave crab found in Indochina. Naming it

Erebusa calobates, which means “stilt-walker from the nether world”, it hints of what can be expected from this area in the years to come! Unlike normal crabs, *Erebusa*, has almost no eyes and is almost blind. Without light, eyes are unnecessary and evolution has selected against them! Instead, it uses its very long legs to feel its way around the cave.

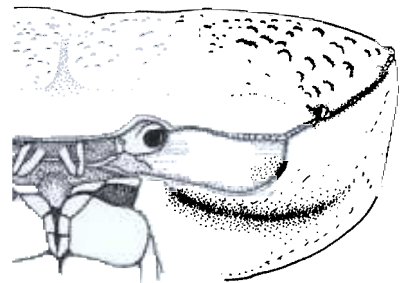
Ref: Yeo, DCJ et al., 1999. *Erebusa calobates*, new genus, new species, a troglobitic crab (Brachyura: Potamidae) from Laos. J. Crust. Biol., 19: 908-916.



NUS graduate student, Cai Yixiong, seen here spelunking in the caves of the Philippines, looking for the strange and wonderful



The bizarre spider-like *Erebusa* of Laos



The tiny eyes of *Erebusa* are an adaptation to a lightless world

A New Orchid Species From The Wild

Orchids are one of the most speciose group of plants on earth (some 20,000 species are known), and they are especially successful in tropical Southeast Asia. *Phalaenopsis* is a genus of orchids well known for their ornamental value as cut-flowers and pot plants. There are 47 species ranging from Yunnan to Australia, India and Papua New

Guinea. Recently, L. Garay and E.A. Christenson, named a beautiful new species collected from Sabah, *P. doweriensis*. A NUS graduate student, Michelle Goh Wee Kee, is currently studying the molecular systematics of *Phalaenopsis* in an attempt to provide a new classification using biochemical markers as well as traditional morphological characters.

Ref: Christenson, E.A. 2001. *Phalaenopsis*: a monograph. Timber Press, Portland, Oregon. 330 pp.



The beautiful *Phalaenopsis doweriensis* orchid from Sabah

FEATURE

The Snakehunters

Between February and April 2001, more than 20 young Singaporeans became the eyes and hands for Harold Voris, Daryl Karns and Bruce Jayne, during their recent research stint in Singapore. These researchers from the world famous Chicago Field Museum of Natural History were here to study the ecology of local mangrove snakes. In addition to general surveys, they were also conducting radio telemetry to find out more about the snakes' movements and preferred habitats. In addition, they were also studying their feeding diet. Hosted by the Raffles Museum and supported by the National Parks Board, the student volunteers helped these

scientists study the four species of mangrove snakes at Sungei Buloh Nature Park and Pasir Ris Park.

Southeast Asia has the greatest diversity of marine and freshwater snakes in the world, but for most, their biology is very poorly understood. Although sea snakes are very poisonous, most mangrove and freshwater snakes do not possess venom strong enough to kill a man. Of the four species of mangrove snakes studied in Singapore, three were previously regarded as rare to very rare. In fact, their rarity is an illusion – they were just very secretive with highly specialised habits. And their behaviour is bizarre – by snake standards at

least! Two species (*Fordonia leucobalia* and *Gerarda prevostiana*) feed only on crabs, while one, *Cantoria violacea*, seems to be a dedicated prawn feeder! These studies help throw more light on the biology and evolution of these interesting animals, and in the process, help in their eventual conservation!



The crab-eating snake, *Fordonia leucobalia* pins its victims down with its head before swallowing them



Cantoria violacea, originally described from Singapore in the mid-1800s, seems to be a specialist shrimp feeder



To work in the very soft mangrove mud, special gear is needed – like these mud-skis designed by Bruce Jayne!



Working late at night in the seemingly inhospitable mangrove swamps of Singapore

THE NEW EXPLORERS

Expeditions

Expeditions are very important for a growing natural history museum. Not only is it an opportunity for a museum to obtain fresh collections for various research missions, it also allows the museum staff a chance to work with like-minded scientists from neighbouring countries. Regional collaborations of this type are integral to building up each other's strengths and bringing the researchers closer together.



An expedition to Pulau Tioman by the Raffles Museum in 1962

Expeditions are conducted for various reasons. They can be generic ones, just to make general collections. They can be targeted – for example, to explore a previously unexplored area and document its fauna and flora so that conservation decisions can be made judiciously.



Yunnan Newt, *Tylototriton shanjing*

Or they can be mission-oriented – to look for specific groups of organisms in order to accomplish a research goal, for example the revision of a selected group of plants or animals.

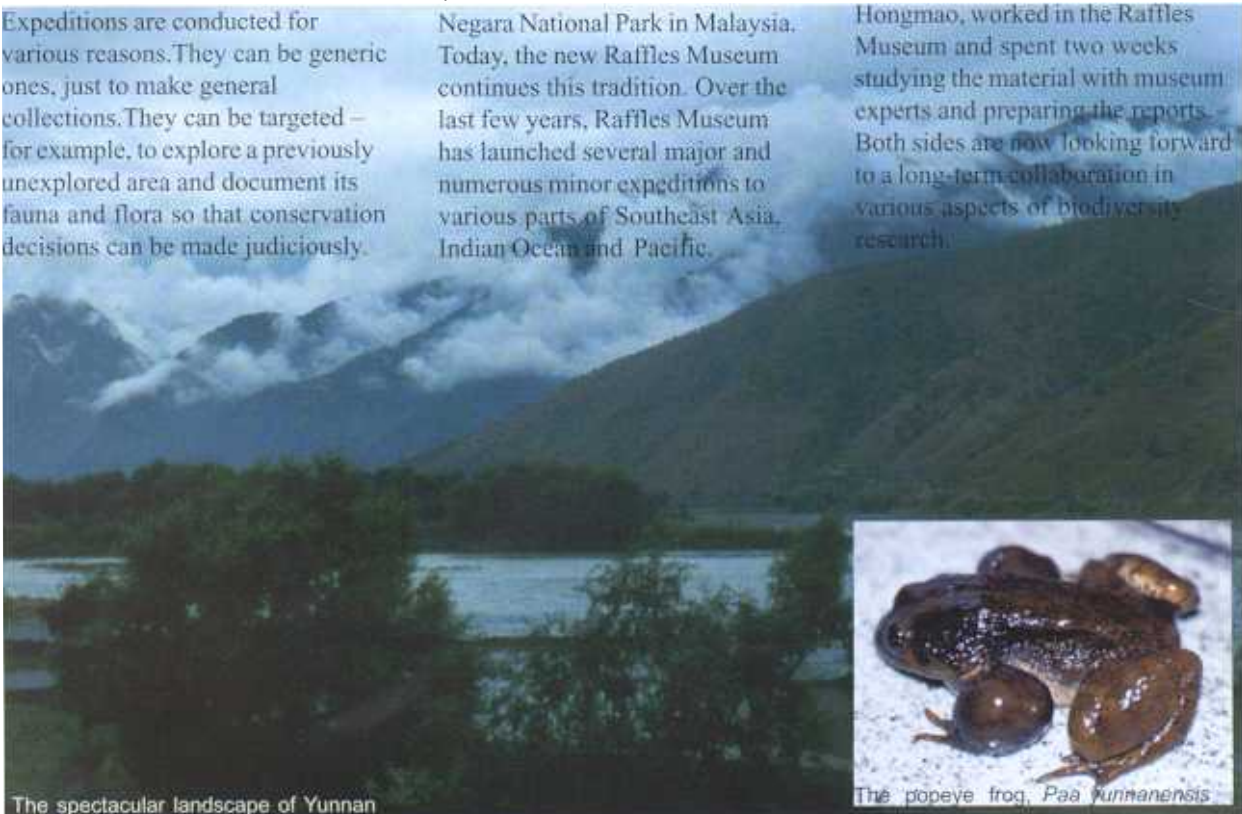
The old Raffles Museum was well known for its many successful expeditions. It was among the first organisations to systematically survey the famous Christmas Island (now part of Australia). It led the way with its many surveys of Pulau Tioman and Taman Negara National Park in Malaysia. Today, the new Raffles Museum continues this tradition. Over the last few years, Raffles Museum has launched several major and numerous minor expeditions to various parts of Southeast Asia, Indian Ocean and Pacific.

Operation Xishuangbana (Yunnan 2000)

In May 2000, the museum conducted a joint survey of the Xishuangbana Basin in Yunnan, China, with the Xishuangbanna Tropical Botanic Gardens of the Chinese Academy of Science. The mission was to see how the diversity of key aquatic animal groups relates to the water quality and hydrology of the system.

Two scientists, a resident spider expert, Li Daiqin, and a visiting entomologist from Scripps, University of California, Lanna Cheng, as well as two graduate students, Tan Heok Hui and Cai Yixiong, worked with staff of the institute for two weeks in Yunnan.

In the return visit in 2001, four researchers from the institute, led by their Deputy Director, Liu Hongmao, worked in the Raffles Museum and spent two weeks studying the material with museum experts and preparing the reports. Both sides are now looking forward to a long-term collaboration in various aspects of biodiversity research.



The spectacular landscape of Yunnan



The popeye frog, *Paa yunnanensis*



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