UNIVERSITY OF MALAYA
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MUSEUM OF ZOOLOGY
Kuala Lumpur

# BULLETIN OF THE MUSEUM OF ZOOLOGY

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## Inside



## Contributors:


**Dr. Sasekumar**

**Dr. John**



**Gary Sing**

**Thary Gazi**



**Khairunnisa S.**

**Lim Tze Tshen**


## Biodiversity Genomics Lab @ Museum of Zoology

According to some, DNA sequences are already the de facto universal communication tool for taxonomic information, providing anchor points for data associated with biological specimens such as those preserved in Natural History Museums.

Regardless of whether or not you can accept this controversial viewpoint, molecular techniques are increasingly employed in biodiversity research to establish the origins and taxonomy of organisms. Molecular techniques are undoubtedly invaluable for detecting the presence of hidden species diversity within cryptic species complexes.

Most of the world's major Natural History Museums have their own state-of-the-art biodiversity genomics laboratories (e.g. LAB @NMHM). The research conducted in molecular taxonomy laboratories centers on the field of biodiversity systematic, including phylogenetics and the genetic structure of animal populations. A good infrastructure enables the DNA-laboratory to be very effective in this fundamental research area. In 2012, Dr. John James Wilson and his team at the Museum of Zoology took the initiative to establish a biodiversity genomics laboratory as part of the Museum's transformation plan. At present, it is a small scale DNA-laboratory, but equipped with standard bench equipment and all the necessary apparatuses (centrifuges, PCR machines, and electrophoresis systems) for basic biodiversity genomics research.

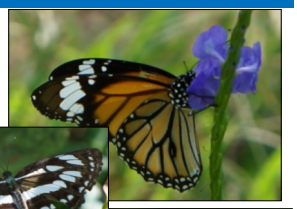
The research scope of the laboratory covers molecular taxonomy, phylogenetics, phylogeography, population biology and conservation biology. Several DNA extraction methods (kits, Chelex and ethanol) have been tested to determine the most cost and time effective protocols for our laboratory situation. Amplification of extracted DNA fragments by PCR can be done within 2 hours. PCR products are then sent to a local company for sequencing.

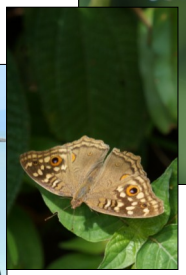
Due to a competitive market place and rapid technological advances, a "DNA barcode" can be obtained very quickly and cheaply from a specimen (for approximately RM25 per specimen using our protocols) making the method easily accessible to biodiversity researchers. Therefore, the team at the Museum of Zoology aims to provide a hub for DNA Barcoding of Life in Malaysia amid increasing interest in these types of studies from the region. Please get in touch with the Biodiversity Genomics Lab (museumzoology@um.edu.my) if you are interested in research collaboration.

***-Gary Sing Kong-Wah***

## Report on Fieldwork by Museum of Zoology Staff

**FIELDWORK 1**





* Sampling of butterflies for the "**DNA Barcoding of The Butterflies in Peninsular Malaysia**" project.
* Langkawi Island and small islands nearby.
* 29th January until 2nd February 2013
* John, Gary, Nisa and Linda (Asian Biodiversity Center's intern)
* During the day, we travelled around the island to waterfalls and other places known for butterflies. The butterflies were captured using sweep nets and photographs of them were taken as well.

RESULTS:

208 butterflies from 4 families (Nymphalidae, Pieridae, Lycaenidae and Papillionidae) were caught and brought to the lab to be preserved and the legs taken for molecular works.

*-continues on page 2*

## Report on Fieldwork by Museum of Zoology Staff

*- continues from page 1*

**FIELDWORK 2**

* First sampling of butterflies, dung beetles and bats for the "**Rapid Assessment of Biodiversity in a Tropical Site using Bioindicator Taxa**" project.
* Rimba Ilmu, University of Malaya
* 6th until 9th March 2013 (3 nights)

* John, Gary, Nisa and Karen
* Standardized surveys were conducted over a four day period:
* Dung beetles were trapped overnight using pit fall traps with cow dung and chicken liver as baits at two transects. Samples were taken to the lab to be preserved and legs were taken for analysis.
* Bats were trapped overnight using mist nets and harp traps. Wing tissues were taken for analysis.
* Butterflies were trapped using sweep nets between 10am-12pm along two transects. The right hind leg was taken from each butterfly before they were released.

RESULTS:

In total, 16 bats, 123 dung beetles and 125 butterflies were caught and DNA samples were brought to the lab for molecular works.

**FIELDWORK 3**

* Second sampling of butterflies, dung beetles and bats for the **Rapid Assessment of Biodiversity in a Tropical Site using Bioindicator Taxa**" project.
* Ulu Gombak Forest Reserve
* 11th until 14th March 2013 (3 nights)
* Gary, Nisa, Karen, Syireen, Ngadiran, Marisi, Ben, Zaidee

RESULTS:

In total, 27 bats, 93 dung beetles and 135 butterflies were caught and DNA samples were brought to the lab for molecular works. **- *Khairunnisa S.***

## Lost Mammal Fossils from Peninsular Malaysia, the Hooijer Collection


No discussion on Peninsular Malaysian Pleistocene mammal faunas is complete without mentioning the mammal fossils reported by Dirk Albert Hooijer in 1962. The whole collection, informally known as the 'Hooijer Collection', was sent to the National Museum of Natural History (Leiden) by B.A.V. Peacock, then Curator of Museums (Perak Museum, Taiping) to be identified by Hooijer in 1957. A total of 51 specimens from 7 species of mammals were noted by Hooijer (see table next page). It is stated that all these were found at a depth of about 30 feet (~9 meter) in tin-bearing deposits inside a limestone cave near Ipoh. The geological age for these fossils was estimated to be Middle Pleistocene based on the presence of certain chronologically indicative species (see below). If this biochronological estimation is reliable, the whole collection would unquestionably represent the oldest Quaternary mammalian remains so far reported from Peninsular Malaysia.

The collection is of special interest because, as noted by Hooijer it contains some species which had not before been reported from Peninsular Malaysia, such as the antelope, *Duboisia santeng* and the hippopotamus. In Southeast Asia, both these two fossil species had only been recorded from a number of Pleistocene sites in Java, and are indicative of a Middle Pleistocene age for the deposits that contain them. Curiously, no remains of these two species have ever been reported from any palaeontological or archaeological sites in Malaysia since Hooijer's 1962 investigation. Apart from that, the occurrence of these species (together with Javan Rhino, Otter Civet and possible Asiatic Wild Buffalo) also suggests the presence of a swampy grassland type of landscape, as opposed to the closed canopy tropical rainforest prevailing nowadays in most lowlands, in this part of Peninsular Malaysia during the Middle Pleistocene times. Because of its palaeoecological and chronological significance the fauna has been cited in almost every scientific article on regional fossil mammal evolution and past vegetational changes since Hooijer published the report.

As part of a renewed research into the Pleistocene mammal faunas of Peninsular Malaysia, Dr. Yasamin Kh. Ibrahim (formerly of the Department of Geology, UM) and me felt the need to re-examine the collection, especially in light of recent developments in Southeast Asian fossil mammal research. Also, there is no picture of specimens accompanying the original paper, therefore a photographic recording of the collection will surely be of great value to other palaeontologists working on Malaysian or Southeast Asian Quaternary fossils.

Hooijer mentioned that the fossils were returned to the University of Malaya (Kuala Lumpur) after his identification work in Leiden. Therefore, it is unlikely that the collection will end up in the National University of Singapore (which was then the Singapore campus of the University of Malaya). However, he did not specifically mention which department of the University the fossils were reposited. This is where our search for the collection really began (and still going on whenever new clues surface). A thorough and repeated search through the current and former depositories of the Zoology Museum (UM) had produced only a single specimen, a pig lower last molar (Figure above). It was not until a casual visit to the Prehistory Gallery of the National Museum that some of the other specimens were finally re-traced. There are, however only 9 specimens on display in the gallery which undoubtedly, according to the original collector's or cataloguer's numbers on the fossils, form part of the collection reported by Hooijer (Figure below). These are mostly of rhinos, but fortunately we managed to identify the shaft of a radius from an immature hippopotamus after comparing it with the description in Hooijer's paper. How did these 9 specimens appear in the National Museum and where are the rest of the specimens, including the only representatives of *Duboisia santeng* in Malaysia? We simply do not know. Searches in the museum in Leiden produced only rhino remains from Gua Cha (Kelantan) and nothing in the storage facilities of the National Museum, Department of Geology (UM), Natural History Museum (Putrajaya) and in Singapore seems to suggest that they once hold part of the collection we are looking for. Results of re-

examination and photos of these 10 recovered specimens were to be found in Yasamin Kh. Ibrahim (2013). Equally puzzling and challenging is to relocate the cave site where this collection was made. Neither Peacock nor Hooijer recorded the exact location of the find, and this makes any attempt to re-investigate or dating the deposits using modern radiometric techniques or to recover more specimens to test certain palaeoecological propositions almost impossible. However, some speculated (Malaysia Nature Society, 1991) that the find spot may be in the vicinity of Gunung (Gua) Datok (Inset below), a former tin- and guano-mining site now within the Sunway Lost World of Tambun water park. A visit to the place in September 2011 revealed that the multi-chambered cave system is located quite high, about 30 meter above the surrounding lands, according to a local guide, and it is mainly an East-West running tunnel system with deep chambers left by former mining activities. Traces of wooden ladders used by former edible birds' nests collectors were also seen in some of the high-vaulted chambers. Even though no fossil-bearing deposits were noted during this very brief survey, this site and the many caves in the surrounding karstic landscape area still worth a more systematic search in view that many sections of cave deposits here had already been well-exposed by former miners.

## Literature cited

D.A. Hooijer. 1962. Report Upon a Collection of Pleistocene Mammals from Tin-bearing Deposits in a Limestone Cave near Ipoh, Kinta Valley, Perak. *Federation Museums Journal* 7 (new series):1-5.

Malaysia Nature Society. 1991. A Conservation Assessment of Limestone Hills in the Kinta Valley (Final report). MNS Project 1/90. Unpublished report.

Yasamin Kh. Ibrahim. 2013. Vertebrate Palaeontology from Selected Pleistocene Cave Sites in Perak and Selangot, Peninsular Malaysia. Unpublished PhD thesis. Department of Geology, Faculty of Science, University of Malaya.

**Far left: A tooth of *Sus sp.* *In the museum of Zology***

***Below: Specimens found in the National Museum***

***Inset: Gua Datuk in Ipoh***

| *Collector's / Cataloguers' # | Other # | *Anatomical Identity | *Species Identity | Current Repository |
|---|---|---|---|---|
| 57 / 1.22 | | Upper DM4 dexter | *Rhinoceros sondaicus* | |
| 57 / 1.29 | | Upper P3 sinister | *Rhinoceros sondaicus* | |
| 57 / 1.16 | 3.3 | Upper P4 dexter | *Rhinoceros sondaicus* | National Museum |
| G.S. 15 | 3.4 | Upper M3 sinister | *Rhinoceros sondaicus* | National Museum |
| 57 / 1.15 | | Fragment of lower tooth | *Rhinoceros sondaicus* | |
| G.S. 22 | | Cervical vertebra | *Rhinoceros sondaicus* | |
| G.S. 18 | 3.7 | Thoracic vertebra | *Rhinoceros sondaicus* | National Museum |
| G.S. 12 | | Processus spinosus of thoracic vertebra | *Rhinoceros sondaicus* | |
| G.S. 7 | | Processus spinosus of thoracic vertebra | *Rhinoceros sondaicus* | |
| G.S. 20 | 3.9 | Proximal portion of scapula | *Rhinoceros sondaicus* | National Museum |
| 57 / 1.6 | 3.1 | Left scaphoid | *Rhinoceros sondaicus* | National Museum |
| 57 / 1.7 | 3.11 | Left unciform | *Rhinoceros sondaicus* | National Museum |
| 57 / 1-2 | 3.? | Right second metacarpal | *Rhinoceros sondaicus* | National Museum |
| G.S. 23 | | Left fourth metatarsal | *Rhinoceros sondaicus* | |
| 57 / 1.23 | | Phalanx | *Rhinoceros sondaicus* | |
| G.S. 2 | | Rib fragment | *? Rhinoceros sondaicus* | |
| G.S. 6 | | Rib fragment | *? Rhinoceros sondaicus* | |
| G.S. 13 | | Rib fragment | *? Rhinoceros sondaicus* | |
| 57 / 1.13 | 3.16 | Lower m3 dexter | *Sus* spec. | Zoology Museum (UM) |
| 57 / 1.1 | 3.17 | Shaft of immature right radius | *Hippopotamus* spec. | National Museum |
| 57 / 1.12 | | Lower m2 dexter | *Cervus* (? *Rusa*) spec. | |
| 57 / 1.26 | | Lower m2 dexter | *Cervus* (? *Rusa*) spec. | |
| 57 / 1.10 | | Upper M3 sinister | *Duboisia santeng* subsp. | |
| 57 / 1.11 | | Lower m3 sinister | *Duboisia santeng* subsp. | |
| 57 / 1.19 | | Lumbar vertebra | ? *Duboisia santeng* | |
| 57 / 1.8 | | Segment of mesosternum | ? *Duboisia santeng* | |
| 57 / 1.3 | | Radius dexter | ? *Duboisia santeng* | |
| G.S. 17 | | Proximal part of radius dexter | ? *Duboisia santeng* | |
| G.S. 9 | | Shaft portion femur | ? *Duboisia santeng* | |
| G.S. 11 | | Shaft portion femur | ? *Duboisia santeng* | |
| G.S. 14 | | Shaft portion femur | ? *Duboisia santeng* | |
| G.S. 21 | | Shaft portion femur | ? *Duboisia santeng* | |
| 57 / 1.24 | | Proximal end of tibia sinister | ? *Duboisia santeng* | |
| 57 / 1.9 | | Distal end of tibia sinister | ? *Duboisia santeng* | |
| 57 / 1.21 | | Distal end of tibia dexter | ? *Duboisia santeng* | |
| 57 / 1.18 | | Calcaneum sinister | ? *Duboisia santeng* | |
| G.S. 1 | | Proximal part of metatarsal dexter | ? *Duboisia santeng* | |
| 57 / 1.14 | | Lower m3 sinister | *Bibos* c.q. *Bubalus* spec. | |
| 57 / 1.4 | | Processus spinosus of thoracic vertebra | *Bibos* c.q. *Bubalus* spec. | |
| 57 / 1.17 | | Proximal end of calcaneum dexter | *Bibos* c.q. *Bubalus* spec. | |
| 57 / 1.25 | | Distal fragment of metatarsal | *Bibos* c.q. *Bubalus* spec. | |
| 57 / 1.5 | 3.35 | Rib fragment | *Bibos* c.q. *Bubalus* spec. | National Museum |
| 57 / 20 | | Rib fragment | *Bibos* c.q. *Bubalus* spec. | |
| 57 / 27 | | Rib fragment | *Bibos* c.q. *Bubalus* spec. | |
| G.S. 3 | | Rib fragment | *Bibos* c.q. *Bubalus* spec. | |
| G.S. 16 | | Rib fragment | *Bibos* c.q. *Bubalus* spec. | |
| G.S. 4 | | Rib fragment | *Bibos* c.q. *Bubalus* spec. | |
| G.S. 5 | | Rib fragment | *Bibos* c.q. *Bubalus* spec. | |
| G.S. 8 | | Rib fragment | *Bibos* c.q. *Bubalus* spec. | |
| G.S 10 | | Rib fragment | *Bibos* c.q. *Bubalus* spec. | |
| 57 / 1.28 | | Cervical vertebra | cf. *Cynogale* | |

* Original information from Hooijer (1962).

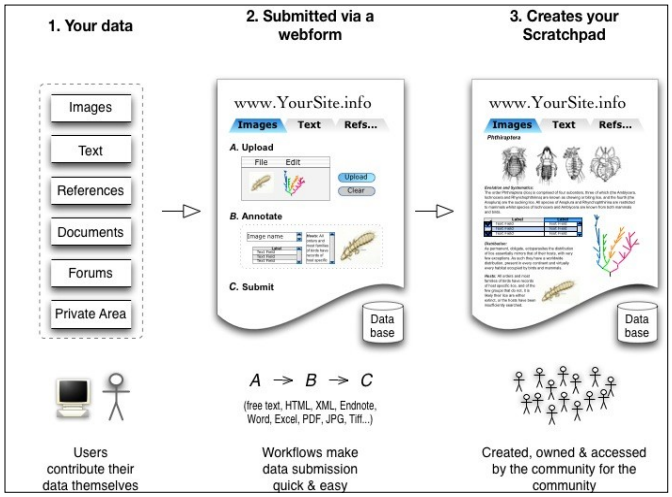
## Acknowledgements

Kamarul Baharin bin A. Kasim and Rohana Husin (National Museum, Department of Museums) kindly provided access to the collection storage facilities and permission to examine the animal fossils in their care. Management of the Sunway Lost World of Tambun for free entrance and professional guidance to Gua Datok. Thanks to the following colleagues for providing key information: Earl of Cranbrook (Natural History Museum, London), Geoffrey Davison (National Parks Board, Singapore), Degor anak Johia (Natural History Museum, Putrajaya), Lee Chai Peng (Department of Geology, UM), Kelvin Lim Kok Peng (Raffles Museum of Biodiversity Research, Singapore), A. Sasekumar (Zoology Museum, UM), Tan Swee Hee (Lee Kong Chian Natural History Museum, Singapore) and John de Vos (National Museum of Natural History, Leiden).

***-Text & images by LIM Tze Tshen***

# Opening up the biodiversity of hyper-diverse Malaysia with Scratchpads: an online framework to build, share and manage information on the diversity of life

The main research focus of Natural History Museums, including our Museum of Zoology, is biodiversity systematics, a scientific field also known as taxonomy. During taxonomic research, data on scientific names, specimens, and geographic localities need to be collected, filed and managed in large quantities. The data is then analysed in combination with yet more data to create taxonomic products like biodiversity inventories and biological classifications.




Historically taxonomists relied on specimen labels, file cards and monographs to record and manage biodiversity data. In the information age, many online resources now are available to make the process of biodiversity data collection, management and analysis easier. One such resource is Scratchpads (http://scratchpads.eu/), operated out of the Natural History Museum, London, UK.

The Museum of Zoology will be hosting a basic training course on Scratchpads later this month. There has been a lot of interest in this course and demand has exceeded the number of places available. Researchers from Forest Research Institute Malaysia, Institute for Medical Research, Department of Agriculture as well as Institute of Biological Sciences, UM will be in participating.

*"Signing up for a Scratchpad is free, quick and simple! No knowledge of website creation is required and your site can cover any aspect of biodiversity (a taxonomic group, a geographical area, club or society, journal, etc)"*

.... From the Scratchpad website.

**Setting up a scratchpad follows a simple workflow.**

By publishing online you allow others to provide advice and feedback during the research process and have a safe (from crashes and accidental deletion) place to store the valuable data it took you a large amount of time and effort to assemble. It also provides an attractive and user-friendly format for displaying the data and integrated workflows for formal publication of the research.

I have been completing a scratchpad for the 1000+ butterfly species of Peninsula Malaysia. This is still a 'work in progress' so the scratchpad is far from complete, but is available for public consumption and comment at malaysiabutterflies.myspecies.info (also linked through the Museum of Zoology website).

I hope that the training course encourages more researchers to adopt the scratchpad system, promoting collaborative research between scientists as well as "opening up the biodiversity of hyper-diverse Malaysia" to the public. Afterall, the world's biodiversity is the responsibility of everyone. Increased knowledge engenders increased passion for the need to protect and conserve our Earth's biological riches.

- ***John J. Wilson***

Scratchpads
biodiversity online

A social networking tool to build, share and publish information on the diversity of life

Scratchpads are an online virtual research environment for biodiversity. Through Scratchpads scientists can structure, curate, share and publish data, creating their own research networks.

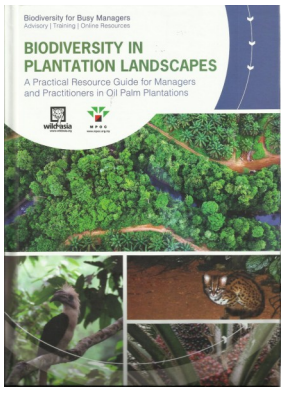
Some key features:

- Build Taxonomies - Manage References
- Manage Taxon Descriptions - Upload Media
- Manage Specimen records - Create Pages
- Manage Localities - Link to online repositories
- Create Maps - Harvest data from external services
-Create Character Matrices - Publish online and to open access journals

**Scratchpads are free to use for everyone**

**Erratum**: In Issue1 of the Bulletin of the Museum of Zoology Mr Lim TT, our research associate was acknowledged as "senior author" of the noteworthy publication. The first author Mr. Moseley wishes to be known as the "senior author". We apologize for any inconvenience caused.

## Book Review




**Title:** Biodiversity in Plantation Landscapes: A practical resource guide for managers and practitioners in Oil Palm Plantations.

**Authors:** Bakewell, D., Azmi, R., Yew, F.K., Ng,F.Y., Basiron,Y. and Sundram K.

**Pp.** 128

**ISBN:** 978-983-9191-15-3

**Publication:** Wild Asia and the Malaysian Palm Oil Council.

Palm oil is an important commodity for developing economies in South-East Asia, but planting oil palms comes at the cost of increasingly scarce natural habitats. It is easy to point fingers and view this as a black and white issue of greedy plantations owners and defenseless natural habitats. Thankfully this book avoids oversimplifying the issues and adopts a more collaborative approach. Published by wildlife NGO Wild Asia and the Malaysian Palm Oil Commission, this book serves as a good introduction and bridge between the concerns of scientists, conservationists and palm oil managers. Most of the advice is practical and examples are provided for biodiversity related problems that palm oil managers might encounter. The book is divided into five chapters that cover basic conservation theory, practical methods to monitor biodiversity, case studies of successful biodiversity enrichment projects and advice on conducting research in palm oil estates. While mainly targeted at oil palm managers, this book is a valuable resource for anyone that wants to understand the complexities of conservation from multiple viewpoints. ***—Thary Gazi***