BULLETIN OF THE MUSEUM OF ZOOLOGY Volume 2 Issue 1

DNA BARCODING IN HYPER-DIVERSE MALAYSIA:

Over the past 50 years, Southeast Asia has suffered the greatest losses of biodiversity of any tropical region in the world. Located at the region's centre, Malaysia is a hyperdiverse country with a particularly acute taxonomic impediment.

DNA barcoding, the use of short standardized DNA sequences for species identification and discovery, offers great promise as a solution to overcome the challenges of biodiversity monitoring and documenting the incredible diversity of the region before it is potentially lost forever.

However, to put things in perspective, there are 4173 DNA barcode records on the Barcode of Life Database (BOLDsystems.org) from Malaysia compared to 623870 from temperate, and comparatively species-depauperate, Canada.

In order to promote DNA barcoding in Malaysia the University of Malaya hosted the father of the movement, Paul Herbert from the University of Guelph, Canada, as a Visiting Professor in October 2013. A public seminar by Prof. Hebert on the International Barcode of Life (ibol.org) was attended by more than 200 people representing numerous academic, government, NGO and research institutions from across the country.

The hugely oversubscribed "basics of DNA barcoding" laboratory workshop initiated 20 graduate students and young scientists in the simple molecular techniques required for biodiversity genomics research. A scientific meeting for professors, lecturers and government researchers was called to instigate the activation of Malaysia as an iBOL partner nation. In addition to the public events, discussions with the university's top management were very fruitful.

Details are being finalised for the creation of a high-throughput DNA barcoding centre and Malaysia Barcode of Life network spearheaded by University of Malaya, capable of leading the region towards heightened biodiversity consciousness. We look forward to becoming an iBOL member in the near future and working closely with our partners from across Southeast Asia and beyond.

-Gary Sing & John J. Wilson

A modified version of this article appears in the Barcode Bulletin: The Newsletter of the International Barcode of Life 4(2):16

Right: The DNA barcoding workshop. Below: Participants of the workshop. Below Right: Prof. Herbert delivering his seminar.















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Visit us at our website: museumzoology .um.edu.my

CONTRIBUTORS



MUSEUM CURA-



A. Sasekumar



Above and top right: Visitors at Petrosains. Right: Museum and Petrosains staff on training day at KLCC.

BULLETIN OF THE MUSEUM OF ZOOLOGY



INSIDE THIS ISSUE:



- 1— The Petrosains exhibition
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- diverse Malaysia



EDITORIAL:

Museum Zoology UM has made good progress the last few months towards its three objectives, 1. Zoological research, 2. Education, and 3. Maintenance of the zoological collection.

Our research activities resulted in seven publications for 2013 (page 2) besides our posters and presentations. Two months into 2014, our Petrosains Centre, UM Rebiodiversity genomics group already has three papers accepted, as well as the same number in review - our research programs over the past couple of years are finally bearing fruits. Our latest projects involving bats, butterflies, and

many other animal groups are proceeding nicely.

The Exhibition Hall is seeing a con-

tinual increase in visitors, with recent visits by German International School, Iranian International School and Kelab Alami Mukim Tg Kupang. Besides this, we have taken our exhibits on the road - to searcher's Conference, UM Convocation Festival. Our biodiversity seminar series and training workshops continue to flourish (page 4).

The entomology staff continue to slowly add accession numbers to our insect collection and digitize the catalogue. Beside this, I was fortunate to be able to temporarily hire a photographer to image our entire butterfly collection, some 3000 preserved butterflies. These beautiful photographs are steadily being uploaded to malaysiabutterflies.myspecies.info so please check it out. The Peacock Pansy (Junonia almana, above) a common, but striking species, is well represented in our collection.

We look forward to welcoming you to Museum Zoology soon. Thanks for your support! -John J. Wilson Assistant Curator

PETROSAINS EXHIBITION:

We recently collaborated with Petrosains for their Nature's Kingdom Exhibition at Petrosains - The Discovery Centre, KLCC. Museum of Zoology lent it's expertise in designing special animal exhibits, and training the staff at Petrosains about the basics of biodiversity in Malaysia.

As Petrosains is a popular tourist attraction that is regularly visited by school aged children, it was a great opportunity to expose the public to some lesser known Malaysian animals such as the Flying Lemur (Galeopterus variegatus), Leopard Cat (Felis bengalensis) and Mud Lobster (Thalassina anomala) from our specimen collection.

Working with Petrosains has been a fantastic experience. A lot of great ideas were exchanged and producing exhibits for Petrosains challenged us to make more interactive and accessible exhibits. The results of this learning experience will be seen in our own exhibition hall soon! -Thary Gazi







Most distant conspecific match (%)

MUSEUM PUBLICATIONS IN 2013: PLOS ONE OPEN @ ACCESS Freely available online

Goh TG, Chen CD, Jeffery J, Izzul AA, Lau KW, Lee HL, Ramli R., Nazni WA, Sofian-Azirun M. Evaluation of bait attractiveness for forensically important flies in lowland and montane forest in Peninsular Malaysia. *Asian Biomedicine* 7(4): 523-528.

Kvist S, Brugler MR, **Goh TG**, Giribet G, Siddall ME. Pyrosequencing the salivary transcriptome of *Haemadipsa interrupta*(Annelida: Clitellata: Haemadipsidae): anticoagulant diversity and insight into the evolution of anticoagulation capabilities in leeches. Invertebrate Biology Online Early.

overview and new material. Raffles Bulletin of Zoology S29: 139-153.

of bats (Chiroptera) at Ulu Gombak since the establishment of the Field Studies Centre in 1965. Raffles Bulletin of Zoology S29: 211-217.

Wilson JJ, Sing KW, Sofian-Azirun M. Building a DNA barcode reference

Yasamin KI, Lim TT, Westaway KE, Earl of Cranbrook, Humphrey L, Muhammad RF, Zhao JX, Lee CP. First discovery of Pleistocene orangutan (*Pongo* sp.) fossils in Peninsular Malaysia: Biogeographic (6): 770-797.

"Museum Zoology UM"

Lim TT. Quaternary *Elephas* fossils from Peninsular Malaysia: Historical

Sing KW, Syaripuddin K, Wilson JJ. Changing perspectives on the diversity

Wilson JJ, Sing KW. DNA barcoding can successfully identify *Penaeus* monodon, associate life cycle stages, and generate hypotheses of unrecognised diversity. Sains Malaysiana 42(12): 1827-1829.

library for the true butterflies (Lepidoptera) of Peninsula Malaysia: What about the subspecies? PLoS ONE 8(11): e79969.

and paleoenvironmental Implications. *Journal of Human Evolution* 65

See our Google Scholar Citations page under

John-James Wilson 1,2s, Kong-Wah Sing 1, Mohd Sofian-Azirun 2 Museum of Zooloay, Institute of Biological Sciences, Faculty of Science, University of Malaya, Kuala Lumpur, Malaysia, 2 Institute of Biological Sciences, Faculty Our DNA barcode library for butterflies of Peninsular Malaysia suggested butterfly species diversity in Asia-Pacific could be underestimated by one third!

Building a DNA Barcode Reference Library for the True

Butterflies (Lepidoptera) of Peninsula Malaysia: What

genome used for species identification and discovery.

MA DNA barcode library was constructed for butterflies from

about the Subspecies?

Peninsula Malaysia in Museum of Zoology, University of Malaya, and analysed with DNA barcodes from other Asia-Pacific localities.

most subspecies possessed unique DNA barcodes (84%).

₩ In 29 cases (36%) conspecific subspecies had large genetic distances

Typical maximum ₩ The vast majority of species (92%) had distinct DNA barcodes and between their DNA barcodes such as typically seen between species.

Journal of Human Evolution

journal homepage: www.elsevier.com/locate/jhevol

First discovery of Pleistocene orangutan (Pongo sp.) fossils in Peninsular Malaysia: Biogeographic and paleoenvironmental implications

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ABSTRACT

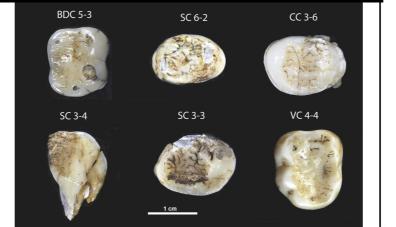
Nine isolated fossil Pongo teeth from two cave sites in Peninsular Malaysia are reported. These are the first fossil Pongo specimens recorded in Peninsular Malaysia and represent significant southward extensions of the ancient Southeast Asian continental range of fossil Pongo during two key periods of the tensions of the anicent southeast resun continent a range of toosil progo during two sey periods of the Quaternary. These new records from Peninsular Malaysia show that ancestral Pongo successfully passed the major biogeographical divide between mainland continental Southeast Asia and the Sunda subregion before 500 ka (thousand years ago). If the presence of Pongo remains in fossil assemblages indicates prevailing forest habitat, then the persistence of Pongo at Batu Caves until 60 ka implies that during the Last Glacial Phase sufficient forest

cover persisted in the west coast plain of what is now Peninsular Malaysia at least ten millennia after a cover persisted in the west coast plant or what is now remisular manaysia at least tert minerina after a presumed corridor of desiccation had extended to central and east Java. Ultimately, environmental conditions of the peninsula during the Last Glacial Maximum evidently became inhospitable for Pongo, causing local extinction. Following post-glacial climatic amelioration and reforestation, a renewed sea barrier prevented re-colonization from the rainforest refugium in Sumatra, accounting for the present day absence of Porgo in apparently hospitable lowland evergreen rainforest of Peninsular Malaysia. The new teeth provide further evidence that Porgo did not undergo a consistent trend toward dental size

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Two papers on fossils were published by our
Research Associate Lim T.T. One reports the first

National University of Singapore discovery of orangutan fossils (teeth, below) in Peninsular Malaysia providing insights into the environmental conditions of our region thousands of years ago!



Our work with DNA barcoding made us ask: Is the species richness of bats at Ulu Gombak the highest in the old world? THE RAFFLES BULLETIN OF ZOOLOGY 2013 Supplement No. 29: 211–217 http://xxxhaelx.org/um/16d/xxxhaelx.org/pub/4D197956-25F9-4C12-AFD0-FC468CCXDD15

> CHANGING PERSPECTIVES ON THE DIVERSITY OF BATS (MAMMALIA: CHIROPTERA) AT ULU GOMBAK SINCE THE ESTABLISHMENT OF THE FIELD STUDY CENTRE IN 1965

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ABSTRACI. — Ulu Gombak Forest Reserve is a selectively logged forest located at the Pahang-Selangor border. A field studies centre was established at the western edge of the reserve by Medway in 1965. Ulu Gornbak had previously been reported as the single locality with the highest species richness of buts in the Old World. In light of recent studies demonstrating extensive numbers of cryptic but species, diversity assessments at Ulu Gombak would benefit from reexamination. In this study we examine changing perspectives on but diversity at Ulu Gombak since the establishment of the Field Study Centre, and particularly, how assessments of species richness change with the incorporation of DNA barcoding into hat surveys. One hundred and sixty records of bats at Ulu Gombak were extracted from literature and from the Museum of Zoology, University of Malaya collection. Fifty-two morphological species of bats had been recorded at Ulu Gombak between 1962 and 2012 which was equivalent to one additional species record every two years throughout this period. During surveys at Ulu Gombak in 2012/2013 DNA beroodes were obtained from 45 bats. The DNA beroodes were assigned to seven species. Four of these were dark taxa, previously reported species which lack formal description, in the genera Cynopterus and Hippostderos. Additionally, a deep DNA harcode divergence (4.2%) from conspecifics from Indonesia strongly suggested the presence of a cryptic species of Chironax which had not been reported previously. These five species were added to the cumulative checklist for Ulu Combak taking the total to 57 species of bats. The high number of cryptic species uncovered supports the prediction that the number of bat species in Ulu Gombak is significantly underestimated. The projected number of 89 bat species provides a benchmark for future, more intensive, surveys using multiple trapping methods and covering a larger

THE RAFFLES BULLETIN OF ZOOLOGY 2013 Supplement No. 29: 139-153 http://zoobank.org/um.lsid:zoobank.org.pub/2E00FB5A-CE52-4B57-95A8-21105BC678F2
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QUATERNARY ELEPHAS FOSSILS FROM PENINSULAR MALAYSIA: HISTORICAL OVERVIEW AND NEW MATERIAL

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ABSTRACT. — Elephant fossils have rarely been reported from Peninsular Malaysia. The present study represents the first attempt at compiling all currently known historical reports about elephant fossil discoveries, over a time span of more than 100 years, supplemented by previously unreported specimens from museum collections and recently found materials. A total of 19 specimens, all isolated dental materials of presumed Late Pleistocene and Holocene age are recorded. Most of these materials represent opportunistic finds from past tin-mining operations and mineral resources surveys; only a few are associated with archaeological artefacts. Fossils have been recorded in all states in Peninsular Malaysia except Kedah, Penang, Melaka and Terengganu. Historical and taphonomic backgrounds of these finds are examined, and it is suggested that rodents (porcupines) have played only a minor role for the accumulation of large fossils (elephant molars) found in caves. Critical morphological and metrical evaluations of the fossils indicate that they all belong to Elephas maximus. Present evidence does not support the original identification of some of the fossils as Palaeoloxodon namadicus. Confirmation of Palaeoloxodon namadicus occurrence in prehistoric Peninsular Malaysia demands the find of better fossils, especially of cranial material

KEY WORDS. - Elephas, Quaternary, fossil, Peninsular Malaysia, Palagoloxodon, Borneo, Southeast Asia