NUS National University of Singapore

Lee Kong Chian
Natural History Museum

Annual Report 2023/24

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Head's Message

I was asked recently about the identity of LKCNHM: does the Museum have a primary focus? And if so, what is it? Research and Collections? Exhibitions? Outreach and Education? This seems to be a fair question, as we are often seen to be promoting all three aspects. In fact, those who hear me talk about LKCNHM often enough, know that I always mention the Museum's collections and research first—with our gallery, its exhibitions, and our outreach and education programmes built around these. So, the answer is: LKCNHM is a research- and collection-centric museum first and foremost. This should not come as a surprise, as we are a university-based natural history museum, and stems from the 200-year old collection of zoological specimens and the long and proud tradition of taxonomic research upon which the Museum (and its predecessors) is built. At LKCNHM, thanks to the effort and foresight of previous leaders and strong support of university management and private donors, we have been fortunate to be able to continue to grow our research and collections. This is quite remarkable considering natural history museums globally are facing general decline in support for their research and collections. Therefore, I am particularly proud of the Museum's research and collection-related highlights in this year's report, including big jumps in the numbers and diversity of staff publications, new species described, and specimens acquired, as well as collaborative workshops/symposia/outputs addressing local and regional conservation and biogeography.

Exhibitions, and Outreach and Education continue a steady course and remain a high priority for LKCNHM. Here, we embrace our role as a research-centric museum that is enhancing its offerings in exhibitions and outreach and education to schools and the general public, while learning from other more established exhibition/outreach-focused museums in the community. As I mentioned previously, the aim is for the Museum to 'level-up' in these areas (to match its established strengths in Research and Collections); and the greatly increased numbers this past year (e.g., in gallery visitors, programme participants) are encouraging signs that we are moving in the right direction. An important theme manifested in several of our exhibition/outreach and education activities this year is interdisciplinarity. Collaboration between artist collectives, librarians, historians, STEM industry (Hitachi) and Museum researchers/educators/historians featured prominently in the two thought-provoking temporary exhibitions on 'Death by Man' and 'Nature Remixed' and in the publication by our Biodiversity Histories unit '8½ Hours in Singapore'.

As always, a strong collaborative and collegial spirit among and between LKCNHM staff and our enthusiastic partners has been central to many of the accomplishments of this past academic year. My congratulations to you all, and heartfelt thanks once again—also to LKCNHM's benefactors and the Faculty of Science—for the unfailing support and for continuing to pull together in the same direction. Your efforts allow the Museum's mission—to nurture interest in biodiversity and the environment, and enhance natural heritage knowledge through its collections and research—to endure.

Associate Professor Darren Yeo

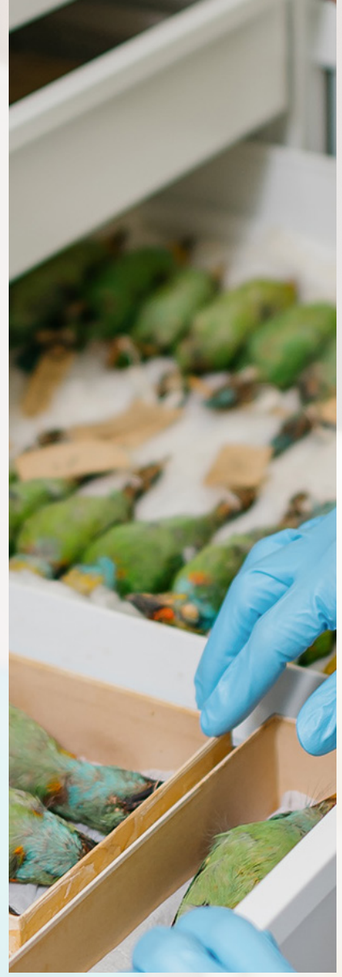
Head of Lee Kong Chian Natural History Museum

Our Year in Numbers

The Museum continues to work towards its vision of being a leader in Southeast Asian biodiversity research, education and outreach. The following numbers sum up some of our accomplishments in this past academic year.

Academic Year 23/24

(August 2023 to July 2024)



Gallery visitors
82,477

Programmes
325

Sponsored programmes
40

Participants
13,419

Volunteers
61

Research visitors
63

Research activities
(e.g., fieldtrips, conferences, workshops)
42

Specimens acquired
43,182

Specimens loaned
1,467

Articles published in museum publications

Raffles Bulletin of Zoology	44
Nature in Singapore	136

Staff publications
107

New species described
71

NUS courses taught
13

NUS students taught
334

Awards and accolades
3

Media appearances by LKCNHM & staff
82

Museum Events

In the past academic year, the Museum hosted many distinguished visitors as well as held multiple events that promote our natural heritage.

From carcasses to contemplation: Death by Man

"It [was] interesting to listen to the different conversations that [Death by Man] has sparked and witness the range of emotions that the stories have evoked. Feeling angry and crying while viewing the portraits and stories shows that people still care."

– Ms Jasvic Lye

Ms Lye memorialises each carcass by giving them a personal name and an account of their death. Her art interrogates the personhood of these animals who have died due to human activity in Singapore.

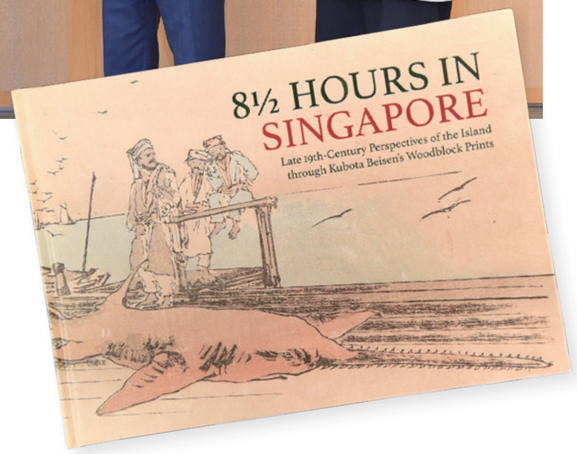
Opened from October 2023 to April 2024, the temporary exhibition '**Death by Man**' is a photographic investigation and documentation of Singapore's wildlife through a journaled obituary by artist-photographer, Ms Jasvic Lye.

Contrasted against the Museum's collection of nameless specimens, Ms Lye's photography and literary efforts personalise the 'casualties' of Singapore's urban environment. Through her personal connection and intimate collaboration with the Animal Concerns Research and Education Society (ACRES) and the National Parks Board, visitors were given insight into the impact humans have in living with nature.

In the spirit of Halloween, guests were encouraged to dress up in their most creative costumes during the opening of the exhibition.

From left to right: Assoc Prof Darren Yeo (Head of LKCNHM), Prof Aaron Thean (NUS Deputy President (Academic Affairs) and Provost), HE Hiroshi Ishikawa (Ambassador of Japan to Singapore), and Assoc Prof Natalie Pang (University Librarian).

Exploring Singapore's historical biodiversity through art



This book leans into environmental, historical and cultural aspects of Kubota's prints, offering a refreshing perspective on late 19th-century Singapore. It represents a unique intersection of art and science, while highlighting the island's historical biodiversity.

On 27 March 2024, the Museum and NUS Libraries launched '**8½ Hours in Singapore: Late 19th-Century Perspectives of the Island through Kubota Beisen's Woodblock Prints**'. Authored by the Museum's Biodiversity Histories team, the book draws inspiration from the 12 woodblock prints of Singapore illustrated by Japanese artist Kubota Beisen during his brief visit to the island in 1889. The book was launched by Guest-of-Honour, NUS Deputy President (Academic Affairs) and Provost, Prof Aaron Thean, as well as the Ambassador of Japan to Singapore, His Excellency Hiroshi Ishikawa.

Kubota Beisen was a renowned Japanese artist from the Meiji period, who stopped by Singapore during his voyage from Japan to France. Despite his short stay of only 8½ hours, he illustrated numerous scenes that captured the wildlife and environments of Singapore at the turn of the century. These prints are historically significant, as they include some of the earliest depictions of a tiger and a sawfish in Singapore.

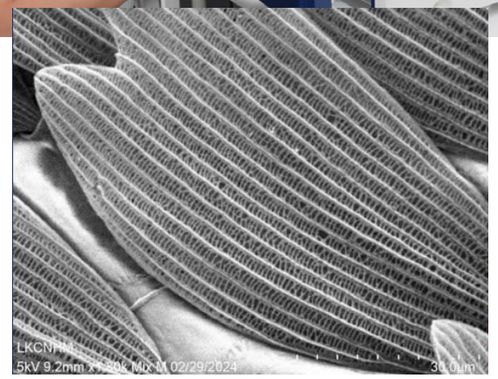
An exhibition of specimens accompanying the book was displayed at both the Museum and NUS Central Library. These specimens provided a glimpse into the rich biodiversity of Singapore as captured in Kubota's art.

This publication marks a significant achievement in showcasing the interdisciplinary study of Singapore's historical biodiversity.

Hitachi x LKCNHM: Advancing STEM Education in Singapore

Following a chance meeting at the Natural History Museum, London, in 2022, and after many months of discussions, the Hitachi TM4000Plus II scanning electron microscope (SEM) finally arrived at the Museum at the end of January 2024. This state-of-the-art microscope is on a year-long loan and this marks its first presence in Asia. Since its arrival, both our outreach and research teams have been actively using it and on 20 May 2024, the Museum hosted an exclusive showcase, '**Hitachi x LKCNHM: Advancing STEM Education in Singapore**', in collaboration with Hitachi Asia, Hitachi High-Tech Singapore, and Hitachi High-Tech America.

As part of Hitachi's Inspire STEM Education Outreach Programme, this event marked the introduction of a series of biodiversity programmes which have been reaching out to educators, students and the wider public. The event also served as a preview of our new temporary exhibition, 'Nature Remixed' by artist collective SISTRUM, which also used the SEM to generate significantly magnified images of sponge spicules invisible to the naked eye for one of the installations.



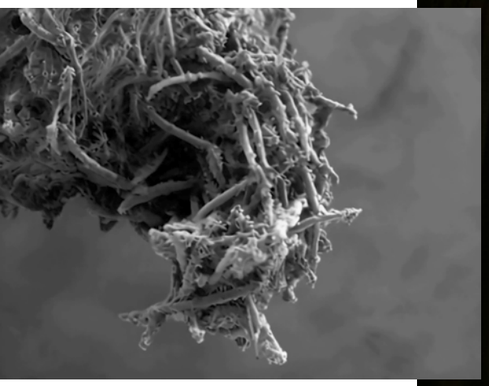
The TM4000Plus II is a powerful microscope that uses focused electron beams, instead of light, to create immensely detailed images of specimens. As electrons have much shorter wavelengths as compared to light, electron microscopes allow users to see objects at significantly high magnifications of up to 100,000 times!

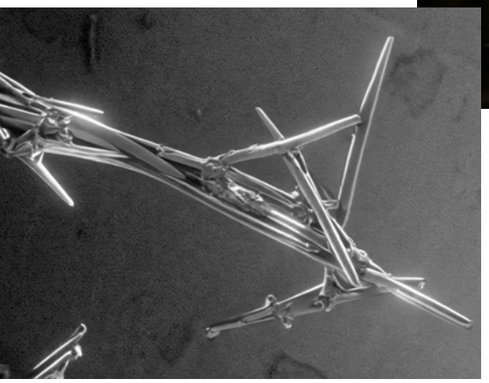
"Our partnership with Hitachi is a transformative step in science education and public outreach. Specifically, this collaboration allows us to make accessible to all, a tangible, hands-on experience of applying a cutting-edge technology in the study of biodiversity. We are excited to see how this initiative will spark curiosity and a deeper understanding and appreciation of the natural world."

– Assoc Prof Darren Yeo, Head of LKCNHM

"Nature Remixed is more than an exhibition; it is an invitation to slow down, observe, and listen. It asks us to venture into unfamiliar territories, to engage with new forms of life and to question our role within the natural world. It calls us to both learn and unlearn, to reimagine and reconnect."

– Ms Lim Shu Min, SISTRUM





'Filtering Microworlds' uses still images of sponge specimens, captured by Hitachi High-Tech's scanning electron microscope, which were fed into a generative artificial intelligence to produce moving images. The final composition also includes a custom sound score which immerses visitors into this unusual perspective of sponges.

Taking a creative look at nature using artificial intelligence: Nature Remixed

Presented from 21 May to 28 June 2024, the temporary exihibition '**Nature Remixed: Learning and Unlearning from New Species**' is a multi-year evolving project produced by the artist collective SISTRUM, which comprises Ms Lim Shu Min, a graphic designer; Mr Ramesh Krishnan, a sound designer; and Ms Laura Miotto, an architect. Proposing the notion of 'remix' as a concept, method and aesthetic attitude for seeing and understanding nature, SISTRUM explores what it means to observe and comprehend the natural world by blurring the lines between human, nature and machine. Using a machine learning algorithm, the team generated images of hybrid forms of flora and fauna that were catalogued during scientific expeditions to Southeast Asia during the 19th century.

Visits by Distinguished Guests

This academic year, the Museum welcomed more distinguished visitors than the previous year. Hosted by the Museum's leadership team, the guests enjoyed enlightening tours of the gallery and the Zoological Reference Collection. The visits also provided opportunities to discuss potential future collaborations.

HE Dante Brandi, Ambassador of Italy to Singapore (first from right)

The visitors included:

- HE Dante Brandi, Ambassador of Italy to Singapore
- HE Judit Pach, Ambassador of Hungary to Singapore
- Dr Gilles Bloch, President of the Muséum national d'Histoire naturelle, Paris
- Ms Honor Harger, Vice President of the ArtScience Museum
- Mr Michael Dagostino, Director of Museums and Cultural Engagement at the Chau Chak Wing Museum, University of Sydney
- Dr Wayne Florence, Director of Research and Exhibitions, Iziko Museums of South Africa
- Mr Loh Khum Yean, Chairman, National Parks Board

Dr Gilles Bloch, President of the Muséum national d'Histoire naturelle, Paris (first from left)

HE Judit Pach, Ambassador of Hungary to Singapore (second from right)

Visits from external organisations

The Museum also hosted delegates from various organisations and museums with keen interest in the Museum and Zoological Reference Collection. Some came specifically to seek deeper insights on the Museum's exhibitions and maintenance. Our colleagues generously shared their knowledge and experience on various aspects of the Museum's operations and management.

Delegates from the National Museum of Nature and Science, Japan and the Japanese Council of Science Museums

Delegates from the Bhutan Foundation and the Wangduechhoeling Palace Project

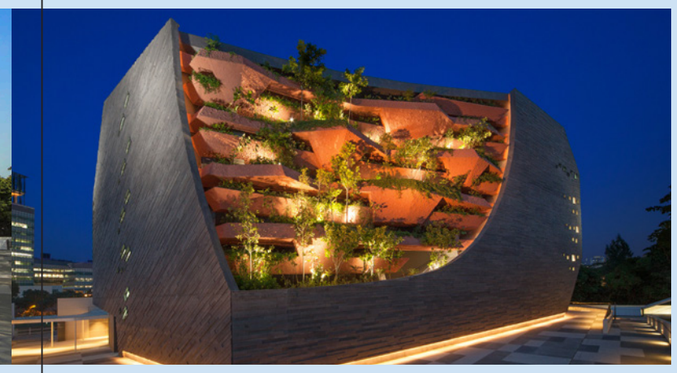
Some organisations who we hosted were:

- The Economist SG Bureau
- Hong Kong Wetland Park
- Zhejiang University Ocean College
- National Science Museum, Thailand
- National Museum of Nature and Science, Japan and the Japanese Council of Science Museums
- Bhutan Foundation and the Wangduechhoeling Palace Project
- National Parks Board
- University of Turin
- Muséum national d'Histoire naturelle, Paris

NParks Chairman, Mr Loh Khum Yean (first from left), and NParks CEO, Ms Hwang Yu-Ning (second from right)

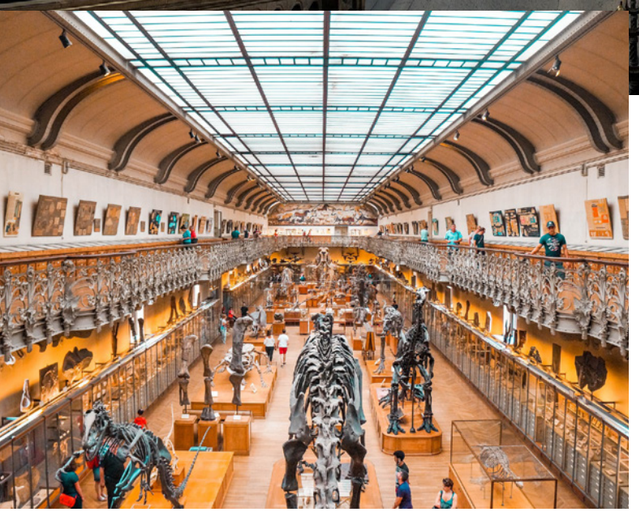
Prof Mei Deqing, Party Secretary, Executive Vice Dean, Ocean College of Zhejiang University (right)

Museum awarded the LEAF Award by NParks



In 2024, the Lee Kong Chian Natural History Museum was awarded the **Landscape Excellence Assessment Framework (LEAF) certification**, having met the Gold level certification standards, with a special mention for Community Wellbeing and Engagement.

LEAF is a certification scheme by the National Parks Board (NParks) which celebrates good landscape design, construction and management of parks and development projects. It was launched in 2013 to recognise projects that restore nature amidst Singapore's urban landscape and contribute to Singapore's City in Nature vision.



Strengthening research collaborations

Since August last year, four Memorandums of Understanding (MoUs) were signed with other natural history museums and an intergovernmental body to foster deeper collaborations for research. The Museum is excited to embark on these new partnerships, which aim to advance scientific knowledge. These collaborations will not only strengthen our research capabilities but also create opportunities for joint projects, exchange programs, and shared resources, benefiting both the Museum and the broader scientific community.

Partner organisations include:

- Natural History Museum, London
- Muséum national d'Histoire naturelle, Paris
- Naturalis Biodiversity Center, Leiden
- The Secretariat of the International Seabed Authority

Signing of the MoU between the National University of Singapore and the Muséum national d'Histoire naturelle, Paris, at the France-Singapore Forum "Nature in the City".

Research & Collections

In the past academic year, many of the Museum's scientists have made new discoveries and are continuing to expand and curate the Zoological Reference Collection, one of the largest in Southeast Asia.

Termites that ‘Thanos-snap’ at their opponents

When it comes to termite colonies, it is commonly known that in addition to the kings and queens, there are the workers and soldiers. The soldier termites’ main role is to protect the colony from invaders such as ants that prey on them.

Most termite soldiers in Singapore are known to bite or even squirt sticky secretions to ward off any invaders. Biting mandibles (i.e., jaws) will result in external physical injuries while sticky fluids are not only irritants but can also immobilise invaders. However, there is a small termite group that employs a different defence—snapping, where termite soldiers use either symmetrical or asymmetrical mandibles.

These termite soldiers have elongated heads housing powerful muscles that force the mandibles together until they slide against each other, leading to a snap. Against any ant invaders, the force of the snap is so strong that not only does it flick the attacking ant away, but it also causes major internal injuries. One particular termite species in Singapore, *Pericapritermes nitobei*, is known to have a snapping velocity of up to 132 m/s.

Mr Foo Maosheng, Associate Curator of Cryogenics Collection & Insects at the Museum, is delving into the mystery of how many species of these snappers exist in Singapore and mapping their habitats. Intriguingly, these snappers are part of the soil-feeding termite group, which serve as bioindicators of soil fertility, hinting at the health of the ecosystems they inhabit. Research is still ongoing, promising deeper insights into their ecological significance.

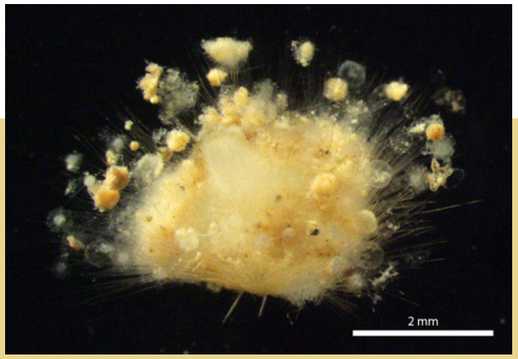
Treasures from the past: the Chuang Shou Hwa shell collection

The Chuang Shou Hwa collection, comprising thousands of unsorted shells and corals collected from Singapore and Malaysia in the 1960s and 70s, was recently gifted to the Museum. Prof Chuang was the Head of Department of Zoology (1971–1977) of the then University of Singapore. He was also the editor and author of two highly regarded books, ‘On Malayan Shores’ and ‘Animal Life and Nature in Singapore’.

The collection is one of the most important that the ZRC has received in the past few decades. Many specimens were from field collections made from places that have since been developed or lost to reclamation. These represent snapshots of the historical biodiversity of these localities, and are of much scientific value and potential, especially since the historical data is sorely wanting.

Processing old collections is often laborious. Although less than half of the shells have been catalogued, we have already discovered the presence of species previously undocumented from Singapore, and a lost type specimen. Future research and publications based on data derived from this collection can be expected.

Museum staff sorting through the collection.



Newly discovered and still unnamed sponge species.

These aren’t your everyday bath sponges: Sponges in the abyssal plains

More than 7,000 demosponge species have been described globally, but less than 2% are known from the abyssal plains, which cover 50% of the Earth’s surface. One such region, the Clarion-Clipperton Zone (CCZ) in the Pacific Ocean, a region being explored for potential deep-sea mining due to its rich polymetallic nodules deposits.

A team from Singapore, including the Museum’s Assistant Senior Curator of Porifera & Other Non-Arthropod Invertebrates, Dr Lim Swee Cheng, studied the unique and largely unexplored marine life inhabiting these abyssal plains, located over 4,000 meters deep. This extreme environment, characterized by near-freezing temperatures (below 4°C), perpetual darkness, and immense pressure, is home to a fascinating array of sponges.

A total of 21 species, most new to science, were discovered. These sponges are notably small (less than 5 mm), with simple skeletons and limited spicule diversity. Molecular phylogenetic analyses revealed *Plenaster craigi*, the most common species, likely represents a new family and possibly a new order. Interestingly, filter-feeding demosponges like *P. craigi* and members of Polymastiidae and Hamacanthidae, are more abundant in nodule fields than the typically dominant carnivorous Cladorhizidae.

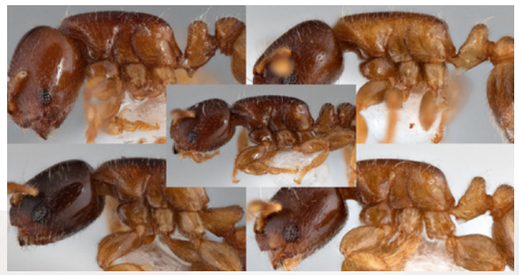
Singapore (SIGNIFY) at The Dead Zoo

The SIGNIFY team visited the National Museum of Ireland, Natural History (NMINH) in November 2023. NMINH is also known to generations of Dubliners as 'The Dead Zoo' for its many taxidermy specimens on display in its public gallery. In the two weeks that the team spent in NMINH, and working closely with the curatorial team, more than 200 specimens collected from Singapore were located and digitised. This included a variety of groups such as birds, insects, mammals, molluscs, fishes, reptiles, and spiders. Of particular significance are the spider type specimens collected by Thomas Workman (an Irish arachnologist well-known for his work in what is now Singapore and Malaysia), materials from William Traill (who published the first comprehensive checklist of molluscs in Singapore), and the first Singapore record of the very rare Selangor mud snake (with only nine specimens known worldwide).

The year 2024 also marks the 50th year of diplomatic ties between Ireland and Singapore. To celebrate this milestone, and in tandem with the closing of the 'The Dead Zoo' for renovation works, **SIGNIFY launched a joint booklet (supported by the Embassy of Ireland in Singapore) with NMINH in late August 2024**.

Booklet featuring the collaboration between SIGNIFY and NMINH.

All that is gold does not glitter: DNA and body shapes reveal cryptic diversity in an inscrutable bark-nesting ant



Human vision is not omnipotent—the world is often more than what we can perceive. The minute ant *Rhopalomastix javana*—which nests in the bark of living trees—was once assumed to be widespread across countries and at various elevations in Southeast Asia. Different populations of these ants appear almost identical to the naked eye.

The Museum's Curator of Insects & Other Terrestrial Arthropods, Dr Wendy Wang, and Dr Aiki Yamada of Tokyo Metropolitan University **uncovered** an unexpected diversity hidden beneath the ant's nondescript appearance. Based on combined evidence from DNA barcodes, genome-wide sequences and body shape analyses of hundreds of ants, the duo discovered that '*R. javana*' was not just one, but at least five different species.

Over 300 images comprising three separate bodily perspectives were analysed via geometric morphometrics—a suite of techniques that assess shape differences while removing effects of size and rotation. Shape analyses revealed subtle but significant differences between putative DNA-supported species units, especially in full-face head images which were found most useful in distinguishing species.

What's this thing you call 'the sun'?: A new species of yeti crab from a deep-sea hydrothermal vent system

A new species of squat lobster (a.k.a. 'yeti crab' living in hydrothermal vents was discovered off the Galapagos Islands, which the Museum's Senior Curator of Crustaceans & Other Marine Arthropods, Dr Jose Christopher E Mendoza, co-described with Chinese colleagues. The discovery and formal description of the new species, which they named *Kiwa gemma*, was **published in the Journal of Crustacean Biology** in late June 2024.

Hydrothermal vents are deep-sea hot springs near volcanic chains where mineral-rich seawater, superheated by magma beneath the ocean floor, emerges and forms large conical 'chimneys' where a unique ecosystem thrives. There, strange creatures have adopted a unique way of life. These creatures have evolved to go about their daily lives in total darkness and extreme pressure. Hydrothermal vent communities stand out in their reliance on chemosynthesis (rather than photosynthesis) as a means to get their energy requirements for living. Many animals there feed on chemosynthetic bacteria, which produce simple carbohydrates not through sunlight (photosynthesis) but by oxidizing available inorganic compounds (e.g., hydrogen sulphide or ionised iron). It has been shown that members of the genus *Kiwa* not only feed on these bacteria, they even grow or 'farm' these microbes on their bodies!

Decades of coral reef stability in the East Asian Seas: what are we missing?

Coral reefs in the East Asian Seas region, including those in Southeast Asia, are some of the most diverse marine habitats in the world. While coral reefs have declined globally due to various manmade pressures, reef habitats in this region appear to be bucking the trend. Indeed, **analysis coordinated** by the Deputy Head of the Museum, Assoc Prof Huang Danwei, of over 24,000 reef surveys performed during the last four decades in East Asia, shows that coral abundance has not declined and seaweed has not taken over reef habitats. However, coastal urbanisation and climate change are driving dominance of coral species which are more tolerant to environmental stress, so urgent action against these impacts are critical to conserve biodiversity.

Biogeography of Tropical Asia Symposium: a summit of biogeographers in tribute to Alfred Wallace

The Biogeography of Tropical Asia Symposium held from 13 to 15 December 2023, welcomed biogeographers from around the world to Singapore, where Wallace's fateful journey first took off, to share their latest research about the plants, animals and geology of this extraordinary region.

This symposium commemorated the 200th anniversary of the birth of Alfred Russell Wallace, a pioneering biologist who laid the foundations for the biogeography subdiscipline through his voyages across 19th century Southeast Asia.

Invited speakers provided a broad sampling of the state of our knowledge of tropical Asia, ranging from paleo-geological formations, to floristic exchanges across islands and endemic zoological phenomenon such as Sulawesi's flying lizards. This meeting also served as a starting point to consolidate expert opinions on the most significant findings of this region in the past decade. These sharing of ideas are being further refined into a scientific review publication.

This event was jointly organised and sponsored by LKCNHM, NUS Department of Biological Sciences, as well as the University of Amsterdam, with additional support from Naturalis Biodiversity Center (Netherlands) and NUS College.

Sonic's Southeast Asian cousins: two new soft-furred hedgehog species discovered in Southeast Asia

Two new species of soft-furred hedgehogs from Southeast Asia have recently been described, while three subspecies have been elevated to species level.

The recently published study was led by Dr Arlo Hinckley, post-doctoral fellow at the Smithsonian's National Museum of Natural History, and co-authored by Mr Marcus Chua, Curator of Mammals at the Museum, and Dr Melissa Hawkins, curator of mammals at the Smithsonian National Museum of Natural History, among others. The study used DNA analyses and physical characteristics to describe two entirely new species of soft-furred hedgehogs, *Hylomys vorax* and *H. macarong*, and elevate three subspecies to the level of species. The two new species are endemic to the threatened Leuser ecosystem, a tropical rainforest in North Sumatra, and Southern Vietnam, respectively.

Two museum specimens from the natural history collections of the Smithsonian and the Academy of Natural Sciences of Drexel University in Philadelphia were vital to describing these two new species. Specimens from the Museum's Zoological Reference Collection were also examined as part of this research.

The study clearly shows the importance of museum collections and modern techniques such as DNA analysis, for even in well-studied animal groups like mammals, there are still discoveries waiting to be made.

Species extinction in Singapore—a new estimate and a call to action

Singapore may have lost most of its original forest, but how much of its biodiversity has actually been lost? After over a decade of work involving many researchers, including Museum staff, **a new paper on Singapore's local extinctions has been published**, revealing that an estimated 37% of species have gone extinct in Singapore over the last 200 years.

This is the most up-to-date figure for Singapore extinctions, and is much lower than a previous estimate that had estimated that Singapore had lost 73% of its species over the last 200 years. Led by Assoc Prof Ryan Chisholm from the Department of Biological Sciences, NUS, this paper is one of the most significant studies done on Singapore's biodiversity to date and serves as an important signpost for further biodiversity research and conservation. With accurate estimates of biodiversity loss and extinction rates, conservation strategies can be better-informed. This paper also serves as an important case study and a window into the future of tropical biodiversity loss for other regions in the world.

The team presenting the Red Data Book to President Tharman Shanmugaratnam.

Singapore Red Data Book—the latest version of Singapore's real life Pokédex

During this year's Festival of Biodiversity, the third edition of the Singapore Red Data Book, jointly edited by the National Parks Board, the Museum, Nature Society Singapore, and featuring expert contributions by academicians, government officers, and citizen scientists, was released. The book, published by the National Parks Board, was unveiled and presented to President Tharman Shanmugaratnam by representatives from the production team. Head of the Museum, Assoc Prof Darren Yeo, Assoc Prof Huang Danwei (Deputy Head) and Dr Hwang Wei Song (Senior Curator of Insects & Other Terrestrial Arthropods) were among the editors of the book.

The Singapore Red Data Book compiles information about flora and fauna that have been recorded from Singapore, such as their scientific and common names and an assessment of their national conservation status. The third edition brings a much-needed update of knowledge regarding Singapore's biodiversity, which will be of great help in future conservation efforts.

Salvaging birds: documenting Singapore's avifauna for now, later and forever

Globally, millions of birds die each year due to collision with man-made structures. As a highly urbanised island nation, Singapore's buildings pose great collision hazards to birds that navigate through the country. Transparent, reflective, and shiny surfaces—such as glass structures, panels, and windows—appear to be major contributors to bird collision events, presumably due to their reduced visibility to birds flying at high speeds. Migrating birds are particularly prone to collision, given their tendency to travel at night as a strategy to avoid daytime predation. As a result, there is a risk for bird collisions with potentially fatal outcomes anywhere artificial structures exist.

This phenomenon of avian mortality in urban environments remains poorly understood, largely because of the challenges inherent to studying highly mobile animal species such as birds. As a long-term project to document Singapore's avifauna, the Museum salvages bird carcasses as an opportunistic method of specimen and data collection. This project relies on reports contributed by members of the public to the Museum's Dead Bird Hotline (Telegram: @deadbirdhotline), whereupon each bird carcass that is reported or collected contributes to valuable, timeless, and irreplaceable biorepositories that could otherwise be difficult to obtain.

Research Visitors to LKCNHM in AY23/24

Dr Gregory Rouse from Scripps Institution of Oceanography, University of California, San Diego, USA

Dr Kanyakorn Piraonapicha
Native Honey Bee & Pollinator Research Center, King Mongkut's University of Technology, Thonburi, Thailand

Prof Jostein Kjaedersen
Arctic University of Norway, Tromso, Norway

Prof Dalton Amorim de Souza
University of São Paulo, São Paulo, Brazil

Dr Liu Xinming
Guangxi University of Chinese Medicine, Nanning, China

Dr Michael Raupach
Bavarian State Collection of Zoology, Munich, Germany

Ms Mary Margaret
Cornell Lab of Ornithology, Cornell University, Ithaca, USA

Ms Eryn Woernley
Cornell Lab of Ornithology, Cornell University, Ithaca, USA

Dr Peter JF Davie
Queensland Museum, Brisbane, Australia

Dr Shane T Ahyong
Australian Museum, Sydney, Australia

Dr Dwi Listyo Rahayu
Marine Bio-industry Division, National Research and Innovation Agency (BRIN), Lombok Utara, Indonesia

Dr Daisy Wowor
Research Center for Biosystematics & Evolution, National Research and Innovation Agency (BRIN), Cibinong, Indonesia

Dr Ernest Teo
Hokkaido University, Sapporo, Japan

Dr Wan Faridah
Monash University Malaysia, Subang Jaya, Malaysia

Prof Hiroshi Miyake
School of Marine Biosciences, Kitasato University, Tokyo, Japan

Dr Sho Toshino
Kuroshio Biological Research Foundation, Ōtsuki, Japan

Dr Nicholas Wei Liang Yap
St. John's Island National Marine Laboratory, Singapore

Dr Nonn Panitvong
Siamensis Biodiversity Conservation Group, Thailand

Dr Ng Ting Hui
Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia

Dr Poramad Trivalairat
Agrarajakumari College of Nursing, Chulabhorn Royal Academy, Bangkok, Thailand

Dr Krittiya Chiangkul
Animal Systematics and Ecology Speciality Research Unit (ASESRU), Kasetsart University, Bangkok, Thailand

Dr Shih Hsi-Te
National Chung Hsing University, Taichung, Taiwan

Mr Hsu Jhih-Wei
National Chung Hsing University, Taichung, Taiwan

Dr. Shih Yi-Jia
Fisheries College, Jimei University, Xiamen, China

Dr Rafhiah Kahar
University Brunei Darussalam, Brunei

Assoc Prof Yoshitaka Kamimura
Keio University, Tokyo, Japan

Ms Yuyang Sun
Yale Peabody Museum, Yale University, New Haven, USA

Mr John Nash
Yale Peabody Museum, Yale University, New Haven, USA

Dr Kristof Zykowski
Yale Peabody Museum, Yale University, New Haven, USA

Ms Helen Wong
St. John's Island National Marine Laboratory, Singapore

Dr Conni M Sidabalok
Research Center for Biosystematics & Evolution, National Research and Innovation Agency (BRIN), Cibinong, Indonesia

Dr Daniel Gustafsson
Institute of Zoology, Guangdong Academy of Sciences, Guangzhou, China

Dr Gregory Rouse
Scripps Institution of Oceanography, University of California, San Diego, USA

Dr Maurice Kottelat
Independent researcher based in Switzerland

Dr. Elena Kupriyanova
Australian Museum, Sydney, Australia

Prof John C Morse
Clemson University, Clemson, USA

Dr Gong Lin
Institute of Oceanology, Chinese Academy of Science, Qingdao, China

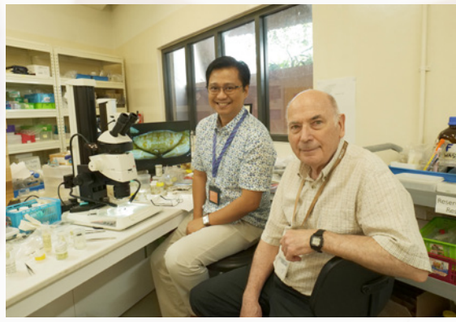
Dr Patricia Kailola
Independent ichthyologist based in Suva, Fiji

Dr Paul F Clark
The Natural History Museum, London, UK

Dr Bertrand Richer De Forges
Muséum national d'Histoire naturelle, Paris, France (and Réunion Island)

Dr Tohru Naruse
University of the Ryukyus, Okinawa, Japan

Undergraduate researchers Mr John Nash and Ms Yuyang Sun, and Dr Kristof Zykowski from Yale Peabody Museum, United States



Dr Paul Clark from the Natural History Museum, London, UK

Dr Harutaka Hata
Smithsonian Institution, Washington DC, USA

Ms Gao Yuting
University of Colorado, Boulder, USA

Dr Sheryl Yap
University of the Philippines Los Baños, Laguna, Philippines

Mr Lester John T Sabadao
University of the Philippines Los Baños, Laguna, Philippines

Mr Cristian C Lucanas
Museum of Natural History, University of the Philippines Los Banos, Laguna, Philippines

Ms Leslie Harris
Natural History Museum of Los Angeles County, Los Angeles, USA

Mr Kevin Madrigal
Université libre de Bruxelles, Brussels, Belgium; Universiti Malaysia Terengganu, Kuala Terengganu, Malaysia

Dr Tsang Ling Ming
Chinese University of Hong Kong, Hong Kong, China

Dr Alireza Nemati
Shahrekord University, Shahrekord, Iran

Outreach & Education

Our Outreach and Education team continued their work to inspire schools and the public on the wonders of nature with engaging programmes, hands-on activities, and captivating tours.

Beauty is in the eye of the beholder

We hosted our inaugural '**Eyes of a Naturalist**' contest from July to October 2023, receiving 81 submissions across photography and illustration categories. Twelve winners were chosen, highlighting biodiversity's beauty and reflecting the work of naturalists. Prepared in Singapore, entries were accompanied by write-ups about the naturalists. Following a month-long exhibition at our Heritage Gallery, the exhibition continued at the Singapore Science Centre until October 2024, alongside the renowned 'Wildlife Photographer of the Year' exhibition by the Natural History Museum, London.

1st Prize (Photography):
Pacific swallow feeding fledgling
by Dr Tan Tze Siong

1st Prize (Illustration):
Helmeted hornbill, a species threatened by reproduction complications
by Mr Beh Lih Khiang

Bridging connections: reaching out to educators

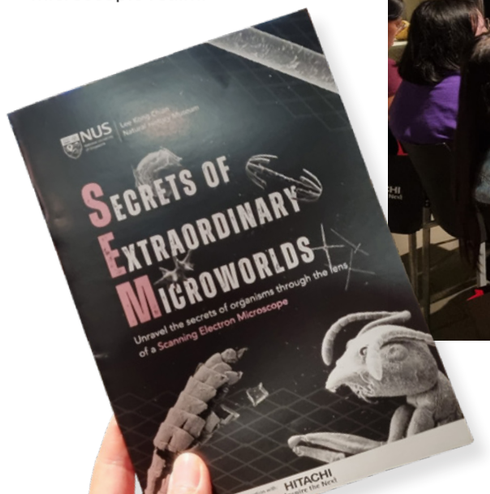
On 21 October 2023, the Education team hosted their inaugural Educator Open House. Fifty educators from various educational institutions came to find out more about the Museum's biodiversity education offerings and the team shared insights into the upcoming school programmes for 2023 to 2024. New programmes offered included the 'Conservation and Sustainability Programme' which focused on Singapore biodiversity conservation, and the 'Biodiversity Microworlds Programme' which explored microscopy in biodiversity analysis. Attendees also enjoyed an exclusive behind-the-scenes tour in the wet and dry collections.

Secrets of Extraordinary Microworlds

From 30 May to 22 June 2024, our Education team hosted an exclusive workshop series where participants delved into the microscopic world using a Scanning Electron Microscope (SEM). In collaboration with Hitachi High-Tech Corporation, the workshop aimed to unveil the hidden intricacies of biodiversity. With over **10 sessions** conducted during the June Holiday period, 100 attendees explored various specimens across phyla and classes, discussing and engaging in hands-on activities, including examining human hairs under the SEM. The fully booked sessions offered participants a unique opportunity to deepen their understanding of nature's microscopic realm.

"I enjoyed looking at the images and learning interesting facts from the facilitators."

– a participant of the programme



Embracing one's inner naturalist

In the second year of the Aspiring Naturalist Programme, the Museum held two workshops: one on coral ecology and the other on herpetology.

The coral ecology workshop featured a Museum tour, hands-on activities, and an outdoor coral walk at Marina at Keppel Bay. Participants explored coral growth forms, common Singaporean corals, and marine conservation. The herpetology workshop included a Museum tour, hands-on activities, and a night walk at Pasir Ris Mangrove, where attendees learned about local herpetofauna, conservation efforts, and the role of naturalists in herpetology research.

Coral Ecology workshop:

"I liked the coral walk. Even though the coral walk was hot, it felt good to see the corals alive in person."

– Participant of the Natural History and Coral Ecology Workshop

"The workshop had shown us some very interesting specimens of amphibians and reptiles which was quite interesting. I also enjoyed the night walk aspect of the workshop."

– Participant of the Natural History and Herpetology Workshop

Herpetology workshop:

Partnering for the climate—again!

Following the successful response to the previous round, the HSBC Climate Change and Biodiversity Programme returned with additional workshop sessions in 2023 and 2024 for both students and the public. These free workshops conducted by LKCNHM, in collaboration with HSBC, invited attendees to delve into the fundamentals of climate change and its impacts on biodiversity. During each session, participants engaged in a gallery tour, hands-on activities, and played the 'Green Champion Card Game' specially designed by our Education team. We conducted a total of 14 weekday school workshop sessions for Primary and Secondary for over 490 students, and nine weekend public workshop sessions for over 250 members of the public.

"It was a great programme with fun hands-on activities. I believe the kids enjoyed it very much... More time could (have been) allocated to the guided tour as well because the Museum itself has so much to offer! The guided gallery tour (was) great, and they learn so much more this way than if they were to roam the Museum on their own. I like that the guide also gave them time to ask questions because the kids were curious about the artefacts!"

- Yishun Secondary School

Diving into a microscopic realm

"I think the students enjoyed the SEM activity the most. I also liked that students could build on their basic microscopy skills and get to try and experience other microscopes they would otherwise only read/hear about."

– Tampines Meridian Junior College

Kindly sponsored by ExxonMobil, the 'Biodiversity Microworlds Programme' was a new workshop which aimed to create awareness about less obvious microscopic biodiversity while learning more about the tools and techniques that can be used to study them. Following the successful run of the ExxonMobil Biodiversity Microworlds Programme that was completed in early 2024 for over 190 students from 10 secondary schools and junior colleges, the second run of this programme in late 2024 will see us incorporate the use of the TM4000Plus II Tabletop Scanning Electron Microscope (SEM), which is on loan from Hitachi High-Tech America as part of the Hitachi High-Tech Inspire STEM Education Outreach Program.

"The hands-on activities were engaging. The short time given for each activity meant that they had to focus and try to answer the questions quickly. The specimen used could be seen clearly, as they were already pre-focused, so students (did not) have to waste time trying to find them. The Museum tour, with its emphasis on preservation of specimen for display and biodiversity, were also interesting."

– Raffles Institution

NUS Courses taught by Museum Staff

Staff	Module	No. of Students
A/P Darren Yeo	BL5230 Biological Invasions	15
	LSM3254 Ecology of Aquatic Environments	71
	LSM4264 Freshwater Biology	20
A/P Huang Danwei	BL5225 Marine Conservation	15
	LSM3252 Evolution and Comparative Genomics	20
	LSM4261 Marine Biology	37
Dr Hwang Wei Song	NST2002 Evolution	13
Dr Joelle Lai	BL5102 Environmental Science	44
	UTC1419 Inside the Museum: Collections and the Public	12
Dr Jose Christopher Mendoza	NST2008 Invertebrate Innovations	21
Dr Lim Swee Cheng	BL5312 Natural History Collections and Conservation	20
Dr Tan Yen Yi	LSM4263 Field Studies in Biodiversity	30
Dr Yuchen Ang	NST2007 Biodiversity and Natural History in Singapore	16

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Page 16: Photograph by Susan Tan, LKCNHM (bottom)

Page 18: Photographs by Foo Maosheng, LKCNHM

Page 19: Photographs by Tan Siong Kiat, LKCNHM (above) and Lim Swee Cheng, LKCNHM (below)

Page 20: Photographs by SIGNIFY, LKCNHM

Page 21: Photographs by SIGNIFY, LKCNHM (above) and Wendy Wang, LKCNHM (below)

Page 22: Photographs by Liu Xinming (above) and Huang Danwei, LKCNHM (below)

Pages 24–25: Photographs by Quentin Martinez (above), Kelvin Lim, LKCNHM (page 24 below), and Tan Heok Hui (page 25 below)

Page 27: Photographs by Tan Yen Yi, LKCNHM

Page 31: Photographs by Tan Tze Siong (top), Beh Lih Khiang (middle) and the Outreach and Education team (bottom), LKCNHM

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All remaining photographs featured in this report are by the Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore.

Support our Natural Heritage

The Museum is dedicated to preserving and sharing the wonders of the natural world with people of all ages and backgrounds. We are home to a collection of over a million specimens, some of which date back to the 1800s, that reflect the diversity and beauty of our flora and fauna in Singapore and in the Southeast Asian region. We rely almost entirely on the generous support of donors like you to continue our work in scientific and biodiversity historical research, as well as inspire visitors to appreciate and protect the natural world. Your donation will help us maintain our collections, fund new research projects, develop new exhibits, and support our educational programs.

Protect and preserve our natural heritage for future generations today.

Scan the QR code to donate now!

Lee Kong Chian Natural History Museum
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