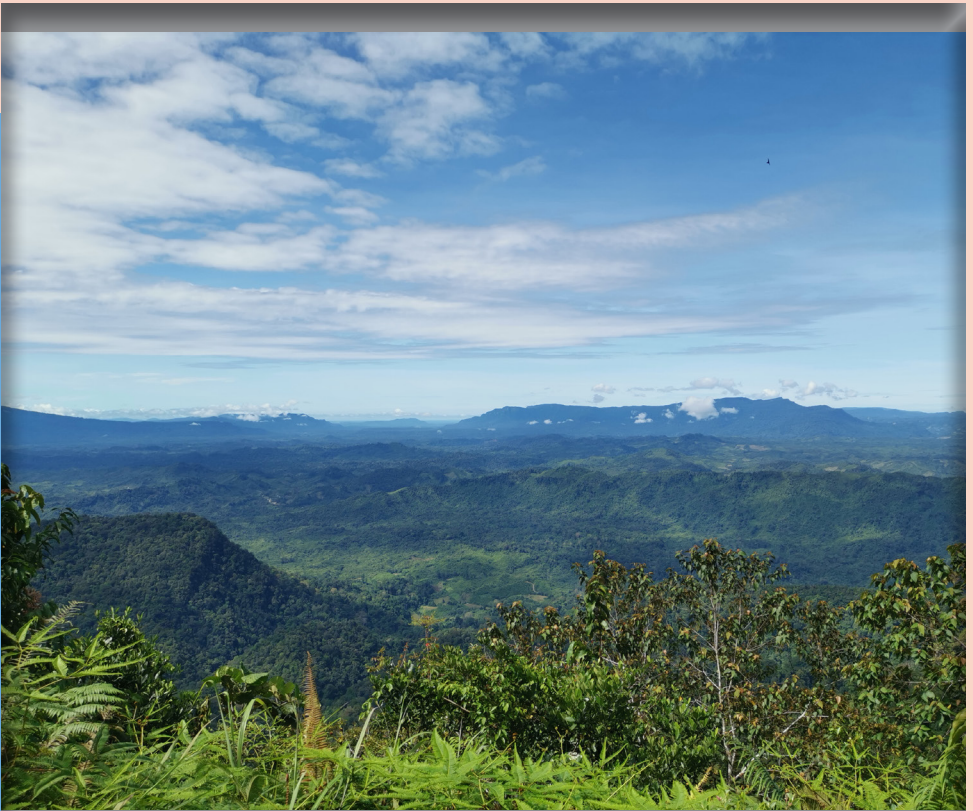


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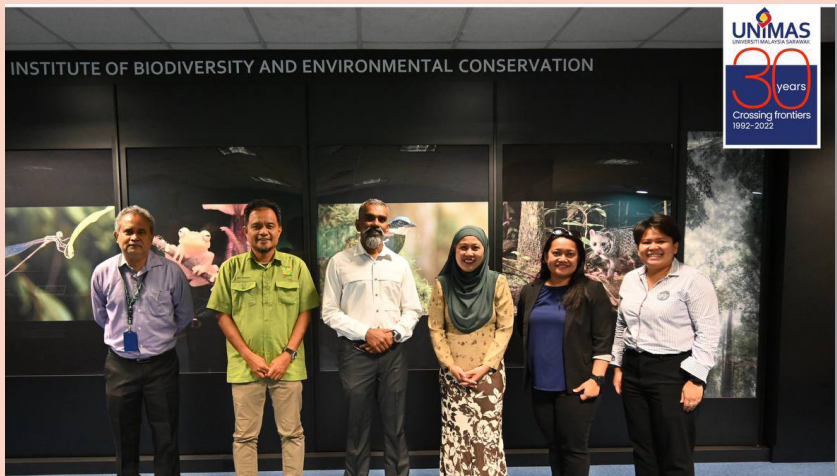
UNIMAS Global - International Relations held an engagement session on 10 March 2023. It was incredibly helpful and informative.



9 March 2023 - Thank you Unimas Corporate for the fruitful engagement session.



8 March 2023 - Official visit of the Secretary of State for the Environment of Timor-Leste's Delegation to Universiti Malaysia Sarawak (UNIMAS) and IBECE.



7 March 2023 - Preliminary discussion with Sarawak Forestry Corporation for 10th International Bornean Frog Race and Night Photography Competition 2023.

3rd March 2023 - Pangolin Rescue

Two representatives from SFC Swat Team has received a juvenile pangoline that was handed in by UNIMAS student. The pangolin was found in an Oil Palm Plantation near Simunjan territories. The handing over was represented by Prof Dr Gabriel Tonga and Ms Rahah Mohamad Yakup from IBEC.



23 February 2023 - Official visit by Malaysian Green Technology & Climate Change (MGTC) to BEC Suite, IBEC.



Speaker

Dr. Estelle CRUZ

*PhD in Ecology & Environment
National Museum of Natural History*

'From Scientific Drawings to Comics'

1st March 2023 | Wednesday

10.00 AM - 11.15 AM

Hybrid mode

Venue: IBEC Meeting Room

Cisco Webex link:

<https://unimas.webex.com/unimas/j.php?MTID=mb3679521a7f0c95e4c13b9b14cee5287>

Meeting number: 2641 849 2090 | Meeting Password: IBEC2023

*Participants who will attend the talk physically may need to bring one 2B-HB pencil and paper for drawing sessions.

Moderator

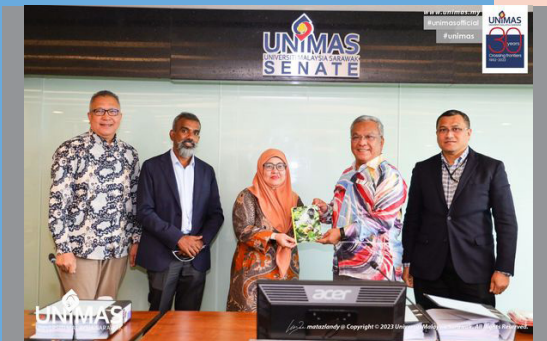
Dr. Jongkar Grinang
Research Fellow

Community-Driven University For A Sustainable World



1st March 2023 - Academicians, researchers and students participated in a research talk entitled 'From Scientific Drawings to Comics'. This research talk was delivered by Dr Estelle CRUZ, from the National Museum of Natural History, France. The session was moderated by Dr Jongkar Grinang.

17 February 2023 - Vice Chancellor, Universiti Malaysia Sarawak presenting another series of Life from Headwaters to the Coast Bako - Biodiversity Between Land and the Sea to Yang Amat Berhormat Premier Sarawak, Datuk Patinggi Tan Sri (Dr) Abang Haji Abdul Rahman Zohari Tun Datuk Abang Haji Openg.



19 January 2023
Presenting another series of Life from Headwaters to the Coast Bako - Biodiversity Between Land and the Sea to Vice Chancellor Universiti Malaysia Sarawak.



17 February 2023-Official visit to Institute of Biological Sciences - Universiti Malaya



Official visit to Institute of Ocean and Earth Sciences - Universiti Malaya



Amanat 2023





Changes to the taxonomy of *Shorea*

Wong Sin Yeng

Although ample evidence from the pre-molecular age suggested that taxonomically not everything in the Dipterocarpaceae was as it should be and would benefit from attention (Heim 1892; Maury 1978; Maury-Lechon 1979) over the past quarter century, despite numerous attempts to get to grips with the evolutionary framework of the dipterocarps, until last year no substantial taxonomic changes had been published.

Molecular work began on the Dipterocarpaceae in 1996 (Tsumura et al. 1996), and there followed in rapid succession Katija et al. (1998), Kamiya et al. (1998), and Dayanandan et al. (1998), all largely dealing with taxa from the humid Asian tropics. Publications in 1999 (Morton et al. 1999) and 2003 (Gamage et al. 2003) dealt respectively with placement of the remarkable taxonomically isolated Guiana Shield *Pseudomonotes* and taxa from Sri Lanka. From 2005

onwards a veritable flood of papers appeared once again dealing with the Asian humid tropics (Kamiya et al. 2005, Yulita et al. 2005, Cao et al., 2006, Gamage et al., 2006, Indrioko et al., 2006). Pursuance of phylogenetic 'truth' was suspended for a while thereafter, although the concomitant techniques were utilized to assist in the tracking of illegal timber (Rachmayanti et al. 2006; Tsumura et al. 2011).

Phylogenetics were re-visited with a vengeance from 2017 onwards, with a flurry of papers beginning in 2017 (Heckenhauer et al. 2017, 2018, 2019), culminating (at least for the time being) with two almost contemporaneous papers (Cvetković et al. 2022 and Ashton & Heckenhauer 2022) that at last pinned their taxonomic colours to the mast, the former at tribal level and the latter at the level of genus, in particular redefining *Shorea*, the preeminent timber genus of the

family in the humid Asian tropics, with its centre of diversity on Borneo.

An outcome of the Ashton & Heckenhauer (2022) paper is that *Shorea* has been broken up into several genera that it is felt better reflect the evolutionary history of the genus. The result for Borneo is that there are now five genera where there was once one:

Anthoshorea Pierre

Neohoepa (P.S.Ashton) P.S.Ashton,

Richetia F.Heim

Rubroshorea (Meijer) P.S.Ashton & J.Heck.

Shorea Roxb. ex C.F.Gaertn.

While these changes will take some getting used to – and at least for *Rubroshorea* there appears to be quite a bit more tinkering required (more extensive sampling is most definitely required) to sort out what looks still to be a dumping ground for taxa that don't obviously fit in the other four genera, the paper is definitely several steps in the right direction.

References

Ashton, P.S. & Heckenhauer, J. 2022. Tribe Shoreae (Dipterocarpaceae subfamily Dipterocarpoideae) finally dissected. *Kew Bulletin* 77: 885–903.

Cao, C.P., Gailing, O., Siregar, I., Indrioko, S.&Finkeldey, R. 2006. Genetic variation at AFLPs for the Dipterocarpaceae and its relation to molecular phylogenies and taxonomic subdivisions. *Journal of Plant Research* 119: 553–558.

Cvetković, T., Hinsinger, D.D., Thomas, D.C., Wieringa, J.J., Velautham, E. & Strijk, J.S. (2022). Phylogenomics and a revised tribal classification of subfamily Dipterocarpoideae (Dipterocarpaceae). *Taxon* 71: 85–102.

Dayanandan, S., Ashton, P.S., Williams, S.M. & Primack, R.B. 1999. Phylogeny of the tropical tree family Dipterocarpaceae based on nucleotide sequences of the chloroplast *RbCL* gene. *American Journal of Botany* 86(8): 1182–1190.

Gamage, D., de Silva, M.P., Inomata, N., Yamazaki,

T. & Szmidt, A.E. 2006. Comprehensive molecular phylogeny of the subfamily Dipterocarpoideae (Dipterocarpaceae) based on chloroplast DNA sequences. *Genes & Genetic Systems* 81(1): 1–12.

Gamage, T.W., de Silva, M., Yoshida, A., Szmidt, A.E. & Yamazaki, T. 2003. Molecular phylogeny of Sri Lankan Dipterocarpaceae in relation to other Asian Dipterocarpaceae based on chloroplast DNA sequences. *Tropics* 13: 79–87.

Heckenhauer, J., Paun, O., Chase, M.W., Ashton, P.S., Kamariah, A.S. & Samuel, R. 2019. Molecular phylogenomics of the tribe Shoreae (Dipterocarpaceae) using whole plastid genomes. *Annals of Botany (Oxford)* 123: 857–865.

Heckenhauer, J., Samuel, R., Ashton, P.S., Kamariah, A.S. & Paun, O. 2018. Phylogenomics resolves evolutionary relationships and provides insights into floral evolution in the tribe Shoreae (Dipterocarpaceae). *Molecular Phylogenetics and Evolution* 127: 1–13.

Heckenhauer, J., Samuel, R., Ashton, P.S., Turner, B., Barfuss, M.H.J., Jang, T.-S., Tensch, E.M., Mccann, J., Salim, K.A., Attanayake, A.M.A.S. & Chase, M.W. 2017. Phylogenetic analyses of plastid DNA suggest a different interpretation of morphological evolution than those used as the basis for previous classifications of Dipterocarpaceae (Malvales). *Botanical Journal of the Linnean Society* 20: 31–39.

Heim, F. (1892). *Recherches sur les Diptéocarpaceés*. Chamerot & Renouard, Paris.

Indrioko, S., Gailing, O. & Finkeldey, R. 2006. Molecular phylogeny of Dipterocarpaceae in Indonesia based on chloroplast DNA. *Plant Systematics and Evolution* 261: 99–115.



Kajita, T., Kamiya, K., Nakamura, K., Tachida, H., Wickneswari, R., Tsumura, Y., Yoshimaru, H. & Yamazaki, T. 1998. Molecular phylogeny of Dipterocarpaceae in Southeast Asia based on nucleotide sequences of matK, trnL intron, and trnL-trnF intergenic spacer region in chloroplast DNA. *Molecular Phylogenetics and Evolution* 10(2): 202–209.

Kamiya, K., Harada, K., Hidenori, T. & Ashton, P.S. 2005. Phylogeny of PgiC gene in *Shorea* and its closely related genera (Dipterocarpaceae), the dominant trees in Southeast Asian tropical rain forests. *American Journal of Botany* 92(5): 775–788.

Kamiya, K., Harada, K., Ogino, K., Kajita, T., Yamazaki, T., Lee, H.-S. & Ashton, P.S. 1998. Molecular phylogeny of dipterocarp species using nucleotide sequences of two non-coding regions in chloroplast DNA. *Tropics* 7(3–4): 195–207.

Maury, G. (1978). Diptérocarpacées: du fruit à la Plantule. Doctoral dissertation, Université Paul Sabatier, Toulouse.

Maury-Lechon, G. (1979). Conséquences taxonomiques de l'étude des caractères des fruits germinations et plantules des Diptérocarpacées. In: G. Maury-Lechon (ed.), *Dipterocarpaceae: taxonomie-phylogénie-écologie*. Mémoires du Muséum national d'Histoire naturelle 26: 81–106, 107–127.

Morton, C.M., Dayanandan, S. & Dissanayake, D. 1999. Phylogeny and biosystematics of Pseudomonotes (Dipterocarpaceae) based on molecular and morphological data. *Plant Systematics and Evolution* 216(3-4): 197–205.

Rachmayanti, Y., Leinemann, L., Oliver, G. & Finkeldey, R. 2006.

Extraction, Amplification and Characterization of Wood DNA from Dipterocarpaceae. *Plant Molecular Biology Reporter* 24: 45–55.

Tsumura, Y., Kado, T., Yoshida, K., Abe, H., Ohtani, M., Taguchi, Y., Fukue, Y., Tani, N., Ueno, S., Yoshimura, K., Kamiya, K., Harada, K., Takeuchi, Y., Diway, B., Finkeldey, R., Na'iem, M., Indrioko, S., Kit, K., Ng, S., Muhammad, N. & Lee, S.L. 2011. Molecular database for classifying *Shorea* species (Dipterocarpaceae) and techniques for checking the legitimacy of timber and wood products. *Journal Plant Research* 124: 35–48.

Tsumura, Y., Kawahara, T., Wickneswari, R. & Yoshimura, K. 1996. Molecular phylogeny of Dipterocarpaceae in Southeast Asia using RFLP of PCR-amplified chloroplast genes. *Theoretical and Applied Genetics* 93(1–2): 22–29.

Yulita, K.S., Bayer, R.J. & West, J.G. 2005. Molecular phylogenetic study of *Hopea* and *Shorea* (Dipterocarpaceae): Evidence from the trnL-trnF and internal transcribed spacer regions. *Plant Species Biology* 20: 167–182.



Comparative Aspects
of the Ecology of Four
Syntopic Species of
Angle-headed Lizards,
Genus *Gonocephalus*
(Reptilia: Agamidae:
Draconinae)

Wong Jye Wen



Species commonly coexist and similar species typically coexist through partitioning resources along certain axes of the multidimensional niche space, while competing over other axes. Habitat, food and time, representing spatial, trophic and temporal dimension respectively, were proposed to be the three main dimensions of ecological space partitioned by most lizards. Investigations on coexistence and resource partitioning among sympatric species of reptilians have been widely conducted in other parts of the world but remain poorly studied in Borneo and other parts of south-east Asia. While some generalisations of ecological aspects may be applicable to local reptilian species, species interactions may differ, depending on geographical location and environment conditions.

Four *Gonocephalus* species (*G. bornensis*, *G. liogaster*, *G. doriae*

and *G. grandis*) were selected for a study of their comparative biology, the rationale being their perceived ecological similarity and syntopic occurrence, to develop a better insight of the ecological phenomena of resource partitioning in the tropical rainforest settings. Studies on ecology, specifically on home range, habitat preference, thermal biology and diet, covering the spatial, thermal and trophic dimension with additional records of parasite, colouration and predation of populations at Kubah National Park, Sarawak, East Malaysia (north-western Borneo) were carried out from June 2018 to December 2019. A total of 16 lizards, representing four species, were equipped with temperature sensitive radio-transmitters, permitting the collection of data on movement and body temperature.

Both males and females of *Gonocephalus doriae* were found to be strongly associated with tree trunks with moderate circumference (0.07-0.3m). Here is an adult female *Gonocephalus doriae* perching vertically on a tree trunk during the day



Gonocephalus grandis are always found near streams and other waterbodies. They are sometimes found perching high up on bigger trees with larger circumference. Here is an adult female *Gonocephalus grandis* perching on a tree branch during the day



was overall a habitat generalist compared to its congeners, whereas *G. doriae* are relatively specialised. All had moderate home range sizes that were similar across species and sexes. The lack of interspecific home range overlaps propose that these species are occupying different parts of the forest, although a more extensive sampling that include more individuals may be needed to confirm this.

The four species were primarily shade-dwellers and have relatively low mean body temperatures. They typically maintained their body temperatures below those of the ambient temperature but above those of the substrate temperature. Body temperatures are likely influenced primarily by passive convection from indirect solar radiation, casual facultative basking, and transit through filtered sunlight, instead of careful thermoregulation from making behavioural adjustments. Therefore, these species are believed to be non-heliothermic or rather facultative non-heliotherms. They exploit the thermal niche differently which are reflected from the spatial niche, and are likely influenced by the trophic niche.

Species of *Gonocephalus* generally occupy similar microhabitats, favouring areas with gentle to moderate slope, high canopy cover, are plastic in their usage of trees in terms of sizes or height, moderate distance to waterbodies, on tree trunk, tree branch, moderate to high humidity, moderate to high ambient temperature, low to median light intensity and low to median perch surface temperatures. Nonetheless, species of *Gonocephalus* diverge slightly along the spatial dimension of their ecological niches by exhibiting different levels of preference towards aspects of microhabitats utilised. *G. bornensis*

An adult female *Gonocephalus bornensis* masticating a *Dinomyrmex gigas* (giant forest ant) on 12 August 2018, at 1330 h



As for diet study, stomach flushing was used to obtain the stomach contents from the lizards. A total of 13 prey types were successfully identified, consisting mainly of insects and other non-insect arthropod groups such as earthworms and snails which were not recorded previously. However, there was insufficient evidence to conclude unequivocally that trophic resource partitioning contributed to coexistence among these species. Nonetheless, ants were considered as a common prey shared among these lizards. Incidental to the collection of regurgitated samples, nematodes were also obtained from stomachs and faeces of some individuals. Four nematode and three acarid species were successfully identified in these lizards. *G. doriae* serve as new host for *Orneoascaris* sp., and both *G. bornensis* and *G. liogaster* serve as new hosts for *Strongyluris* sp.

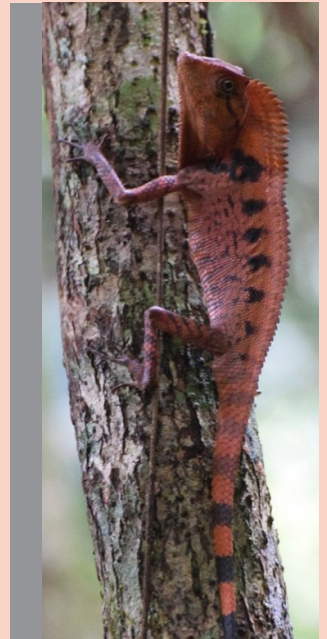
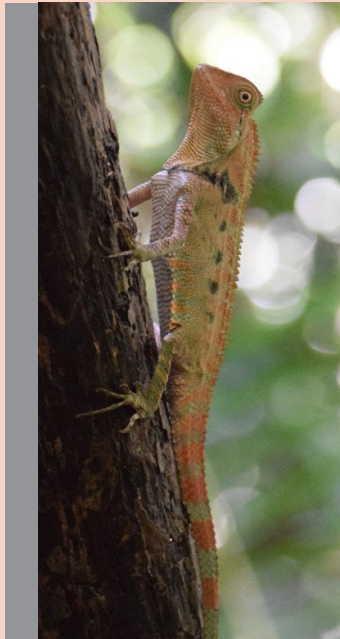
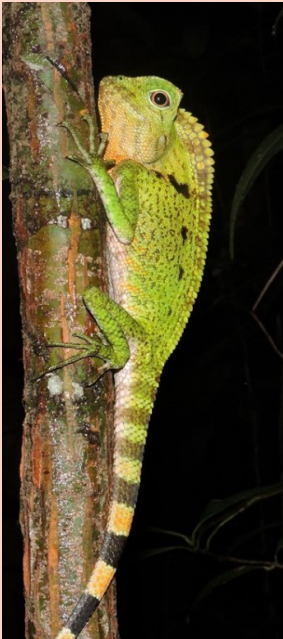
Some other interesting observations of the species were their display of sexual dichromatism, where males are generally more colourful and vibrant compared to females. Individuals of the genus are able to quickly change skin colouration from dull to bright or vice versa for social interaction and thermoregulation. Furthermore, a *G. liogaster* was also found preyed upon by a *Ptyas carinata*, contributing to the list of predators of *Gonocephalus*.

Overall, this study adds to the knowledge of these species and expands current understanding of resource partitioning and mechanisms of coexistence of lizard populations in Borneo's tropical rainforest, which may be beneficial for both conservation and management as well as future studies on other Bornean ectothermic species.

An example of dull colouration displayed during the day under direct exposure to sunlight likely to aid with thermoregulation. Adult female *Gonocephalus bornensis* day colouration. (right) Colouration in shade; (left) Colouration under direct exposure to sunlight.



Gonocephalus doriae have shown to be able to change their skin colours to enhance their appearance during courtship or intrasexual exchanges. Here shows the Dynamic physiological colour change in adult males. (left) Natural colouration; (middle) Partially breeding colouration; (right) Colouration associated to courtship or intrasexual interactions





Epiphytes at Oil Palm Plantation in Jagoi Area, Bau

Bridgette anak Philip

Any plant that grows upon another plant or structure only for physical support is known as an epiphyte, sometimes known as an air plant. Epiphytes are not parasitic on the supporting plants and do not have any evident nutrient sources or attachments to the ground. A study was done on the Jagoi SALCRA plantation in Bau, focusing on the diversity and density of epiphytes on oil palm (*Elaeis guineensis*) trees, based on the age of the plantation and the distance of the plot to the forest edge. Five oil palm trees were sampled in each plot. The study concludes that there are 50 families with 1365 individual species found in the oil palm plantation around Jagoi. The most dominant families belong to the family Polypodiaceae, Davalliaceae, and Arecaceae.

The study also concludes that the most common types of epiphytes are ferns consisting of the *Davallia denticulata* (Rabbit's Foot fern), *Asplenium nidus* (Bird's Nest fern), *Nephrolepis radicans* (Sword fern), and more. The oil palm plantation plots with older age (>15 years old) have the highest epiphyte density, followed by mature oil palm plots (10-15 years old) and young oil palm plots (<10 years old). The distance of the oil palm plots to the forest edges does not show much difference, as the oil palm plot with a 10 m distance from the forest edge has just slightly higher frequency (684 epiphytes individual) compared to the oil palm plot with a 100 m distance from the forest edge (681 epiphytes individual).

Publications

Cindy, Peter and Gianna, Minton and Anna Norliza, Zulkifli Poh and Goh, Ann Jie and Andrew Alek, Tuen and Samuel, Kiyui. and Marie-Françoise, Van Bresse and Oswald Braken, Tisen (2023) Records of Postmortem Attentive Behavior on an Irrawaddy Dolphin (*Orcaella brevirostris*) Calf and Implications for Conservation in Kuching Bay, Sarawak, East Malaysia. *Aquatic Mammals*, 49 (1).

Mohd-Azlan, J., M.K. Suaidi & I. Das. (Eds.). 2023. Bako National Park. Biodiversity between land and the sea. UNIMAS Publisher, Kota Samarahan and Natural History Publications (Borneo), Kota Kinabalu. 131 pp.

Mohd-Azlan, J., M.K. Suaidi & I. Das. 2023. Preface. In: Bako National Park. Biodiversity between land and the sea. pp:ix-x. J. Mohd-Azlan, M.K. Suaidi & I. Das (Eds.). UNIMAS Publisher, Kota Samarahan and Natural History Publications (Borneo), Kota Kinabalu.

Mohd-Azlan, J., M.K. Suaidi & I. Das. 2023. Introduction. In: Bako National Park. Biodiversity between land and the sea. pp:1-2. J. Mohd-Azlan, M.K. Suaidi & I. Das (Eds.). UNIMAS Publisher, Kota Samarahan and 18Natural History Publications (Borneo), Kota Kinabalu.

Mohd-Azlan, J. & S.S. Kaicheen. 2023. Large mammals. In: Bako National Park. Biodiversity between land and the sea. pp:99-105. J. Mohd-Azlan, M.K. Suaidi & I. Das (Eds.). UNIMAS Publisher, Kota Samarahan and Natural History Publications (Borneo), Kota Kinabalu.

Mohd-Azlan, J. & S.S. Kaicheen. 2023. Bearded pig. In: Bako National Park. Biodiversity between land and the sea. pp:123-124. M.A. Jayasilan, M.K. Suaidi & I. Das (Eds.). UNIMAS Publisher, Kota Samarahan and Natural History Publications (Borneo), Kota Kinabalu.

Philoveny, P., & Mohd-Azlan, J. (2023). How do people in the "Land of Hornbills" perceive Hornbills?. *Bird Conservation International*, 33, e5.

David, P., Lescure, J., Savage, J.M., Das, I., Pauwels, O.S., Vogel, G. and Ziegler, T., 2023. *Coluber korros* Lesson, 1831 and *Coluber korros* Schlegel, 1837 (Reptilia: Squamata:

Colubridae): there is a korros too many in the family. *Zootaxa*, 5231(3), pp.331-339.

Veronica, Martin and Indraneil, Das (2023) Bornean Keeled Pit-viper. In: Bako : Biodiversity between land and the sea. Life from Headwaters to the Coast . UNIMAS Publisher and Natural History Publications (Borneo) Sdn Bhd, Kota Samarahan and Kota Kinabalu, pp. 111-113.

Indraneil, Das and Pui Yong, Min and Sabariman, Hassan and Taha, Wahab (2023) Reptiles. In: Bako : Biodiversity between land and the sea. Life from Headwaters to the Coast . UNIMAS Publisher and Natural History Publications (Borneo) Sdn Bhd, Kota Samarahan and Kota Kinabalu, pp. 69-76.

Indraneil, Das and Ramlah, Zainudin and Pui Yong, Min and Elvy Quatrin, Deka and Taha, Wahab (2023) AMPHIBIANS. In: BAKO : Biodiversity Between Land and the Sea. Life from Headwaters to the Coast . UNIMAS Publisher and Natural History Publications (Borneo) Sdn. Bhd., pp. 65-68.

Engkamat, Lading and Indraneil, Das (2023) Saltwater crocodile. In: Bako : Biodiversity between land and the sea. Life from Headwaters to the Coast . UNIMAS Publisher and Natural History Publications (Borneo) Sdn Bhd, Kota Samarahan and Kota Kinabalu, pp. 106-110.

Davis, H.R., Nashriq, I., Woytek, K.S., Wikramanayake, S.A., Bauer, A.M., Karin, B.R., Brennan, I.G., Iskandar, D.T. and Das, I., Genomic analysis of Bornean geckos (*Gekkonidae: Cyrtodactylus*) reveals need for updated taxonomy. *Zoologica Scripta*.

Jongkar, Grinang (2023) CRABS AND SHRIMPS. In: Bako : Biodiversity between land and the sea. Life from headwaters to the coast . UNIMAS Publisher and Natural History Publications (Borneo) Sdn. Bhd., pp. 57-59.

Wong, Sin Yeng (2023) TWO ENDEMIC HERBS. In: BAKO : Biodiversity Between Land and the Sea. Life from Headwaters to the Coast . UNIMAS Publisher and Natural History Publications (Borneo) Sdn. Bhd., pp. 25-28.

Publications

Haigh AL, Gibernau M, Maurin O, Bailey P, Carlen MM, Hay A, Leempoel K, McGinnie C, Mayo S, Wong SY, Zuluaga A, Zuntini AR, Baker WJ, Forest F. (2023). Target sequence data shed new light on the infrafamilial classification of Araceae. *American Journal of Botany*. 2023: e16117.

Lau, A.C., Mohamed, W.M.A., Nakao, R., Onuma, M., Qiu, Y., Nakajima, N., Shimozuru, M., Mohd-Azlan, J., Moustafa, M.A.M. and Tsubota, T., 2023. The dynamics of the microbiome in Ixodidae are shaped by tick ontogeny and pathogens in Sarawak, Malaysian Borneo. *Microbial Genomics*, 9(2), p.000954.

Ord, T.J., A. Diesmos, N. Ahmad & I. Das. 2023. Evolutionary loss of complexity in animal signals: cause and consequence. *Evolution* 77(3):660–669.

Kurz, D.J., Connor, T., Brodie, J.F., Baking, E.L., Szeto, S.H., Hearn, A.J., Gardner, P.C., Wearn, O.R., Deith, M.C., Deere, N.J. and Ampeng, A., 2023. Socio-ecological factors shape the distribution of a cultural keystone species in Malaysian Borneo. *npj Biodiversity*, 2(1), p.4.

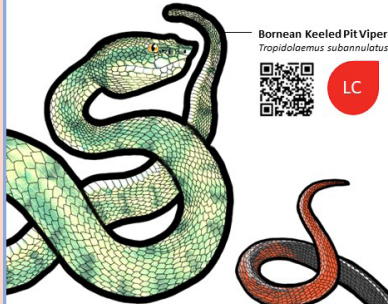
Mi, C., L. Ma, X. Li, S. Meiri, U. Roll, O. Osyrko, D. Pincheira-Donoso, Lily, J. Daniel, B. Safaei-Mahroo, H. Ghaffari, J. Smid, S. Jarvie, R. Mwangi Kimani, L. M. Nneji, R. Masroor, S.M. Kazemi, A. Bauer, C. Nogueira, D. Meirte, D.G. Chapple, I. Das, L. Grismer, L.J. Avila, M.A. Ribeiro-Junio, O.J.S. Tallowin, O. Torres-Carvajal, P. Wagner, S.R. Ron, Y. Wang, Y. Itescu, Z.T. Nagy, M. Yang, D. Wilcove, X. Liu & W. Du. 2023. Global protected areas as refuges for amphibians and reptiles under climate change. *Nature Communications* 14:e1389. doi:10.1038/s41467-023-36987-y

Venomous Snakes of Baleh Kapit, Sarawak

About this poster

This poster illustrates a total of nine species of venomous land snakes. The account is based on sighting records from the Baleh HEP site and adjacent areas. In addition, we also included those species that are likely to occur at the site, based on their geographical and elevational ranges. This poster aims to generate awareness amongst members of the public on potentially dangerous snakes and provide necessary information for species identification.

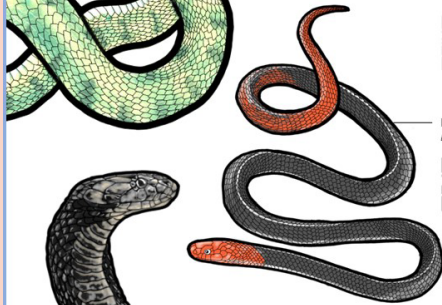
For all species, we provide a common name, the current scientific name and conservation status according to the IUCN Red List (VU = Vulnerable, LC = Least Concern). Finally, we provide a Quick Response (QR) code for each species, that links to the Malaysia Biodiversity Information System (MyBIS) page. Please scan the QR code for more information on the species.



Bornean Keeled Pit Viper
Tropidolaemus subannulatus



LC



Sumatran Pit Viper
Trimeresurus sumatranus



LC



Equatorial Spitting Cobra
Naja sumatrana



LC



Blue Coral Snake
Calliophis bivirgatus



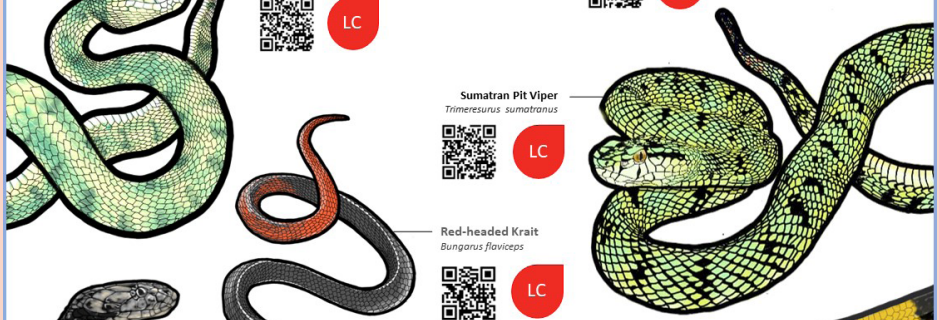
LC



Bornean Leaf-nosed Pit Viper
Craspedocephalus borneensis



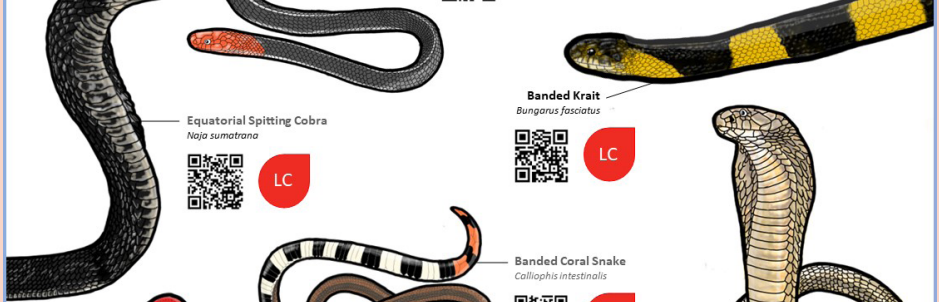
LC



Banded Krait
Bungarus fasciatus



LC



Banded Coral Snake
Calliophis intestinalis



LC



King Cobra
Ophiophagus hannah



VU

Further reading material



Land Snakes of Medical Significance in Malaysia. 3rd Edition

Reference
Ismail, A.K., Teo, E.W., Das, I., Vasuruchapong, T. & Weinstein, S.A.
(2022) *Land Snakes of Medical Significance in Malaysia. 3rd Edition*.
Forest Research Institute Malaysia (FRIM), Malaysia. 97 pp.

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