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Some *Goniothalamus* spp. of Sarawak. *Goniothalamus* spp. are rich in secondary metabolites with good potential to be developed as drugs
(Photograph courtesy of Fasihuddin B Ahmad)

Contents

Dean's Message

Prof Dr Shabdin Mohd Long

Recently UNIMAS has established a centre of excellence which is located at the Faculty. The centre is known as Centre of Excellence for Sago Research (CoESAR). Since our academic staffs are involved in various aspects of sago research, the establishment of CoESAR is appreciated by the faculty members. CoESAR research will focused on four major area which are Agronomy (research on soil fertility and management, pest and disease management, nursery production and management, field planting); Molecular Genetics (research on sago palm genetics and molecular biology); Starch Technology (research on the uses of starch and starch chemistry especially fermentation and production of lactic acid, glucose and bioethanol from sago starch; chemistry of sago starch and modification of starch for numerous applications) and Utilization (research on the use of sago waste and bioconversion into useful products). It is no doubt that the establishment of CoESAR will promote research activity and collaboration with other established centre and also focused research which will have significant impact on research, development and commercialization.

Faculty has finalized all the documentation to establish five new academic programme. The five new programme which are: Chemistry and Food Technology; Microbiology; Aquaculture; Bioforensic and Science and Plantation Management will be the addition to the five existing programme that have been offered since 1993. By the addition of the new programme it is hoped that we will be able strengthen our academic programme, attract more students, and also to create manpower for various job demand based on current needs. The new program will be offered in 2012.

In order to facilitate the publication of research finding, Faculty has also finalized the publication of *Borneo Journal of Resource Science and Technology*. The first volume will be published by the end of 2010 and this journal will serve a good platform for all academic staffs to publish their recent finding.

My sincere hope that all academic staffs will show high commitment in order to achieve excellent performance in teaching, research, publication, consultancy and public services.

Please feel free to direct your enquiry to me at e-mail: lshabdin@frst.unimas.my or to the editorial members for further information.

New plants taxa from Sarawak

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Borneo is considered as one of the centre for plant diversity. It was estimated that the number of flowering plants in the whole of Borneo ranged between 10,000 to 12,000 species; equivalent to 6% of the world total plant species. Many botanical excursions have been conducted in Sarawak since 1880s by great number of famous botanists, horticulturists and other researchers to records and discovering new species. Since then, many new species have been described from Sarawak until today, with cumulative estimation of two new species per day. Hence, this paper is to share with the readers of 19 new taxa that we discovered from the year 2005 – 2010. It has become very clear that biodiversity of Borneo, particularly Sarawak is very rich, and many new species can still be encountered.

List of new species described (2005 – 2010)

Alpinia epiphytica Meekiong, Ipor & Tawan, *Heart of Borneo Series: Lanjak Entimau Wildlife Sanctuary – Sarawak Hidden Jewel* (2010).
This unique new species is the only species in the genus so far recorded with epiphytic habit. The type specimen of this species is from Nanga Tekalit, Lanjak Entimau Wildlife Sanctuary, and by far is considered as hyper-endemic to that area.

Boesenbergia latongensis Meekiong & H. Ibrahim, *Heart of Borneo Series: Lanjak Entimau Wildlife Sanctuary – Sarawak Hidden Jewel* (2010).
This species is allies to *Boesenbergia oligosperma* with having thick leaves and yellow flowers but can be differentiated by flower morphological. One of among five new gingers species discovered during the Scientific Expedition to Lanjak Entimau Wildlife Sanctuary.

Begonia hidiri Tawan, Ipor & Meekiong, *Folia Malaysiana* 10(1): 48 (2009).
This hairy cane-like begonia was first discovered during the UNIMAS Scientific Expedition to Gunung Murud in 2003 by Hidir Marzuki. This species is unique among the member of Section *Petermannia* as it produced separated male and female flowers from different nodes.

Begonia kurakura Tawan, Ipor & Meekiong, *Folia Malaysiana* 10(1):50 (2009).
This species has unique epithet name, *kurakura* (tortoise) as the shaped of leaves was look-liked a tortoise shell and the leaves also eaten by them. This tufted begonia discovered during the Scientific Expedition in Lanjak Entimau Wildlife Sanctuary.

Costus bullatus Meekiong, Muliati & Ipor, *Folia Malaysiana* 7(1&2): 65 (2006).
This dwarf *Costus* species is belong to the Section *Paracostus* and confined to the limestone area. The distribution of this species is very localized to small limestone area in Bau and considered as hyper-endemic. The epithet name is referring to the bullate leaves, which is unique in the genus.

Costus eburneus Meekiong, Muliati & Tawan, *Folia Malaysiana* 7(1&2): 66 (2006).
This species closely similar to *Costus bullatus* by having bullate leaves and producing flowers on the node but can be distinguished by the flower morphological. This species is also a hyper-endemic species, which so far recorded from one isolated limestone area in Bau.

Costus muluensis Meekiong, Ipor & Tawan, *Folia Malaysiana*, 7 (1&2): 60 (2006).
The type specimen of this species was collected from the base of Gunung Api, Mulu National Park. Another dwarf species belong to the Section *Paracostus* that very well distributed in Sarawak.

Costus mulus Meekiong, Ipor & Tawan, *Rheedea* 18: 87-89 (2008).
This species was discovered in Tutuh in 2004. The inflorescence is terminal on separated leafless shoot, flower white with yellow band on the central tip of labellum and also the presence of purple blotches on the tip of sepal.

Alpinia epiphytica

Begonia kurakura

Boesenbergia latongensis

Begonia hidiri

Costus bullatus *Costus eburneus*

Costus muluensis *Costus mulus*

Musa bauensis Hakkinen & Meekiong, *Systematics and Biodiversity* 2(2): 170 (2005).
This new wild banana is a limestone specialist and so far recorded from Bau and Serian limestone area. *Musa bauensis* is not closely related to any other *Musa* species with having cream-coloured male flowers that remaining shriveled on the rachis.

Musa borneensis Becc. var. ***alutacea*** Hakkinen & Meekiong, *Acta Phytotaxonomica et Geobotanica* 56 (3):220 (2005).
A new variety of *Musa borneensis* described based on specimen collected from UNIMAS, Kota Samarahan. This variety can be differentiated from other by having leathery yellow bract of male bud and also producing red-purple sap.

Musa borneensis Becc. var. ***flavida*** (M. Hotta) Hakkinen & Meekiong, *Acta Phytotaxonomica et Geobotanica* 56(3):218 (2005).
The variety was changed it status from a species to variety of *Musa borneensis* due to similarity of morphological and anatomical.

Musa borneensis Becc. var. ***lutea*** Hakkinen & Meekiong, *Acta Phytotaxonomica et Geobotanica* 56 (3):222 (2005).
The specimen of this variety was collected from Crocker Range, Sabah. This variety also encountered in Lawas, Sarawak.

Musa borneensis Becc. var. ***phoenicea*** Hakkinen & Meekiong, *Acta Phytotaxonomica et Geobotanica* 56 (3):223 (2005).
The specimen of this variety was collected from Serian. This variety can be distinguished from other varieties by having watery red-purple sap, rounded male bud and pink-purple bract of male bud.

Musa borneensis Becc. var. ***sarawakensis*** Hakkinen & Meekiong, *Acta Phytotaxonomica et Geobotanica* 56(3):224 (2005).
This variety is the most common variety, can be found throughout Sarawak with wide range of habitat and soil types.

Musa juwiniana Meekiong, Ipor & Tawan, *Folia Malaysiana* 9(2): 110 (2008).
The species is an allies to *Musa campestris* and *Musa voonii* but differ by having biserrate fruits and also biserrate male flower. This species is common by the roadside on the northern east of Sarawak, and the type specimen was collected from Lapok, just outside boundary of Loagan Bunut National Park.

Musa sakaiana Meekiong, Ipor & Tawan, *Folia Malaysiana* 6(3&4): 132 (2005).
Another new species discovered during the Scientific Expedition to Gunung Murud. This epithet name of this wild banana is given after YB Dr Judson Sakai Tagal, who tragically died in helicopter crash near the Gunung Murud. This species is unique among the Bornean species with having pendulous fruit bunch and parallel hands.

Musa bauensis

Plagiostachys altistachya Meekiong & C.K. Lim, *Heart of Borneo Series: Lanjak Entimau Wildlife Sanctuary – Sarawak Hidden Jewel* (2010).
This unusual *Plagiostachys* easily recognized by having inflorescence near to terminal leafy shoot. The flowers are small, with parallel reddish stripes on the labellum. This species was collected from Nanga Joh, Lanjak Entimau Wildlife Sanctuary.

Scaphochlamys iporii Meekiong, *Heart of Borneo Series: Lanjak Entimau Wildlife Sanctuary – Sarawak Hidden Jewel* (2010).
This dwarf ginger species is named after Isa Ipor, who first discovered the plant during the Reece for Scientific Expedition to Lanjak Entimau Wildlife Sanctuary in 2008. This one-leaf species can be recognized by having white lilac flower and hairy corolla lobe.

Scaphochlamys iporii

Scaphochlamys salahuddiniana Meekiong, *Heart of Borneo Series: Lanjak Entimau Wildlife Sanctuary – Sarawak Hidden Jewel* (2010).
This species was collected from Gunung Sepali, Lanjak Entimau Wildlife Sanctuary, lithophytes on alluvial soils. This one-leaf species easily recognize by having heart-shaped leaf and deeply bilobed labellum.

Scaphochlamys salahuddiniana

Plagiostachys altistachya

Surveys of bird diversity around Padawan limestone areas and Bengoh Range

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Background Information

Padawan limestone area in Kuching Division is a typical karst landscape dotted with numerous limestone outcrops. The limestone forests on these outcrops are generally poor in commercial timber species and fortunately for this are left untouched. The more fertile mineral soils in the lowland surrounding the base of these outcrops have been cleared and converted into farmlands or orchards except for few less densely populated or inaccessible remote corners. However, in view of the rapid growth and ever expanding township and development, nothing much is known about its biodiversity or how the fauna is adapting to these changes, and hence the focus of these surveys. The objective is to document the species richness and explore the impact of forest fragmentation on the avian fauna.

In 2008, the Department of Zoology conducted a week-long field work at Gunung Sewa, Kampung Giam. This followed by a short survey to the nearby Bengoh Range in November 2008. In 2009, similar survey was carried out at Gunung Regu at Kampung Temurang. The sampling site is located within the Beraang area comprising Gunung Regu and Gunung Sebakam, both of which are limestone outcrops surrounded by granite formation in the north and sandstone-shale in the south.

The banana orchard inside the foline formation at Gunung Regu (above); Bengoh Range (below)

Survey methodologies

Three surveys were conducted between 2008 and 2009; Gunung Sewa at Giam (16 to 23 August 2008), Bengoh Range (27 November to 3 December 2009) and at Gunung Regu, Temurang (15 to 20 August 2009). The primary sampling methods used is observation using Nikon *Sporter I* (8 x 36) binocular. Songs and birds' calls were also used for identification, especially skulking species. Whenever weather permits, observations were carried out from 0600 – 1130 hours, and from 1400 – 1730 hours. This is complimented by 20 mist-nets that were opened from 0600 – 1800 hours for a total of 20 days.

Results

Altogether, 151 species of birds from 39 families were recorded from the Padawan limestone areas and Bengoh Range (Table 1).

Table 1: The number of bird species recorded from three sam-

Gunung Sewa, Giam	Bengoh Range	Gunung Regu, Temurang
74 (27 families)	**93** (30 families)	**115** (31 families)

The results showed that certain bird groups adapted well to the altered and fragmented habitat, while some larger species are distinctively missing. Many species actually thrived on the abundance food source provided by this mosaic habitat types. Large birds such as hornbills and raptors are clearly under represented. Throughout the survey period, only the Bushy-crested Hornbill (*Anorrhinus galeritus*) was recorded at Gunung Regu. This is a hardy species and it seems to be adapting well to the fragmented forests. The only raptor recorded is the Crested Serpent Eagle (*Spilornis cheela*) from two sites (i.e. Regu and Bengoh); both areas with relatively large intake forests.

Some common species that were recorded from these areas include the cuckoos (some migratory), kingfisher, barbet, woodpeckers, broadbills, leafbirds, babblers, flycatchers, flowerpeckers, sunbirds and spiderhunters. In addition, pigeon and dove are also relatively common especially at Gunung Regu where there are few fig trees (*Ficus* spp.) in fruiting season.

The bulbuls (family Pycnonotidae) are well represented especially at Regu and Bengoh with 13 species recorded. One interesting observation is that Red-eyed Bulbul (*Pycnonotus brunneus*) was seen feeding on small orchid buds (*Dendrobium* sp.). Regu and Bengoh showed a higher number of species of Babbler (Family Timaliidae) as compared to Giam. Altogether, 20 species of babblers were recorded. Most species found at Giam are hardy species that adapt well in secondary forests or disturbed habitat. A few examples are the Striped Tit Babbler (*Macronous gularis*), Black-throated Babbler (*Stachyris nigricollis*) and Chestnut-winged Babbler (*S. erythroptera*).

Three species of cave dwellers that roost and nest in caves were recorded, namely the Black-nest Swiftlets (*Aerodramus maximus*), the Mossy-nest Swiftlets (*A. salanganus*) and the Glossy Swiftlets (*Collocalia esculenta*). They are all insectivorous birds that feed on their wings catching airborne insects or small invertebrates that were swept skyward by the wing. Although there is no cave at Bengoh Range, swiftlets have been seen foraging above the canopy of the mixed dipterocarp forests along the mountain slope.

Robins and forktails are mainly forest birds that love to frequent forest streams. Nevertheless, at Kampung Giam a White-rumped Shama (*Copsychus malabaricus*) never fail to visit the rubbish bins placed beside the popular picnic spot. May be it is foraging for left-over food or the maggots from the garbage. In any case, this is rather unusual because this niche is normally occupied by Magpie Robin (*C. saularis*) in town areas.

Malaysian Blue Flycatcher (*Cyornis turcosus*) (above); Rufous-winged Philentoma (*Philentoma pyrhopterum*)

Scalet-rumped Trogon (*Harpactes duvaucelii*) (above) & Fairy Pitta (*Pitta nympha*) (below)

Gould Frogmouth (*Batrachostomus stellatus*) (left); Green Broadbill (*Calyptomena viridis*) (right)

Throughout these surveys, bird species that are of special interest are those associated with pristine habitat or indicators of good forests. These include the Spotted Fantail (*Rhipidura perlata*) that was recorded at Regu and Bengoh; both from relatively intake forests. Others are the Scaly-breasted Bulbul (*Pycnonotus squamatus*) and Yellow-bellied Bulbul (*Alophoixus phaeocephalus*) that were recorded at Regu. Similarly, the blue flycatcher (*Cyornis spp*) and *Philentoma spp.* were only recorded in good forests at Regu, and the later species only at Bengoh.

The family Trogonidae is also a good indicator of undisturbed habitat. Two species of trogons, namely Red-naped Trogon (*Harpectes kasumba*) and Scarlet-rumped Trogon (*H. duvaucelii*) were recorded at Regu and Giam. Only two species of pitta, i.e. Blue-winged Pitta (*Pitta moluccensis*) and Fairy Pitta (*P. nympha*) were recorded, and both records were from Bengoh. On the other hand, Green Broadbill (*Calyptomena viridis*) was recorded in all three sites, but at Giam this species is confined to the south-western part of Gunung Sewa where the forest is undisturbed.

Two unique observations were noted at Bengoh Range. The first is the captured of a Gould's Frogmouth (*Batrachostomus stellatus*) from the family Batrachostomidae. This is a true forest birds that is rarely seen or difficult to observe because of its superb camouflage. The second is the presence of a flock of Pin-tailed Parrotfinch (*Erythrura prasina*) at the paddy field at the foothill of Bengoh Range. This reinforced the notion that Bengoh Range should be protected for its unique and high biodiversity values.

Flowerpeckers (8 species) and sunbirds (6 species) exhibit different adaptation in terms of feeding behavior. At Giam where there are smaller patches of intake forest, they depend on the orchards for food, mainly mistletoes growing on old durians trees. They also picked up small insects such as ants for food. At Regu and Bengoh, these two groups were mostly seen high up in the forest canopy foraging for food; less so in the orchards area. In all three sites, they also feast on the fruits of the *Melastoma* spp. shrubs.

Conclusions

Borneo has roughly 664 species of birds, and hence the 151 species recorded from Padawan and Bengoh ange represents 23% of the total bird fauna of Borneo. Certain bird groups can adapt well to the altered and fragmented habitat, but larger species that require larger home range are distinctively under represented. On the contrary, many smaller species actually thrived on the abundant food source, especially the fruit orchards. In places where the forests are severely fragmented, the small refuge provided by the limestone forests is very important.

Acknowledgements

These surveys would not have materialized if not for the financial and logistic support from the Faculty of Resource Science and Technology, UNIMAS. The demanding field survey is made possible with the assistance from the staff, laboratory assistants and students of the Department of Zoology. Special thank to Sarawak Forest Department and Sarawak Forestry Corporation for the research permits (NPW.907.4.2 (III)-97; NPW.907.4.(IV)-131 and NCCD.907.4.2(IV)-16), and the local villagers from Kampung Giam, Denu and Temurang.

References

Mackinnon, J. and Phillipps, K. (1995). *A Field Guide to the Birds of Borneo, Sumatra, Java and Bali.* Oxford University Press, Oxford.

Myers, S. (2009). *A Field Guide to the Birds of Borneo.* Talisman Publishing Pte. Ltd.

Phillipps, Q. and Phillipps, K. (2009). *Phillipps' Field Guide to the Birds of Borneo.* John Beaufoy Publishing Ltd.

Smythies, B. E. (1999). *The Birds of Borneo.* (4th Ed. Revised by G. W. H. Davison). Natural History Publications, Kota Kinabalu.

Bioassay studies of organotin(IV) complexes with vitamin K_3 derivative

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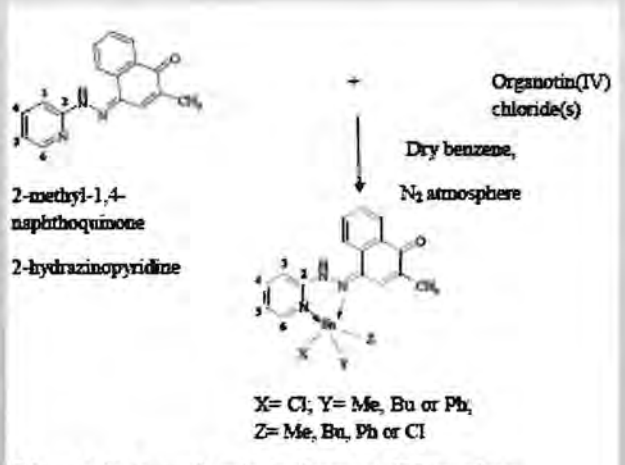
Vitamin K_3 is a chemical compound which also known as menadione or 2-methyl-1,4-naphthoquinone. Its water soluble derivative, menadione sodium bisulfite has shown significant antitumor activity *in vitro* (Casas, 2006). In recent years, Grgurić-Šipka *et al.* (2008) have conducted a research to study the cytotoxic activity of new organoruthenium(II) complexes; one of the ligand used, namely vitamin K_3-thiosemicarbazone. The organoruthenium(II) complexes showed toxic effect and might have the capability to suppress autoimmune disease.

Based on the literature review, report on organotin(IV) complexes containing Vitamin K_3 derivatives are not available. Therefore, the authors are interested to study the bioassays of organotin(IV) complexes of Vitamin K_3 derivatives.The organotin(IV) complexes were prepared with Vitamin K_3- derivative as shown in Scheme 1.



Scheme 1: The general synthesis of organotin(IV) complexes.

Toxicity test against *Artemia salina*

The toxicity of ligand (**1**) and its organotin(IV) complexes are shown in Table 1. Results showed that compound [$MeSnCl_2$(VHzP)] (**2**) gave the highest LC_{50}. Among all the compounds, complex [Ph_2SnCl(VHzP)] (**7**) showed the highest toxicity towards *Artemia salina* with LC_{50} of 66.07 µg/mL (Fig. 1).

The result showed that the toxicity depend on the R group (alkyl or phenyl group) present in the organotin (IV) complexes. Compounds with the bulky R group showed higher toxicity against *Artemia salina* compared to the smaller R group. This might be due to the ability of the bulky group to dissociate to form ionic compound, thus increasing the permeability of the compounds into cells (Affan *et al.*, 2009).

Table 1: The LC_{50} of ligand (1) and its complexes (2-7)

Complexes		LC_{50} (µg/ml)
VHzP	(1)	107.15
[$MeSnCl_2$(VHzP)]	(2)	331.13
[$BuSnCl_2$(VHzP)]	(3)	302.00
[$PhSnCl_2$(VHzP)]	(4)	109.65
[Me_2SnCl(VHzP)]	(5)	251.19
[Bu_2SnCl(VHzP)]	(6)	89.13
[Ph_2SnCl(VHzP)]	(7)	66.07

Termiticidal activity of ligand (1) and its organotin(IV) complexes (2-7)

Termiticidal activity was done by using *Captotermes* sp. Among all the compounds, [Ph_2SnCl(VHzP)] (**7**) has good termiticidal effect, because within 5-7 days, it can kill all the termites population (Fig. 2). This results might also due to the effect of R group attached to the organotin(IV) complexes. Complexes with larger R group attached to the tin(IV) atom showed good activity compared to the smaller size R group (Bergamashi *et al.*, 1997).

Bu_2SnCl(VHzP)] (**2**) has antimicrobial effect against *S. aureus* at all the concentrations tested. The relative zones of inhibition, which were 8 .7 mm and 8.6 mm

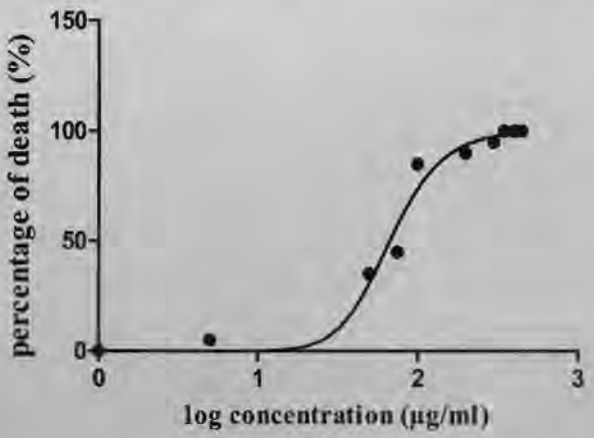


Fig. 1: Toxicity test of [Ph_2SnCl(VHzP)] (7)

were generated when the bacterium culture was treated with [Bu_2SnCl(VHzP)] (**2**) at the concentration of 100 µg/mL and 25 µg/mL .

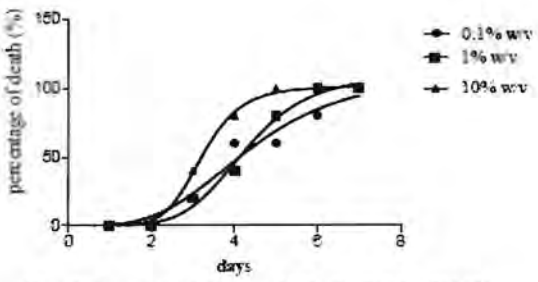


Fig. 2: Termiticidal test of [$Ph_2SnCl(VHzP)$] (7)

The MIC value for *S. aureus* was 50 µg/mL, which created 6.7 mm as its relative inhibition zone around the disc. Data revealed that [$MeSnCl_2(VHzP)$] (2) is not a dose dependent drug, because at different concentrations, it able to generate zones of inhibition with different sizes.

[$Ph_2SnCl(VHzP)$] (7) also exhibit moderate inhibition towards *S. aureus*. Growth of the bacterium was inhibited at the concentration from 200 µg/mL to 12.5 µg/mL. Concentration of the compound at 200 µg/mL and 100 µg/mL showed greatest inhibition by generating relative inhibition zones 8.6 mm and 8.2 mm around the discs. While, the MIC value of [$Ph_2SnCl(VHzP)$] (7) against *S.aureus* was 12.5 µg/mL with relative inhibition zone, 7.2 mm around the disc. Generally, all the organotin(IV) complexes showed higher antibacterial activities towards *S. aureus* compared to the free ligand (1). Factors such as solubility and conductivity by the presence of metal ions might be the possible reasons for the increasing of biological activity of the complexes compared to the free ligand (Abou-Melha and Faruk, 2007).

Acknowledgements

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References

Abou-Melha, K. S. and Faruk, H. (2007). *J. Iran Chem. Soc.* 5(1): 122-134.

Affan, M. A., Fasihuddin, B. A., Liew, Y.Z., Foo, S. W and Ismail, J. (2009) *J. Sci. Res.* 1(2): 306-316.

Bergamaschi, G., Bonardi, A., Leporati, E., Mazza, P., Pelagatti, P., Pelizzi, C., Pelizzi, G., Rodríguez-Argüelles, M.C. and Zani, F. (1997). *J. Inorg Biochem* 68: 295-305.

Casas, J. S., Castellano, E. E., Couce, M. D., Ellena, J., Sánchez, A., Sordo, J. and Taboada, C. (2006). *J. Inorg. Biochem.* 100: 1858-1860.

Grgurić-Šipka, S., Alshtewi, M. A. M., Jeremić, D., Kaluderovic, G. N., Gómez Ruiz, S., Žižak, Ž., Juranić, Z and Sabo, T. J. (2008). *J. Serb. Chem. Soc.* 73 (6): 619-630.

Ancient lineages of Bornean frogs support the hypothetical Lupar gap barrier

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The Lupar gap was supposedly formed by the Lupar River 10-15 mya (Hutchinson, 1996). This might have been due to the tectonic evolution of Borneo that created the Lupar line problem (Fig. 1) which divided Sarawak into 2 geologically distinct areas and thus limited the dispersal and restricted gene flow among frog populations. The Lupar gap barrier to the COI mtDNA gene has been observed in species that revealed highly distinct of mtDNA and long evolutionary isolation (ancient haplotypes) as seen in two species of the fanged frogs, *Limnonectes kuhli* (Ramlah, 1998) and *Limnonectes leporinus* (Ramlah, 2003; Elvy, 2010) and recently in the green paddy frog *Hylarana erythraea* (Ramlah, 2010).

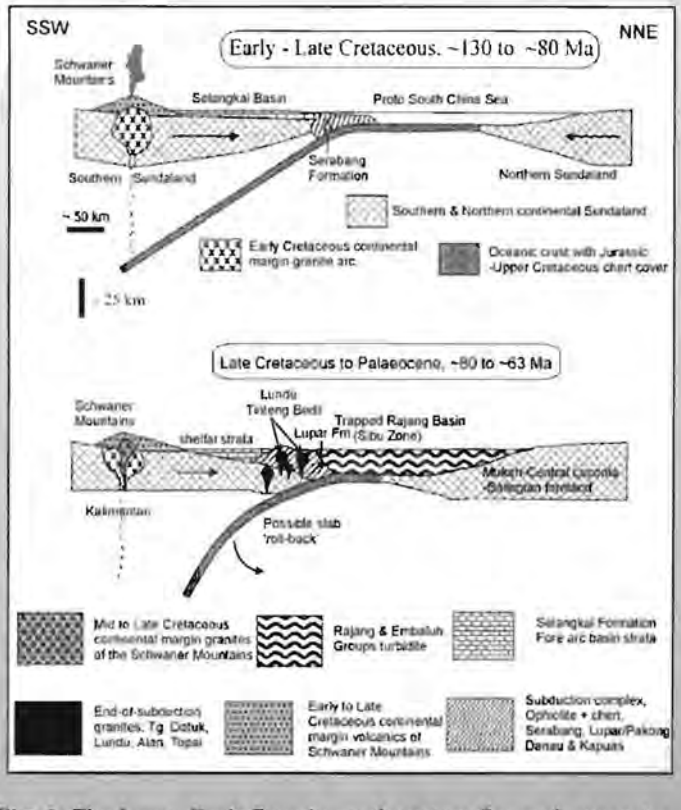

Fig. 1: The Lupar Fault Zone in southwestern Sarawak separates the Silantek Formation to the south from the Rajang Group to the north (adapted from Hutchinson, 1996)

Why COI gene? Cytochrome c oxidase (COX) is the component of the respiratory chain that catalyzes the reduction of oxygen to water. The COI subunit is one of three mitochondrial subunits of the enzyme complex. It is thus a functionally critical enzyme in oxidative phosphorylation and selective pressure is usually reflected by the conservative nature of amino acid sequence. High amino acid variability of the gene in the three species reflects the polymorphism of their ancient lineages.

The Lupar Valley (gap) consists of a large river (Batang Lupar) and extensive swamp forests surrounding the area. This creates a great barrier for dispersal of frogs that are intolerant of acidic environments and those which are stream or pond dwellers. Since *H. erythraea* is a pond dweller and never found in swampy areas except when turned into plantations, the Lupar Valley may have served as a barrier to its dispersal (Fig. 2). For the endemic Bornean riparian frogs, *L. leporinus*, the species is completely riparian (stream dwelling species) and live along streams with moderate to steep gradients (Inger and Stuebing, 1997). Such streams do not occur in the Lupar Valley separating the Matang-Gading-Padawan areas from Batang Ai. No extensive lowland gap separates Batang Ai from Bario, Mulu, Brunei and Danum, Sabah. These factors may explain the sharp West-East break in the species (Fig. 3) caused by the hypothetical Lupar gap.

Fig. 2: The minimum-spanning network (MSN) generated by Network 4.5.0.2 illustrating the relationship of the green paddy frog Hylarana erythraea in Pahang and Sarawak, incorporated into Sarawak geological map showing the Lupar line and water depths of Sarawak coast.

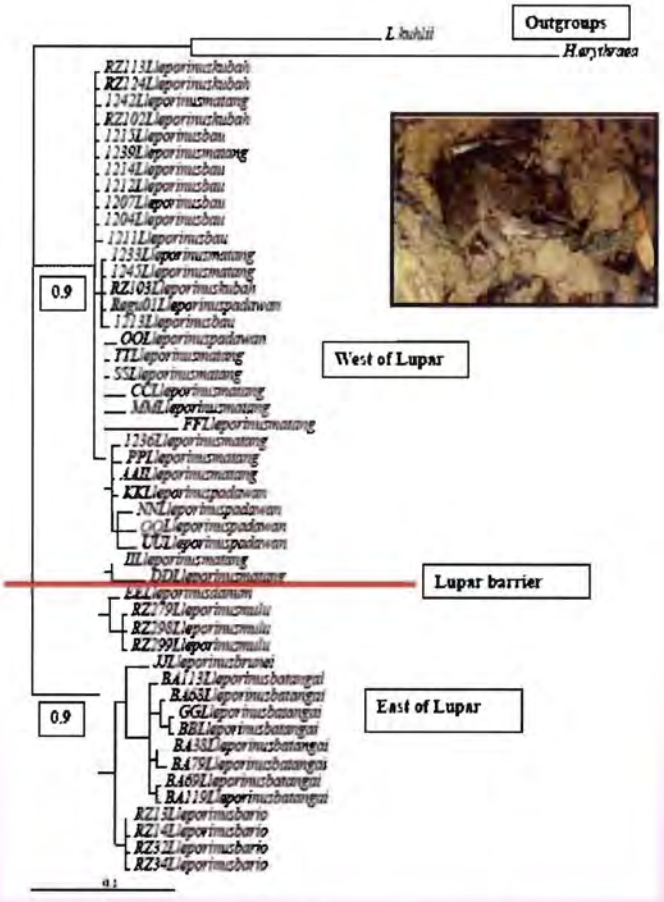

Fig. 3: Bayesian inference of the 50% majority rule consensus tree of cytochrome oxidase subunit 1 (CO1) mtDNA of *Limnonectes leporinus*. Bayesian posterior probabilities (BPPs) are accordingly indicated below the branch nodes (source from Elvy 2010).

References

Hutchinson, C.S. (1996). *Tectonics Evolution of Southeast Asia.* Geological Society of London, Special Publication No. 106, pp. 247-261.

Elvy, Q.D.K. (2010). Unpublished Thesis. BSc.

Ramlah, Z. (1998). MSc Thesis, University of Illinois at Chicago, USA.

Ramlah, Z. (2003). Herpetology and The Future. *Proceedings of the International Conference on Bornean Herpetology*, pp. 64-71.

Ramlah, Z., Shukor, M.N., Norhayati, A., Badrul Munir, M.Z. and Mustafa, A.R. 2010. *Zoological Studies* 49 (5): 688 - 702.

Numerical taxonomy of Bornean hornbills (Family: Bucerotidae), using morphometric parameters

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Hornbills (Family Bucerotidae) are distinguished omnivorous creatures, found in Asia and Africa and recognized for their large size and similarly large bill. In this study, only five out of eight species of Bornean hornbills were available, namely, white crested (white crowned) hornbill (*Berenicornis comatus*), bushy crested hornbill (*Anorrhinus galeritus*), wreathed

Illustration of 3 of the 5 Hornbill Species available in the Sarawak Museum specimen

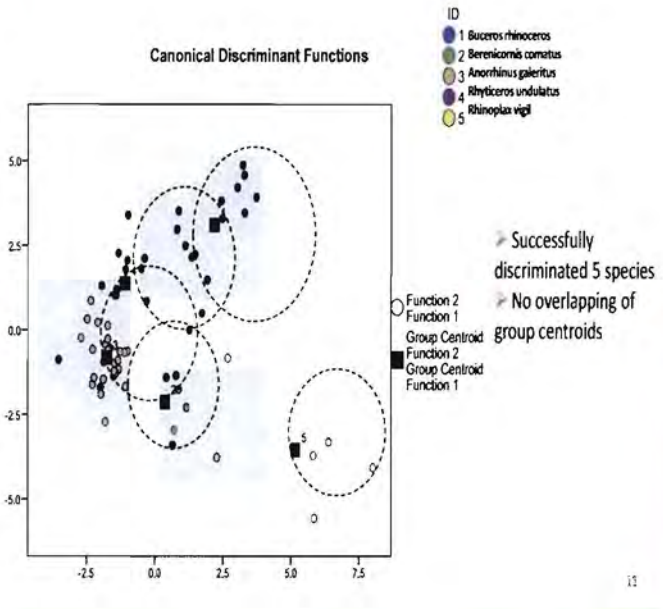
hornbill (*Rhyticeros undulatus*), rhinoceros hornbill (*Buceros rhinoceros*) and helmeted hornbill (*Rhinoplax vigil*) .Nine morphological features (Tarsus, Bill Length, Bill Depth, Bill Width, Head Bill, Wing Length, Wing Span, Tail Length, Total Length) were measured from 83 specimens of 5 hornbill species of Borneo available in the Sarawak Museum collection

The specimens were analyzed using morphometric cluster analysis and they were successfully clustered into 5 species. Specimens of the Bushy-Crested hornbills and Wreathed hornbills were analysed in the same method and the results showed that there are variations between specimens of the same species from different localities.

Logistic regression analysis was done for the Bushy Crested hornbills and it showed that the diagnostic character for gender differentiation in this species is the total length. The linear logistic regression equation for the prediction is:

$$Y = -45.3460 + 0.0637089\ (TL)$$

Overall the percentage of correct prediction is 84.2% (16 of 19 specimens correctly predicted).



In conclusion, the five species of hornbills were successfully discriminated in the canonical discriminant analysis Distinctive variations were found between the individuals of the same species from a different region or locality. Male bushy-crested hornbills (*Anorrhinus galeritus)* tend to be larger than the females and therefore showing sexual dimorphism in hornbills.

Morinda citrifolia

Morinda citrifolia or well known as 'mengkudu' is easily available and widely used by local community as a traditional medicine to treat hypertension, asthma, wounds, diabetes, cough, lumbago, rheumatism and many more.

The first UNIMAS-LSU-KU expedition to Mount Pueh

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Universiti Malaysia Sarawak (UNIMAS), Louisiana State University (LSU), and the University of Kansas (KU) signed a Memorandum of Understanding (MoU) in April 2007. Among the general areas of cooperation outlined in the MoU were: (1) joint research, (2) staff exchange, (3) joint meetings, and (4) joint fund applications.

The general areas of cooperation item no. 4, i.e., application for joint fund, has been achieved through a successful grant application awarded for the project entitled "Biogeography of birds in the lowlands and mountains of Borneo" by the National Geographic Society to Prof Dr Frederick H. Sheldon (LSU), Prof Dr Mustafa Abdul Rahman (UNIMAS) and Dr Robert G. Moyle (KU) (Reference: 8753-10 - National Geographic Society). The grant was approved for 2 years with a total amount of RM 78,000.00. The expedition to Mt Pueh was the first initiative to fulfill the general areas of cooperation item no. 1, i.e., joint research.

The expedition to Mt Pueh was carried out from 9 January to 3 February 2010. The purpose of the expedition was to collect bird skins and tissues for the study of the Bornean biogeography. The Mt. Pueh area is important for such work because its avifauna exemplifies westernmost Borneo and is essential for comparative studies of geographic variation on the island as a whole. The mountain has a variety of endemic subspecies whose biogeographic history is a mystery.

The participants of this field work included Prof Dr. Mustafa Abdul Rahman (Lecturer), Mr Isa Sait (Laboratory Assistant), Miss Rahah Mohd. Yakup (Laboratory Assistant), Miss Nurul Ashikeen (Postgraduate Student), Miss Zahirunisa Abd Rahim (Postgraduate Student) from UNIMAS; Prof Dr. Frederick H. Sheldon (Lecturer), Mr John Mittermeier (Postgraduate Student), and Mr Timothy Paine (Postgraduate Student) from LSU and Dr. Robert G. Moyle (Lecturer) from KU; and local helpers included Mr Buie anak Belayong and Mr Dwen. Also visiting the first camp were a number of Faculty of Resource Science and Technology students and staff interested in mammals.

The original plan for this field work was to spend two weeks collecting at a low elevation and about two weeks on the mountain top. However, heavy rain precluded work at high elevation. Thus, we concentrated on obtaining a thorough collection at the mountain's base. In doing so, we worked from two different camps:

Camp 1: 11-18 January 2010. This camp was located about 1 km beyond the silkworm farm at the base of Mt. Pueh, N 1° 48' 04" E 109° 42' 44", elevation 150 m. The forest in this area was selectively logged perhaps 40 years earlier. It sloped steeply into a river valley. In general, the forest was much like primary forest, although in some areas near the silkworm plantation where we set nets the habitat was scrubbier.

Camp 2: 22 January – 2 February 2010. This camp was located just above the Digi Telephone Towers behind Kg Pueh and Kg Siru on the lowest slopes of Mt. Pueh: N 1° 49' 07" E 109° 42' 23", elevation 60 m (in nearby Kg Pueh and Kg Siru the elevation was essentially sea level). The habitat immediately adjacent to the camp was "kebun forest," consisting of secondary forest in various stages of recovery from shifting cultivation. Much of our collecting was done in forest dominated by 15-20 year old rubber and fruit trees that were planted as part of the regeneration process. We also netted in village scrub in Kg Pueh and Kg Siru.

We set up 25 mist-nets at each camp site to catch birds and the results are as follows. A list of specimens is presented in the table.

Camp 1:
At the first camp, netting was difficult because of a lack of good ridge sites and an excessive amount of rain. Still, we managed to collect 86 individuals of 39 species, including some notable old forest species, such as Chestnut-naped Forktail, Brown Fulvetta, White-necked Babbler, and Scaly-crowned Babbler.

Camp 2:
At camp two we netted in a variety of secondary and scrub habitats and collected 139 individuals of 50 species. These included some relatively unexpected birds. In secondary forest adjacent to the kampungs we caught Hooded Pitta, Black Magpie, and Crested Jay, and in the "Kebun Forest" we caught Rufous-collared Kingfisher, White-bellied Woodpecker, Yellow-bellied Bulbul and Grey-cheeked Bulbul. The migratory Siberian Blue Robin was also in the scrubby forest.

Harmful algal blooms in Malaysia

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[2]*Institue of Biodiversity and Environmental Conservation*

Harmful algal blooms events have been increasingly reported in the country, not only the frequency and severity of the events, but also involved more species that previously not known. Toxic dinoflagellate *Pyrodinium bahamense* var. *compressum* (Fig. 1a) that responsible for paralytic shellfish poisoning (PSP) events on the west coast of Sabah remains the most important causative organism. Blooms of other PSP toxin producing dinofagellates, *Alexandrium minutum* (Fig. 1b), *Alexandrium tamiyavanichii* (Fig. 1c), and several other species in both west and east coast of Peninsula Malaysia warrant the need of more precautious measures by the relevant authority to prevent any future human intoxication.

Sebatu, a small fishing village located in the southern part of the Straits of Malacca and Sg. Geting Lagoon, Tumpat at the northeastern coast are the two locations with confirmed PSP incidences in Peninsula Malaysia.

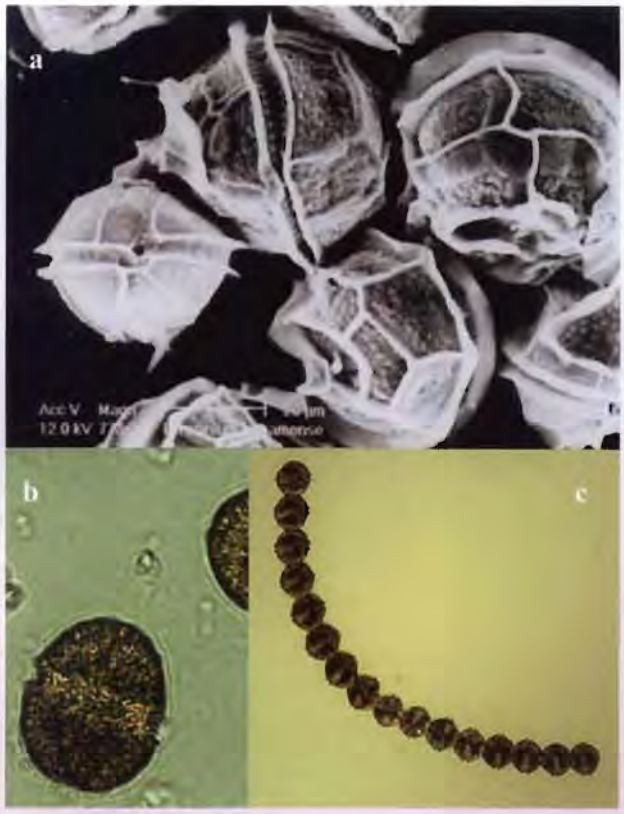

Fig. 1: Light micrograph of *Pyrodinium bahamense* var. *compressum* (a), *Alexandrium minutum* (b) and chain-forming *Alexandrium tamiyavanichii* (c).

Blooms of several non phycotoxins producing dinoflagellates, *Cochlodinium polykrikoides*, *Noctiluca scintillans*, *Ceratium furca*, *Prorocentrum minumum*, and raphidophyte, *Chatonella ovata* were also reported in Malaysian waters. Blooms of these species have caused severe damages to the finfishes maricultures industries.

With the rapid development of maricultures industries to meet the increasing demand of seafood product for local and export market, more proactive measures should be taken, not only by the relevant government agencies but also aquaculture operators, in management and mitigation of HABs events.

Selections of areas for aquacultures site should be based on the analyses of phytoplankton assemblages and hydrological conditions (e.g. water mixing and current), before the implementation of mariculture projects. Best management practices (BMP) and other mitigation efforts such as moving pens and clay spraying should be adopted by the operators in effort to minimize the impact of these natural events to the industries.

A new tribe, novel and resurrected genera, and new species in Araceae

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A new tribe, 4 new genera, two resurrected genera and 19 novel species were described between 2008 – 2010 based on a combination of vegetative and reproductive morphology and molecular analyses.

Philonotieae - a new tribe

A new Neotropical tribe of Araceae: Aroideae, Philonotieae S.Y.Wong & P.C.Boyce, was published. Philonotieae is sister to Crytocoryneae + Palaeotropical Schismatoglottideae, with these three tribes comprising the Schismatoglottid Alliance. *Philonotion* Schott is resurrected, based on the type *P. spruceanum*, and two additional species of Neotropical *Schismatoglottis* were transferred to *Philonotion*. The genus *Philonotion* is currently considered to be the only genus of Philonotieae, with the tribe basal to the rest of the alliance.

New and resurrected genera

Hestia S.Y.Wong & P.C.Boyce was described as a new genus from Sarawak, typified by *Hestia longifolia* (Ridl.) S.Y.Wong & P.C.Boyce (≡ *Schismatoglottis longifolia* Ridl.). In addition, based on combined molecular and morphological analyses the genus *Apoballis* Schott was resurrected. *Pichinia* S.Y.Wong & P.C.Boyce was described as a new genus from Sarawak, with one species, *Pichinia disticha* S.Y.Wong & P.C.Boyce. This genus is, so far, known only from the type locality on limestone close to the Kalimantan border.

Schottarum P.C.Boyce & S.Y.Wong and *Bakoa* P.C.Boyce & S.Y.Wong were described as new genera from Sarawak, each with one species: *Schottarum sarikeense* (Bogner & M.Hotta) P.C.Boyce & S.Y.Wong based upon *Schismatoglottis sarikeensis* (Bogner & M.Hotta) Bogner & A.Hay and *Bakoa lucens* (Bogner) P.C.Boyce & S.Y.Wong based upon *Piptospatha lucens* (Bogner) Bogner & A.Hay. *Bakoa* is endemic to Bako N.P.

New species *Schismatoglottis clausula* S.Y.Wong, *S. dulosa* S.Y.Wong, and *S. jitinae* S.Y.Wong, are new taxa belonging to the Borneo-endmeic Multiflora Group *sensu* Hay and Yuzammi.

In a revision of the *Schismatoglottis nervosa* Ridl. species complex, seven taxa novel and mostly locally endemic taxa are described (*Schismatoglottis adoceta* S.Y.Wong, *S. linae* S.Y.Wong, *S. matangensis* S.Y.Wong, *S. simonii* S.Y.Wong, *S. tessellata* S.Y.Wong, *S. turbata* S.Y.Wong, and *S. ulusarikeiensis* S.Y.Wong.)

Hestia longifolia (Ridl.) S.Y.Wong & P.C.Boyce. A. Plant in habitat on podsol. B. The diagnostic nodding inflorescences, the inflorescence to the left at female anthesis.

Fieldwork targeting indigenous *Homalomena* at Nanga Sumpa, part of the Batang Ai drainage system (Sri Aman Divison, Sarawak) has to date revealed in excess of 20 species, of which six novelties are so far described:

Homalomena atrox P.C.Boyce, S.Y.Wong & Fasihuddin B. Ahmad, *H. clandestina* P.C.Boyce, S.Y.Wong & Fasihuddin B. Ahmad, *H. hanneae* P.C.Boyce, S.Y.Wong & Fasihuddin B. Ahmad, *H. sengkenyang* P.C.Boyce, S.Y.Wong & Fasihuddin B. Ahmad, *H. symplocarpiifolia* P.C.Boyce, S.Y.Wong & Fasihuddin B. Ahmad, and *H. vivens* P.C.Boyce, S.Y.Wong & Fasihuddin B. Ahmad.

A-B. *Bakoa lucens* (Bogner) S.Y.Wong & P.C.Boyce. Note the spathe barely opens. **C-D.** *Pichinia disticha* S.Y.Wong & P.C.Boyce, type locality on liemstone. **E-F.** *Schottarum sarikeense* (Bogner) S.Y.Wong & P.C.Boyce, inflorescence at male anthesis, with the thecae horns extended.

In the review of *Piptospatha elongata* (Engl.) N.E. Br. in Sarawak, it was shown that the species comprises three morphologically and ecologically distinct taxa, two of which are new to science and have described as *Piptospatha impolita* S.Y.Wong, P.C.Boyce & Bogner and *P. viridistigma* S.Y.Wong, P.C.Boyce & Bogner. The latter is a limestone obligate.

Schismatoglottis confinis S.Y.Wong & P.C.Boyce was described and illustrated as a new species closely related to *Schismatoglottis bauensis* A.Hay & C.Lee.

References

Wong S.Y., Boyce, P.C., Ahmad Sofiman, O. and Leaw, C.P. (2010). *Taxon* 59(1): 117 – 124.

Wong, S.Y. and Boyce, P.C. (2010). *Botanical Studies*. 51: 249 – 255.

Wong, S.Y. and Boyce, P.C. (2010). *Gardens' Bull. Sing.* 61(2): 297-304.

Wong, S.Y. (2010) *Gardens' Bull. Sing.* 61(2): 285-296.

Wong, S.Y. (2010) *Gardens' Bull. Sing.* 62(1):185 - 217.

Boyce, P.C., Wong, S.Y. and Fasihuddin, B.A. (2010) *Gardens' Bull. Sing.* 61(2): 29-78.

Wong, S.Y., Boyce, P.C. and Bogner, J. (2009) *Gardens' Bull. Sing.* 61 (1): 221 – 238.

Boyce, P.C. and Wong, S.Y. (2008) *Botanical Studies* 49: 393 – 404.

Wong, S.Y. and Boyce, P.C. (2008) *Gardens' Bull. Sing.* 60(1): 155 – 163.

FRST's Recent Publications

Adeni, D.S.A., Abd-Aziz, S., Bujang, K.B. and Hassan, M.A. 2010. Bioconversion of Sago Residue into Value Added Products. *African J. of Biotechnol.* 9(14): 2016-2021.

Boyce, P.C., Wong, S.Y. and Fasihuddin B. A. 2010. Studies on Homalomeneae (Araceae) of Borneo II: The *Homalomena* of Nanga Sumpa (Batang Ai) – Novel & pre–existing taxa, and notes on Iban Usages. *Gardens' Bull. Sing.* 61(2): 29 – 78.

Boyce, P.C., Wong, S.Y., Low, S.L., Ting, A.P.J., Low, S.E., Ooi, I.H. and Ng, K.K. 2010. Araceae of Borneo. Aroideana. *Aroideana.* 33: 3 – 74.

Bushra, A.M., Ibrahim, J., Fasihuddin, B.A. and Juriati J. 2010. Antiplatelet aggregation and platelet activating factor (PAF) receptor antagonistic activities of the essential oils of five *Goniothalamus* species. *Molecules* 15: 5124-5138.

Chin, S.F. and Pang, S.C. 2010. Tetrapropylammonium-Manganese oxide/Polypyrrole Hybrid Nanocomposite Thin Films as Novel Electrode Materials for Supercapacitors. *Materials Chemistry and Physics* 124: 29–32.

Fasihuddin, B.A., Bushra, M.A. and Ibrahim, J. A. 2010. A comparative study of the constituents of the essential oils of *Goniothalamus tapis* Miq and *G. tapisoides* Mat Salleh from Borneo. *J. Essent. Oil Res.* 22: 1 – 4.

Ipor, I.B., Tawan, C.S., Niels, J., Suwidji, W., Takashige, I., Nurul Hafizah M. A. and Hairul Azman, R. 2010. Genotyping natural hybrids of *Cryptocoryne purpurea* in Borneo and Peninsular Malaysia. *Journal of Tropical Biology and Conservation* 7: 81 – 86.

Ipor, I.B., Tawan, C.S., Othman, F. and Meekiong, K. 2010. Preponderance of Tapang trees, *Koompassia excelsa* (Becc.) Taubert and the distribution of its seedlings. *Malaysian Forester* 73(2): 191 – 203.

Lim, H.C, Rahman, M.A., Lim, S.L.H., Moyle, R.G. and Sheldon, F.H. 2010. Revisiting Wallace's haunt: Coalescent simulations and niche modeling reveal historical mechanisms that promote population divergence. *Evolution* 37: XX-XX.

Mustafa Abdul Rahman, Isa Sait and Besar Ketol. 2010. A Brief Study on Birds at Gunung Silam, Sabah, Malaysia. *Sarawak Museum Journal* LXVI(87): XX-XX.

Pang, S.C., Khoh, W.H. and Chin, S.F. 2010. Nanoparticulate Magnetite Thin Tilms as Electrode Materials for the Fabrication of Electrochemical Capacitors. *Journal of Materials Science* 45:5598–5604

Pang, S.C., Kiu, L.P. and Chin, S.F. 2010. Removal of Heavy Metals from Aqueous Solution by Agricultural Wastes. *World Applied Science Journal* 9(4): 412-426.

Rahman, M.A., Gawin, D.F.A. and Moritz, C. 2010. Patterns of genetic variation in the little spiderhunter (*Arachnothera longirostra*) in Southeast Asia. *Raffles Bulletin of Zoology* 58(2): 207-216.

Ramlah Zainudin, Shukor Mohd Nor, Norhayati Ahmad, Badrul Munir Md-Zain, and Mustafa Abdul Rahman. 2010. Genetic Structure of *Hylarana erythraea* (Amphibia: Anura: Ranidae) from Malaysia. *Zoological Studies* 49(5): 688-702.

Rashid, W.A., Musa, H., King, W.S. and Bujang, K.B. 2010. The Potential of Extended Aeration System for Sago Effluent Treatment. *American Journal of Applied Sciences* 7(5): 616-619.

Shabdin, M.L. and Ramli, R. 2010. *Kekunci Siput dan Kerang-kerangan di Perairan Pantai Malaysia Timur*, Universiti Malaysia Terengganu, Kuala Terengganu, 120 pp.

Shabdin, M.L. 2010. Macrofauna of Rajang River, Sarawak, Malaysia Borneo. *Journal of Tropical Biology and Conservation* 7: 11 - 30.

Songan, P., Tonga, G., Rahman, M.A., Hong, K.S. and Law, L. 2010. *Factor Influencing Students' Selection of Universiti Malaysia Sarawak*, Universiti Malaysia Sarawak, Kota Samarahan (ISBN 978-967-5527-05-0)

Tung, L.S., Wong, S.Y. and Boyce, P.C. 2010. Studies on Homalomeneae (Araceae) of Borneo VI: *Homalomena giamensis*, a new species from Sarawak, Malaysian Borneo, with notes on its pollination. *Aroideana* 33: 201 – 211.

Wong, S.Y. 2010. Studies on Schismatoglottideae (Araceae) of Borneo XIII: A revision of the *Schismatoglottis nervosa* complex. *Gardens' Bull. Sing.* 62(1):185 – 217.

Wong, S.Y. 2010. Studies on Schismatoglottideae (Araceae) of Borneo XII: Three new species of *Schismatoglottis* in the multiflora group. *Gardens' Bull. Sing.* 61(2): 285 – 296.

Wong, S.Y. and Boyce, P.C. 2010. Studies on Schismatoglottideae (Araceae) of Borneo IX: A new genus, *Hestia,* and resurrection of *Apoballis. Botanical Studies* 51: 249 – 255.

Zainudin, R., Rahman, M.A., Zain, B.M.M, Shukur, M.N., Inger, R.F. and Norhayati, A. 2010. Mating calls description of five species of frogs from the genus *Hylarana* Tschudi (1838) (Amphibia, Anura, Ranidae) from Sarawak, Malaysia. *Sains Malaysiana* 39(3): 363-369.

FRST's Upcoming Event

Taxonomist and Ecologist Conference 2010, 9-10th December 2010, CAIS Auditorium, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak

Seminar Universiti Malaysia Sarawak – Field Museum Natural History, Chicago, Illinois, USA, 18 December 2010, Four Point Hotel, Kuching, Sarawak

2nd International Symposium on Eco-Zoonoses and Emerging Infectious Diseases, 14-16 December 2011, CAIS Auditorium, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak

9th Malaysia Genetic Congress, 28-30th September 2011, Pullman Hotel, Kuching, Sarawak