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Malaysia

Asasi Biology Colloquium (ABC) 2018

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Message from the Chairman

Assalamualaikum w.b.t and Salam sejahtera,

First and foremost, I would like to say Alhamdulillah and to express my gratitude to everyone including students, staffs and invited panels and juries to participate in this edition of Asasi Biology Colloquium 2018 (ABC 2018).

Taking step into down memory lane, the event was started humbly on 6th April 2015 and known as 1st Asasi Mini Biology Colloquium. With the success of mini event, we decided to transform it into The Asasi Biology Colloquium beginning in 2016. Similar to the previous year's organisation, this year's event is also a continuation of students' educational trip to various prominent national parks nearby in Kuching, Sarawak such as Gunung Gading National Park, Kubah National Park, Santubong National Park and Bako National Park which was held throughout March 2018. The trip was conducted with each group is given a specific titles for them to work out. All of the findings will be documented in a form of extended abstract and posters.

The main objective of the activity is to expose the students with proper understanding and methodology of a related scientific research. The reason being, before entering this foundation program, most of the students is not familiar with academic posters and scientific writing, therefore, we hope that this activity will act as a fundamental platform for them to learn the experience before they enter the degree program in the near future. Besides that, the activity also could help them improving their communication and technical skills as required.

On behalf of the committee member, once again I would like to thank everyone including Dean and Deputy Dean of Pusat Pengajian Pra-Universiti, UNIMAS for their support and encouragement for making this event a reality. On top of that, we also thank Sarawak Forestry Corporation (SFC) for their support during the trips to the national parks, and last but not least to all the staffs, invited juries, laboratory demonstrators and the students for their commitments in making sure the success of ABC 2018.

MOHAMAD RAZIF OTHMAN

CENTRE FOR PRE-UNIVERSITY STUDIES, UNIMAS

Organising Committee

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Asasi Biology Colloquium (ABC) 2018

Tentative

Date: Wednesday, 28 March 2018

Venue: Foyer, Meeting Room and Main Meeting Room of Centre for Pre-University Studies, Universiti Malaysia Sarawak

Time: 0900 – 1730

Participants: All Life Sciences Foundation Studies Students

Time	Program	Venue
9.00 am	Poster exhibition	Foyer
11.00 am	Briefing evaluation by protocol unit to juries	Meeting room
11.20 am	Pre poster evaluation by juries	Foyer
12.30 pm	Lunch (Guest juries and lecturers)	Meeting room
1.30 pm	Poster displays (attended by students) and evaluations by juries	Foyer
2.45 pm	End of evaluation, marks calculation	Meeting room
3.00 pm	The announcement for the 2 best posters for Bako and Gading sites and 4 for Kubah site (8 groups in total)	Foyer
3.15 pm	Oral presentations from all the best posters by student group representative (15 mins each group, 10 mins presentation, 5 mins question and answer session)	Main meeting room
5.15 pm	Comments from the guest juries Certificates and hampers giving ceremony	Main meeting room
5.30 pm	End of program Tea and snacks	Meeting room

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Kubah National Park, Sarawak

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PC 08	The Potentials of Gunung Gading National Park, Sarawak in Ecotourism	2-2

INVERTEBRATES IN KUBAH NATIONAL PARK, SARAWAK

Zakwan, M., Joseph. B., Iddin, M., Enilyn, K., Esmeralda, M., Nur Adhila, R., Afizah, R.K., Nur Ain, P., Rachael, G., Rasyiqah, A.R., Grace, H., Athirah, N., Karen, L. and Christharina, S.G.

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Introduction

Kubah National Park is a wildlife center with many biodiversity. Kubah is mostly covered by mixed dipterocarp forest. The height of Gunung Serapi where it located at is 2500ft above sea level. One of the biodiversity in Kubah is invertebrate. There are 150,000 different types of invertebrate that can be found. Invertebrate is an example of animal that neither possess nor develop a backbone or spine derived from the notochord. The objective of this study is to document the invertebrate species in Kubah National Park for our result.

Materials and Methods

The documentation was carried out in Kubah National Park and the invertebrates were documented by capturing the picture.

Results and Discussion

Earthworm
Kingdom: Animalia
Phylum: Annelida
Class: Clitellata
Subclass: Oligochaeta
Order: Haplotaxida
Family: Lumbricidae
Genus: *Lumbricus*
Species: *L. terrestris*

Earthworms and their relatives live anywhere there is moist soil and dead plant material. Reddish brown in colour, pointed posterior and anterior end. No eyes or other discerning

facial features. It helps to take nutrients down through the soil profile, bringing them into closer contact with plant root.



Tractor millipede

Kingdom: Animalia
 Phylum: Arthropoda
 Class: Diplopoda
 Order: Polydesmida
 Family: Platyrrhacidae

Tractor millipede live on tree bark. Have wave-like mechanical movement of the limbs, strictly vegetarian, feeds on rotting vegetation. About 5 inches long and quite harmless. It play a crucial role in decomposition of leaf litter and in nutrient cycling back into soil. (US Forest Service and Research Development).



Weaver ant

Kingdom: Animalia
 Phylum: Arthropoda
 Class: Insecta
 Order: Hymenoptera
 Family: Formicidae
 Subfamily: Formicinae
 Genus: *Oecophylla*

Weaver ant live in trees and are known for their unique nest building behaviour where workers construct nest by weaving together leaves using larval silk. Vary in colour from reddish to yellowish brown dependent on the species. It plays an important role in biological pest control.



Giant ant
 Kingdom: Animalia
 Phylum: Arthropoda
 Class: Insecta
 Order: Hymenoptera
 Family: Formicidae
 Subfamily: Formicinae
 Genus: *Camponotus*
 Species: *C. gigas*

Giant ant reside both outdoors and indoors in moist,decaying or hollow wood. Body colour is a combination of black and dull red. Have a circle hairs at the tip of their abdomen.It helps as decomposer by feeding on organic waste.



Flame leg millipede
 Kingdom: Animalia
 Phylum: Arthropoda
 Class: Diplopoda
 Order: Spirobolida
 Family: Trigoniulidae
 Genus: *Trigoniulus*

Flame leg millipede are one of the most beautiful and striking millipede. Their lifespan is two years. Millipede usually found in moist and damp area. It have long segmented bodies, short heads and many pairs of legs. It helps in improving soil structure.



Stick insect

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Phasmatodea
Family: Phasmatidae

Stick insect resemble a twig. Usually it is very thin and elongated. Found in woodland area to help them to camouflage from predators(A-Z Animals). Play an important role in the balance of ecosystem due to what they consume. They eat dead foliage too. (Bioexpedition)



Termite

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Blattodea

Termite live in damp and dying wood. Whitish or colourless. Short antennae. They have two sets of wings that are equal length. It helps to decompose dead tress and turn them back into fertile soil, which can help forest group faster. In addition, it helps in increasing soil quality.



Hammerhead Worm
 Kingdom: Animalia
 Phylum: Platyhelminthes
 Class: Rhabditophora
 Order: Tricladida
 Suborder: Continenticola
 Family: Geoplanidae

Hammerhead worm live in moist soil. Slimy worm that has a head looks like hammer. Dark brown in colour and flat body.

Conclusion

To summarize, there were around 8 species of invertebrates that can be found in Kubah National Park. Some of the species found include the millipede, termite, and earthworm. The invertebrates found can be classified into few phylum such as annelid, arthropoda and Platyhelminthes. At different feet above sea level and at different type of environment, different species can be found.

References

- Anonymous. (2018,May 11). Tractor Millipede [Web log post]. Retrieved March 10,2018, from <http://hortlog.blogspot.my/2008/09/tractor-millipede.html?m=1>
- Anonymous, [2018, March 10],Stick insect,A-Z Animals-Animal Facts, Pictures and Resources from <https://a-z-animals.com/animals/stick-insect/>
- Animals, A (n.d). Stick Insect. Retrieved March 10,2018, from <https://a-z-animals.com/animals/stick-insect/>
- Anonymous,[2009,November 11], Retrieved on 10 March on www.sabah.com/wordpress/hammer-head-worm/
- Carpenter Antss, Camponotus sp. (n.d), Retrieved on March 10,2018, from <https://urbanentomology.tamu.edu/urban-pests/ants/carpenter/>
- Millipede Stock Photos and Images. (n.d). Retrieved March,2018, from <http://www.alamy.com/stock-photo/millipede.html?page=3>

**HABITAT ASSOCIATION OF ANURANS IN KUBAH NATIONAL PARK,
SARAWAK**

Syazwan, A., Amirul, H., Fabian, M., Danish, A., Irsyad, F., Ervynna, C.,
Ezzarina, A., Nafisah, M., Natasha, N., Arinah, A., Batrisyia, D., Farzana, M.,
Winda, C., Miekaella, T., Qistina, I. and Tingga, R.C.T.

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Introduction

On 3rd of March of 2018, a research has conducted at Kubah National Park. Kubah National Park is rich with fascinating biodiversity located in Matang area, Sarawak. The well protected area of dipterocarp forest are rich with palms, orchids, and pitcher plants. Punctuated with hardened limestone and soft base rock which lead to the formation of clear stream, waterfall and bathing becomes the perfect habitat for Anurans. There are approximately 80 different species of frog present in Kubah National Park. Frogs in Kubah National Park prefers to go out at night and are most active an hour after sunset. During the day, frogs hide away in leaves and cracks to be hidden from the sun and predators. The objectives are to study about the habitat of anurans in Kubah. Besides, this trip is to study about a variety species of anurans in Kubah National Park and to differentiate the characteristics of each anurans. Furthermore, the main goal is to find the relationship between the characteristics of anurans with their habitat. This is to understand out how the characteristic of anurans allow them to adapt with their habitat.

Materials and Methods

The research was conducted at Kubah National Park. The technique of this study is called forest transect. Every species that were found, the photographic evidence was taken. The survey was done by visual observation. Then, the scientific name of the frog was identified using a guide book, A Guide to The Frogs of Kubah National Park. By observation of it morphological traits, the species of the frog or toad can be determined. The habitat of the anuran was observed and examined. Relate the habitat to its characteristics and morphological traits. Then, an activity called frogging was conducted at the frog pond, which is one of the method that was used to collect sample. Photographic evidence of every frog

found was taken and studied their morphological traits and characteristic, in order to link this species with their habitat. For this research, the forest transect method was applied. A forest transect is an approach that required to walk along the trail of Kubah National Park. The method of frogging, visual observing, searching and listing were emphasize during this research. Then, the pattern of the frog was observed before searching it on internet and using other sources such as book. After doing that, the significance of the anurans that were found based on their habitat can be detected. Besides that, the habitat have been analyse and the reason why the species prefer that habitat were discussed.

Results



Microhyla nepenthicola



Microhyla malang



Ingerophrynus divergens



Limnonectes palavanensis



Hylarana raniceps



Rhacophorus pardalis



Megophrys nasuta

Discussion

Generally, 5 frogs and 2 toads were found during this trip. Based on the observation, all of the frogs are relatively small in size. The relative size of male anurans are smaller compared to the female anurans of the same species, which to allow the male to grasp a female with his front legs during mating process, called amplexus. The colouration of all anurans that were found shows that they have a darker brownish body colour on their surface. This morphological trait is very significant since it helps them to escape the predator, especially at the forest floor and the lowland. This trait allows them to camouflage with the surrounding and blend with the nature well.

First species was found known as *Hylarana raniceps* at the pond near the stream, where the environment was humid and wet. The frog appears to be brownish but this frog species is actually greenish in colour. It will appear to be brownish when it feels stress. This species inhabits a broad range of lowland primary and secondary rainforest. However, it will breed in ponds or intermittent stream, which is why they are abundantly seen at the pond near the streams (Linsam, 2018). Then, the second specimen which is a toad, known as *Ingerophrynus divergens* was found (Taha, 2014). This species is poisonous towards other frogs. However, it does not harm human. The adults of this species feed on wide variety of arthropods, favoring ants and termites. The colouration and stripes at the hind legs allow the frog to hide from its predator during the daylight by camouflage between the dry leaves.

A distribution of pitcher plants along the Summit Trail contain a huge number of tadpoles. This tadpole species is known as *Microhyla nepenthicola*. While the pitcher plant species that this species live and develop in is *Nepenthes ampullaria*. This frog species spend most of its life cycle inside the pitcher plant as the pitcher plant provide them with nutrients and protection from predator. *Microhyla nepenthicola* has less webbing on its feet than most frogs, which beneficial for them to climb the sides of the pitcher plant, which can be slippery (Werrington, 2018). Next, species that found was *Limnonectes palavanensis*. This species shows parental care, where the male of this species guard the tadpoles that had hatch from the eggs laid on the ground, and then carries the tadpole on its back to water. As this frog species practice paternal care, which is rare trait, helps to increase the rate of survival of its young.

Apart from that, we also discovered egg belongs to the infamous Harlequin tree frog, or scientifically known as *Rhacophorus pardalis*, (Hazebroek and Morshidi, 2006) in which it looks like a puffy-white foam stuck onto a leaf. This frog species live on the tree, thus they mate and reproduce also on leaf. They will glide by flapping between their fingers, which

help them to climb up the tree trunk and glide from one tree to another. They lay their eggs in the foam nest and hang themselves over the water. When the tadpole hatches, they will drop into themselves into the pond to continue their development. The sixth species that was found was *Microhyla malang*. This frog species is very small in size and has an extremely inconspicuous appearance. Small organisms are able to move faster and have alertness to their current situation. This is beneficial for this species to survive from being prey of the predator and can live in an infinite resourceful area (Thatsofarah, 2018). Since they merely need a small amount of food and nutrients to survive and live. The last species that was found was *Megophrys nasuta*. This species has the capability to camouflage with its surroundings. What is unique about this frog species is that it has a dark brown dorsal surface camouflage that really blends well with the forest floor and its snout is drawn out into a long triangular projection, forming a "horn". Its arms and legs are barred with brownish skin folds, which is identical to its surrounding habitat. Their horns give them a structure of dry leaves.

References

- Linsam, A. (n.d.). *Frog Tour At Kubah National Park*. Retrieved on 6 Mar 2018 from Frog Tour at Kubah National Park.com:<https://sarawaktourism.com/blog/frog-tour-at-kubah-national-park/>
- Thatsofarah. (n.d.). *MY SARAWAK ADVENTURES: FROGS OF KUBAH NATIONAL PARK, SARAWAK*. Retrieved on 6 Mar 2018 from thatsofarah.com:
<http://thatsofarah.com/frogs-kubah-national-park-sarawak/>
- Werrington, I. (n.d.). *Frogs & toads: identification*. Retrieved on 8 Mar 2018 from Frogs & toads:identification.com:<http://www.froglife.org/info-advice/frequently-asked-questions/frogs-toads-identification/>
- Hazebroek, H. P., A. Morshidi, A.K. (2006). *National Parks of Sarawak*. Kota Kinabalu: Natural History Publication (Borneo) Sdn. Bhd.
- Taha, Wahab and Das, I. and Pui, Yong Min and Haas, A. (2014). *A Guide to The Frogs of Kubah National Park*. Sarawak Forestry.

INSECTA IN KUBAH NATIONAL PARK, SARAWAK

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Muhammad Zal Aidi, M.F., Beatrice, C.C.L., Jeremiah, A.A., Nurul Arrisya Aimi, M.A.,
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Introduction

A study on the insects and their characteristics was conducted in Kubah National Park on 3rd March, 2018. Kubah National Park is located on the slopes of Gunung Serapi, the tallest mountain in the landscape of Sarawak's capital, Kuching. The dipterocarp forest offers seven trails namely Waterfall Trail, Rayu Trail, Main Trail, Selang Trail, Summit Trail, Palmetum, and Belian Trail. The study was conducted along Summit Trail which is 5km in length with its summit located at 2500ft above sea level. Insects or Insecta originated from a Latin word, "Insectum". They are the largest group of hexapoda which essentially means any member of the phylum Arthropoda, which is itself the largest of the animal phyla. Insects have segmented bodies, jointed legs, and exoskeletons. Insects are distinguished from other arthropods by their body, which is divided into three major regions: firstly, the head, which bears the mouthparts, eyes, and a pair of antennae, next, the three-segmented thorax, which usually has three pairs of legs in adults and usually one or two pairs of wings, and thirdly, the many-segmented abdomen. Insects may be found in nearly all the environments, although only a small number of species reside in the oceans, a habitat dominated by another arthropod group, crustaceans. The differences of morphological traits and ecological roles between insects in Kubah National Park and the general characteristics of insects can be influenced by several factors such as adaptability and wide geographical distributions.

The fundamental objective of this study is to carry out observation to characterize insects present in Kubah National Park and to determine the important morphological parameters that could be used for species identification. This study was undertaken as part of investigating evidence for local adaptation, if any, by focusing on the physical characteristics and roles of the insects present in Kubah National Park.

Materials and Methods

Gunung Serapi Summit Trail was the chosen trail to conduct this study. For the data collection, the technique of observing and photographing were used to obtain the data. The devices used to capture all the images of the insects are Nikon DSLR camera and Olympus Tough TG-3 camera. Abundance of resources were used to interpret the data obtained during the observation phase of this study. To get to know the right details regarding the specific morphology for each species, reference books, online articles, and consultation on scientific advices from the expertise in the field of entomology is used in order to study the features and roles of each species. The findings were then compared to the standard taxonomic classification of species.

Results and Discussion

The preliminary data collected in this study focuses on six different insects namely *Anoplognathus* sp., *Ypthima pandocus*, *Camponotus gigas*, *Euphaea* sp., *Vespula* sp., and *Xylocopa* sp. The data in forms of photographs were analyzed through morphological traits such as shape of the abdomen, colors and or wings on the insects is used to identify species when comparing to standard taxonomic classifications. The Malaysian Leaf Beetle (*Anoplognathus* sp.) is an oval-shaped and short-legged, with the antennae about half the body length, and less than 12 mm in size. Several adaptations has enabled them to expand into many habitats such as leaf litter, logs and soil that would otherwise damage the wings of less well protected insect groups. The Leaf Beetle, from the finding of this study, is small and round. The antennae are fairly short. It exhibits shiny brown-red chitin. It feeds on leaves and flowers, which means it dwells under the leaves and flowers to supply itself with enough nutrients and free of predators. The Leaf Beetle that was observed resting under a leaf of a tree located at 1000ft below the summit of Gunung Serapi. Their ecological roles include reducing the amount of weed seeds in the soil which in turn, increase crops and conserve farmland biodiversity. Researchers have found that they play a supporting role to herbicides in controlling weeds and improving food security.

Ypthima pandocus, or more commonly known as common three-ring, is a species of butterfly found in most dry areas of Africa and Asia specifically in Thailand, Malaysia and Singapore. At the time of the study, this species of butterfly was found along the Summit Trail's elevation approximately 1000ft-1500ft above sea level. This species is identified through its wings morphology. The most prominent feature on the wings that aided species identification is the moderately large, bi-pupiled, yellow-ringed, subapical ocellus on the forewing, and two

yellow-ringed ocelli on the hindwing. The hindwing has three yellow-ringed black ocelli hence, the given name, common three-ring. The Rings species, as commonly referred to them, are relatively small and unattractive butterflies. *Ypthima pandocus* has a feeble flight and is usually found close to the ground. Butterflies play a vital role in giving clues on changes in the environment such as the effects of new farming practices and pesticides by monitoring their numbers. Butterflies also benefit plants by pollinating flowers whilst feeding on their nectar and help in seed productions. *Camponotus gigas* is a dominant member of the ant communities of the Southeast Asian rain forests (Yamane *et al.* 1996) and one of the largest ant species in the world. Among one of the largest ant species in the world. Based on the findings, this type of ant is usually found in the area of the leaf litter approximately below 1000ft of elevation on Gunung Serapi Summit Trail, Kubah National Park. Generally, the nests are usually found in the giant trunk of a dead and fallen tree. It was discovered that they are mainly found amongst leaf litter and solitarily rather than huddled in a colony. This is because foraging is mainly nocturnal. During the daytime foraging is reduced and is restricted to a much smaller number of workers which roam the forest floor. Ants play an important role in the environment. They aerate soils, which allows water and oxygen to reach roots of plants. Furthermore, they also take seeds down into their tunnel to eat the nutritious elaiosomes, a part of the seeds.

Euphaea sp. the damselfly is a common species in lowland forest in Peninsular Malaysia, Sumatra and Borneo. In Sarawak, this species occurs in primary forest, but is also common in secondary and highly disturbed forest. It appears to be confined to lowland areas. Based on this study, this beautiful damselfly was found around 800ft to 1500ft on the Summit Trail. The damselfly is a graceful flier with slender body and long, filmy, ne-veined wings. It is conventionally petite, more delicate and fly weakly when compared to a dragonfly. It has a metallic blue needle like abdomen. *Euphaea* sp. play key roles in the ecological system. They are predators as both nymphs and adults, feeding on prey such as mosquitos and biting flies. The nymphs are in turn, an essential food resource for fish and amphibians. In addition, they can be an indicators of different biotypes and habitats which is used as a tool to assess the biological health of aquatic habitats. A wasp is any insect of the order Hymenoptera that is neither a bee nor an ant. Based on the observation, the wasp that were discovered is *Vespula* sp. and was found amongst leaf litter approximately 400ft above sea level. A careful observation on their abdominal morphology identify them as *Vespula* sp. Shape analysis suggests that *Vespula* sp. have pointed lower abdomens and narrow “waist” that separates the abdomen from the thorax. Furthermore, it can be seen that the colour of wasp found during

this study in Kubah National Park was yellow and black abdomen with black wings, quite similar to bumble bees. They make up an enormously diverse array of insects, with some 30,000 identified species but they basically fall into one of two categories: solitary or social. Solitary wasp species live and operate alone while wasp species that identified as social life and work together in colonies. The wasp *Vespula* sp., we encountered were around the area of observation solitarily. Wasps preys on insects and parasites which can damage crops and other vegetation. In agriculture, they contribute to yeast contents found in grapes which can produce wine.

Carpenter Bee is under the order of Hymenoptera and genus *Xylocopa* sp. Hymenoptera is known to have two pairs of membranous wings, the front are usually bigger compare to the back wings. This Carpenter Bee is found approximately 500ft to 600ft on the Summit Trail. Varied species has different size, some are at 1/2 to 1 inch long, as similar in size to bumble bees, but some species can be as small as 1/4 inch. Its morphology that leads to species identification is the colour on their wings and body. Their body can be black, green or purplish in colour depending on the species and may have various markings with minimal hairs. The observation during this study shows that the Carpenter Bee has purplish body and wings. Their abdomen are shiny and mostly hairless. Carpenter bees act as pollinating agent for the wild plants to contribute food source for birds and other wildlife.

It has been suggested that morphological traits such as abdominal features, colors and patterns on the insects' body play a role in determining the species of insects. Further studies are required to strengthen the analyses with larger sample sizes representing more location covering the different elevation and climatic zone to determine the exact species and ecological characteristic of insects in Kubah National Park.

Conclusion

In conclusion, this paper presents the morphology and roles for insect population in Kubah National Park with respect to its characteristics. These result demonstrate that they are important morphological parameters that could be used for species identification. This study has proven that morphological traits can lead to species identification of insects in Kubah National Park specifically Gunung Serapi Summit Trail.

References

Australian Museum. (n.d.). Retrieved March 09, 2018, from <https://australianmuseum.net.au/paper-wasps>

Corbet, P. S. (2013, July 02). Odonata. Retrieved March 09, 2018, from <https://www.britannica.com/animal/Odonata>

CSIRO (n.d.). Retrieved March 09, 2018, from <http://www.ento.csiro.au/education/insects/odonata.html>

Hyodo, F., Kishimoto-Yamada, K., Matsuoka, M., Tanaka, H. O., Hashimoto, Y., Ishii, R. and Itioka, T. (2016). *Food Webs*, 6: 48.

Introduction to the Odonata. (n.d.). Retrieved March 09, 2018, from <http://www.ucmp.berkeley.edu/arthropoda/uniramia/odonatoida.html>

Morphological and Functional Diversity of Ant Mandibles (n.d.). Retrieved from http://www.antwiki.org/wiki/Morphological_and_Functional_Diversity_of_Ant_Mandibles

Pfeiffer M. & Linsenmair K.E. (1999). *Contributions to the life history of the Malaysian giant ant Camponotus gigas (Hymenoptera, Formicidae)*. *Insectes soc*, 47 (2000) 123–132

Pfeiffer M. & Linsenmair K.E. (2001). *Territoriality in the Malaysian giant ant Camponotus gigas (Hymenoptera/Formicidae)*. Japan Ethological Society and Springer, 19:75–85

Watmough, R. H. (1983). *Journal of Animal Ecology*. 52 (1): 111-125.

Smith, L. (n.d.). *Hymenoptera - the bees, ants, wasps (social and solitary) & saw flies*. Retrieved March 09, 2018, from <http://www.bumblebee.org/invertebrates/Hymenoptera.htm>

PLANT ADAPTATION IN KUBAH NATIONAL PARK, SARAWAK

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Introduction

Kubah National Park (KNP) is one of Sarawak's most attractive national park. Established in 1989 due to its exceptionally rich plant life, the park covers an area of 2,230 hectares, and comprises the heavily forested slopes and ridges of the Serapi range. KNP is situated 22Km west of Kuching city, near Matang village. At heights of between 150-450 metres, KNP's soft sandstone is punctuated with bands of hardened limestone which have created several beautiful waterfalls (Hazelbroek and Morshidi, 2000). The main attraction of this National Park is its waterfall and crystal-clear streams. The waterfall trail is a three hours journey to the waterfall and back to the park HQ. The trails pass through mixed dipterocarp forest connected by numerous plank walk section across swampy area and small stream. Mixed dipterocarp forest is home to family dipterocarpaceae and they make up most of the big trees in the forest. Referring to the vast area, plant that have the ability to adapt can survive while the ones that can't will be eliminated whereby survival of the fittest is implemented. Survival of the fittest is a phrase originated from Darwinian evolutionary theory as a way of describing the mechanism of natural selection. Adaptation allows production as a rebound to the ever-changing environment. They qualify the plant to reduce competition in many ways and increase reproduction.

Materials and Methods

The observation was conducted along waterfall trail of KNP. The plants adaptations were recorded and photographed using DSLR camera and phones along the trail. Online research, books and journal references were used to finalize the results.

Results and Discussion

A total of 141 individuals from five types of plant adaptations were recorded in this study (Table 1).

Table 1: List of plant adaptations along waterfall trail of KNP

No.	Plant	Individuals	Characteristic / adaptations	Discussions
1.	Vines and climbers	52	Lianas Having their roots in the ground and climbing high into tree canopy to reach available sunlight Use other trees to support their growth	Maximise the sunlight that they received, so increase the rate of photosynthesis Physically linking trees together
2.	Epiphytes	9	Birds Nest Fern Grow on trees to take advantage of the sunlight in the canopy.	Greater surface area, means more chloroplast, thus effective photosynthesis
3.	Buttress roots	35	Timber trees Have established roots that spread outwards from their trunks to support themselves. Provide extra strength from strong wind and heavy rains	Reduce stress tension The triangle-like shaped of the root helps to spread the weight of trees evenly More stability, thus less easily get toppled by strong wind
4.	Pitcher plants	41	Genus <i>Nepenthes</i> The interior walls are waxy and slippery Plant's enzymes digest the meal and plant can absorb nutrients Elongated structure contains pool of water	The insect will easily fall of into the interior part that is filled with digestive enzymes The nutrients in the insects help to flourish the plants Help to contain the digestive enzymes.
5.	Stilt-root trees	4	Absorb water and nutrients, especially during the dry season Anchor themselves in the soil trapping sediment which helps to stabilize the tree	Allow it to increase height and maintain mechanical stability without having to concurrently invest in increased stem diameter and underground root structure.
	Total	141		