



SCHOOL OF BIOLOGICAL SCIENCES UNIVERSITI SAINS MALAYSIA



KEELE SUMMER SCHOOL PROGRAM 2022



ORGANIZED BY:
SCHOOL OF BIOLOGICAL SCIENCES
UNIVERSITI SAINS MALAYSIA



Welcome to Malaysia!

After two years of hiatus due to the pandemic, this course will offer new experiences and knowledge to you!



The field school conducted by Universiti Sains Malaysia, Penang, is truly unique among study abroad programs. The objectives of this program are to introduce students to the study of tropical biodiversity/ecology and conservation biology, and experience the complexity and beauty of some of the most biologically diverse and threatened ecosystems in the world.

The program is designed for biology majors and represents a unique opportunity to learn about the inner workings of field ecology under the direct guidance of experienced ecologists. Field trips expose students to the wealth of diversity that makes Malaysia a most unique tropical classroom. Students have ample opportunity to enjoy a hands-on, participatory learning process, as well as to expand their academic and personal horizons in the context of a supportive learning environment. During the program you will be busy with various field activities from chasing after aquatic insects to understanding orangutan conservation and rehabilitation!

We will begin with introductory lectures and discussions on tropical ecosystems and its diverse biodiversity. This is demonstrated through one ecosystem of the tropics which is the mangrove. This particular ecosystem occupies transitional zones along many sheltered coastlines in the country. The first site visit would be the Matang and Merbok mangrove area. Known as a popular site for ecotourism, Matang and Merbok mangroves represent a unique situation where there is balance between commercialization and nature awareness. There has been an increase in the aquaculture development in the area, thus it would be interesting to figure out how they can manage to balance between economy and nature.

TIME	PROGRAM
PLACE: CEMACS	
29 JULY 2022 (FRIDAY)	
0730 – 0800	Breakfast
0800 – 1200	Mini Project
1200 – 1300	Lunch
1400 – 1800	Mini Project
1900 – 2000	Dinner
2000 – 2200	Mini Project
30 JULY 2022 (SATURDAY)	
0730 – 0800	Breakfast
0800 – 1200	Mini Project
1200 – 1300	Lunch
1400 – 1800	Free and Easy
2000 – 2200	Farewell Barbeque
31 JULY 2022 (SUNDAY)	
0730 – 0800	Breakfast
0800 – 1000	CEMACS Check Out
	Travel to Kuala Lumpur

TIME	PROGRAM
PLACE: CEMACS	
25 JULY 2022 (MONDAY)	
0800 – 1000	CEMACS Check In
1200 – 1300	Lunch
1400 – 1800	Briefing for all ecosystems Safety Briefing Forest Ecosystem 1
1900 – 2000	Dinner
2000 – 2100	Herpetofauna Briefing
2100 – 2230	Herping 1 (Looking for Reptiles at Night)
26 JULY 2022 (TUESDAY)	
0730 – 0800	Breakfast
0800 – 1200	Coastal and Marine Ecosystem 1 Ocean Resource Talk by Dato' Prof. Aileen Tan Shau Hwai (10.30 - 11.30 am)
1200 – 1300	Lunch
1400 – 1800	River Ecosystem 1
1900 – 2000	Dinner
2000 – 2200	Herping 2 (Looking for Reptiles at Night)
27 JULY 2022 (WEDNESDAY)	
0730 – 0800	Breakfast
0800 – 1200	Coastal & Marine Ecosystem 2
1200 – 1300	Lunch
1400 – 1800	Forest Ecosystem 2
1900 – 2000	Dinner
2000 – 2130	Insect Light Trapping & Identification
28 JULY 2022 (THURSDAY)	
0730 – 0800	Breakfast
0800 – 1200	River Ecosystem 2
1200 – 1300	Lunch
1400 – 1800	Pantai Kerachut Turtle Sanctuary Visit
1900 – 2000	Dinner

Afterwards, we will conduct our field trip at Penang Hill. One of the oldest and the most popular iconic spot of Penang. Located right in the middle of an urban setting, the Penang Hill forest represents a unique look on the effects of urbanization towards the flora and fauna.



We would also be visiting the newly established Habitat tree top canopy walk. Established as a nature conservation effort, the habitat has actively promoting science especially conservation in their daily activities.

After that, we will be visiting the only Orangutan Sanctuary Island (there are no Orangutans in the Peninsular-except the ones in zoos and this center!). Founded by the owner of the Bukit Merah Laketown Resort, the Sanctuary has since improved and currently retains a free independent trust association. It is equipped with the latest tools and clinics with dedicated staff. Starting from three Orangutans from Borneo, the sanctuary now has more than 20 orangutans. Interestingly, here, we are the one in cage!



TIMETABLE



TIME	DESCRIPTION
14 JULY 2022 (THURSDAY)	
Departure from United Kingdom	
15 JULY 2022 (FRIDAY)	
Arrival in Penang & Check-in Accommodation	
16 JULY 2022 (SATURDAY) PLACE: USM	
IMCC Program at USM	
17 JULY 2022 (SUNDAY)	
IMCC Program at USM	
18 JULY 2022 (MONDAY) PLACE: SCHOOL OF BIOLOGICAL SCIENCES, ROOM 107	
0930-0950	Student Presentation 1
0950-1010	Student Presentation 2
1010-1030	Student Presentation 3
1030-1050	Student Presentation 4
1050- 1110	Student Presentation 5
1110-1130	Student Presentation 6
1200- 1300	Brief Introduction to Tropical Ecology
1300 - 1430	Lunch Break (on campus)
1430- 1700	USM campus nature walk and Introduction to <i>iNaturalist</i> App
19 JULY 2022 (TUESDAY)	
0800 - 1700	Shorebird at Teluk Air Tawar
20 JULY 2022 (WEDNESDAY)	
0800 - 1700	Mangrove Site Visit at Matang Mangrove Park
21 JULY 2022 (THURSDAY)	
0800- 1700	Shrimp and Oyster Farm Visit at Sungai Merbok, Kedah
22 JULY 2022 (FRIDAY)	
0800- 1700	Bukit Merah Orang Utan Island and Zoo Taiping
23 JULY 2022	
0900 - 1100	Penang Botanical Garden & Lunch at Penang Hill
1500- 2000	The Habitat Penang Hill Visit Ecotourism Talk & Sunset Nature Walk
24 JULY 2022	
REST DAY	

HERPETOFAUNA

Malaysia named as one of the megabiodiversity country in the world. Its vast rainforest contains lots of the unique and endemic flora and fauna found nowhere else in the world.

This course will cover one of the group of animals found here commonly known as herpetofauna or reptiles and amphibians. Students will be carried through the basic ecology and diversity of the group in this region. This will be done through an hour lecture. Students will be given an opportunity to ask questions and discuss their own experience or interest in herpetology. This two-way lecture is aimed to spark interest among the students to study this unique and interesting animals.

Herpetofauna active mainly at night, hence there will be a fieldwork to be carried out at night while we are at USM-CEMACS research station at Mukahead. During this walk, student will be experiencing the actual field survey method known as Visual Encounter Survey, along the trail towards and along Tukun river which is situated about ten minutes from the station by foot. Reptiles and amphibians found during the survey will be shown and introduced to the students with regards of the basic identification features and how to differentiate them from each other. This walk might take about 2 hours.

By the end of the course, students are expected to understand these understudied animals and experience 'hands on' research methodology of herpetofauna.

To bring during the nightwalk/fieldwork:

- Flashlight/torchlight/headlamp with spare batteries or fully charged For better spotting chance, a higher lumen is preferred but not a must.
- Poncho (in case it rains)
- Rubber shoe/any shoe (might get wet)
- Insect repellent



DO'S AND DON'TS

- Never handle animals especially snakes unless told to do so.
- Do not bring back or harm animals
- Always be cautious while walking along trail or river as it might be slippery
- Careful when holding a branch or trees as there might be thorns or dangerous animals on it. Always shine your light where you step!



The final portion of this program will be conducted at CEMACS, USM's field station located at Balik Pulau (literally translated to the "other side of the island"). Located within the smallest National Park in Malaysia, CEMACS offers a unique opportunity to learn and experience the various ecosystem-natural forest, river, ocean studies, coastal forest.

The final highlight would be the visit to the Kerachut Turtle center, located within a hiking distance from CEMACS. If we are lucky, we can participate in the turtle release program!

Assoc Prof Dr Nik Fadzly N Rosely
Program Manager
Keele Summer School Program 2022



Turtle Release Program at Pantai Kerachut



II: BIOTIC

Button snail collection (*Umbonium vestiarum*)

- i. This study aims to determine the distribution and population of *Umbonium vestiarum* on the sandy shore.
- ii. The *U. vestiarum* shall be collected from the intertidal zones, which are, supra-littoral, littoral, and sub-littoral zones.
- iii. Place a core tube on the sand and carefully push it down into the sand until the marked line reached the ground.
- iv. Dig the sand outside the core tube until you reached the bottom of the core tube. You are going to pull out the core tube together with the sand in it.
- v. Place the perspex at the bottom of the core tube and carefully secure the lower opening of the core tube with the perspex. Once the opening is secure, retrieve both the core tube and the perspex from the sand.
- vi. Carefully transfer the sand inside the core tube onto a sieve provided by sliding the core tube from the perspex onto the sieve. Pull up the core tube. The sand will exit the core tube.
- vii. Sieve the sand out by using seawater. Mind the waves.
- viii. In the marked area, dig out the sand up to a depth of 20cm.
- ix. Count the number of live *Umbonium vestiarum*
- x. Repeat step iii – ix at other zones.



ICHTHYOFAUNA – PULL NET

- i. Put on your life vest/jacket and a pair of shoes (preferably rubber shoes)
- ii. Stand, queue, and distance yourselves along the pull net.
- iii. Hold the float line and enter the coastal waters at a designated point.
- iv. Once you enter the water, do not lift the pull net. Let it drag on the ocean's floor.
- v. The first and the last persons with the pole have to pull the pole without lifting it throughout the exercise,
- vi. Once the pull net is in the water, everyone, except the persons who are holding the poles, must let go and not step on the net.
- vii. The persons holding the poles now have to pull the net slowly toward the designated direction for a certain distance. The net shall in 'U' or 'C' formation. No one is allowed to walk/swim in front of the net.

ICHTHYOFAUNA – CAST NET

- i. Please watch this Youtube video to learn how to cast a net: <https://www.youtube.com/watch?v=eTSG6xz4YMQ>
- ii. Select an area to cast and start casting. Try to avoid casting near a structure as it can tear the cast net while you pulling it up.
- iii. Check and take out for any trapped/captured fish from the cast net (if any).
- iv. Try to ID the captured fish using respective references.

- viii. Towards the end of the distance, the net must be brought over the shore. The persons holding the poles can now change their direction and slowly pull towards the shoreline.
- ix. At the shoreline, pull and bring the two poles closely together and make sure the net is entirely off the water.
- x. Check and take out for any trapped/captured fish from the pull net (if any).
- xi. Try to ID the captured fish using respective references.

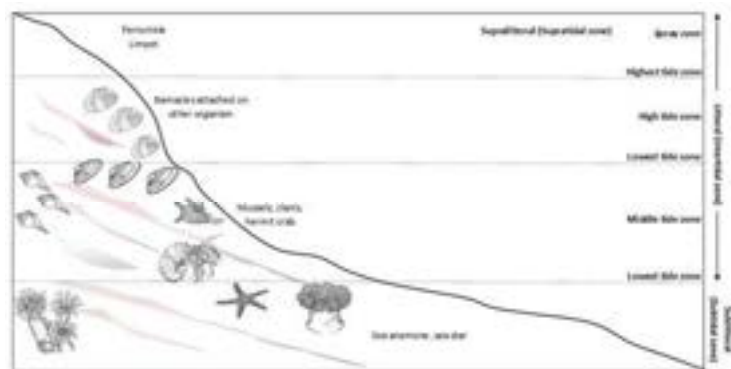


Figure 1: Intertidal zonation and example biological communities in Teluk Aling, Penang

LIST OF EQUIPMENT:

- YSI professional multiprobe
- Whirling hygrometer
- Clinometer
- Lux meter
- Anemometer
- Refractometer
- Secchi disc
- Hydropropeller
- Measuring tape
- Pull net
- Cast net

ACTIVITY

I: ABIOTIC – PHYSICAL PARAMETERS

Measure the following parameters at each location (sandy shore, rocky shore, and sub-littoral) by using respective equipment (choose 3 random points at each location):

- o Dissolved oxygen (mg/L)
- o Water temperature (°C)
- o pH
- o conductivity (µS/cm)
- o Total dissolved solids (TDS)
- o Salinity (ppm)
- o Secchi disc's depth
- o Relative humidity
- o Light intensity
- o Wind speed
- o Water velocity (cms-1)
- o Slope

Take note of your surrounding conditions (e.g., high/low tide; weather, etc.)

INTRODUCTION TO MALAYSIA'S BIODIVERSITY

Located in the tropics, Malaysia borders with Thailand in the north, Singapore and Indonesia in the South and Brunei in the east. Peninsular Malaysia is at the tip of mainland Southeast Asia, while the states of Sarawak and Sabah are on the islands of Borneo. The Peninsular is connected to Thailand by land and is accessible to Singapore by a causeway. Malaysia is strategically located along the Straits of Malacca and the South China Sea. The Malaysian land mass makes up part of the continental shelf of Southeast Asia covered during interglacials by the South China Sea.

The complicated history of island formation on the Sunda Shelf and changing landbridge connections with mainland Southeast Asia have resulted in a high degree of endemism and local distribution discontinuities. Endemism is the degree to which species are found only in a given place. This can be thought of as a measure of "irreplaceability". Since endemic species cannot be found anywhere else, the area where an endemic species lives is wholly irreplaceable.

Sundaland, the biogeographical province that has resulted from these changes, has been identified as one of the Earth's biodiversity hotspots that holds especially high numbers of endemic species. As other hotspots

around the world, Sundaland faces extreme threats and it is a paradox in determining how to incorporate threats, costs, and opportunities into conservation priorities.

Malaysia, covering a total area of 329,750 sq. km, is the fourth largest (in terms of biodiversity) of the tropical rainforest, and having extraordinary diversity of plant and animal life. Some of the world's richest and most complex ecosystems can be found in Malaysia. Malaysia has at least 19 distinct ecosystems (Whitmore, 1975) containing up to about 7% of the world's species.

Ecosystems with terrestrial habitat include coastal forest, lowland evergreen forest, lower montane forest and the upper montane forest. The aquatic habitats include vast meandering rivers, isolated oxbow lakes, mountain streams and lakes, coastal wetland mangroves and coral reefs. The terrestrial flora, as well as fauna, is found in a range of habitats and ecosystems from the lowlands to the top of the highest mountains, and in a wide range of forest types. These forest types form the cradle of the country's biological diversity.



Although Malaysia's size is similar to that of Norway, natural trees and forests cover almost two thirds of the land, an area equivalent to almost the entire United Kingdom. Over 90% of terrestrial species in Malaysia occur within natural forests. With no less of 72% of its total land area under natural forests and tree plantations, Malaysia has also set aside extensive areas for nature parks, wildlife reserves, bird sanctuaries, and marine conservation parks. The forest itself is one of the most ancient rainforests on the planet, far older than the equatorial forests of the Amazon or the Congo. It has for tens of thousands of years been the home of indigenous nomadic forest tribes, and ancient civilizations have flourished and disappeared in its vastness.

These areas, totaling 2.1 million hectares, are protected by law and a further 670,000 hectares are under consideration for inclusion into this protected area network including wetland areas, open-lake ecosystems, quartz-ridge forests, and limestone formation.

The flora of Malaysia is conservatively estimated to contain about 12,500 species of flowering plants, and more than 1,100 species of ferns and fern allies. Many of these are unique and are found nowhere else in the world. In Peninsular Malaysia, well over 26% of the tree species are endemic. Higher endemism is expected in the herbaceous flora with some of the larger genera estimated to be endemic in more than 80% of their species. Many of these hyperendemic plants are found only in a few valleys or mountain tops.

The island of Borneo, containing the Malaysian states of Sabah and Sarawak, has been listed as one of the world's key areas for endemism. Malaysia is blessed with a high number of mangrove species of global biodiversity significance – there are 41 mangrove species, that is two-thirds of the world's total.

Malaysian vertebrates comprise about 300 species of wild mammals, 700-750 species of birds, 350 species of reptiles, 165 species of amphibians, and more than 300 species of freshwater fish. While there are about identified 1,200 species of butterflies and 12,000 species of moths in Malaysia, little is known of other groups. The diversity of insects in tropical forests is so large that no concrete estimates exist, but a very conservative estimate puts it to more than 100,000 species of invertebrates.

The marine ecosystem surrounding the country's landmass, which includes coral reefs, is extremely rich in the variety of life-forms. With less than 200 m depth, the Sunda shelf adjacent to the coast of Malaysia is where many coral-encrusted islands concentrate. The coral reef community in Malaysia is considered to be one of the most diverse in the world, as it is part of the famous Coral Triangle, home to the world's most abundant variety of corals and sea life. This extraordinary area holds the richest concentration of iridescent corals, fish, crustaceans, molluscs, and marine plants in the world. Its waters hold an array of over 600 reef-building coral species—which encompass 75% of all species known in the world. However, the marine flora and fauna have been poorly documented and further research is needed to catalogue these marine species.



Coastal and marine ecosystems are among the most productive ecosystems in the world, provide many services to human society, and are of great economic value. Coastal ecosystems, found along continental margins, are regions of remarkable biological productivity and high accessibility. This has made them a center of human activity for millennia. Coastal ecosystems provide a wide array of goods and services: they host the world's primary ports of commerce; they are the primary producers of fish, shellfish, and seaweed for both human and animal consumption; and they are also a considerable source of fertilizer, pharmaceuticals, cosmetics, household products, and construction materials. Coastal ecosystems store and cycle nutrients, filter pollutants from inland freshwater systems, and help to protect shorelines and coastal land from erosion and storms. Beyond the shorelines, oceans play a vital role in regulating global hydrology and climate, and they are a major carbon sink and oxygen source because of the high productivity of phytoplankton. The beauty of coastal ecosystems makes them a magnet for the world's population. People gravitate to coastal regions to live as well as for leisure, recreational activities, and tourism.

The intertidal zone or littoral zone is the area between the high and low tide limits. The intertidal zone has four physical subdivisions based on the amount of exposure they receive. These are the spray zone, high tide zone, mid-tide zone, and low tide zone.

Each subzone has its characteristics and distinct biological communities (*Figure 1*). The spray zone is only submerged during rare and very high tides or severe storms and is usually dry, but can be repeatedly wetted by wind-blown spray. Some of the organisms that can be found in this zone include lichens and periwinkle snails. The high tide zone is flooded during the peaks of the once- or twice-daily high tides. Common organisms here include shore crabs, barnacles, blue-green seaweed, limpets, and chitons. The mid-tide zone is generally submerged except for a fairly short period during low tide. Communities here include sea urchins, starfish and anemones, snails, and mussel beds. The low tide zone is exposed only during the lowest spring tides. Red algae, sea stars, sea urchins, anemones, sponges, and kelp are amongst the dominant organisms found here.

RIVER ECOSYSTEM

THE IMPORTANCE OF RIVER

Low-order upland riverine ecosystems are extremely important freshwater resources, which are often high in species endemism and biological productivity. These ecosystems are also closely intertwined with the watershed as well as forest structure and function. Thus, correlations can be made between rivers with certain fish or other species and the state of health of the catchment. Upland riverine ecosystems are also sources of recruits for fish populations in downstream reservoirs and lakes. The interface of rivers and reservoirs is a staging area for fish migrating upstream to spawn and downstream into the reservoir to spend their adult lives. Thus, these two habitats need to have a clean and pristine environment as it determines the continuous cycle of fish movements.

Riffles and pools, stream gradient, water velocity, and in-stream woody debris and rocks create heterogeneous habitats and influence longitudinal biota distributions and in-stream material and nutrient transport. Furthermore, the overall productivity of the downstream water body depends on input transported from upstream and the respective area's physical characteristics.

II: BIOTIC*

- Try to catch and observe any mobile organisms that you can find by using the scoop nets provided. Release the organisms once you're done. Keep the organisms alive at all times.
- Observe the types of your surrounding plants/trees.
- Observe any other biota that you can find.

*This activity may be conducted together with Aquatic Insects' activity.

ACTIVITY

List of equipment:

- YSI professional multiprobe
- Whirling hygrometer
- Clinometer
- Lux meter
- Anemometer
- Hydropropeller
- Measuring tape
- Stopwatch (or watch/handphone)
- Scoop nets
- Magnifying glass

I: ABIOTIC – PHYSICAL PARAMETERS

Measure the following parameters at each reach (low, middle, and upper) by using respective equipment (choose 3 random points at each reach):

- Dissolved oxygen (mg/L)
- Water temperature (°C)
- pH
- Conductivity (µS/cm)
- Total dissolved solids (TDS)
- Relative humidity
- Light intensity
- Wind speed
- Water velocity (cms-1)
- Slope

* Take note of your surrounding conditions (e.g., high/low tide; riverbed materials; organic matter; canopy cover, etc.)

Although a number of valuable ecosystems have been preserved and protected as national and marine parks, others are highly threatened as the pace of socio-economic development is rapidly taking its toll on the natural landscapes and resources. They are under intense pressure from urban development, habitat destruction, over-exploitation, logging, shrimp farming, and agricultural monocultures. The immediate threats to Malaysia's biodiversity are growing in both scale and scope. Endangerment has proceeded to a point that for several ecosystems such as the mangrove forest, peat swamp forests, freshwater swamp forests and limestone hill forests, only a few scattered areas remain. The underlying causes are a complex network, rooted both in our expanding population, demands and ways that we share and manage our resources. These factors make conservation challenges, especially with increasing population growth, climate change, and impeding extinction cascades.

Malaysia's rich, complex, and delicately balanced ecosystems make it a fascinating region to explore and learn about biodiversity and the conflict between finite ecological resources and seemingly infinite human demands.



INTSRUCTORS



NIK FADZLY



NURUL 'AIN



ZARUL HAZRIN



WAN FATMA



NIK MOHD IZHAM



HAZZEMAN



NADINE RUPERT



FOONG SWEE YOEK



ROSNIDA TAJUDDIN

During the fieldwork, students are suggested:

- To wear long sleeve shirt and long trouser as precaution due to there are trees with spines and thorn that could cause unwanted injuries.
- To wear covered shoes (preferably rubber shoes in case of rain).
- To bring poncho (in case of rain).
- To bring insect repellent.

Required apparatuses to be brought along to the sampling sites:

(a) Macrofungi diversity

- Paper bags
- Pocket knife
- Magnification lens
- Camera (Phone camera is sufficient)
- Field data sheet
- Ballpen
- Measuring tape / ruler
- Disposable gloves

b) Forest profiling

- Graph paper & other stationaries (marker pen, ruler, pencil, pen, eraser etc)
- Drawing board
- DBH Meter/ Measuring tape
- Hypsometer
- Microclimate measuring equipment.



c) Small mammal trapping

- Trap
- Bait
- Bright colour ribbon
- Warning tape (Red and white tape)
- Rope
- Camera (Phone camera is sufficient)

DO'S AND DON'TS

- Do not touch wild macrofungi without gloves
- Do not eat the wild macrofungi in any circumstances
- Wipe your hands with wet tissue after finish working with macrofungi and immediately wash your hands thoroughly.
- Be careful when holding tree branches or branch as there might be thorns or dangerous animal on it. Watch your step.
- For small mammal trapping, make sure the door lock is correctly positioned.
- Before checking the traps in the following morning, be alert of your surrounding as the predator (eg. snake) for the captured mammals might be near to the trap



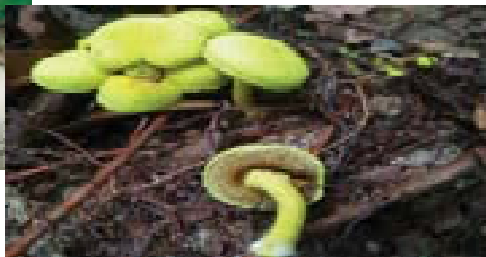
FOREST ECOSYSTEM

Total land area in Malaysia encompasses between 59% to 70% of tropical rainforests. Malaysia rainforests can be classified into different types according to region and they are lowland dipterocarp forest, hill dipterocarp forest, upper hill dipterocarp forest, oak-laurel forest, montane ericaceous forest, peat swamp forest, mangrove forest, freshwater swamp forest, heath forest, and forests that thrive on limestone and quartz ridges. These forests are home to various types of flora, fungi and fauna, and some species are endemic to Malaysia rainforests.

The type of rainforest in Penang National Park covering Mukahead is hill dipterocarp forest with line-up of beautiful and high value dipterocarp species. The forest ecosystem section for this course will cover small mammal trapping types, drawing of forest profile, and recording and identifying macrofungi diversity. In this course, students will have a real-life experience and sessions with field botanists and mycologists, and conduct hands-on research sampling. Students will be given a basic ecology and diversity of flora, fauna and fungi found in this region through an hour lecture before heading to the designated sampling sites. This will help students to have better understanding and clearer picture before going to the field. During the lecture students will be reminded on the Do's and Don'ts as safety and precaution.



During the forest ecosystem field work, students are required to hike up the hill following the trail up to the designated plot. This plot is set for forest profiling activities. During the hiking, students are required to survey the trail for any sign of macrofungi presence. Explanation will be given covering the scientific name, local name, ecological strategies, and economical values onsite upon the types of macrofungi found. It will take two hours to complete this forest ecosystem. In the end of this ecosystem, students are expected to understand the diversity of flora, fauna and fungi found in Mukahead and their functions, and experience the 'hands-on' research methodology of forestry and mycology.



NOOR KHALIDAH



MUIN MD AKIL



ZAKI ZAINOL



AINI HASANAH



NASIR AZIZAN &
NUR MUNIRA

The instructors for this course are composed of the top researchers in their fields, such as primatology, ichthyology, avian studies, herpetofauna, bats, fungi, insects and more. We have also included members of Non-Governmental Organization (NGOs), such as the Malaysian Primatological Society and Shorebirds and Waterbirds of Peninsular Malaysia.

Please interact with us, ask questions, engage in discussions and don't be shy.



WHAT IS IMCC?

IMCC stands for USM's International Mobility and Collaboration Center. IMCC specialises in helping foreign/international students to experience the many different cultures in Malaysia. They have lined up several cultural activities for you! And they have kept it as a secret to surprise you. They also appointed buddies who are USM students that will be your own tourist guide/life guru. Buddies will help you in finding your way through Penang!

Hint: Get your dancing shoes ready



CEMACS: Coastal/marine Ecosystem

1. Students will learn the different abiotic characteristics of rocky shore, sandy shore and sublittoral.
2. Students will learn about types of organisms that live in the rocky shore, sandy shore and sublittoral.
3. Students will learn about species abundance and diversity in rocky shore, sandy shore and sublittoral.
4. Students will be able to relate the abiotic characteristic with the diversity and abundance of organism in rocky shore, sandy, shore and sublittoral.

CEMACS: Herpetofauna

1. Get to know some of the species, how to identify and differentiate them.
2. Learn to appreciate this unique group of animals and their adaptations, which are often mislabelled as being scary and dangerous.
3. Learn about the unique adaptations and evolution of this group.
4. Get hands on experience on proper handling and sampling of these taxa.
5. Get hands on experience of night-sampling.

CEMACS: Forest Ecosystem

1. Student will learn to use appropriate equipment for recording microclimate parameters, such as temperature, relative humidity, wind velocity, light intensity and inclination.
2. Student will understand diversity in the rainforest by drawing a forest profile, estimation of plant species abundance in designated plot besides observation of different types of fungi.
3. Student will learn to identify the terrestrial insects and insects along the forest trail.



CEMACS: Kerachut Sea Turtle Sanctuary

1. Student will learn about the conservation efforts of sea turtles at Kerachut Beach, Penang National Park.
2. Students will learn about the species of turtles at Kerachut.
3. Students will learn about ex-situ and in-situ conservation efforts.
4. Students will learn how to handle and release turtle hatchlings (if offered by the center on that day).

CEMACS: River Ecosystem

1. Students will learn how to conduct basic river ecology studies.
2. Students will learn how to sample aquatic insects and how to identify them.

3. Students will learn how to conduct basic water quality assessment using DO meters and water quality testing equipments.

Shorebirds and waterbirds excursions

1. Students will learn how to identify different species of shorebirds and waterbirds.
2. Students will learn about the ecology and distribution of the many different species of shorebirds and waterbirds.
3. Students will learn about the migratory routes and different morphological changes that occurs during different breeding seasons for shorebirds and waterbirds



The Habitat Penang Hill

1. In The Habitat Penang Hill, students will immerse themselves in another tropical rainforest, this time a hill ecosystem that is part of a UNESCO Man and Biosphere Reserve. Here, we will apply iNaturalist to record local biodiversity under professional guidance of The Habitat nature guides.
2. Students will learn about a local, sustainable, green business approach that achieves nature conservation through eco-tourism, education and world-class facilities in an ancient rainforest.

Bukit Merah Orang Utan Island and Zoo Taiping



1. Students will learn about ex-situ conservation of orangutans.
2. Students will learn about the management of an ecotourism company.
3. Student will learn about the difference between conservation efforts from a private company compared to a government entity.

Durian orchard visit

1. Students will learn about the management of an ecotourism and fruit distributing business.
2. Students can sample the unique flavour of durian.
3. Students will learn about the ecology, morphology and distribution of durians.

Clothes & Personal Items

- Towel (fast drying) and toiletries
- Medication,
- For wet weather – rain jacket/poncho
- Comfortable and sturdy light-weight work/hiking shoes with good grip – hiking boots highly recommended (be sure they are fully broken in before traveling)
- Recreational-type sandals (e.g., Crocs, Teva's) or shoes to get wet/muddy in (for river, mangroves, and coral reef time)
- Flip-flops
- Socks (some comfortable pairs for work and hiking)
- Field hat with brim (very important for protection from the sun)
- Long-sleeved, light colored shirts for field work (quick-drying)
- Field pants (e.g., quick-dry khaki or convertible pants)
- Shorts, T-Shirts; normal/"City-life" clothes and shoes for around campus and/or going out
- Swim wear
- Sunglasses (important)

Optional but recommended

- Camera (with all the memory cards and batteries you'll need)
- Swiss army knife or Leatherman (pack in checked baggage, not in carry-on's)
- Spare eyeglasses or contacts (bring your prescription)/contact lens solution
- Reading books



PACKING LIST

General – other key items

- Alarm clock (important!)
- Prescription medicines (enough for your entire trip)
- Over-the-counter medicine for headaches, cramps, stomach, diarrhea, etc.
- A small rucksack for the field (with rain/water-proof cover)
- Field notebook/journal (mandatory)
- Headlamp (to double as flashlight, with extra batteries)
- Water bottle or canteen
- Insect repellent spray
- Sunscreen (very important!!)
- Pens, pencils etc.

COURSE STRUCTURE

Designed specifically for biology and environmental conservation students, this course provides a unique two-week program to study ecology and biodiversity in the tropics through field-based experiences.

COURSE AIMS:

- Acquire knowledge of the rich local biodiversity
- Apply knowledge to recognize environmental problems
- Encourage critical thinking and problem solving
- Discuss common goals in solving some of these problems
- Encourage interactions with people from different cultural backgrounds

PROGRAM EVALUATION

The assessments for this final year module LSC30066 Tropical Biology Field Course is comprised of:

- 1) Lab Notebook 10%
- 2) Project Report 70%
- 3) Presentation 20%

The presentation should be prepared before the course as we will set a session at the beginning of the course so you can give a 15-20 min presentation.

The idea of the presentation is to prepare you for the trip and to undertake research into an aspect of biology that is related to tropical biology and the field course.



KEELE SUMMER SCHOOL PROGRAM LEARNING OUTCOMES

iNaturalist USM Campus Nature Walk

1. Students will learn about general tropical rainforest ecology and biodiversity (lecture)
2. Students will be introduced to the app iNaturalist to record biodiversity and learn how to identify local taxa throughout their field trip
3. Students will explore biodiversity at USM campus and be visiting an ancient rainforest on campus at EcoHub/Durian Valley (Forest EduTrail). Here, they will gain hands-on experience on identification of certain taxa and “feel the forest”.
4. Students will further learn about USM’s approach to sustainability through urban farming on campus, i.e., stingless bee honey, fruit orchard, and composting etc. at Bukit TI (IT Hill)

Mangrove section: Matang Mangrove Education Park

1. Identify unique biological and ecological adaptations of mangrove species
2. Learn basic morphological characteristics to identify several mangrove tree and invertebrate species
3. Compare field observation techniques (hand capture versus visual observation) when assessing the abundance of mangrove crabs
4. Assess the importance of mangrove diversity in response to anthropocentric disturbance impacting mangroves



Mangrove section: Oyster and shrimp farms

1. Students will learn on the management of mangrove forest from the perspective of agricultural industry.
2. Students will learn about the management and handling of oyster and shrimp farms around the mangrove areas.
3. Students will learn about the balance between harvesting resource and maintaining a sustainable environment for the mangrove areas.

JOURNALING

The journal is the nucleus of your field records. It is a precise daily account of your many observations, and it should be given high priority, even when you are short of time or exhausted. The journal should maximize information while employing economy of style. It is a complete account of your observations and should be directly quotable.

General rules:

- Write in full sentences.
- Pages should be numbered.
- A margin about 2.5 cm wide should be drawn down the left hand side of the page. Write on one side of the paper only.
- Fill every page, and do not start a new page for each new day.
- The year and your name and initials should be written in the left hand margin at the top of every page.
- The date should be written in the margin where each new daily account begins and on the first line of every continuation page.
- Each daily account should contain the following standard information:

DATE: Format - "10 May" in the left hand margin.

LOCALITY (and/or route): Be concise without sacrificing accuracy. Order the information so that it goes from the most detailed (i.e., GPS readings) to the most general (place name). When traveling, we have the opportunity to notice many ecological transitions or contrasts. Be aware how your environment is changing and seek to explain those changes in terms of elevation, microclimate, or other factors.

WEATHER: Record the weather at dawn, dusk and midday, or when the weather changes significantly during the day. Essentials to include are temperature (C), wind speed and precipitation (if available).

ELEVATION: Approximate elevation in metres above sea level.

TIME: Recording time is important for special events, or for describing how long was spent in a particular location or at a particular activity.

DAILY ACCOUNT: Main features of the day, and your observations, e.g., special activities such as an early morning bird walk, and interesting facts you learn from our USM hosts. Keep the style succinct. You can also use maps, photos or drawings.

SPECIES LISTS: List of all the bird and mammal species recorded each day or at each location, plus lists of any other species of interest (such as plants where they are identified – for identification, make use of the iNaturalis app).

Always annotate the species lists with additional information such as how many individuals (estimated by order of magnitude), whether the observation was a sign, sight, sound or capture record, whether a species account has been written, whether a photograph was taken, and so on. If you do use symbols or abbreviations, you MUST provide a legend. Who will know what you mean in a hundred years?



GENERAL REMINDERS

Students are expected to actively participate in discussions and analyses of field activities, lectures and assigned tasks. You are expected to take class notes since the lecture notes do not cover all issues discussed in class. Some of the classes and readings will be given out sufficiently ahead of time. The days are structured to be outdoors as much as possible, with a lecture early in the day followed by fieldwork. On some nights, after dinner, you will be engaged in discussions or tasks related to the day's activities. Days can be long and packed, try to use your free time to get sufficient rest of your body and mind. Always remember to drink enough water (stay hydrated!) and bring small snacks (e.g., packed biscuits/cookies) during the field trips in case you get hungry.

Since this program is likely more intensive than you might be used to at your home institution, participation in all

components of the program is mandatory because there is little room to make up for lost time. Therefore, it is important that you are prepared for all land and water-based activities and that you bring necessary equipment for field exercises to get involved.

As time will be a restraining factor, it is recommended that you manage your free time wisely to ensure that you complete assignments, discussions, observations, journal-writing etc, while also getting enough rest. We will be away from modern classroom facilities most of the time, hence, you will have to learn to adjust yourselves to available resources to execute your work. Since we will be on the move most of the time and going into remoter areas during the field trip, briefing will be given frequently including discussing local culture, norms, and taboos that you should be sensitive to.

NOTES KEEPING FOR FIELD JOURNAL

Part of your responsibility in the Malaysia Field School Program is to keep a field journal. Good field techniques include the keeping of a written log or diary that contains observations and impressions of your trip and nature. A significant portion of your final mark will be based on the results of your journal-keeping efforts. You will be submitting your field journal for evaluation at the end of the program, and it will be returned to you as a permanent record of your expedition.

THE TRADITION OF A FIELD JOURNAL

The study of plants and animals in their natural environment requires observations at all levels of organization from the individual organism to the ecosystem, and includes behavior, life history traits, distribution, abundance, habitat, landscape, and all kinds of inter-relationships.

The field journal is the naturalist/ecologist's record of all these matters as they present themselves to the observer. It is a permanent record of observations and should be useful and comprehensible to others. Through the keeping of a field journal, you are training yourself in comprehensive and precise observation accompanied by careful & succinct description.

The standard field journal consists of three components:

JOURNAL: a narrative diary of daily observations, including locality information, weather and conditions and species lists;

SPECIES ACCOUNTS: running notes on individual observations of selected species;

CATALOGUE: a systematic and sequential list of all captures and collections, including reference numbers. This could also mean collecting of specimens by digital images and recording them as they relate to your catalogue.



IMPORTANT THINGS TO NOTE FOR THE FIELD TRIPS

Please have all your personal necessities with you, enough to last for at least the first couple of weeks of the field trip. We will be some distance away from any convenient stores during some stretches; hence, it is advisable that you are well-stocked for this duration.

Please pack all your belongings and take them for the whole field trip. We will provide space for everyone. For things that you do not wish to bring along, please pack them neatly, label them with your name and hand them over to any of the coordinators for safe-keeping. However, do not leave behind any valuables or important documents.

If you have any problems of any manner, at any time during or outside of the field trip, do not hesitate to speak to any of the coordinators or instructors. We are more than happy to assist and guide you.

Last but not least, enjoy yourselves, but at the same time always remember, stay responsible and **SAFETY FIRST**.

THE NOTEBOOK

The field notebook is the basis for your record keeping in a binded notebook (not in loose sheets, please buy a proper notebook before the trip). Get in the habit of looking around intelligently and writing down EVERYTHING of interest, all the time, whatever the conditions. Write notes at the time of your observations or you will forget.

Take good field notes. The key to this is **staying alert, engaged and questioning** all the time.

KEEPING A GOOD JOURNAL

Being organized, alert and disciplined are the keys to good journal writing. A good journal contains valuable scientific information that may be used by someone decades later. Allow time at the end of the day to write your journal, and make it a priority, even at the expense of observing time. Make transcribing field notes part of your daily routine. Don't be daunted by the task or spend hours in preparation. Just do it. Be legible, and as neat as you can, but don't make calligraphy a priority. Cultivate brevity. Quality, not quantity is the key. If you get behind, do not compound the problem. Better write a good account for today than spend the time trying to catch up from yesterday. Minimize repetition between the journal and species accounts.