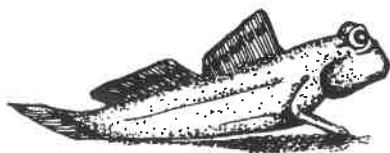


Mudskippers



Strange Creatures Of The Swamp



Mudskippers are usually found in mangrove swamps at the estuaries of rivers. The mud deposited by the rivers here is a suitable place for mudskippers to build their burrows. There is no shortage of food, as algae and small animals like worms, crabs and snails on which they feed are found in abundance in the waters and mudflats.

These strange creatures of the swamp are fish that do not behave like fish: they hop out of the water, "walk" across the mud and even climb trees. They are equally at home on land and in water.

Come to Sungei Buloh Nature Park, and don't forget to bring your binoculars. The best places in the Park to observe mudskippers are the Mangrove Boardwalk at the Visitor Centre and the Mangrove Arboretum. You'll be fascinated when you spot mudskippers- some veritable giants among them, lazing in their private mud pools at low tide.

The Park is home to at least five species of mudskippers- the Giant, Dark-gilled, Gold-spotted, Blue-spotted and Lanceolate Mudskippers. At high tide, these fish clamber up the still roots of mangrove plants to rest. Their weird bulging eyes lie close together on the top of their heads and are equipped with lower eyelids... so don't be surprised if you catch a mudskipper blinking at you!!

SWIM, HOP AND CRAWL, THIS FISH DOES THEM ALL

Using its powerful pectoral fins as legs, the mudskipper crawls around in the mud. When disturbed, it seeks the safety of water by using its tail to hop across the mud. Back in the water, it swims around like other fishes do, but keeps its head above water.

Sometimes the fish "treads water" by flexing its tail slowly from side to side, using its pectoral fins to maintain balance. When provoked, it flips its tail vigorously from side to side, and leaps across the water before settling back for a swim.

Can you breathe through your skin? The mudskipper can!! In water, the mudskipper breathes through gills like other fishes do. However, when on land, it carries around its own "air tanks": a mixture of air and water

in its gill chambers. The blood vessels in the gills absorb the oxygen as the water passes through the gills. When the oxygen is used up, a fresh mouthful of water is gulped in.

For added security, it has moist skin under which there is a rich supply of blood vessels. This enables the fish to breathe through its skin as well.

FINDING A MATE IN THE MUD

The mudskipper goes to great lengths to attract a mate. Each species of mudskipper has its own courtship style. The amorous Gold-spotted Mudskipper starts off by selecting a site on the mudflat not too near the other burrows, for he treasures his privacy. Then he builds a burrow by scooping out mouthfuls of mud and dumping the mud around the burrow entrance.

His house completed, the mudskipper casts his roving eyes around, and when he spots an attractive female, wags his tail and jumps around with his dorsal fins erect. The curious female edges closer for a better view, and this makes him show off even more. With his head held high, he puffs up his orange throat for her to see, then disappears head first into the burrow.

The female lingers coyly outside the burrow until he reappears and starts blowing bubbles her way. Falling for his bubbles, she follows him into the tunnel of love.

After mating, the pair emerge from the burrow. There she sits smugly at the edge of the burrow, while her mate scampers about defending the territory. He is kept busy chasing away rival males trying to grab his mate, as well as mangrove crabs out to usurp him from his home.

So there you have it: the intimate secrets of this most unusual creature. Come see this versatile fish in action at Sungei Buloh now.



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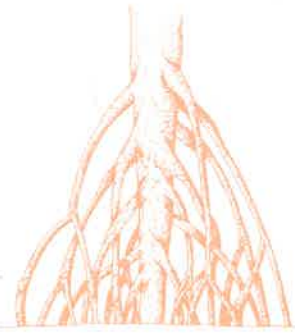
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Some mangrove species exhibit vivipary, that is, seeds germinate in the fruit while still attached to the plant. *Rhizophora* embryos germinate directly on the tree to produce seedlings with a long, javelin-shaped root. These seedlings eventually fall and become anchored in the mud below. In this way, the seedlings are not easily washed away by the tide.

ANIMAL LIFE

Buried in the mudflats are annelids and molluscs. On the mudflats and in the waters are crustaceans (crabs and prawns), fish (such as mudskippers; see previous article) and insects (ants, beetles and moths). On the trunks and leaves of trees are other life-forms such as crabs and shellfish, some of which are semi-terrestrial and migrate from the mudflats to the branches. Keep your ears peeled for the raucous call of the Collared Kingfisher, and look out for predators such as the Malayan Water Monitor and the White-bellied Sea Eagle. All these animals find their little niche in the mangrove ecosystem and cope well with the conditions within it.

To appreciate the flora and fauna of the mangrove ecosystem without getting your shoes muddy, walk along the Mangrove Boardwalk at the Visitor Centre. It is 500m long and visitors taking a leisurely stroll should take about 20 minutes to complete the route.

A WALK ON THE WILD SIDE

THE MANGROVE BOARDWALK

It is a commonly held belief that mangrove ecosystems are hostile, mosquito-infested places that should be cleared as they serve no useful purpose. This misconception can be dispelled upon a visit to mangrove areas. Mangrove ecosystems teem with life: insects, arachnids, crustaceans, molluscs, annelids, birds and reptiles abound.

Mangroves develop along sheltered coastlines where fine silt of a river has been allowed to settle. The roots of the mangrove trap silt and debris. When the detrital matter decays, an enriched mud is formed. This enriched mud forms good breeding grounds for fish, prawns and crustaceans.

In order to cope with these conditions, mangroves have developed special features. The unusual root systems of many mangrove species bear testimony to this. For example, roots of the *Rhizophora* species branch from the trunks above the water to help prop up the trees and to help the trees breathe. These roots extend seaward and act as breakwaters, preventing erosion of the coastline.

To cope with the problem of salinity, mangrove leaves are thick, fleshy and waxy. This helps to minimise water loss. Some species have leaves which can store the salt absorbed in crystalline form. When the leaves fall, the salt is lost.

PLANT LIFE

Mangroves are trees of tropical countries which grow on muddy land and near water. In Singapore, they are found in the northern and western parts of the main island and on Pulau Tekong, Pulau Ubin and some of the southern islands.

The conditions that mangrove trees have to endure are harsh. The mud is water-logged and anaerobic (that is, lacking in oxygen). Salinity is high and the constant ebb and flow of tides makes it difficult for roots to anchor.



The sun, sea and trees at the Boardwalk

FINDING YOUR WAY ABOUT THE PARK

To help visitors take in the sights and sounds of the Park, boardwalks, strategically positioned hides, screens and signs have been constructed along the walking trails.

Route One circles brackish water ponds where resident herons and migratory waders feed. Mangroves, coastal plants and all manner of grasses and wildflowers line the walking trail.

Route Two includes a boardwalk that passes through a stand of local fruit trees, masses of ferns and a sea of mangroves. Visitors will be able to spot resident herons perched on treetops squawking noisily. This trail also leads to the Tower Hide.

Route Three leads to freshwater ponds at the western end of the Park. Freshwater plants, waterbirds and a wide variety of other birds inhabiting what was formerly agricultural land can be observed.

Come to the Park and enjoy this treasure trove of natural wonders. Don't forget your hat, comfortable walking shoes, lots of drinking water and a pair of binoculars.



SITE STUDIES AT SUNGEI BULOH

Two pivotal roles of the Park are Conservation and Research. In recognition of the area as an important wetland site in Singapore, efforts are being made to maximise the carrying capacity of the reserve for birds and other wildlife. Carrying capacity refers to the number of birds the mudflats can support based on the food available. In addition, it is hoped that judicious research and management efforts made will contribute to ornithological and biological knowledge regionally and internationally.

One on-going long-term project, a joint study with the National Institute of Education (Nanyang Technological University), involves studying the carrying capacity of the mudflats of the Park. Changes in the levels of their food source, benthic (seabottom-dwelling) organisms found in the mudflats are being studied in relation to time and space. The feeding habits of the waders, in particular, the Common Redshank are also being monitored. Mud at different areas is sampled on a monthly basis to determine the number and type of benthic organisms in the ponds. Certain parameters are varied, such as vegetation cover and the frequency with which the ponds are flushed with sea water.

Any correlation between the number of waders feeding on the mudflats and the number of benthic organisms present will enable us to better manage the ponds so as to maximise productivity of the mudflats, in order to attract more birds to stay at Sungei Buloh.

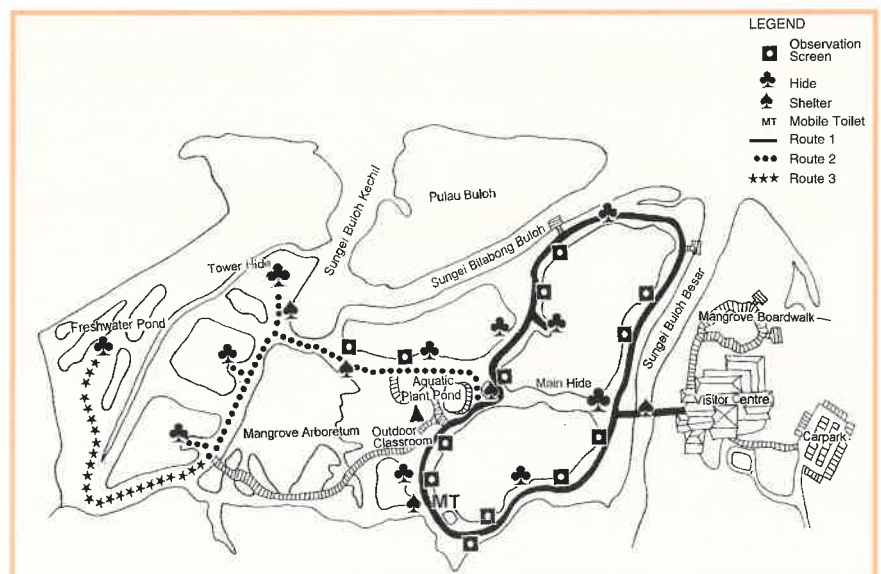
A preliminary mapping study is also being done to identify the different habitats

needed by the birds (waders and otherwise) for feeding, roosting and nesting, so as to better manage the Park to suit the birds' needs.

Basic inventory of the flora and fauna of the Park is being taken. Plant specimens collected are pressed and identified. A set of the more common specimens is kept at the Resource Room for educational purposes. With the information collected, a map of Park vegetation is being constructed. Collection and identification of the Park fauna is also in progress. A reference collection is being developed, with special emphasis on arthropods (animals with hard external skeleton and jointed limbs), fishes, amphibians and reptiles. The collection and listing of fauna is a joint study conducted with the Zoological Reference Collection (National University of Singapore).

The rate of colonisation and regeneration of mangroves at Pulau Buloh and the Visitor Centre is being studied. All mangrove trees at two study plots will be tagged and mapped. Their growth, death and regeneration will be monitored on a long-term basis. This project is being carried out together with a research team from the National Institute of Education (Nanyang Technological University).

The results of these studies would determine the future direction that park management policies take, hence the importance of understanding the Park, its varied inhabitants and habitats. If you would like to contribute to these efforts as a volunteer attached to the Scientific Department, call the Scientific Officer for more details.



Map of the Park

Activities



For The December School Holidays WHITHER THE WADERS?? The waders have arrived!!

Come see them at Sungei Buloh Nature Park and learn about their incredible journey from the tundras of Siberia, through the northern countries of Asia, across Indo-China and Thailand and down through Peninsula Malaysia.

Enjoy watching these birds and their antics in the cool comfort of our observation hides, scattered strategically throughout the Park. Here, you will be able to watch the birds without being seen by them. Signs placed in the hides provide valuable information on the birds.

Bring along your binoculars. Laminated, full-colour bird identification charts (\$1.50

each) can be bought from the Souvenir Shop. A bird identification key, providing guidelines for systematic identification of the more common waders, will be incorporated into the Information Kit. The Information Kit (\$1.60) contains ideas and materials for activities that can be carried out by groups and families. Get your copy from the ticketing counter during the school vacation.

10 days during the December school vacation have been set aside for birdwatching activities. The dates are 4-8 December and 11-15 December (Mondays to Fridays). On these weekdays, birdwatching sessions will

be conducted in the Main Hide. There will be 2 sessions per day: 1 at 9.30 am and 1 at 3.30 pm. Catch the audio-visual show in the Theatre at 9.00 am and 3.00 pm before proceeding to the Main Hide. In case of rainy weather, a slide presentation on the waders will be screened in the Theatre in place of the birdwatching activity.

So what are you waiting for? Come down to the Park today and be amazed at the feathered wonder that is the wader.

For more information, call the Education Department.

V.I.P. VISITS



Rear-Admiral Teo signing the guest book

Bright sunny skies and glorious weather greeted our visitors from across the Causeway when they came to the Park in July. Headed by Menteri Besar (Johor) A. Ghani Othman, the delegates took in the sights and sounds of the Mangrove Boardwalk and watched herons carvorting near the Mangrove Arboretum. The Menteri Besar gave the "thumbs up" for the Park, stating that Sungei Buloh is "an example that Johor could emulate. Well done."

Delegations from the ASEAN countries did a spot of wader watching when they dropped by in September. Led by Acting Minister for the Environment, Rear-Admiral

(NS) Teo Chee Hean, they watched these feisty birds in action on the mudflats from the Main Hide. In addition, Rear-Admiral Teo and the Minister of Development (Brunei), Pengiran Dato Seri Paduka Dr Ismail expressed interest in the day-to-day running of the Park and not unexpectedly, important issues such as pollution control.

P A R K Information

Opening Hours

7.30 am to 7.00 pm on weekdays
7.00 am to 7.00 pm on Sundays and public holidays

Admission

\$1.00 per adult
\$0.50 per child/student/senior citizen

AV Show

Mondays to Saturdays
9.00 am, 11.00am, 1.00 pm, 3.00 pm
and 5.00 pm
Sundays and Public Holidays
Hourly from 9.00 am to 5.00 pm

How to get to the Park

Bus 925 to Kranji Dam (15 minutes' walk from the Park) on Mondays to Saturdays and Park entrance on Sundays and Public Holidays

Sungei Buloh Nature Park

Neo Tiew Crescent
Singapore 2471

Tel: 793 7377 • Fax: 793 7271

BE A PART OF THE NEWSLETTER!!

If you've come to the Park before and would like to wax lyrical about the trip, here's your chance. Poem or prose, we welcome contributions from visitors on what they experienced while they were here. Photographs are welcome too.



Education

Watch science come alive in a classroom without walls! Come to Sungei Buloh Nature Park and experience the wonders of nature... do a spot of birdwatching, walk through a sea of mangroves, discover the wealth of life in a freshwater pond or watch vegetables grow. These are some of the many learning opportunities available to school groups. Contact the Education Department for more details.