NATURE WATCH

Official Magazine of Nature Society (Singapore)

Volume 17 No 4 Oct-Dec 2009

Featuring:

Hooked on Hawkmoths
Orchids in Myanmar
Birding Cuba
Hornbill Research
Sterculia

NATURE SOCIETY
(SINGAPORE)

MICA (P) 085/08/2008

Message from Editor

In my first issue as editor of *Nature Watch* (Volume 16/4) I wrote an appeal for contributions in this space. I know we have talented members and associates with exceptional knowledge and experiences, and I was hoping that they would share this with the rest of the nature community. This appeal is now starting to bear fruit.

For this issue, Dr. Leong Tzi Ming has contributed a unique and attractive presentation of the little-studied hawk moths of Singapore. The multi-talented zoologist author is also an exceptional photographer, so we have designed his material as a stand-alone pull-out section which readers can pin up and/or keep for future reference.

Iain Ewing has again offered to share his global birding experiences with us, this time from the somewhat enigmatic but picturesque country of Cuba. Botanist expert Hubert Kurzweil shows us some rare orchids from the remote parts of Myanmar, while amateur naturalist Tony O'Dempsey features one of his favorite local flowering plants.

We are especially appreciative in this issue to have the support of world-renowned ornithologist Dr. Pilai Poonswad. Her studies of hornbills in Thailand are highly respected and this new update of data and images will interest many in the region.

All this doesn't mean that readers should start showing complacency. On the opposite, I hope this success of sourcing membership-driven quality content will spur other members and followers of NSS to strengthen their support for the society and its official magazine. Please keep the stories coming.

A younger Dr. Pilai Poonswad with a younger editor in a hide in southern Thailand May 1998, waiting for a Helmeted Hornbill to appear at its nest nearby.

Thank you,

Morten Strange
Editor-in-chief
February 2010

Share with us

Your stories, articles, surveys, observations and brilliant photographs and send them to the address on page 1. If you are not sure, please send an e-mail to contact@nss.org.sg with a proposal and we will get back to you. Articles can be e-mailed across as a simple Word document (no funny fonts or colours or inserts, please) or saved on a CD and mailed with the illustrations as separate high res. files. Digital pictures must be in 300 dpi, absolutely sharp and as large as possible, jpeg compression is OK. Do NOT crop, brighten or sharpen, we will do all that as necessary. Thank you very much.

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Editor-in-chief
Morten Strange

Assistant Editor
Margie Hall

Designer
S.T. Leng

Contributing Writers, Photographers and Illustrators
Vilma D'Rozario, Iain Ewing, Tejas Ewing, Hubert Kurzweil, Leong Tzi Ming, Celine Low, Saw Lwin, Pete Morris, Tony O'Dempsey, Pilai Poonswad, Morten Strange

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Orchids in Myanmar

A field survey of the Putao region, Kachin State

Text and photos by **Hubert Kurzweil** & **Saw Lwin**

Together with his local partner, Saw Lwin, Hubert Kurzweil goes to a remote part of Myanmar in search of rare orchids. Between them they produce ground-breaking results, collecting, documenting and cataloguing many different varieties.

The orchid flora of Myanmar is one of the least known in South-east Asia. This is largely due to the political isolation of the country. In order to address this situation, we decided several years ago to undertake floristic research on the country's orchids. Myanmar covers 678.500km^2, which is more than Thailand and Peninsular Malaysia together, so in view of the size of the country we agreed to concentrate on a certain region, and Kachin State in the north appeared as the most interesting to us. Here large tracks of undisturbed forest still exist.

Apart from being poorly known, the orchid flora of Myanmar is also very rich and we estimate that around 1,000 different species occur in the country. This corresponds with the numbers in adjacent countries. The high diversity of the orchid flora is a consequence of the multitude of available habitats and different climatic zones.

From steaming hot lowland tropical rainforest in the south of Myanmar to the cool montane forest near the snow-line in the north, many different habitat types are found in the country. In fact, the far north of the country, the region where we have undertaken most of our fieldwork so far, is frequently referred to as the Myanmar Himalaya and is situated at more or less the same geographical latitude as the Nepal Himalaya.

Generally, many orchids as well as other plants belong to widespread Asian species, but there are also Malesian floristic elements (particularly in the south of Myanmar) and Himalayan floristic elements (particularly in the north). The high level of floristic diversity is reflected in the inclusion of Myanmar in the Indo-Burma and the Himalaya biodiversity hotspots of the US-based organisation Conservation International.

All of the large Asian orchid genera are represented in the country, among them *Dendrobium*, *Bulbophyllum*, *Eria*, *Coelogyne*, *Habenaria*, *Liparis*, *Cymbidium*, *Calanthe*, *Oberonia* and *Vanda*. The largest are the first two, with around 125 and 85 species respectively.

So far we have undertaken two collecting trips in the mountains around Putao in the northern-most part of Myanmar near the Tibetan border, on one trip heading to Naung Mung in the north-eastern region of Putao and on the other exploring the Hponkanrazi area to the west of Naung Mung.

Myanmar is currently opening up to foreigners and especially the central parts of the country are now easily accessible to non-Myanmar nationals. But large areas remain which are completely out of bounds to foreigners - areas close to the international borders with Thailand, Laos, China, India and Bangladesh.

The high level of floristic diversity is reflected in the inclusion of Myanmar in the Indo-Burma and the Himalaya biodiversity hotspots of the US-based organisation Conservation International.

Putao is accessible to foreigners, although a 'Restricted Area Permit' has to be obtained. To visit the Putao area non-Myanmar nationals are also required to join a registered local tour company. We chose Northern Safaris (Yangon) for this purpose.

The small town of Putao, only accessible from the air, is an ideal starting point for any expedition. The Headquarters of the Hkakaborazi National Park about 100km further north are situated in Putao – Hkakaborazi is Myanmar's highest mountain at 5,881m.

In the mountains around Putao there are no roads and you have to walk. To make life a little easier you can hire a truck to take you to the starting point and use porters to have luggage carried. Porters are cheap and reliable and are also very helpful in other respects. Apart from food, our provisions included newspapers for drying plants and spirit for preserving flowers. All this we bought at the local market there.

We had also brought some heavy equipment with us from Yangon, including a plant press, empty spirit bottles, an extensive selection of photographic equipment, books, maps, one laptop computer, as well as personal stuff.

From left: Musa sp. Family Musaceae; The terrestrial orchid *Calanthe plantaginea* was very common in one area; An attractive epiphytic species of Fam. Ericaceae, Agapetes sp.
Facing page: *Spiranthes sinensis* Family Orchidaceae, is an interesting terrestrial orchid. The small white or pink flowers are arranged around the floral axis like a spiral staircase.

From top: *Cymbidium eburneum*; *Vanda cristata*; Flower of the epiphytic orchid *Dendrobium nobile*.

We needed 13 porters in the beginning, and again about this number towards the end of our trips, when we had a large amount of collected plant material to carry.

On both of our trips we spent about ten days in the forest. After leaving Putao we first walked through cultivated land and secondary forest before reaching the undisturbed mountain forest. Unfortunately, although the forest cover of Myanmar is currently still considerably higher than in neighbouring India and Thailand, natural habitats are disappearing fast as in many other parts of the world.

The high mountains towering above us were covered in snow and ice but we stayed mainly in the forest in the foothills where the orchids are most diverse. And there were indeed many orchids, as in mountain forests in other parts of the world, not just in terms of different species but also in terms of numbers.

Many of the branches or entire trees were thickly covered in orchids and other plants, which sometimes become so heavy that branches break off or entire trees collapse under their weight. In fact, picking up orchids on fallen branches is a good way of collecting epiphytic orchids.

Both of our trips were during the dry season in January-March when rivers were quite empty making walking rather easy. However, there is also occasional rain in the dry season and the mountains are often shrouded in mist

We managed to collect a large amount of orchids, both terrestrial and epiphytic. We collected 2-3 specimens each of all orchids that we found, the flowering ones for pressing or preserving in spirit and the non-flowering ones in the living state.

The idea behind collecting live plants is to take them to a nursery hoping that they will flower in cultivation in the next few months or years so that we can identify them. Among the flowering orchids that we collected were the beautiful large-flowered *Dendrobium nobile*, *Vanda cristata*, *Eria marginata* and *Calanthe plantaginea*.

In addition we found also many other flowering orchids in the genera *Eria*, *Bulbophyllum*, *Coelogyne* and *Panisea*. The celebrated 'Black Orchid', *Paphiopedilum wardii*, is one of the many plants named after the famous plant collector Francis Kingdon-Ward, in fact he was the one who discovered it in the beginning of the 20th century.

The red *Coelogyne ecarinata* has an unusual colour for its genus (where the dominating flower colour is white or cream) and would be an interesting plant to introduce into cultivation.

In a wet spot next to a stream we found many plants of the widespread *Spiranthes sinensis*

Snow-covered peaks of the Hponkanrazi mountain range in the early sunlight.

Many of the branches or entire trees were thickly covered in orchids and other plants, which sometimes become so heavy that branches break off or entire trees collapse under their weight.

with its interesting inflorescences. Once we found a flowering orchid right next to a village and started unpacking our photographic equipment. As soon as the villagers saw us they ran off into the forest and came back with big bunches of more orchids, among them several different species, with a few in flower which was of course very welcome! We then spent over an hour in this spot, photographing all these orchids.

In the forest we also found many interesting plants other than orchids, like several species of *Rhododendron* and *Agapetes* (both Family Ericaceae), one *Musa* species (Family Musaceae) as well as some begonias.

Forest near the snowline is more sparse, less tall, with branches covered in a thick layer of moss, and the species composition is obviously different. Some temperate plants appear here,

Our porters were good tree climbers.

like species of *Abies* (Family Pinaceae). Epiphytic orchids do not occur here as it gets too cold at night; the highest epiphytic orchid was found at about 3,000m. But there are still several terrestrial orchids, such as species in the genera *Tainia*, *Calanthe* and *Goodyera*. We also assume that there would be several species in the genera *Habenaria* and *Peristylus*, but they would be dormant in this season.

The most important part of our work was to process our material in the evening. During the day we only put our plants into labelled collecting bags and made short field notes. But at the end of the day we labelled every single plant, photographed it, prepared herbarium sheets of the flowering specimens, put flowers into spirit and wrote detailed notes.

All non-flowering specimens got packed into boxes as they were taken to a nursery. It is necessary to cultivate the orchids inside of Myanmar, as the export of wild-collected orchids to Singapore is not allowed by either the Myanmar Forest Department or CITES (an international agreement that regulates the transfer of endangered plants and animals over borders). This arrangement is also in line with the procedure in many other countries in the world. It is our hope that one day these new varieties can be exported from the Myanmar nursery as cultivated plants. In the meantime, export of our herbarium specimens and preserved material to Singapore is possible.

We are planning publications on the orchids of the region but these will obviously not be based on our collecting activities alone. Enormous collections were accumulated by the early plant collectors Francis Kingdon-Ward, George Forrest, Reginald Farrer, Rev. Charles Samuel Pollock Parish and others who worked in British colonial times. Their collections are now mainly housed in British herbaria (London, Edinburgh).

Based on a thorough examination of all of the material that is available to us we plan to write a detailed checklist of Myanmar orchids and a field-guide to the orchids of the northern parts of the country. We also envisage writing a bilingual guide to the genera of Myanmar orchids for the use of Forest Department officials, tourists, orchid growers and university students.

However, our studies are not simply aimed at increasing the level of scientific understanding of the orchids in this biodiversity-rich region. We are also undertaking our studies for the benefit of communities in Myanmar, as orchids play an important role in the local horticultural trade, as well as in the recently established and ever-increasing local eco-tourism industry.

The small town of Putao, only accessible from the air, is an ideal starting point for any expedition. The Headquarters of the Hkakaborazi National Park about 100km further north are situated in Putao – Hkakaborazi is Myanmar's highest mountain at 5,881m.

Arriving back in Putao after a successful expedition in the mountains.

An overnight hut built by the villagers who sometimes walk through the area.

This remote village, Ziyadam, was our base for several days.

Acknowledgements *During both trips we made use of the facilities of the Hkakaborazi Environmental Education Centre and Park Headquarters in Putao and we would like to thank its staff. We would furthermore like to acknowledge the Myanmar Forest Department for the granting of a collecting permission and the Myanmar Ministry of Defence for permission to enter the area.*

Hubert Kurzweil*, Singapore Botanic Gardens, is an Austrian botanist who moved to Singapore four years ago. Currently he focuses on floristic and taxonomic studies of the orchids of mainland Asia, particularly those of Thailand and Myanmar. Hubert has been a member of NSS for several years.*

Saw Lwin*, is a Central Executive Member of the Myanmar Floriculturist Association in Yangon, Myanmar, and is an authority on the orchids of his country. Saw has taken part in numerous biological expeditions in northern Myanmar.*

Birding Cuba

A social and environmental time capsule

Text by **Iain Ewing** Photos by **Tejas Ewing**

This time Iain Ewing and his son, Tejas, take us to the little visited country of Cuba in search of endemic birds - foremost of all the diminutive Bee Hummingbird.

When you see birds and beaches, sun and sand, as well as cars with tail fins, you know you are in Cuba. My son, Tejas, and I arrived at the Havana airport on 28 December, 2008, and there to meet us was our guide, Orestes "El Chino" Martinez. Within minutes of clearing customs we had our first lifer of the trip, the Antillean Palm-Swift flying above the airport buildings.

Heading for Vinales National Park, in the northwest of Cuba, with El Chino driving us along the main east-west highway, we found that the road was almost empty but the few cars we did see were usually enormous American sedans from the 1950s, with the flashy tail fins typical of the era. Perhaps because of the lack of traffic, in and around ponds beside the highway we got good views of numerous water birds as well as Turkey Vulture and Snail Kite. In the sugar cane fields were Caribbean endemics like Loggerhead Kingbird and Red-legged Thrush, the Cuban endemic Cuban Blackbird and many other birds.

The next day we enjoyed some of the best birdwatching of our lives. Between dawn and dusk some of the highlights included: Western Stripe-headed Tanager (one of only three

The traffic in Cuba is generally light.

Bare-legged Owl *Gymnoglaux lawrencii.*

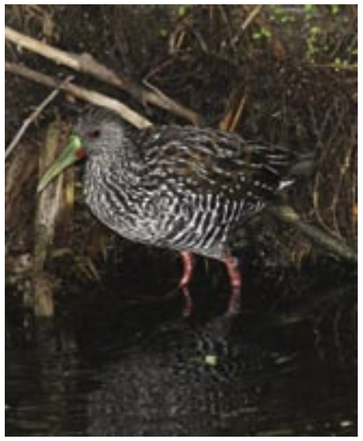
Cuban Trogon *Priotelus temnurus.*

Cuban Pygmy Owl *Glaucidium siju.*

All photos on this page: Pete Morris

Cuban Tody *Todus multicolor.*

Grey-headed Quail-Dove *Geotrygon caniceps.*



Spotted Rail *Pardirallus maculatus.*

tanagers found on Cuba), Red-legged Honeycreeper, and Yellow-faced Grassquit. We had our first sightings of some Caribbean endemics: Great Lizard-Cuckoo, Cuban Emerald, West Indian Woodpecker, Crescent-eyed Pewee, Cuban Bullfinch, Cuban Grassquit, Tawny-shouldered Blackbird, Greater Antillean Grackle and Greater Antillean Oriole.

We also saw some superb full Cuban endemics: Cuban Woodpecker, Cuban Solitaire, Cuban Vireo, Yellow-headed Warbler and, in the twilight after the sun went down, Bare-legged Owl and Cuban Pygmy-Owl. So, in one day, we had added to our trip list 42 species, 29 of which were lifers! Not only that, but some of these birds, like the Cuban Trogon and the Cuban Tody, really were amazingly beautiful and allowed us wonderful, close views.

In the years since the revolution which brought Fidel Castro to power in 1959, Cuba has not developed at the same pace as the rest of the Caribbean. In many ways tourism is still in its infancy. There are very few hotels once you get away from Havana, and the best places to stay are in the homes of Cubans, who get a license from the government to rent out one or two rooms to tourists.

The *casa particulier* that we stayed at in Zapata was by the beach, and very comfortable, but what was spectacular was the food. Every day, for lunch or dinner, we had fresh, succulent, delicious lobster, and when we were not eating lobster, we were eating fantastic fresh fish. In fact, everywhere we went in Cuba the food was superb and so was the service. The people whom we met were uniformly friendly and polite and most of them spoke good English.

Because of the slower pace of development there is a lot of unspoiled nature on the island. Many of the places we visited were designated as national parks and there does not seem to be unregulated development. Since there are very few cars and not much industry, the air and the water are clean.

The next day, we drove to the Cienaga Zapata – the world-famous Zapata swamp – via Soroa and La Guira National Park. This was, in many ways, the highlight of our trip. It is the home territory of El Chino, and he knows the swamp like the back of his hand – which is a good thing as, once you get into the swamp, it would be really difficult to get out on your own.

The species we were hoping to see included some of the most sought-after birds in the life list of any bird-

Cienaga Zapata – the world-famous Zapata swamp – is the home territory of [our guide] El Chino, and he knows the swamp like the back of his hand – which is a good thing as, once you get into the swamp, it would be really difficult to get out on your own.

watching addict: the Zapata Wren, the Zapata Rail, Gundlach's Hawk, and the smallest bird in the world – the Bee Hummingbird. We knew that these birds would not be easy, but El Chino was amazing.

During the three full days we had at Zapata he helped us get great views of Gundlach's Hawk, Spotted Rail, the endemic and very shy Gray-headed Quail-Dove, the spectacular Cuban Parrot, the Stygian Owl and the endemic Greater Antillean Nightjar.

When it came to finding the Zapata Wren, El Chino was the undisputed expert. He is now 52 years old and he has been studying this bird since he was a teenager. When he found the first nest, after spending each day for several months up to his chest in the water of the swamp, he was so excited that he had a heart attack and his family had to put him in the hospital for several days while he recovered.

On the first day of the New Year, we set out before dawn into the swamp. Arriving at our guide's favourite spot, we waited in anticipation as the sky brightened. Suddenly, El Chino motioned for us to be quiet. He had heard the wren singing. The song was, to me, unexpectedly loud and musical. We could see exactly the bush, in amongst the reeds and the water, where the bird was sitting and singing – but we couldn't see the bird. It was very frustrating!

El Chino motioned for us to stay where we were. He started softly playing the call of the wren on his tape recorder whilst retreating down the trail. The tactic worked. Perhaps the bird felt that he had chased an intruder away, and

The Bee Hummingbird

The world's smallest bird

Photo: Pete Morris

The Bee Hummingbird (*Mellisuga helenae*) is found only on Cuba and is the smallest bird in the world. It is 5 cm long and weighs an incredibly low 1.8 grams, which is about the same as a Singapore 5-cent coin! The male in the photo has iridescent feathers and lateral plumes that sparkle and change colour as the light falls on them. During breeding the head is almost crimson. The female is somewhat larger with greenish upperparts and whitish underparts. Like all members of the hummingbird family, it is lightning fast with jerky flight, accelerating and stopping in the air with amazing speed. The wingbeat is 80 times per second, too fast for the human eye to see. It feeds mainly on nectar and might visit 1,500 flowers in one day to collect enough energy to make it through the night.

Although ecologically similar, hummingbirds are not related to our sunbirds at all. They are in a very different order, Apodiformes, which also includes the swifts and treeswifts. With their specialized feeding manners and extreme high metabolism they are tough to keep in captivity. Jurong BirdPark has never had much luck with this, and an escapee hummingbird has never been recorded in Singapore.

he came out into the open and sang proudly. He was joined by his mate, and we had priceless views of them singing together.

We spent the next hour looking for the Zapata Rail. Suddenly, El Chino froze. He could hear the Zapata Rail calling no more than 3 metres from us in the reeds. He played the rail's call and it called back. There was another call also – a Spotted Rail. After a few minutes we had a view of the Spotted Rail, but the Zapata Rail never showed. It was a true skulker. El Chino told us not to be disappointed. After all, he said, he had only seen it about five or six times in his life. Zapata was also where we found the ultimate prize of a Cuban birding trip, the Bee Hummingbird, the smallest bird in the world.

The Bee Hummingbird can be relatively easy to see during the main breeding season in March and April, but is notoriously difficult to see at other times. On our third and last day at Zapata we were starting to feel a bit anxious, and as the afternoon wore on, without any Bee Hummingbird, we were beginning to worry that we might miss it. Finally, we went back to a place we had visited each day, and we both had fleeting glimpses of it. That night, the lobster and beer tasted better than ever!

After all the excitement of Zapata, our trip was not over yet. In the next three days we visited the eastern part of Cuba, where El Chino helped us find a new selection of lifers. It was amazing to go walking with El Chino and be in a wooded area with not a bird in sight. Suddenly he would start making a squeaking sound with his lips, and twenty or thirty warblers squeaking back would surround us. It was as if he really could talk to the birds!

The final part of our trip had nothing to do with birds, but even the most passionate birdwatcher could not miss Havana. Founded in 1514 by Diego Velasquez de Leon, it became one of the main ports and commercial centres of the Americas. A city of great beauty and culture, back in 1958, before the revolution, it had more movie theatres than New York. There are a multitude of buildings, and sometimes even whole streets, in various architectural styles from colonial to Art Nouveau to Art Deco. On our last day, El Chino took us to Lenin Park, where we were able to see our final lifer of the trip, the Caribbean Coot.

In only twelve wonderful days, we had met great people, eaten great food, enjoyed great sightseeing, and seen a total of 112 birds, including 63 lifers, and 20 of the 22 Cuban endemics. We missed the Zapata Rail and also the Blue-headed Quail-Dove. We also missed the Cuban Martin, as it winters in South America, and only comes to Cuba in the summer to breed. But I am actually glad we missed them, as now we have a reason to return to Cuba again, and have another great trip with El Chino.

Many of the places we visited were designated as national parks and there does not seem to be unregulated development.

Iain Ewing *is a long-time member of NSS and a member of the NSS Advisory Council. He is CEO & Principal Trainer of Ewing Communications Pte Ltd. He travels 220 days a year around the world on business and to observe birds and nature.*

Travel notes *We flew from Panama City to Havana on Copa Airlines, and from Havana to London via Paris on Air France. From the time we arrived in Cuba and until we left, we only paid for our food and beer (which was very reasonably priced). El Chino arranged all our accommodation, the car rental (which is not cheap, as there are not many new cars in Cuba), and did all the driving. In Havana, you have an excellent choice of beautiful hotels in renovated colonial mansions. Outside of Havana, we stayed in* casas particuliers*, and they were all clean and comfortable, with good food. El Chino is definitely one of the best bird guides in the world, truly passionate and tireless, and he does his best to make sure you see all the birds on your list. If you are traveling alone, estimate about S$300 per day for everything. You can contact El Chino at: chino.zapata@gmail.com*

Editor's note *Since Iain and Tejas did not take many photographs of the birds they saw on Cuba, I had to appeal to an old friend for visuals. Pete Morris always helped me with my bird books when I did those in the 1990s. He was a young and extremely talented British naturalist and wildlife photographer then. Today Pete is a not-so-young and extremely talented British naturalist and wildlife photographer, and he is still willing to help me. Look at his amazing itinerary on http://www.birdquest.co.uk/ourteam.cfm?team=9. Pete conducts wildlife tours on seven different continents within a year plus!*

MAIN REFERENCE

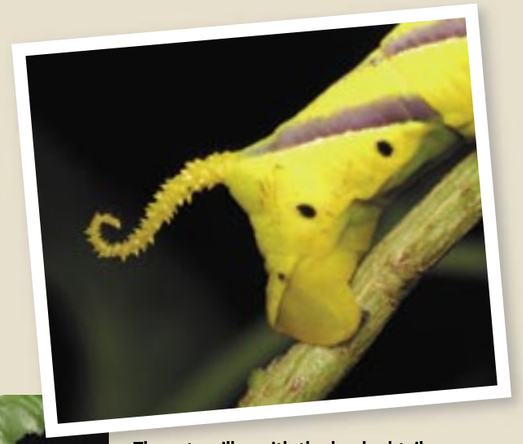
Raffaele, H. et al. (1998) *Birds of the West Indies.* Christopher Helm, London.

Special Pull-out Section

Hooked on Hawkmoths

Text and photos by **Leong Tzi Ming**

While our local butterflies have been well documented, the moths remain poorly studied. Leong Tzi Ming has tried to understand them better, beginning with the hawkmoth family.



The caterpillar with the hooked tail on top of the page is an *Acherontia lachesis*, i.e. the same animal which later turns into the mature moth on the cover of this magazine!

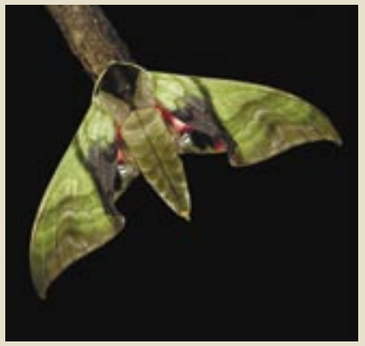
Hawkmoths are named after predatory birds, most certainly due to the elegant resemblance of their wings, when fully outstretched, to those of a raptor. They belong in a family of their own known as the Sphingidae, named after the Egyptian Sphinx. This family name makes reference to the characteristic upright posture adopted by many sphingid caterpillars when alarmed. Most hawkmoth caterpillars also possess a tail horn at their rear end, which comes in a variety of shapes, sizes and textures.

The adult moths are relatively strong and skillful flyers, equipped with a long 'tongue' (proboscis) for inserting into flowers and sucking up nectar. On quiet evenings you may have caught brief glimpses of a small moth darting from flower to flower, hovering with extremely rapid wing beats. That would probably be the Hummingbird Hawkmoth (*Macroglossum* species), which is one of the most diverse genera within the sphingids. On rare occasions you might even be privileged to witness a mating pair! When hawkmoths mate, the tips of their abdomens will unite, with the male often suspended beneath the female.

***Daphnusa ocellaris* Mating.**

Sphingidae of Singapore

Around the world, at least 1288 species of hawkmoths are known. In Singapore, the sphingid diversity exceeds 45 species. Some species appear to be confined to the remnant forests within the Central Nature Reserve, as their caterpillars only feed on the leaves of certain types of host plants, such as oaks or dipterocarps. Other species are less fussy feeders, consuming a wider variety of plants. These hawkmoths tend to have a much broader geographic range due to their adaptability. Check the centerfold selection of species, all photographed in Singapore, and see if you recognize any.



***Callambulyx amanda* from Borneo.**

Hummingbird Hawkmoth.

Hawkmoths of Singapore

Photos by **Leong Tzi Ming**

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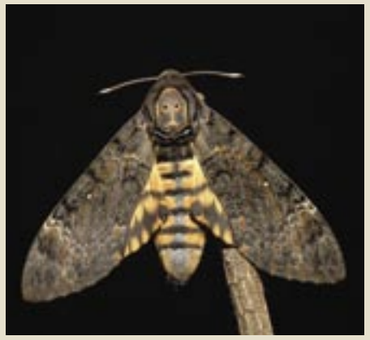

Acherontia styx medusa


Ambulyx substrigilis


Daphnis hypothous


Enpinanga vigens


Macroglossum sitiene


Theretra clotho


Acosmeryx shervillii


Amplypterus panopus


Daphnis nerii


Eupanacra automedon


Neogurelca hyas


Theretra latreillii


Agrius convolvuli


Cechenena helops


Daphnusa ocellaris


Eupanacra mydon


Pergesa acteus


Theretra nessus


Ambulyx moorei


Cypa terranea


Enpinanga borneensis


Eurypteryx bhaga


Psilogramma increta


Theretra suffusa

Miracle of Metamorphosis
Prior to entering slumberland as a pupa, hawkmoth caterpillars need to feed furiously in order to stock up on sufficient nutrients and energy required for the tedious process of transformation. Their caterpillars tend to be rather conspicuous when crawling about in search of fresh, juicy leaves to chew on. Some of them display striking false eyes (ocelli), designed to frighten off any potential predators. When the caterpillar's appetite has been finally satisfied, it then proceeds to the pupal stage, enshrouding itself in a hard protective casing. Some species have an exceptionally long proboscis, so a dedicated structure is required to house the organ as it develops.

A typical hawkmoth normally spends two to four weeks as a pupa, depending on the size of the species as well as the ambient temperature. Just before it is due to 'hatch' out from within, the pupa often attains a darker shade, especially around the wing region. Whenever a healthy hawkmoth successfully crawls out, climbs up and stretches its wings to the fullest, it is an opportunity to sit back and appreciate the subtle beauty of such refined symmetry. It is a time to contemplate the miraculous journey it has experienced, the countless cycles since its species first appeared on our living planet. So, if you have the chance to adopt a hawkmoth caterpillar, just ask yourself: why not? Who knows, you just might get hooked!

***Macroglossum sitiene* caterpillar.**

***Pergesa acteus* pupa.**

***Theretra suffusa* pupa.**

***Eupanacra automedon* caterpillar.**

***Cechenena helops* caterpillar.**

Dr. Leong Tzi Ming *(above) has been constantly distracted by many pretty moths during his nocturnal forays into the forest to survey wildlife. Like a 'moth to a flame', he was lured by their beauty and has showered endless attention upon their larval stages and their preferred host plants. Although frogs might be his first love (see* Nature Watch *Vol. 17/3), hawkmoths will always be one of his hot favourites.*

Acknowledgements *I am grateful to Ian J. Kitching (The Natural History Museum, London) for being a constant and generous wellspring of sphingid information and advice. Special thanks to Vilma D'Rozario for her regular updates on the hawkmoths she encounters and the caterpillars she rears.*

Hornbill Research in Thailand

Text by **Dr. Pilai Poonswad** Photos by **Thailand Hornbill Project**

Hornbills are well known as one of the most magnificent bird groups in Asian tropical forests. As flagship species, their presence and status reflect the health of the forest ecosystems. Here Dr. Pilai Poonswad provides an update on the important research and conservation work going on in Thailand.

Research sites

Research on hornbills in Thailand has been carried out by the Thailand Hornbill Project (THP), based at the Faculty of Science, Mahidol University, and supported by Hornbill Research Foundation (HRF) for the past twenty years. The THP has conducted ground-breaking research on the breeding biology of hornbills, including their nesting behaviour, nest characteristics, nest plaster materials, food and feeding and breeding success, with further studies continuing on home range, nutrients, influence of availability of suitable nest cavities and dispersal. Long-term monitoring of breeding status was conducted for four hornbill species in Moist Evergreen Forest (70 km^2) at Khao Yai National Park (KYNP), six species in Hill Evergreen Forest (132 km^2) and in Mixed Deciduous Forests (248 km^2) at Huai Kha Khaeng Wildlife Sanctuary (HKK), and six species in Tropical Rain Forest (90 km^2) at Budo-Sungai Padi National Park (BSNP). Hornbills breed once a year. The breeding season at KYNP and HKK is from January to May, whilst at BSNP it is from March to July. Researchers have observed 2,703 nesting-cavity years at KYNP since 1981, 1,615 at HKK since 1990, and 1,437 at BSNP since 1994.

Nesting habits

When nesting, female hornbills seal themselves into a cavity of a large tree. Among 23 genera of nest trees at KYNP, the most important were *Dipterocarpus* and *Cleistocalyx* (formerly *Syzygium*). In HKK, major nest trees are *Cleistocalyx*, *Tetrameles* and *Dipterocarpus*. In BSNP, the major nest trees are Dipterocarpaceae (*Hopea*, *Shorea* and *Nelobalanocarpus*), but *Hopea* is the most important genus, accounting for 40%. Nest plaster material comprises food debris, wood chips, decayed wood and mud. The shape of nest entrances is oval or elongated, and the nest cavity measures about 50 cm deep x 40 cm wide x 100+ cm long.

Rhinoceros Hornbill (*Buceros rhinoceros*), female breaking out of nest

Hornbills are unable to excavate their own nest cavities, as do woodpeckers. But wood-decaying fungi play key roles in development of cavities in trees. Our study done in KYNP (2004-2008) found that the number of trees with at least one cavity was 15.5% in *Dipterocarpus* and 13.7% in *Cleistocalyx*.

Of a total of 1,137 fungal isolates (i.e. isolated samples) from these tree genera, the highest number was from *Dipterocarpus* (565 isolates) out of a total of 65 species, 49 genera, 31 families and 4 phyla that were identified. Forty species were isolated from live *Dipterocarpus*, 51 from *Cleistocalyx*, 11 from dead *Dipterocarpus* and 10 from dead *Cleistocalyx*.

Apart from these, there were 11 species (16.2%) found exclusively in *Dipterocarpus* and 20 species (29.4%) in *Cleistocalyx*. Four species (6.15%) were found to be common among all these tree species. Identified fungi involved in creating the cavities were almost all soft rot fungi (97%), i.e. *Trichoderma* spp., *Gliocladium* spp. and *Fusarium* spp. and a few white rot fungi (3%), i.e. *Sporotrichum spp*. and *Coprinus sp*.

Natural damage to nest trees and nest cavities obviously affects the breeding success of hornbills by reducing availability of suitable nest cavities. The shortage of nest cavities results in nest competition at KYNP, incidents of which were recorded for as high as 33% of the cavities available. The need for nest improvement by our field staff is 50% in trees of *Dipterocarpus*, 29% in *Cleistocalyx* and 21% in others.

A nest tree is a tree with a cavity and observed hornbill activity, not all of those turn out to be suitable. In KYNP, 201 nest trees were found. Annually, over 26 years and without repair, 35 nests (72% of 50 suitable trees) were used and produced an average of 42 chicks. After 75 nests were repaired, over 16 years, an additional 23 chicks were fledged annually. The average life span of a cavity was about 9 years, but after repair it was extended for another 4 years. The main causes of unsuitability were sunken nest floors (50%) and narrowed or closed entrances (40%).

At HKK, 63 nest trees in Hill Evergreen Forest were located, and 148 in Mixed Deciduous Forest, 211 in

Helmeted Hornbill (*Rhinoplax vigil*), male at nest.

total. Annually, over 17 years, only 26 nests (86% of 31 suitable sites) were used and produced 19 chicks (49% success). After 31 nests were repaired over 5 years, an additional 12 chicks were fledged annually. Average life span of a cavity in trees at Hill Evergreen Forest was 6 years, whereas in Mixed Deciduous Forest it was slightly longer at 8 years. In Mixed Deciduous Forest, the unsuitability factors of 19 nests were sunken nest floor (41%) and narrowed nest entrance (36%), while in Hill Evergreen Forest for 12 nests sunken nest floor was 79%.

In Tropical Rain Forest at Budo Mountain, a part of BSNP, 166 nest trees were recorded. Annually, over 15 years, 37 nests were used and produced at least 29 chicks (71% success). The average life span of a cavity was 7 years, and sunken floor was the main cause of unsuitability (63%).

Food and seed dispersal

Although hornbills are omnivorous, their main diets are fruits, varying between 60-95% of the total diet depending on species. Research found that fruits are an important source of all nutrients, especially fat, for four hornbill species at KYNP. Ripe fruits of 139 plant species, from 76 genera and 36 plant families were recorded in the diet of hornbills.

In the hornbill's annual life cycle, fruit species consumed were: 22 species during the pre-breeding season; 63 species during the breeding season and 65 species during the non-breeding season. Major food-plant families were *Lauraceae*, *Moraceae*, *Annonaceae* and *Meliaceae*, but we suggest that delivery of animal protein may be linked, in some way, to breeding success. Animals in the diet comprised 70 species belonging to various groups, including insects and arthropods, amphibians, reptiles, mollusks, crustaceans, fishes, mammals and birds.

Hornbills are able to store many fruits per feeding in the esophagus and stomach, and then regurgitate their seeds as they move, making hornbills significant seed dispersal agents.

To clarify the effect of hornbill loss on seed dispersal in tropical forests, research was done at BSNP and Hala-Bala Wildlife Sanctuary (HBWS) in southernmost Thailand (2005-2008). Mahidol University Government Fund, National Center for Genetic Engineering and Biotechnology (BIOTEC) and HRF, supported the research. The results showed that hornbills consumed at least 89 fruit species and tended to ignore well-protected fruits, fruits of small trees, green-brown fruits, very small fruits (<10mm in diameter), or very large fruits (>40mm in diameter).

Although hornbills had clear feeding preferences for numerous fruit varieties, they also seemed to be quite flexible in eating whatever was available in the forest. Additionally, hornbills also moved over large ranges, 4-35 km² depending on the species, thus enhancing seed dispersion. Therefore, it was predicted that with fewer dispersal agents, there would be less seed removal, higher seed predation and less recruitment of large-seeded plants in fragments than in continuous forests in southern Thailand.

Territories and densities

Studies of home range size for individual males of three hornbill species monitored using radio telemetry at KYNP (1998-1991) revealed that the home range of Great Hornbill was 3.7 km², White-throated Brown Hornbill 4.3 km² and Wreathed Hornbill 10 km2 in the breeding season. In the non-breeding season, the range size of the Wreathed Hornbill (28 km²) was greater than that of the Great Hornbill (14.7 km2). In Hill Evergreen Forest at HKK, the year round home range and habitat utilization of Rufous-necked Hornbills (2004-2006) was 15 km² and of Brown Hornbills was 33 km². At Budo Mountain, estimated mean home

The three areas of study

Bushy-crested Hornbill (*Anorrhinus galeritus*) Hornbill at nesting tree.

1 **Khao Yai National Park** is situated in northeast Thailand (14°5′-35′ and 101°5′-52′E). It covers an area of 2,168 km². Approximately 90% of forest cover (evergreen forest) are suitable for four species of hornbills. This is the 2008 breeding success of four hornbill species in our study area within the park.

Location	Hornbill species	No. existing nest	No. sealed	No. success	% Success of sealed
Khao Yai N.P.	Great *Buceros bicornis*	43	29	29	100
	Wreathed *Rhyticeros undulatus*	35	16	15	94
	White-throated Brown *Anorrhinus austeni*	24	13	13	100
	Oriental Pied *Anthracoceros albirostris*	*51*	*29*	*29*	*100*
	Total	**153**	**87**	**86**	**99**

2 **Huai Kha Khaeng Wildlife Sanctuary** is situated in western part of Thailand (15°00′-35′-15°50′N and 99°00′-99°28′E). It covers an area of 2,780 km². Approximately 75% of various forest types (including monsoon evergreen, hill evergreen, mixed deciduous forset and secondary growth) are utilized by 6 species of hornbills. This is the 2008 breeding success of five hornbill species in our study area, no nest of Wreathed Hornbill was found.

Location	Hornbill species	No. existing nest	No. sealed	No. success	% Success of sealed
HKK Wildlife Sanctuary	Great	21	18	12	67
	Rufous-necked *Aceros nipalensis*	10	4	4	100
	Plain-pouched *Rhyticeros subruficollis*	7	5	5	100
	Tickell's Brown *Anorrhinus tickelli*	8	6	6	100
	Oriental Pied	25	21	20	95
	Total	**71**	**54**	**47**	**87**

3 **Budo Mountain** is a part of Budo-Sungai Padi National Park, which is situated in southern Thailand (101°30′-101°40′E and 6°21′-6°35′N). It covers an area of 189 km². The area is covered by tropical rainforest, but is experiencing heavy encroachment and conversion to fruit and Para rubber plantation. Approximately 40% of the remaining forest supports 6 species of hornbills. This is the 2008 breeding success of the six hornbill species in our study area.

Location	Hornbill species	No. existing nest	No. sealed	No. success	% Success of sealed
Budo Mountain	Great Hornbill	51	18	16	89
	Rhinoceros Hornbill *Buceros rhinoceros*	38	6	3	50
	Helmeted Hornbill *Rhinoplax vigil*	9	1	1	100
	Wreathed Hornbill	11	1	1	100
	Bushy-crested Hornbill *Anorrhinus galeritus*	11	2	2	100
	White-crowned Hornbill *Berenicornis comatus*	9	0	0	0
	Total	**129**	**29**	**23**	**79**

range of fledglings of Great Hornbills (2006) was 2.1 km² and the core area was 2 km². Differences in range sizes of different species may relate to breeding strategy and differences in diet within each study area. To gain more detailed insight into home range studies, movement patterns and habitat utilizations of hornbills in the western and northeastern forests, GPS Satellite Telemetry is currently being used, with financial support from PTT Exploration and Production PCL.

Through awareness of various ongoing threats to hornbill populations, including habitat destruction, poaching and felling of potential nest trees, a five-year grant (2004-2008) from BIOTEC was received. It was for a study of the species diversity, genetic variation and population sizes across the fragmented forest landscape in 12 forest complexes, with intensive study in three main sites from different geographic regions, including the Western Forest Complex (WEFCOM), KYNP and BSNP, all, important habitats for hornbills.

Population density of four species in Mixed Evergreen Forest at KYNP (1,965 km²) was estimated at 32 individuals/km² and for 6 species in Mixed Evergreen Forest, Mixed Deciduous Forest, Hill Evergreen Forest and Dry Dipterocarp Forests at HKK (2,697 km²) was estimated at 42 individuals/km². In the Tropical Rain Forest at BSNP (189 km²), the estimated population was highest at 47 individuals/km². The differences in densities of hornbills between these study sites may be due to differences in the area, type and perhaps the quality of these forests.

Population studies

The genetic variation and differentiation of Great Hornbill populations living in three forest habitats (HKK, KYNP and BSNP), which differ in patch size, habitat integrity and disturbance were compared. Microsatellite DNA markers from Great Hornbills were applied as a tool to track desirable traits. Thirteen polymorphic microsatellite markers were isolated and characterized.

The results indicated that Great Hornbill populations of KYNP showed no significant genetic differentiation at all hierarchical levels and therefore were considered as a single population. Since all Great Hornbill population levels in three different types of forest habitats at HKK showed significant partitioning of genetic divergence, it was postulated that these three subpopulations have different local adaptability for each area.

At Budo, there was statistically significant genetic differentiation present among and within individuals inside the region, but not between subpopulations, and this implied that these three subpopulations in Budo were recently separated.

Comparison of genetic divergence among Great Hornbill populations in three geographic regions (HKK, KYNP and Budo) showed high significant genetic differentiation. Great Hornbill populations of KYNP and HKK showed the least genetic divergence, with the largest divergence observed between populations of KYNP and Budo. These genetic divergences corresponded well to the isolation by distance between those regions.

Phylogenetic relationship among 13 hornbill species in Thailand was determined using the mitochondrial DNA sequences of the complete cytochrome b gene and a D-loop region. The phylogenetic trees indicated that the genus *Rhinoplax* (Helmeted Hornbill), a member of the large-casqued hornbill group, is most closely related to the hornbills of genus *Buceros* (Great and Rhinoceros Hornbills).

Therefore, Helmeted Hornbill is presumed to be the oldest or immediate ancestor of Great and Rhinoceros Hornbills. Conversely, the White-crowned Hornbill (*Berenicornis*), an intermediate-casqued hornbill, was shown by the analysis to be more related to *Buceros* than any of the other species. For the small-casqued hornbills of *Rhyticeros* genus, Wreathed Hornbill (*R. undulatus*) and Plain-pouched Hornbill (*R. subruficollis*) are in the same clade, indicating closely related hornbills of similar shape and color of their casques. This group of hornbills has Rufous-necked Hornbill (*Aceros nipalensis*) as their common immediate ancestor or, in other words, Rufous-necked Hornbill is a living ancestor to hornbills of this linage.

To understand the origin and radiation of Asian hornbills (Bucerotiformes), a dated phylogeny of hornbills using mitochondrial DNA sequences of the cytochrome b gene was compiled. The study included all 15 genera and 31 species of Asian hornbills (23 additional species in the order occur in Africa only).

It was discovered that all clades leading to frugivorous hornbills originated in the mid-Eocene (~48 Millions of years ago) and this explosive radiation coincided with a remarkable floral invasion of Asian rainforests. The invasion commenced when the micro-continent of India reached Asia and its distinctive flora colonized in two waves, one mid-Eocene when offshore the Sunda Shelf, the second late Eocene on collision with the Asian mainland.

In modern rain forests, most flowering-plant species produce fleshy fruits and have their seeds, many of which are large, dispersed primarily by vertebrates. Trees in the proto-Indian forests had similar large seeds and each wave of the Indian floral invasion would have required agents with different seed dispersal abilities, the first for long-distance overwater dispersal, the second including short-distance terrestrial dispersal.

Hornbills, together with Old World fruit pigeons and fruit bats, were available at the time for the first wave, while smaller and/or less mobile taxa only became available or relevant for the second wave. The rapid colonization of the Asian flora seems improbable unless assisted by frugivorous vertebrates, such as hornbills.

Habitat requirements

Remote sensing and GIS were used to compare changes in hornbill habitats (1985-2000). The results showed that at core areas of WEFCOM, the former agricultural areas were reduced by 1% per year after the village relocation conducted by the government during the late 1990s allowed the forest to recover. This resulted in a 0.02 % per year increase of forest area.

The same trend occurred in KYNP but, in contrast, at Budo, agricultural areas increased 6% per year and the forest area decreased by 5% per year, showing an alarming situation for the future of hornbills at Budo Mountain. The results from a distribution model of 9 hornbill species (except species with insufficient data, including Bushy-crested, Wrinkled, and Plain-pouched Hornbills; and also excluding the common Oriental Pied Hornbill that occurs in many places), using an MaxEnt Model, revealed that only 8% of forest areas in Thailand are being occupied by hornbills.

This habitat modeling at a finer scale was done for a single species as well, the Rufous-necked Hornbill in WEFCOM. These models predicted that the distributions of all hornbill species, except for the Oriental Pied Hornbill, were affected by the patch size of the forest habitat.

Further, we characterized six different forests that are home to hornbill populations, to identify habitat traits within these various forest communities. The forest sites differed significantly in their structure and tree species diversity, as well as in their relative number of potential food and nest trees.

Trees of known hornbill food species were at relatively high densities at all sites, but they differed in the relative contribution of a few key species and families. Although big trees were found at comparable densities across sites, neither big-tree species diversity nor density could accurately gauge the number of trees in which cavities that hornbills require for nesting could be found.

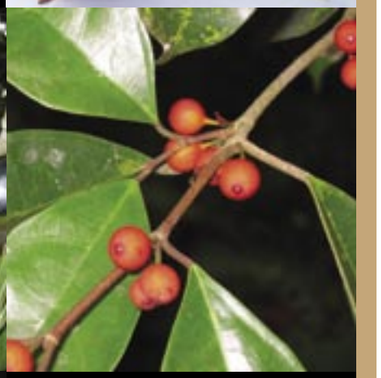
The combination of a lower percentage of potential nest trees and the predominance of a relatively small group of food tree species in montane and dry evergreen forest could render such habitats less capable of supporting hornbill populations compared to lowland dipterocarp and moist evergreen forests.

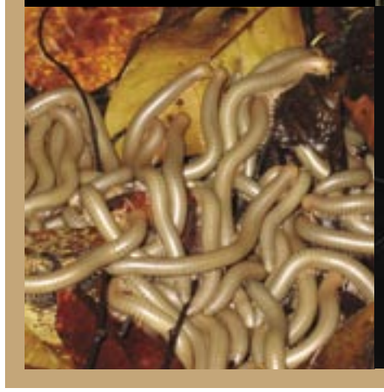
The study suggests that detailed information on hornbill food and nest tree species will be required to optimize the management of hornbill conservation areas, as opposed to a quick evalu-

Hornbill Menu

Although hornbills are omnivorous, their main diets are fruits, varying between 60-95% of the total diet depending on species.

Hornbills are able to store many fruits per feeding in the esophagus and stomach, and then regurgitate their seeds as they move, making hornbills significant seed dispersal agents.





Animals in the diet comprised 70 species belonging to various groups, including insects and arthropods, amphibians, reptiles, mollusks, crustaceans, fishes, mammals and birds.

This Great Hornbill (*Buceros bicornis*) has taken to an artificial nesting box.

The field staff who makes it all possible.

ation of forest structure and diversity. Moreover, the identification and conservation of core areas for optimal hornbill feeding and nesting habitats will be a useful initiative for the continued presence of these majestic birds in Asian forests.

Adopt a hornbill's nest

Nevertheless, the loss of forest area is not the only factor affecting hornbill survival, since poaching and illegal logging also are important factors. BSNP, one of the main study sites in southernmost Thailand, had experienced heavy poaching.

An intensive campaign was started in 1994. Over 40 villagers (former poachers/illegal loggers) from 13 villages around Budo Mountain participated in our research and conservation programmes. Urban people could also take part through such schemes as hornbill nest adoption, with 1,622 nest-years of adoption to date. The program is now considered successful in terms of poaching eradication and dissemination of the hornbill conservation message to the public. Since 1994, villagers have observed and guarded for 1,303 nest cavity-years and, for these, there has been 70% breeding success and over 400 chicks have fledged.

In our attempt to increase the breeding population of Budo Mountain, the number of suitable nesting sites were increased by providing artificial nests. Nineteen artificial nests were installed at Budo Mountain in 2005 and four species (Great, Rhinoceros, Helmeted and Wreathed Hornbills) checked the nests, but none was used.

In 2006, three species (Great, Rhinoceros and Helmeted Hornbills) came to artificial nests and a Great Hornbill was found in one with a chick. In 2007, two species (Great and Rhinoceros Hornbills) investigated nests and two pairs of Great Hornbills occupied nest boxes. In 2008, the same two species investigated nests and three pairs of Great Hornbills imprisoned themselves. And in 2009, the same two species checked the nests and five Great Hornbills sealed themselves into nest boxes.

The success of the nest adoption program has led to a second phase, the establishment of the Budo Hornbill Conservation & Education Center in 2004 on a piece of land donated by a villager's family. The Center provides educational and conservation lessons for approximately 400 individuals per year to schoolteachers, children, teenagers and villagers in the surrounding area.

Aside from these programs, we are expanding the channel for communication between persons or groups with an interest in hornbills through a Hornbill Network. Presently, 18 local schools surrounding Budo Mountain are members of the Network. Our conservation programs show clear, progressive development of relationships among urban, rural and natural environments, using hornbills as a tool. Consequently, hornbills are being conserved in a sustainable manner.

Academic and government institutes, e.g. the National Park, Wildlife, Plant Conservation Department, Education Ministry and Tourism Authority of Thailand can use and apply the information from each level of success, including our techniques, databases and publications, for the proper management of and for recovery plans in degraded and/ or logged forests.

Hornbill Family Adoption

Year	Total	
	Supporters	No. of nests adopted
1998	59	72
1999	69	106
2000	93	119
2001	83	109
2002	92	128
2003	93	148
2004	103	183
2005	109	206
2006	124	223
2007	106	174
2008	89	171

Anyone who adopts a hornbill nest does not only make in important contribution to nature conservation. He/She will also receive a full report of events at the end of the nesting cycle together with photographs of his/her birds. A visit to the nest during breeding can sometimes be arranged at own cost. Please go to http://www.sc.mahidol.ac.th/research/hornbill.htm and find the link to the Adoption Program at the bottom of the page.

About Dr. Pilai Poonswad

Pilai Poonswad has an M.Sc. in Microbiology from Mahidol University and a Ph.D. in Avian Ecology from Osaka City University, Japan. Her field of expertise is Avian Parasitology and Avian Biology and Ecology. She is the representative of Thailand in the International Ornithological Committee, a founder and committee member of Hornbill Research Foundation and elected as Honorary Fellow of American Ornithologists' Union. She is currently Professor of Biology at the Department of Microbiology, Faculty of Science, Mahidol University, Bangkok, Thailand. Lately she has received numerous honors and awards for her scientific work and contribution to conservation.

HONORS

2009 • Recipient of 2008 *Distinguished alumni* from Graduate Studies of Mahidol University

2008 • Recipient of *2007 The Dushdi Mala Medal for Great Eminence in Science*, awarded by His Majesty King Bhumibhol (King Rama IX)

2007 • Recipient of *2006 Outstanding Lecturer Award (Science & Technology)* from the Council of the University Faculty Senates of Thailand

• Recipient of *2007 National Outstanding Person Award (Natural Resources and environment)* from Prime Minister Office, The Royal Thai Government

• Recipient of *BCST-Swarovski Award 2007 (Outstanding Bird Conservationist)* from Bird Conservation Society of Thailand & Swarovski Optik, Austria

2006 • The first Thai Laureate of *The 2006 Rolex Awards for Enterprise* from Rolex SA, Switzerland

• The first Thai recipient of *The 52nd Annual Chevron Conservation Awards* from Chevron Corporation, USA

• Recipient of *2006 Faculty of Science Outstanding Lecturer Award (Professor level)* from Faculty Senate of Faculty of Science, Mahidol University, Bangkok, Thailand

• Recipient of *2005 Mahidol University Prize for Excellence in Research* from Mahidol University, Bangkok, Thailand

Sterculia coccinea

Text by **Tony O'Dempsey**

Tony O'Dempsey is a long-standing supporter of the nature community in Singapore and an active member of the NSS Vertebrate Study Group. He also has an interest in the trees and plants of the region. He will be presenting some of his favorite Singapore plants in this and future issues of *Nature Watch*.

THIS native shrub, known locally as *Kelumpang*, occupies the understorey of the secondary and primary forests of Singapore. Generally the *Sterculia* shrub will go unnoticed as it provides infill in the dullness beneath the crowns of larger trees. However, if you are in the forest after a dry spell, you may be lucky to be treated to the display of its unique scarlet seed pod opened out to reveal numerous black seeds. *Sterculia* flowerings after a dry spell usually occur twice a year. The picture below was taken in May 2009 during a nocturnal Central Catchment Nature Reserve fauna survey. It is believed that the specimens photographed are *S. coccinea*.

The *Sterculia* genus is represented in Singapore by a number of native trees and shrubs.

The Sterculliaceae family includes the well known Cocoa tree (*Theobroma cacao*) which was introduced to the South-east Asian regions from tropical America.

Photo: Tony O'Dempsey

Sterculia bush.

Photo: Tony O'Dempsey

Sterculia leaf.

Photo: Celine Low

***Sterculia*'s scarlet seed pod opened out to reveal numerous black seeds.**