Bats - More than a mythical creature

By MICHAEL CHEANG

Pictures by KAMAL SALEHUDDIN and STEFFEN WATZKE

IT is seven in the evening. The sun is setting, but Steffen Watzke suddenly announces: “Let’s go for breakfast.”

No, he does not have an eating disorder. Watzke, 29, and his colleague, Ursula Lensing, 31, are two scientists studying bats at the Kuala Selangor Nature Park in Selangor. Since bats are nocturnal animals, Watzke and Lensing have become creatures of the night themselves, sleeping in the day and working at night. Hence, their odd meal times.

Steffen Watzke (right) and Ursula Lensing have become nocturnal just like the subject of their study.

Speaking with a slight Malaysian accent – a result of having lived here on and off for almost five years – Watzke explains: “We normally get up at about 4pm or 5pm, have our “breakfast” and then do our work until about 5am, and go to sleep at about 7am.”

“We’ve been living like this ever since we began our research,” Lensing adds, while taking another stick of *satay*. They are from Stuttgart, Germany, and are pursuing their doctorates at the University of Munich. Watzke is studying the foraging ecology and social biology of long-tongued bats while Lensing is researching into the mating system of short-nosed fruit bats.

In their work on bats at the nature park, however, they discovered that there is more to the furry flying mammal than old vampire tales of blood-sucking pests.

“Mangroves are not just forests but a part of an elaborate ecosystem in which all components in that eco-system are linked together. Bats are not only crucial to the survival of the mangrove ecosystem. They are important for the welfare and survival of humans,” explains Watzke.

This eventually led to them starting a conservation project in their spare time to determine the link between mangroves and bats. They called it *The Mangrove Connection.*

To get a clearer picture of what The Mangrove Connection is all about, one has to start by learning about the mangrove trees and bats. There are two types of mangroves – coastal and riparian mangroves which are also known as river line mangroves. The site of the Germans’ study is the riparian mangroves along Sungai Selangor at Kampung Kuantan, a popular tourist destination famous for its fireflies.

Just as mangrove forests are often termed the “forgotten forests,” Watzke calls riparian mangroves the “forgotten mangroves.”

"They are often neglected because they consist of only two to three rows along the river," he says. "However, they are equally as important as coastal mangroves."

The main tree species in riparian mangroves is the *Sonneratia caseolaris* or *beremban*. It is in these trees that the famous Kuala Selangor fireflies flock to at nights and display their lights. What is most unique about the beremban tree is that it only flowers at night, year round. This is actually a unique characteristic of plants that depend on bats for pollination. For instance, the flowers of durian trees bloom only in late evening and drop before dawn. Thus, durian trees depend on bats as pollinators too.

A long-tongued fruit bat leaves a beremban flower after feeding on its nectar. Its body is now covered with pollen which is spread to another flower.

About the size of a palm, the beremban flower is cup-shaped and has a pale, unattractive colour. Flowers normally use colours to attract pollinators. However, the night-blooming beremban obviously does not need to "advertise" itself that way. Hence, its lack of colour. Instead, it emits a strong, sour smell – an odour that repulses humans but attracts bats.

The structure of the flower is also adapted to pollination by bats. It is strong and sturdy, able to withstand the weight of bats which cling onto it with their feet. By doing so, the entire body of the bat is dusted with pollen.

Beremban trees and bats are closely connected, a result of millions of years of co-evolution. Watzke says more than half of the world's approximately 970 species of bats use plants for food and shelter. In return, many plants depend on bats for pollination, fertilisation and seed dispersal.

In their project, Watzke and Linsing focus on two exclusively mangrove-related, nectar-eating species of bats, the long-tongued fruit bat (*Macroglossus minimus)* and cave fruit bat *(Eonycteris spelaea).*

While insects and birds also help spread the pollen of beremban trees, the two species of bats are the main pollinators. Nevertheless, they differ greatly physically and in their social behaviour. The long-tongued fruit bat is no larger than a man's hand and each weighs only 15g to 20g. However, its tongue can extend to almost one third of it's body length, hence its name. This species is mainly residential, roosting solitarily in trees and palms near mangroves.

The cave fruit bat is a different story. As its name implies, it roosts in caves during the day and feeds at night. The nearest colony of this bat is in Batu Caves in Gombak, Selangor. What is most remarkable about this species is that every night, they fly from Batu Caves to Kuala Selangor to feed before returning to the caves before morning – a journey of over 100km.

The cave fruit bat flies from Batu Caves to Kuala Selangor every night to feed on the flowers of the beremban trees, and flies back before dawn.

Both bats and the beremban trees are considered "keystone species" in riparian mangroves. Keystone species are those which through their interaction support other species. Should they disappear, other species will go too. Without either the bats or the beremban trees, the mangrove ecosystem would collapse.

"We ran a series of experiments to prove this connection between the two species of bats and the beremban tree," says Lensing. "First, we screened the visitors the flowers had such as insects, birds and bats, to find out which one actually contribute to pollination of the flowers."

Pollination is successful if a visitor *touches* the anthers (the male portion) of one flower to get its pollen and come into contact with the stigma (the female part) of another flower. "We found that bats were the most frequent visitors and they contributed to almost 95% of the trees' pollination," says Lensing.

Next, they had to determine how much the beremban trees depended on the bats for pollination. To do this, they separated the flowers into two groups. One group was the control group, where a few hundred flowers were marked but not tinkered with. They were exposed to natural pollinators such as insects, bats and birds. This group provided data on flowers which develop into fruits under normal and natural conditions.

A second group of flowers were bagged to prevent natural pollination from occurring. "We slipped into the role of bats and pollinated the flowers ourselves," says Lensing. This they did by transferring pollen from other flowers to the stigma of the bagged ones. This represented the maximum possible pollination rate of the plant.

Months later, results from both groups were compared. The scientists found little difference between the number of flowers that had developed into fruits and the number of seeds that each fruit contained, in both groups. This meant that pollination which occurred under normal conditions was close to the maximum possible pollination rate seen in the second group. Hence, the scientists concluded that beremban trees depend heavily on bats for pollination. In return, the bats depend on beremban flowers for food.

"If we take away one of them, there would be catastrophic effects on the ecosystem. Without the trees, the fruit bats would die out. Although the trees may survive without the bats, they will not be able to reproduce and will eventually die out too," Watzke explains.

"And without the mangroves, humans would also be badly affected. We would lose important sources of freshwater, fisheries would be affected by the lack of catch, and there would be no bats to help pollinate other fruit trees such as durian, petai and jambu."

A long-tongued fruit bat heading for the flower of a banana plant.

Durian trees, like beremban trees, rely on bats for over 95% of their pollination. Durian estate owners, who cover their trees with nets to prevent pollination by bats, have proven that just by excluding bats, durian trees would not fruit.

The beremban tree is also indirectly linked to durians. Consider this – the durian tree only flowers once or twice a year. Therefore, bats cannot depend on durian trees for food year-round. This is where the beremban tree comes into the picture. It provides food for the bats year-round.

"Without beremban trees to keep the bats well-fed throughout the durian trees' non-flowering season, there wouldn't be bats to pollinate the durian trees," says Lensing.

Thus, without the bats or the beremban trees, there would be no durians. That is a prospect even the two German scientists cannot bear to imagine. "I don't know how we're going to survive without durians!" Watzke says with a laugh.

Taking on a serious tone, he adds: "Most people do not care about something unless it affects them directly. That is why we always mention durians and fireflies because by linking the loss of bats or mangrove trees directly to the loss of durians or fireflies, people will sit up and take notice, and begin to understand how important the mangroves and bats are to us."

That is what The Mangrove Connection is all about. There is still work to be done, however. Watzke says apart from conducting research, they have to translate the scientific knowledge into simple terms so that people can understand how keystone species in mangroves can affect humans.