

Knowing the value of mangroves

Mangroves covered 13 per cent of Singapore's land area more than 200 years ago. Today, only about 700ha, or 0.5 per cent, remain. After four years of research, mangrove expert Daniel Friess of the National University of Singapore speaks to **Samantha Boh** about why these plants need to be conserved.

Q Where can we find mangroves in Singapore?

A We have about 700ha of mangroves scattered over various parts of the island, including Sungei Buloh Wetland Reserve, Labrador Park and Pasir Ris. They can also be found offshore on Pulau Ubin, Pulau Tekong and Pulau Semakau.

Q Why put a value on mangroves?

A People often ask what mangroves provide and why we should care about them. I embarked on a four-year project in 2014 precisely to work out how they benefit people, in the hopes that the data will justify their conservation.

Especially in land-scarce Singapore, where there is a need to make hard decisions on which areas to develop, such information will guide decision-makers to make the right call.

We made use of the concept called ecosystem services. It has many definitions but basically it means the benefits that people can derive from an ecosystem.

Ecosystem services are grouped into three broad categories: provisioning, such as how they provide material benefits like food or fuel; regulating, such as how they control climate change; and cultural, such as recreational and educational benefits.

Q What provisioning services, or material benefits, do mangroves provide?

A Mangroves are nursery grounds for young fish, which hide among the plants' roots to protect themselves from predators. The fish species we found living among mangroves were also very different from those found around seawalls.

Hence, if we lose the mangroves, we may well also lose those fish species as it appears they can't live among seawalls, and 70 per cent to 80 per cent of Singapore's coasts have seawalls.

Q How do they act as regulators to maintain environmental conditions favourable to life?

A They do this in three ways. Firstly, they protect the coast. During a storm, mangroves here reduce the height of incoming waves by 60 to 80 per cent. This has to do with the mangrove width, with wider ones taking out more energy. Hence, they play an important role in protecting our shorelines. With mangroves, you don't have as many problems with erosion and maintenance of the seawalls.

Secondly, mangroves have water-logged soils, which contain a different set of bacteria from those that reside in forest soil. Therefore, leaves and branches which fall onto mangrove soil do not get broken down, hence the carbon within them get logged into the soil.

Mangroves store 500 tonnes of carbon per hectare, three times more than seagrass and almost double that of the Bukit Timah Nature Reserve.

In total, mangroves here store 450,571.7 tonnes of carbon, equivalent to the annual per capita emissions of 621,089 people. Destroying them, however, means releasing all the stored carbon into the atmosphere.

Thirdly, we found that mangroves cool the urban climate. We measured the temperature in and around mangroves for around nine to 10 months, between noon and 2pm, and found that they can decrease the temperature by 3 deg C.

Q How do mangroves contribute culturally?

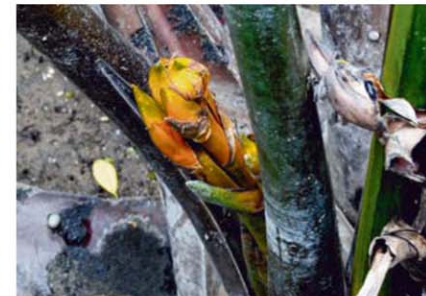
A NUS students asked people what they thought of mangroves and



Associate Professor Daniel Friess with NUS students Seah Li Yi (left) and Aleena Kua, both 22, researching mangroves at Sungei Buloh Wetland Reserve. ST PHOTOS: KHALID BABA



Mangroves are nursery grounds for young fish, which hide among the roots of the plants to protect themselves from predators.



Left: The bud of *Nypa fruticans*, commonly known as the nipa palm or mangrove palm. It is often found among mangroves. This was found at the Sungei Buloh Wetland Reserve.



Below left: A crab and a mudskipper in the soil near the mangroves at Sungei Buloh Wetland Reserve during low tide.

how often they visit them, among other questions, and by scanning through images uploaded on social media, we got a sense that people visited mangroves for social and education reasons, and that they are tourist attractions as well.

For instance, we used the geotags of the images to create a heat map. We found that people visited Chek Jawa for its landscape, as they took many photos of the mangroves.

Q How do you plan to use your findings?

A We hope the findings will help in decision-making. We haven't made proposals to the authorities yet but have suggested that mangroves be included in carbon accounting (processes taken to measure carbon emissions and the impact of carbon reduction strategies).

We will be using this project as a template for a larger project to work out the value for other ecosystems in Singapore.

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Besides Sungei Buloh Wetland Reserve, mangroves can also be found in Labrador Park and Pasir Ris as well as offshore on Pulau Ubin, Pulau Tekong and Pulau Semakau.