



The NUS study team, including (from left) Ms Rie Chong, Mr Marcus Chua, Ms Lorraine Tan and Dr Chong Kwek Yan, found that while a large proportion of dipterocarp fruits had fallen to the ground, many of the seeds did not germinate despite not showing signs of predation or fungal attack. ST PHOTO: CHEW SENG KIM

Winged wonders of the forest on the wane



Seeds of dipterocarp trees not germinating, likely due to fragmented forests: NUS study

Carolyn Khew

Those old enough will remember the fruit of the kapur tree spinning as it falls gently to the ground.

The tree is from the dipterocarp family and four of its members are in danger of disappearing here. The *Shorea macroptera* and *Dipterocarpus kunstleri* are listed as internationally critically endangered, while *Shorea pauciflora* and *Dipterocarpus sublamellatus* are internationally endangered.

In the first conducted study of dipterocarp fruit production in Singapore, researchers from the National University of Singapore (NUS) found that one-third of the seeds produced by four species of dipterocarp trees in Singapore's nature reserves did not germinate.

Wings on the fruit of the dipterocarp, or "two-winged fruit" in Greek, cause it to spin. This helps it to stay in the air longer so it can be

carried farther away from its parent.

With a great diversity of leaf forms and some 600 species in the region, dipterocarps can grow up to 80m tall. But many of these forests have diminished over the years.

Dipterocarps, once abundant in Singapore, have also disappeared because of deforestation. Less than 2 per cent of Singapore's original forests remain today.

This has led to fragmented forests and the NUS research suggests that it could be because of this that many of the dipterocarp seeds are not actually viable.

The research was featured together with other dipterocarp studies last month in a special issue in science journal *Plant Ecology And Diversity*.

"They showed no signs of damage – not eaten by rodents or insects. But they were found not to germinate at all despite repeated visits over three to five months," said Dr Chong Kwek Yan, a senior tutor at

NUS' Department of Biological Sciences.

"They may not have been able to initiate germination because of inbreeding."

Conducted from July to August in 2014 following a dry spell a few months before, the study aimed to find out what would happen to seeds following a mass masting event, or mass fruiting.

Researchers set up seed traps, collecting more than 3,000 seeds around the MacRitchie forest and observed if they grew and what kind of predators ate them.

In pre-1800 Singapore, the main primary forest cover, aside from mangrove and freshwater swamp forests, was the lowland dipterocarp forest, said Dr Lena Chan, group director of the National Biodiversity Centre at the National Parks Board (NParks).

However, the primary lowland dipterocarp forest diminished over the years due to timber extraction and clearing of forest for gambier and pepper plantations.

"As dipterocarp trees have a slow natural reproduction and regeneration rate, they require a long period

of time before they can become established in any adjacent secondary forest," said Dr Chan.

"Almost all remaining naturally grown dipterocarp trees are restricted to patches of primary forests in the nature reserves."

According to research centre Biodiversity International's website, systematic logging of the largest and most fruitful trees reduces the rate of seed production and increases the risk of inbreeding and diversity loss.

According to NParks, dipterocarps, also known as forest giants, are iconic trees that constitute the backbone of Indo-Malayan rainforests. A long-term plan is needed to conserve Singapore's natural heritage, said Dr Chong. This would involve nurturing seedlings in nurseries, for instance, before replanting them in the forest.

He added: "These forest giants remind me of our place, geographically, in the natural world. If they go extinct in Singapore, then we would have lost an important link with the rest of South-east Asia."

A macaque at a seed trap set up by NUS researchers for their dipterocarp study. The primate is among predators that eat the seeds.

PHOTO: NATURAL HISTORY MUSEUM

kcarolyn@sph.com.sg