Source: *The Sunday Times,* Think, p37
Date: 25 January 2015

Corralling support for reef conservation

As list of endangered species grows, marine biologist believes it is time to prioritise those more worthy of saving

Audrey Tan

ST PHOTO: KUA CHEE SIONG

Dr Huang Danwei's coral-conservation method takes into account their origins, contributions to the surrounding ecology, and whether they are genetically rare. He says that "transplantation and restoration of corals to regenerate reefs require the prioritisation of individual species".

Coral reefs are among the most endangered ecosystems in the world, and a third of reef-building corals face a high risk of extinction.

For decades, they have been besieged by people's actions – from pollution to overfishing and coastal development – and there is no sign that the onslaught will let up.

With an ever-growing list of endangered species, and as the authorities and conservation groups grapple with limited resources, one Singaporean marine biologist believes it may be time to ask whether some species are worth saving over others.

The National University of Singapore's Dr Huang Danwei, 33, has come up with a new way of classifying corals that he believes could help eco-warriors better allocate their time and money.

Unlike existing classification systems that simply look at the coral species' numbers in the wild to determine their conservation status, his method takes into account their origins, contributions to the surrounding ecology, and whether they are genetically rare.

Take, for example, *Diploastrea heliopora*, a dome-shaped coral found in large colonies in Singapore's southern waters.

Although it is listed as being only "near-threatened" in the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species, Dr Huang feels it should be moved further up the conservation priority list.

"The *Diploastrea* group originated about 100 million years ago, and other than *Diploastrea heliopora*, there are no longer any more close living relatives in the group worldwide," he says.

It is an important builder of Singapore's reefs, and its loss could lead to coral cover in local waters shrinking further.

The Republic has already lost 65 per cent of its original coral reefs to extensive reclamation work, and has about 9.5 sq km left.

Coral reefs are major marine habitats, providing food and shelter for many organisms. Since fish gather there in large numbers, reefs are also a rich source of food for people.

Dr Huang, who got his doctorate in marine biology in 2012 from the Scripps Institution of Oceanography in the United States, believes his classification system is more holistic.

Another important factor, he says, is a coral species' biological significance – which refers to its history and genetic rarity. The further back a species' origins, the longer it has contributed to and evolved with an ecosystem, making it more valuable, he believes.

Species with few or no living relatives should be given more attention, as it means genetic information from their entire families could disappear if they become extinct.

Using his new metric, which combines risk of extinction with biological significance, Dr Huang had in 2012 come up with a conservation priority scheme for the 842 reef-building hard coral species found around the world. His work is being used by the London-based conservation programme EDGE of Existence to develop conservation strategies.

Singapore's National Parks Board is also working with him, although it has said it aims to conserve all coral species that occur in local waters based on its own priority list.

Responding to queries, Dr Lena Chan, director of its National Biodiversity Centre, said: "Though much remains to be understood about Singapore's coral species diversity, we will continue working with key collaborators, including Dr Huang, to expand our knowledge which would form the basis for sustainable management of Singapore's coastal and marine habitats."

In research funded by Wildlife Reserves Singapore and published earlier this month, Dr Huang built on his earlier work by applying his metric to each of the 141 coral regions of the world, ranking them to highlight areas which could lose the most biodiversity.

A surprising find was that even though coral-rich areas have higher proportions of threatened species, it is the less vibrant reef regions that stand to lose more biologically important species.

Areas such as the Caribbean, East Hawaii and Pacific Costa Rica, for instance, have fewer hard coral species than say, the Great Barrier Reef or the Coral Triangle – widely considered the world's richest underwater wilderness. But these more sparse reef regions stand to lose much more historically significant species.

As for Singapore, one piece of good news is that even though about a fifth of hard coral species here and in surrounding waters are at risk of extinction, the Republic is actually "quite safe in terms of loss of history", similar to the Great Barrier Reef and Coral Triangle, according to the research by Dr Huang and Professor Kaustuv Roy of the University of California, San Diego.

Some conservation groups, while acknowledging the merit of his work, say management strategies also need to consider the entire ecosystem as a whole, instead of homing in on certain species.

The World Wide Fund for Nature Singapore says: "We address the threats the coral reefs face and work to get a larger part of the ocean protected, so the coral reef ecosystem in those protected places can thrive in the future when the threats are mitigated."

Dr Michael Webster, executive director of US-based Coral Reef Alliance, agrees, noting that threats faced by individual species are the same as those which affect the entire ecosystem.

"By taking steps to reduce the overarching threats to reefs, we can provide a healthy environment for all coral species, and the organisms that depend on them, so that they can be more resilient and adaptable to larger global changes, such as warming ocean temperatures and increasingly acidic oceans."

But he adds that there are situations where single species coral conservation efforts might be appropriate. "For example, conservation efforts sometimes prioritise endangered species for targeted management actions like establishing protected areas, growing and outplanting corals, or reducing pollution."

Dr Huang says that "without understanding individual species, one would never get to understand entire ecosystems".

Pointing to the recent transplantation of corals from a lagoon in Singapore's offshore landfill to its marine park, he says: "Transplantation and restoration of corals to regenerate reefs require the prioritisation of individual species.

"Singapore cannot afford to lose any more of our biologically important species, and our study provides a scientific basis to target them for conservation."

audreyt@sph.com.sg

PHOTO: DR HUANG DANWEI

Beautiful Science

This delicate flower-like pattern belongs to the *Orbicella faveolata* – an endangered species of hard coral found in the Caribbean that is also a major reef-builder there.

Sadly, this undersea condominium for many reef-dwelling creatures is in trouble – and marine biologist Huang Danwei believes its loss could lead to the collapse of reefs in the region.

This coral was highly abundant decades ago, but its numbers have declined sharply because of habitat loss, coral bleaching and disease.

Its lineage dates back more than 20 million years. It has only two other close living relatives – so the loss of any *Orbicella* species could put the whole lineage at risk. That is why Dr Huang believes the species should be ranked high on the conservation priority list.

There's hope yet for lost coral species

Singapore's waters have been home to some 255 species of reef-building hard coral, but researchers have seen fewer of them in recent years.

National University of Singapore marine biologist Huang Danwei, in a study led by recently retired coral expert Chou Loke Ming, said he has recorded only 170 species since 2005.

Species such as the *Seriatopora hystrix* (thin bird's nest coral) and the *Echinopora horrida* (hedgehog coral), for instance, can no longer be seen in local waters.

This is not surprising, given the loss of habitat areas that Singapore has experienced, said Dr Huang.

"I think we're lucky that we have lost only at most 85 of our historically recorded 255 species."

Over the past 30 years, Singapore has also lost about 65 per cent of its original coral reefs due to reclamation work.

Unlike projects today, those in charge of earlier works did not take precautions, such as having barriers around the site to contain the sediment spread.

When the seabed is stirred up by reclamation, particles become suspended in the water and are abrasive against the soft tissue of the corals.

Reclamation also affects visibility, meaning less sunlight passes through the water and less algae grow on the corals.

Since corals depend largely on algae for food, many slowly died.

As a result of the sedimentation, Singapore's remaining reefs cannot grow at depths beyond 8m. Up until the mid-1960s, corals and other reef life used to thrive at depths of more than 10m.

Still, Dr Huang believes the local extinction is reversible.

"Our coral populations are genetically well connected to others in the region, such as those in Malaysia and Indonesia," he said.

"If we can find a way to reduce sedimentation levels and impacts from shipping and recreation, there is a high chance that these 85 species can find their way back and thrive in our waters."

Audrey Tan