

After 450 million years, the Chinese horseshoe crab is now endangered

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(Image: Alamy)

The horseshoe crab has been around since before the dinosaurs. Over the past 30 years, numbers in China, home to one of four species of this “living fossil”, have plummeted. One of the main reasons is demand for the animal’s copper-based blood, which is used to make the most sensitive indicator of bacteria ever discovered.

In March this year, the International Union for Conservation of Nature (IUCN) listed the Chinese horseshoe crab (also known as the tri-spine horseshoe) as endangered. But few people in China are aware of the plight of this 450-million-year-old creature, and experts are calling for stronger measures to protect it.

Precious blue blood

The Chinese horseshoe is found across Southeast Asia, but 95% of its numbers are concentrated in China’s waters, especially along the coast of the southern region of Guangxi. Two of its relatives, the mangrove horseshoe and the Indo-Pacific horseshoe, are also native to Asia with some presence in China. The fourth species,

the American horseshoe, is found in the Gulf of Mexico and along North America's Atlantic coast. All have a similar appearance with a hard shell covering most of the body and a long sword-like tail. Despite the name, they are more closely related to spiders and scorpions than crabs.

In the 1950s, US scientists discovered that the blood of the horseshoe clots when it comes into contact with bacterial endotoxins. This led to the development of LAL, a processed extract of the blood used to test for bacterial contaminants during the manufacture of anything that might enter the human body, from surgical equipment to vaccinations.

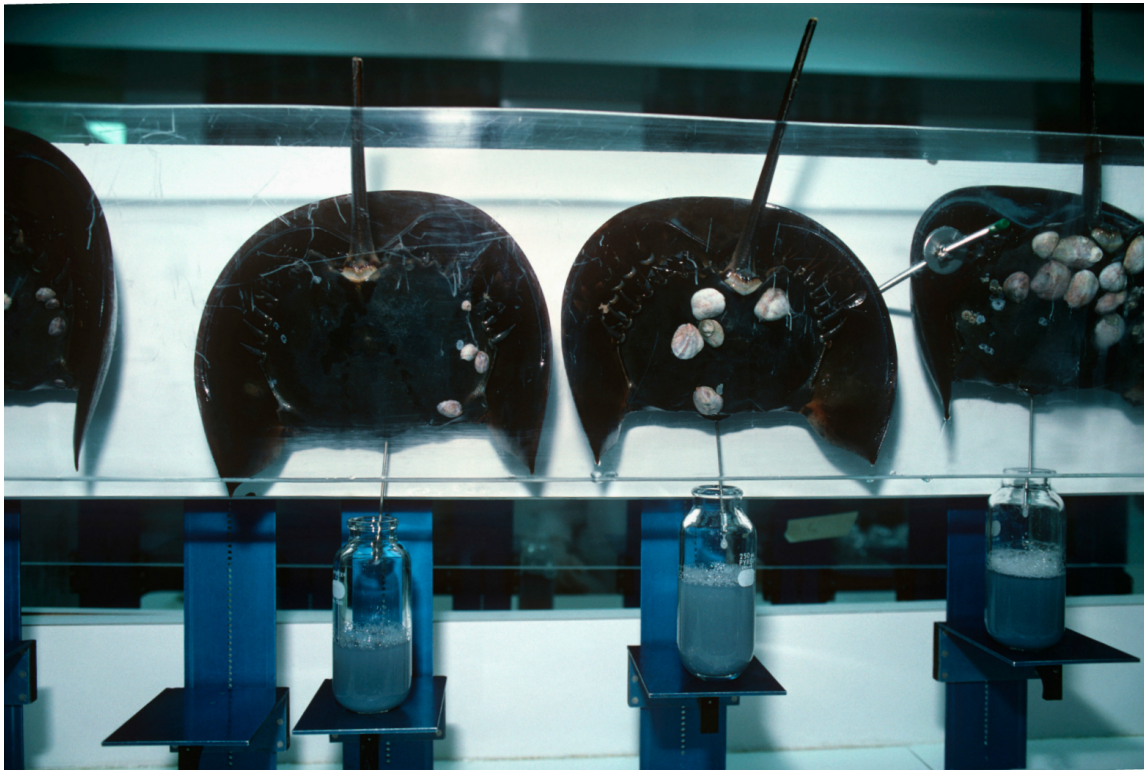
Demand for LAL and the lack of better alternatives make it one of the most expensive liquids in the world, with an oft-cited price tag of US\$60,000 per gallon (4.55 litres).

Increasing demand in China

With its own native species to exploit, China's developing biomedical industry started to produce its own version of LAL in the 1980s, during the country's reform and opening up period. The largest of the four species, the Chinese horseshoe is easier to work with and provides more blood than its American cousin.

Increasing demand from the biomedical industry has seen a corresponding decline in Chinese horseshoe numbers. There were 600,000-700,000 breeding pairs on the Guangxi coast prior to the 1990s, according to a 2015 paper. By 2010, there were only 300,000.

Chen Ruifang of the Guangxi Ocean Institute says current numbers are likely to be significantly lower. Based on its research, the institute estimates the current population of Chinese horseshoes in Guangxi to be only 40,000 breeding pairs.



Harvesting the blue blood of the horseshoe crab (Image: Alamy)

China does not currently protect the horseshoe at the national level, but there are some provincial-level protections. In Guangxi, regulations requiring licences for the catching, breeding, sale or use of the species were introduced in 1991.

Huang Nie of the Guangxi fisheries authority says these regulations limit the catch of wild horseshoe crabs in the region to 20,000 pairs a year. They also control the extraction of their blood: only fine needles of no more than 0.7mm in diameter can be used, and no more than 20% of the animal's blood can be taken. Once the blood has been harvested, the horseshoes are kept in captivity to recuperate and then returned to the wild.

These measures are more stringent than elsewhere in China. "Little harm would come to crab populations if companies stuck to the rules," claims Huang. But there are problems with enforcement.

Jie Xiaoyong of the South China Sea Fisheries Research Institute explains that some biomedical firms buy horseshoes from unlicensed fishermen and drain their blood dry to maximise profits, selling their meat on to restaurants and their shells for use in industry and agriculture. "Although the authorities have strict controls on the use of the horseshoe crab, there are still grey areas," he says.

There is as yet no data showing the specific impact of China's biomedical industry on horseshoe crab populations, but Jie notes the distribution of the species has shrunk significantly over the past 30 years. Horseshoes were once commonly found from the mouth of the Yangtze to the Guangxi coast. But none have been seen along the coast of Zhejiang province for over a decade, and there are now only occasional sightings in Fujian, Guangdong and Guangxi.

"When populations off Guangxi's coast can't meet supply, the trade might shift to Vietnam or other countries in southeast Asia," warns Jie.

Living fossils on the dinner table



Chinese horseshoe crabs for sale in a Guangxi market (Image: Harvey Jiang/CC BY NC)

The demand for horseshoe blood is not the only reason for the decline in the species. The animal is also popular with novelty-seeking diners in China, though a 2013 campaign to reduce consumption did have an effect.

Lin Wuying, scientific director of the Guangxi Biodiversity Research and Conservation Association, believes the popularity is in part the result of the animal's growing scarcity. But the properties of its meat have also been exaggerated, with many consumers believing it can help reduce fever or stimulate lactation.

Chen Ruifang comments that "there is no evidence to suggest horseshoe crabs have any particular nutritional value." Instead, some species should not be eaten at all. The mangrove horseshoe, also found in China but more common in tropical

waters, contains tetrodotoxin, a potent neurotoxin. Several cases of food poisoning and even death have been linked to the consumption of its meat and eggs.

Despite the craze, most experts agree that the biomedical industry is the greatest driver behind overfishing of the species.

Saving the Chinese horseshoe crab



Juvenile horseshoe crabs ready to be released into the wild beach (Image: Zhong Jianshan/China Dialogue)

Horseshoe crabs spend most of the year in deeper water, coming to shore only to breed. In Guangxi, the breeding season is in June. While it was once common to see large numbers of adults gathering on Guangxi beaches to lay their eggs, this is no longer the case.

The Guangxi Ocean Institute is doing what it can to bring the horseshoe crab back. With the government's support, it has developed a captive breeding programme to boost wild populations. Every year since 2013, it has released tens of thousands of hatchlings into the ocean.

But it is not yet clear if this programme is doing any good. According to Chen Ruifang, the hatchlings are not tracked, making it impossible to know how many survive or if their numbers are enough to sustain populations.

Chen also points out that horseshoe crabs are slow-growing which limits their chances of making it to breeding age (they are only able to give birth after around 20 years). Conditions along the Guangxi coast do not make it easy for juveniles to survive. Studies by the Guangxi Biodiversity Research and Conservation Association have found a range of threats. Large infrastructure projects and the growth of cities, tourism and shipping have destroyed large parts of the habitats of both the Chinese and the mangrove horseshoe crabs. Pollution is also having an impact.

Looking to the future



Releasing juvenile horseshoes on a Beihai beach (Image: Zhong Jianshan/China Dialogue)

It's clear that more needs to be done to save this ancient animal. Chen says his institute is seeking to address the limitations of its breeding programme. It has already proposed a new project to track hatchlings released into the wild using DNA. They are also working to make their captive breeding methods commercially viable. If horseshoes can be successfully farmed, it would reduce the pressure of overfishing on wild populations.

In Beihai this June, at the Fourth International Workshop on the Science and Conservation of Horseshoe Crabs, experts also called for stronger legal protection for the species.

In response, the national authorities are now considering adding all three species of horseshoe crab found in China to its wildlife conservation directory. This is a major step, considering that this list has only had two minor amendments since its release in 1989.

At present though, the horseshoe is only protected under local regulations. The authorities in Guangxi confiscate several hundred pairs of illegally caught horseshoes every year. But punishment is rare.

Huang Nie is hopeful that the Chinese horseshoe crab's recent addition to the IUCN's red list of endangered species will make a difference. He suggests one way to strengthen legal protections would be to list the species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This would either ban or control cross-border trade in both the animal and products made from its blood. But any effort to protect the horseshoe under CITES would have to wait for at least three years, for the convention's next conference to discuss new additions to its appendices.