



A living giant clam. Howard Chew/Alamy

Businessweek

Islands of Mass Destruction

How China killed essential reefs and built military bases on top.

By Dune Lawrence and Wenxin Fan

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ON A MAP OF THE WORLD, THE SOUTH CHINA SEA APPEARS AS A SCRAP OF BLUE AMID THE TANGLE OF ISLANDS AND PENINSULAS THAT make up Southeast Asia between the Indian and Pacific oceans. Its 1.4 million-square-mile expanse, so modest next to its aquatic neighbors, is nonetheless economically vital to the countries that border it and to the rest of us: More than \$5 trillion in goods are shipped through it every year, and its waters produce roughly 12 percent of the world's fish catch.

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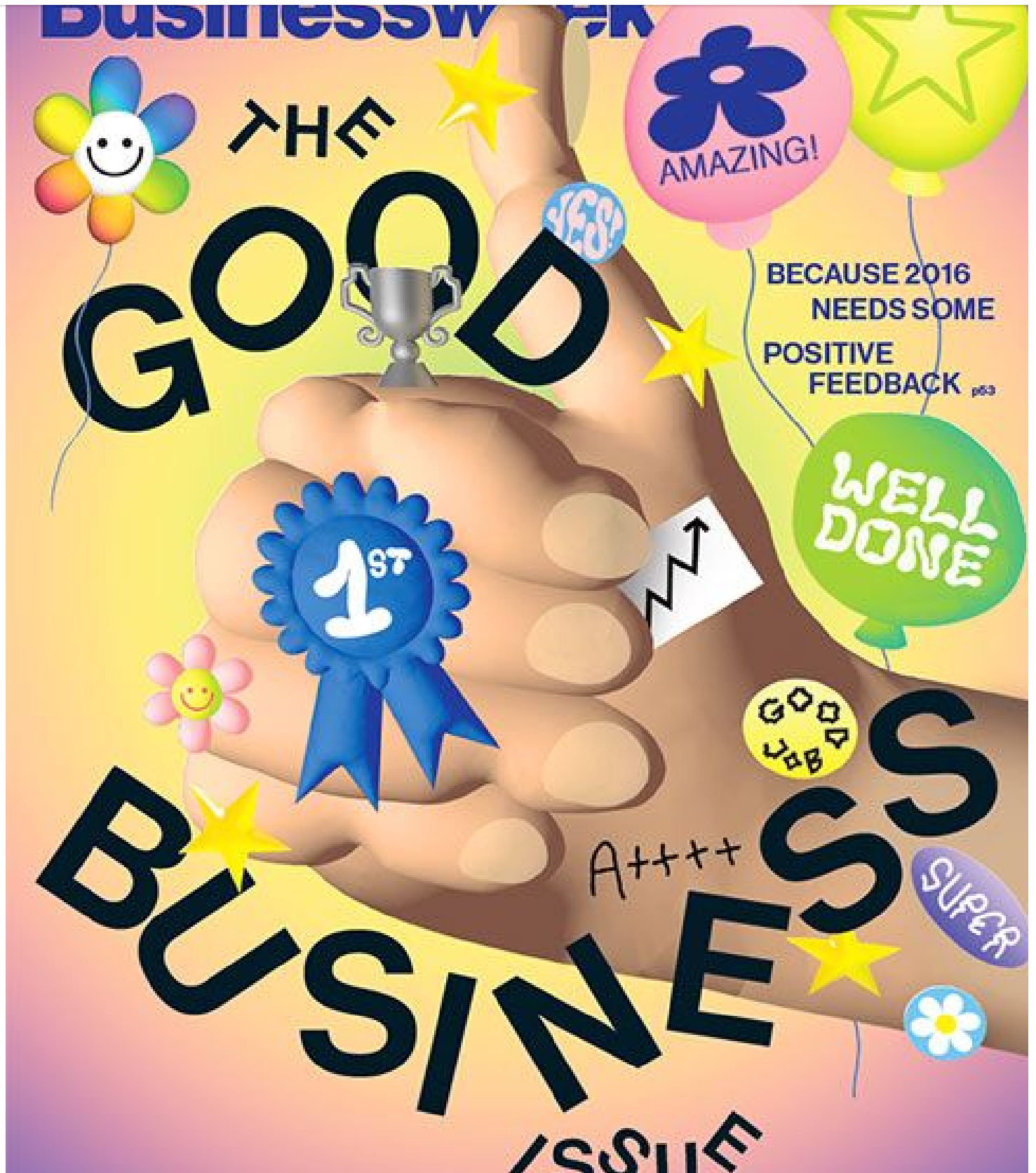
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unsubdue threat or armed force.

Mobile signal towers on the newly cemented islands now beam the message, in Chinese and English, “Welcome to China” to cell phone on any ships passing within reach. But its latest moves, in the long-running dispute with its neighbors over the sea, the fish in it, and the oil beneath it, are anything but welcoming: China appears to have deployed weapons systems on all seven islands, and last week seized U.S. Navy underwater drone.

In the run-up to all this, as most international observers watched the islands bloom in time-lapse on satellite photos, John McManus arrived with a film crew in February 2016, to document a less visible crisis under the water. To McManus, a professor of marine biology and ecology at the University of Miami, the Spratlys aren’t just tiny chips out of a blue background on Google Maps; from dives there in the early 1990s, he remembers seeing schools of hammerhead sharks so dense they eclipsed the light. This time, he swam through milk of deserted dead coral—of the few fish he saw, the largest barely reached 4 inches.

“I’ve never seen a reef where you could swim for a kilometer without seeing a single fish,” he says.

WHEN WE MET IN EARLY NOVEMBER, MCMANUS HAD JUST MOVED OFFICES AT THE ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC Science, on Virginia Key next to the Miami “Seaquarium.” A large desk was jammed under windows that look over Biscayne Bay. McManus rummaged through a box to find an extension cord before opening a laptop to pull up slides.

McManus is tall and broad-shouldered, but slightly stooped at 64. He tends to follow his statements with a reflexive chuckle. He decided to become a biologist as a third-grader in landlocked Vermont and followed through with a bachelor’s degree in marine biology from the University of Connecticut. He helped pay his way by joining the ROTC and went on active duty after graduation as an amphibious cargo operations officer stationed in Virginia Beach. He returned to UConn for graduate work in marine zoology, but by 1978 he was running out of money and signed up for the Peace Corps, asking to be sent to any country with a coast. He was assigned to the Philippines, where he conducted coral reef surveys and met his future wife, Liana Talaue-McManus, a Filipina marine scientist. He stayed for two decades, minus three years to get his Ph.D., studying the reefs and fisheries of the region and becoming one of the world’s experts on the ecology of the South China Sea.

“It’s like burning down the rainforest to get the elephant”

The first signs of what was to come appeared in late 2012. Satellite photos of reefs in the Spratlys showed mysterious arcs, like puffs of cartoon smoke, obscuring the darker areas of coral and rock. A colleague forwarded them to McManus, wondering if the shapes might be signs of *muro-ami* fishing, where fishermen pound large rocks into a reef, tearing up the coral to scare their prey out of hiding and up into a net above. Another theory, floated first in an article on the Asia Pacific Defense Forum, a military affairs website, explained the arcs as scars left by fishermen harvesting giant clams.

Giant clams are an important species in the rich reef systems of the Indo-Pacific waters; they anchor seaweed and sponges, shelter young fish, and help accumulate the calcium deposits that grow reefs over time. Underwater, the elegantly undulating shells part to reveal a mantle of flesh in rainbow hues: blue, turquoise, yellow, and orange—mottled and spotted with yet more colors. The largest can reach almost 5 feet across and weigh more than 600 pounds. Long hunted for their meat, they’re also prized in the aquarium market, though they’re protected by international law.

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Hainan opened up to foreign investment and a Taiwanese entrepreneur arrived in 1990.

The man, Zhan Dexiong, had run a business for years in Southeast Asia turning seashells into beads and handicrafts. Tanmen had a dozen small boats and no electricity, according to Zhan's son, Zhan Yulong. It did have a cheap and abundant supply of all kinds of seashells, which the locals discarded after taking the meat out. The elder Zhan bought generators, moved machines from his factory in the Philippines, and set up the first foreign venture in town.

By the early 2000s, the success of that first factory had attracted copycats and spurred the creation of a special industrial zone devoted to shell processing. Over the next decade, Chinese consumers, avid buyers of jade and ivory, developed a taste for *objets* from those factories, intricate sculptures with giant clamshells as the medium. Although China listed giant clams as a protected species, Tanmen fishermen found a loophole, going after the large shells of long dead clams, buried within reefs. By 2012 the shells from giant clams, dead or alive, had become the most valuable harvest for the vessels sailing from Tanmen into the South China Sea. Boats regularly came home with 200-ton hauls, which could sell for 2,000 yuan (\$290) a ton—big money in a place where the annual income for a fisherman was 6,000 yuan.

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submerged reefs encompassing a lagoon with just one narrow entrance. Shells from the shoal fetched a premium for their purplish color, some as much as 30,000 yuan apiece. Both countries—and Taiwan—claim Scarborough, which sits more than 140 miles off the coast of Luzon, the largest island in the Philippines, and roughly three and a half times that distance from Tanmen. Filipino soldiers boarded the boats and found them loaded with hundreds of clamshells. Within hours, Chinese government ships arrived to face off with the Filipinos, who eventually withdrew. China has remained in control of Scarborough ever since.

The Chinese fishermen returned to Tanmen to be feted by state media as patriots and photographed grinning in front of heaps of creamy-gray shells.

The Philippines and China are both signatories to the United Nations Convention on the Law of the Sea (UNCLOS); the Philippines initiated proceedings against China for violations of the law in the Permanent Court of Arbitration (PCA) in The Hague in January 2013.

That spring, Tanmen received the ultimate honor: a visit from China's newly minted president, Xi Jinping. He shook hands with men wearing traditional basket hats, urging them to build bigger boats to catch more fish in support of China's sovereignty over the South China Sea and pledging financial support. He made good on his word: Government funds went to adding new 500-ton boats to the local fishing fleet and subsidized voyages.

Xi made no mention of giant clams, but the local shell industry became the biggest, and most obvious, beneficiary of the government's largesse: The number of clam-processing factories ballooned to more than 100. Families turned their streetfront homes into shops; along the main artery, Fugang, or "Rich Port," Street, two-thirds of the 300 stores sold clamshell carvings. There were Buddhas reclining among clouds; the many-armed Guanyin, goddess of mercy; intricate landscapes of mountains and trees; there were even, ironically, clamshells shaped to look like ivory tusks. Tourists were beginning to visit from the seaside resorts of nearby Bo'ao, which hosts an annual Davos-like summit, while middlemen bought in bulk to hawk the carvings online.

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fly. He also trained a team of students to help with his research; they swam each reef at least once every two months, tracking the numbers and sizes of 600 species of fish. They also gathered data on dynamite-blast fishing. Such practices, coupled with population pressures and poverty, were quickly undermining the ecological balance in the waters off Bolinao. “It was extremely heavily overfished and fish species would basically disappear,” McManus says. “Where do you get the fish when you run out?”

A colleague at the University of the Philippines suggested that the Spratlys helped replenish coastal resources, providing what McManu calls “fortuitous pulses of fish.” The situation there was already dangerous—in 1988, Chinese navy ships killed dozens of Vietnamese soldiers on Johnson South Reef. But McManus didn’t need to visit; he devised a way to figure out whether fish larvae from the Spratlys could reach the coast of the Philippines, drifting with the ocean currents, in the weeks it takes for them to develop the ability to swim. He started with old arrow charts of drift data in the South China Sea, recording where ships meant to go and where they’d ended up, which he found in a paper from the 1960s.

“They were all just arrows to indicate how fast the currents were going,” he says. “Monsoon directions change. They go from the northeast sometimes, and from the southwest at other times.”

His estimates showed that replenishment larvae could make it to Luzon and other parts of the Philippines from the Spratlys; when the currents shifted, like a top-loading washing machine drum reversing direction, larvae could also make it up to Taiwan and South China

“The most important long-term resources to be had from the Spratlys may be those which are already being used—the larvae of fish and invertebrates which the Spratlys apparently supply to heavily fished waters elsewhere around the South China Sea,” McManus wrote in 1992 paper about his findings. “The Spratly Island area could be considered a ‘savings bank’ where commercially important fish and invertebrates (as capital) are saved from overharvest.”

In his paper, McManus proposed a policy solution to the tensions in the South China Sea: Make the Spratlys into a marine park, jointly run by all six countries with claims to the reefs. At that time, few fishermen made it all the way out to the Spratlys, so limits on fishing there would have little direct negative impact while conserving fisheries that produced hundreds of millions of dollars in exports annually, not to mention food for the bordering nations.

The paper appeared in a quarterly magazine about fisheries, *Naga*, after the more general-interest *Far Eastern Economic Review* rejected it “with considerable amusement,” McManus says. “Something about protecting my own reputation from being ruined by an article like that.”

McManus found the scientific community more receptive, at least initially. The MacArthur Foundation awarded him a grant for a regional fish genetics study, with scientists from six different nations. The results shored up the idea that the coastal and commercial fisheries depend on the genetic reserve of the Spratlys.

After that, he says, funding dried up. In 2000 the University of Miami lured McManus back to the U.S., appointing him director of a new research center and his wife a professor of marine affairs. He continued to write and speak about the Spratlys but devoted himself mainly to fundraising efforts for the center, teaching, and building a computer model for how reefs recover from storms and other damage.

“I’ve never seen a reef where you could swim for a kilometer without seeing a single fish”

In 2015, McManus was invited to speak at a symposium on the South China Sea in Brussels. The Philippines’ case against China in The Hague had triggered an unexpected response. The nations competing over the sea had established bases on some reefs over the years to support their claims—mostly small structures, but also a resort, built by Malaysia. By 2014, however, satellite images showed China embarking on construction over the reefs on a much larger scale, converting its posts into permanent bases.

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appeared to be intentionally cutting up the coral reef, revving the engines of their dinghies while at anchor and kicking up long plumes of sand and debris in the water. Another journalist, Victor Robert Lee, who'd been tracking developments in the South China Sea for *the Diplomat*, found images online of fishermen standing on reefs, dragging small vessels outfitted with propellers on long shafts across them to dig up the largest giant shells, buried in the coral.

McManus couldn't quite believe it until he saw it for himself, in February 2016, with the documentary film crew. The crew flew to the Spratlys from Manila, landing on Thitu Island, where the Philippines has a base. They motored out by boat, on the alert for China's coast guard, to reach an unnamed reef, dubbed Checkmark by McManus for its shape. He took his camera and started swimming—through pure devastation. “It's like burning down the rainforest to get the elephant,” McManus says.

Early in the expedition, a wet nylon rope cut into his legs. By the time he got back to Manila, the wound had turned gangrenous after days swimming and living onboard the small boat. Desperate to back up the evidence against China, he uploaded his photos from a hospital bed before flying back to the U.S.

“I was imagining the whole time, if they amputate my legs, it'll be so great for the cause!” McManus says. “That was the most important thing I've ever done in my life.”

McManus redid his calculations, based on his ground truthing. There was almost 62 sq. mi. of damage—together, an area almost as large as two Manhattans—to reefs across the South China Sea. Forty square miles of the devastation was the work of Chinese giant clam fishers; the rest was from dredging and filling in beneath the islands. In the Spratlys alone, he found 27 sq. mi. of clamming-related damage, all of it directly attributable to China, wrought since the Philippines had brought its arbitration case.

The Hague's PCA Tribunal published its verdict on July 12 in favor of the Philippines, ruling that China's claims to the South China Sea had no legal or historical basis and that China had violated its obligation under UNCLOS to protect and preserve the marine environment. McManus's evidence featured prominently in the written decision: “The Tribunal recalls in particular the very recent examinations conducted by Professor McManus, which led him to estimate that China is responsible for almost 70 square kilometres (27 sq. mi.) of coral reef damage from giant clam harvesting using propellers, a practice he described as more thoroughly damaging to marine life than anything he had seen in four decades of investigating coral reef degradation.”

China refused to participate in the process in The Hague, leaving the tribunal to piece together possible motivations for its apparent support of the clam harvesting. In public statements and a report in 2015, China claimed the island-building wasn't damaging to the environment and took place in areas of coral that were already dead. The tribunal came to a more sinister conclusion, based on the evidence, that China was fully aware of and even tolerated and protected the practice, creating the conditions necessary to claim that the construction of Chinese bases itself wasn't harming the reefs.

BEIJING REJECTED THE TRIBUNAL VERDICT, CALLING IT “A POLITICAL FARCE UNDER THE CLOAK OF LAW” AND DISMISSING THE FINDINGS on the environment, saying that it had taken “an array of measures to effectively protect” the ecosystem. The local government of Tanmen held public meetings about the damage from clam fishing as early as July 2013, and more than a year before the ruling it imposed a ban on harvest and sale; the ban put some factories out of business as supply shrank. Locals like Li Xuanru, a shop owner who's still operating, undercut the tribunal's theory. “Xi would be furious had we told him the bigger boats were out for giant clams,” he says.

The backstory hardly matters now. McManus is focused on curbing further destruction. “We have to stigmatize this. This is not just a clam, it's an entire reef system,” he says. He's tried to get environmental groups to help turn giant clams into another giant panda, without much luck; nongovernmental organizations already working in China to stigmatize ivory, shark fins, and tiger bones may fear retaliation for bringing the fraught South China Sea into the picture.

But McManus's point—that all the countries fighting over the South China Sea share a common enemy—is taking hold. In September the

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Since the tribunal's ruling, both the national and provincial Chinese governments have stepped in with stiffer penalties against those selling giant clam carvings. At least one Tanmen shop full of carvings responded by pasting paper over the characters for giant clam wherever they appeared on their shelves.

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