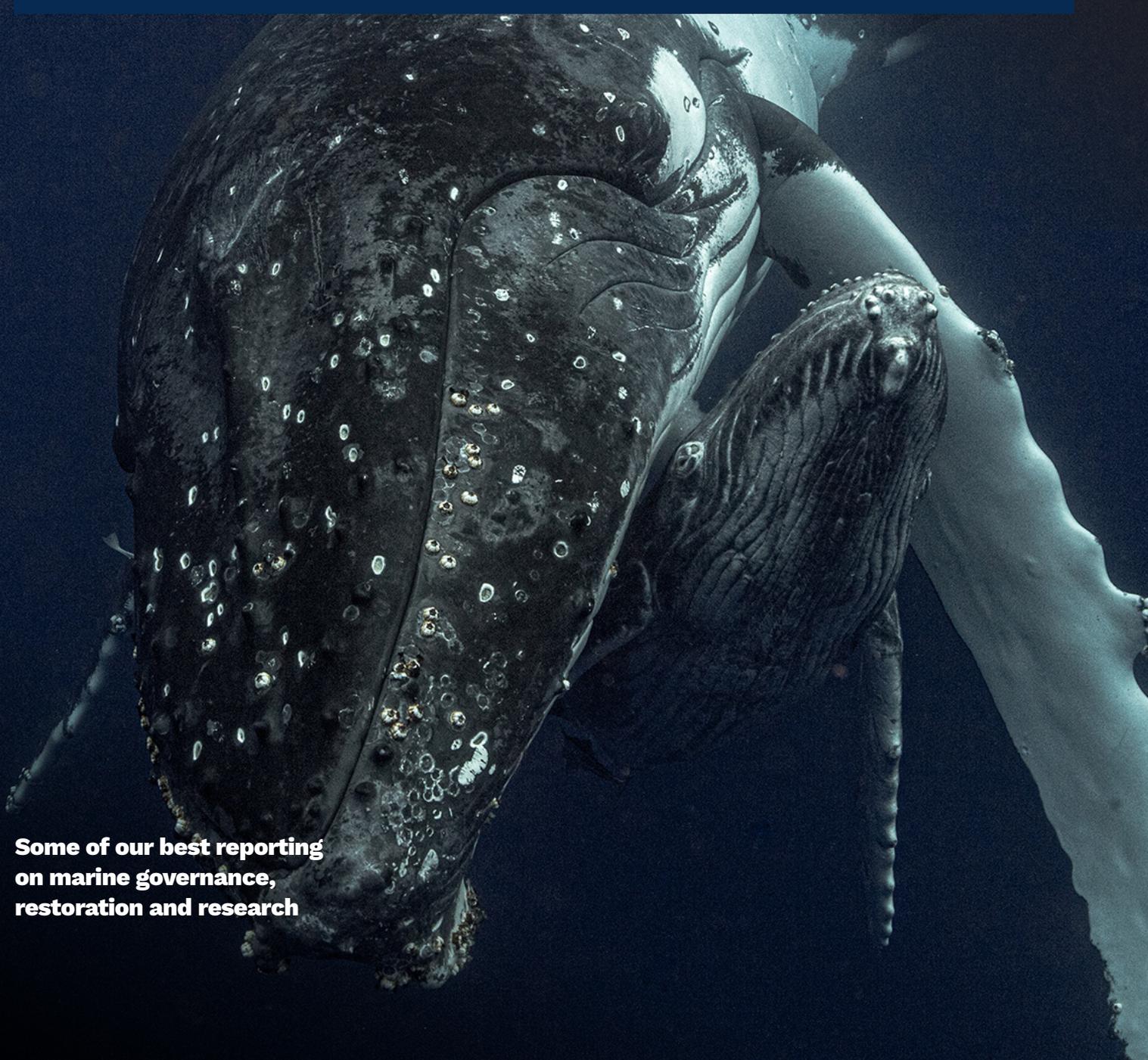


Towards a blue ecological civilisation



**Some of our best reporting
on marine governance,
restoration and research**

FOREWORD

Expectations were high for 2020. A revision of the Fisheries Law was to improve China's management of its fishing on the high seas; the UN Conference of the Parties to the Convention on Biological Diversity, to be held in Kunming, was to determine a new framework for global protection of biodiversity; and finalising rules on deep-sea mining and fishing subsidies would help make use of the ocean sustainable. Or at least, that was the plan.

The Covid-19 pandemic disrupted these processes, forcing the cancellation of meetings and negotiations. It also hit aquaculture and shipping, among other sectors. Around the world, the pause button was pressed on normal life – giving us the opportunity to reconsider the relationship between humanity and the rest of nature.

Covering 70% of the world's surface, the ocean feeds over one billion of us. It absorbs one-third of global carbon emissions and produces half of the world's oxygen. Ocean life is vital for maintaining ecological balance and tackling climate change; from the three major ocean ecosystems – coral reefs, kelp beds and mangrove forests – to whales that help fertilise planet-cooling microscopic algae with their excrement. In the ocean depths there may be

species containing compounds that could cure disease and even prevent the next pandemic. To protect and restore the ocean is to protect humanity.

China has been making progress. A major squid fishing and processing nation, it has sought to protect and more sustainably use squid populations by implementing a closed season in certain squid fishing grounds. To protect migratory bird routes, it has applied for World Heritage status for wetlands on the Bohai Sea. A revision of the country's Fisheries Law, designed to improve management of distant-water fishing and protect ocean resources, is under way. China's concept of a building an "ecological civilisation" can help protect the country's ocean ecosystems and resources, and this would have global benefits.

We share the fate of the ocean. Hopefully, upcoming talks on fishing subsidies and deep-sea mining will give full consideration to the future of ocean ecosystems, and the Kunming CBD conference, now postponed to next year, will provide a solid basis for their protection. We hope that by working together to protect and restore ocean life we will deepen the sense that we belong to a shared, blue ecological civilisation.



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Transshipment: frozen tuna are transferred from the Hung Hwa 202 to the Hsiang Hao, a Panama-flagged reefer operating out of Tokyo, Japan, in the middle of the Atlantic (Image © Tommy Trenchard / Greenpeace)

GOVERNANCE

China targets distant-water criminals with new fisheries law

As distant-water fleets continue to put pressure on global fish populations, revisions to China's top fishing law should leave less space for illegal actors

By **Zhang Chun** | January 21, 2020

As China's distant-water fishing fleet has grown considerably over the past 20 years, so too has the challenge of overseeing its operations. While the majority of distant-water vessels do not break the law, the remoteness of their operations nonetheless enables IUU (illegal, unreported, unregulated) fishing to persist, robbing coastal nations of resources and hampering efforts to make the fishing industry sustainable.

The introduction of new tools like blacklisting in 2020 will likely be key to managing Chinese distant-water fishing.

Two years ago, the Ministry of Agriculture added several fishing company officials and boat captains to its blacklist. Resulting sanctions for the



A revision of the Fisheries Law – the top document regulating China's fishing industry – will now include the blacklist system. Experts believe the law will come into force later this year."

firms included the removal of subsidies and bans on distant-water operations. Some captains were banned entirely from the fishing industry. One such was the skipper of the Fu Yuan Yu Leng 999, apprehended in the Galápagos marine reserve carrying thousands of illegally caught sharks.

A revision of the Fisheries Law – the top document regulating China's fishing industry – will now include the blacklist system. Experts believe the law will come into force later this year.

Enforcement

The law, which governs fishing in Chinese waters and by Chinese vessels further afield, is enforced by the Ministry of Agriculture's Fisheries Bureau. It started life in 1986, and has been revised

four times, between 2000 and 2013.

Official notes on the upcoming revision make clear the law has not kept up with rapid changes to the industry. For example, tougher action is needed on new practices like electrofishing.

The revision clarifies who bears responsibility for breaking the law, increases penalties and clarifies details on enforcement. It includes a new section on oversight and management, specifying law enforcement powers and standards for evidence gathering. Wang Canfa, a professor at China University of Political Science and Law who helped draft the revision, said that “there was little language on law enforcement in the original, and lots of problems during enforcement.”

The law will receive several new additions to help curb IUU fishing. As well as the blacklist system, there will be requirements for vessels to record their port movements, with larger vessels having to stick to designated ports. Meanwhile, foreign vessels on the IUU lists of regional fisheries management organisations that China is party to will be banned from using Chinese ports.

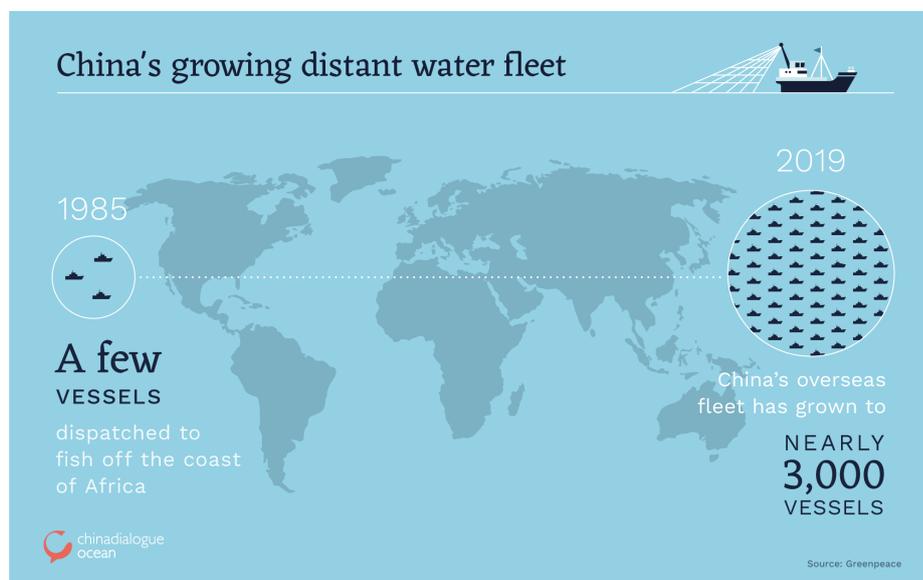
Assuming the revision comes into force, severe breaches could result in Chinese vessels being confiscated, companies having their distant-water fishing licence revoked, and inclusion on the blacklist.

Rapid expansion

Though China began distant-water fishing later than major players like Norway and Japan, it has quickly expanded its activities. In 1985, the first Chinese distant-water fleet, of 13 vessels, reached African waters. By the end of 2018, China had almost 2,600 distant-water vessels, catching two million tonnes of fish a year.

With all major fishing nations expanding capacity, the number of vessels is growing faster than overall catch.

China’s rapid expansion of its fleet at a time when fisheries are in decline – 93% of the world’s commercial fish stocks are overfished or fished at maximum levels – has caused concern, and various controversies have led to tougher oversight.



In July 2019, opinions were solicited on revisions of distant-water fishing regulations, part of the Fisheries Law system, and the changes will explicitly ban distant-water firms and vessels from engaging in IUU activity.

In late August, due to “ever tougher requirements from regional fishery management organisations and host nations,” China published a proposed revision to rules managing vessel-monitoring systems, also due to come into force this year. It will require Chinese vessels to implement the strictest applicable vessel-monitoring rules – whether they belong to China, the host nation, or a regional fishery management organisation. Any vessel removing or turning off its transponder will lose subsidies for the year.

Then a draft of the revised fisheries law, including the blacklist system, was published for consultation. Tang Jianye, a professor at Shanghai Ocean University, thinks it will strengthen the system. Mei Hong, a professor at China Ocean University, says the inclusion of the blacklist shows how seriously China is taking fisheries management and also brings the country into line with international treaties.

China is already a member of seven fishing treaties and management organisations, including the Western and Central Pacific Fisheries Commission, the South Pacific Regional Fisheries

Management Organisation, and the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). These commonly require their members to take measures at their ports to stop IUU fishing.

The revised Fisheries Law therefore states a “breach of relevant international treaties China has ratified or joined” as reason for inclusion on the blacklist.

Offending foreign vessels will be banned from Chinese ports and, in serious cases, confiscated. While this is the first time such measures have been formalised in legislation, similar actions have been taken before. In 2016, China detained a foreign vessel after it failed to prove the legality of the Patagonian toothfish onboard. CCAMLR confirmed the fish had been caught illegally, and requested the catch be sold. In 2018, the proceeds were donated to CCAMLR.

Lining up with port state measures

Alongside identifying IUU vessels via regional fishery organisation reports, the revision of the law includes articles on port state oversight of foreign fishing boats.

The UN’s Port State Measures Agreement requires signatories to refuse IUU vessels entry to port, and to confiscate catches and even vessels. The agreement, which came into force in June 2016, requires port states to confirm the place of registration of all foreign

vessels in port, check for illegal catches, and share information in real time with other port states. Sixty-six nations plus the European Union have now signed up. But 77 coastal nations, including China, have not.

However, in a response to a proposal at the People's National Congress, the Ministry of Agriculture said it is "working with other departments to join and implement the Port State Measures Agreement."

Yet the country's existing fishery management systems are nowhere near adequate to do so. Chinese academics Wang Tiantian and Tang Yi have pointed out that the oversight of fishing and non-fishing ports belongs to different departments; it is not clear who would be responsible for IUU fishing checks

when a foreign vessel docks at a non-fishing port.

As they are rarely accepted by China's fishing ports, foreign vessels do tend to dock at these non-fishing ports – where checks are carried out by marine and customs authorities.

"Determining if fish have been caught illegally, or if a vessel has been engaged in IUU fishing, is highly specialised work, and the marine and customs authorities will struggle. It should be done by the fisheries bureau," said Tang Yi, a professor at Shanghai Ocean University.

Tang said articles in the revised Fisheries Law pave the way for port state measures to be implemented, and establish a process for checks on foreign vessels at non-fishing ports. To him the most important thing is systems for

communication between the marine, customs and fishery authorities, so that fishery authorities know in real time when potential IUU vessels are arriving or leaving, and can be present at checks.

If China does sign up to the Port State Measures Agreement, its first task will be to designate ports for foreign fishing vessels to use. It will then need to allocate enforcement staff, build infrastructure at ports, and encourage cooperation across different departments. According to Wang Tiantian and Tang Yi's paper, this will be no small challenge, and very costly.

But the benefits for fish populations and the countless people who rely on them for protein and a living would be vast. 🍷

Zhang Chun is a senior researcher at China Dialogue.

GOVERNANCE

China announces closed season on squid spawning grounds

Will temporary bans for China's distant-water fleet in the Atlantic and Pacific help squid populations?

By **Zhang Chun** | June 18, 2020

In early June, the Ministry of Agriculture's Bureau of Fisheries announced plans for two closed seasons on squid fishing in parts of the south-west Atlantic and eastern Pacific, to give two species a better chance of reproducing.

The closed seasons cover what are believed to be the main spawning grounds of the Humboldt squid, in

waters to the west of Ecuador's Galapagos Islands, from July to September, and of the Argentine shortfin squid, off Argentina, Uruguay and Brazil, from September to November.

This is the first time China has voluntarily imposed a closed season on the high seas. Some experts regard it as an important step forward in China's management of distant-water fishing (DWF), and crucial for protecting the squid fishing industry. But others say the

impact will be limited and that stronger oversight of fishing vessels is needed, or even a new fisheries management body specifically for squid.

Two overexploited species

Unlike fish such as tuna, the 10 major commercially fished squid species have a lifespan of only a year and die after spawning. Population sizes are therefore particularly vulnerable to external factors. The El Niño weather pattern and

China's distant-water squid fishing closed seasons



September-November closed season

Atlantic Ocean

Pacific Ocean

July-September closed season



Humboldt squid, one of two species the closed seasons aim to protect (Image: Alamy)

other changes in the ocean environment can cause numbers to fluctuate by a factor of ten. Squid are also threatened by overfishing, with most commercially valuable species already fished to unsustainable levels.

The Argentine shortfin squid and Humboldt squid are two of the species commonly caught by Chinese vessels. Populations of the Argentine shortfin have been low in recent years, with average catch by Chinese vessels in the southwest Atlantic only 50 tonnes in 2019, compared to up to 2,000 tonnes previously, according to a spokesperson from the Zhoushan Distant Water Fishing Association. This scarcity forced fishing vessels to head for the Pacific earlier than usual. According to FAO data, catches of the Argentine shortfin, Humboldt and Japanese flying squid have declined for four years running, with the Argentine shortfin seeing the greatest drop.

In Seafood Watch, a sustainable seafood guide produced by Monterey Bay Aquarium, the Argentine shortfin is given a red rating, meaning fishing is occurring at unsustainable levels. As a result, the species cannot be sold in supermarkets or hotels in North America that have made strict sustainability commitments, according to Wang Songlin, chair of the

Qingdao Marine Conservation Society. The Humboldt squid has a yellow rating, meaning there is no significant overfishing problem, but that fisheries management could be improved.

Countries with significant squid populations in their exclusive economic zones, such as Peru and Mexico, already use quotas and “catch ratios” – in which a limited percentage of the catchable population may be fished. “But many commercially valuable squid species migrate between national waters and the high seas, and currently there’s no fisheries organisation to manage squid resources,” explained Wang Songlin.

China is a major catcher, trader and consumer of ocean squid. Its distant-water fleet accounts for 50-70% of the high seas catch, Chen Xinjun, head of the China National Distant Water Fishing Association’s squid fishing technology group, told media. Squid accounts for one third of all China’s DWF catch and for nine consecutive years China has caught more squid than any other nation.

“China is the biggest international processor and trader of squid. Conserving high seas squid stocks is crucial for the sustainability of that industry,” said Wang. He thinks doing so is in China’s own interests, and that the size and influence of the industry means it should act as a responsible fishing power.

A voluntary closed season

However, the closed seasons cover only a small part of the area squid populations are found, and do not apply during the main fishing season. Wang said: “The most important aspect of a closed season is protecting spawning.” As long as the main spawning grounds and times are covered, it will be effective, he added.

According to a paper on global squid fisheries published in 2015, the Argentine shortfin squid spawns mainly in July and August on the continental shelf and slope off northern Argentina, Uruguay and Brazil. That matches closely with the location and timing of China’s proposed closed season there.

The Humboldt squid spawns year-round, but with two peaks from February to April and September to November. That second peak coincides with China’s closed

season. But the squid fisheries paper says more research is needed on the spawning sites of the Humboldt squid. Large squid populations do exist in the high seas 200 nautical miles off Ecuador and Peru, according to a book on distant-water fisheries edited by Chen Xinjun.

The announcement said the outcome of the measures will be assessed annually, with the length and extent of the closed seasons to be adjusted accordingly. Success will of course depend not just on covering the right area, but on effective oversight and enforcement.

China's DWF fleet has committed significant breaches of rules in both proposed closed season areas. One vessel captain suspected of illegally fishing for sharks off the Galapagos has been in custody in Ecuador since 2017. And Chinese vessels have repeatedly fished within Argentina's EEZ. According to Wang Songling, because commercially fished squid species are migratory, vessels do sometimes enter national waters in pursuit. The closed seasons may to some extent reduce the risk of such incidents.

In early May, a Chinese fishing vessel was chased by the Argentine coast guard after fishing for squid in the Argentine EEZ. But according to non-profit Global Fishing Watch, Chinese vessels are most likely to be found in the waters off southern Argentina during the squid fishing season (December to July) – neither the time nor place covered by the closed seasons. Milko Schwartzman, an Argentine fishing expert, said that the closures will not change behaviour during the actual fishing seasons.

He thinks the inclusion of vessel-management measures such as electronic monitoring and electronic fishing logs are positive, calling them “a step in the direction to avoid conflict and overfishing and IUU fishing. But to be effective, they need to be implemented under a transparent and verifiable process.”

Will it happen?

Implementation of the closed season will depend on strong vessel management.

China has been working to strengthen management of its DWF fleet. A DWF planning document released in 2017 called for wider use of remote monitoring

1/3

of China's distant-water fishing catch is squid

systems, logs which report catches in real time, and better coverage by fishery observers. All of these measures will be used to oversee the squid fishing closed seasons. Regulations for a DWF vessel-monitoring system which came into force in January have tougher requirements, with locations now to be reported hourly, rather than every four hours, and new early warnings and alerts for border breaches.

“If strictly implemented, the vessel-monitoring system alone would be enough to enforce the closed season,” said a DWF expert who wished to remain anonymous. According to the rules, all DWF vessels must have a vessel-monitoring system (VMS) installed, unless fishing in waters with particular requirements. The VMS sends encrypted signals on a frequency monitored by the government and is usually more reliable than the automatic identification system (AIS) used to avoid collisions. In China, it also monitors number of days spent fishing, which is then used for calculating fishing subsidies.

To rein in an ever-expanding fishing fleet, China has also toughened up punishments for breaches. Since early 2018, captains and company officials guilty of major rule breaches have been publicly blacklisted and temporarily banned from working, while the companies involved lose out on subsidies and are temporarily or permanently banned from DWF. These measures have been written into DWF regulations and a revision of the Fisheries Law, giving them full legal force.

But though vessel-monitoring data is such an important tool for vessel safety and fishing management, only Indonesia, Chile, Panama and Peru have made it public. This makes it hard for others to evaluate how rules are being enforced. Vessels of many nations fish illegally in the EEZs of other nations. Preventing

such encroaches has always been a problem. In theory, making location data public would reduce the practice. According to Milko Schwartzman, three vessels – including Chinese – fished within Argentina's EEZ this May. When so far from home, captains are sometimes willing to take risks.

Fishery management organisations

“Adjustments to the scope of the closed season, and improvements to the measures taken, can be made later, but the most important thing is to take the first step.” The anonymous DWF expert said you can't lay down the strongest policy right away if it is to be accepted and implemented smoothly.

The Ministry of Agriculture's announcement also said that it will suggest regional fisheries management organisations (RFMOs) look at longer-term and more effective measures, such as implementing international closed seasons in line with China's, or establishing an international squid-management organisation.

Currently, important and valuable fishery resources on the high seas are managed by RFMOs. They ensure resources are used sustainably by monitoring populations of marine animals, bycatch and fishing capacity, and by overseeing fishing activity. Their influence over Chinese fishing vessels is increasing: to comply with the rules of the RFMOs it has signed up to, China has set up a compliance centre to train fishing industry personnel. In April, it carried out the first corporate compliance assessment. The results of that assessment will contribute to decisions on future fishing activity and subsidies.

Milko Schwartzman thinks that although Argentina does not support the idea of a dedicated squid RFMO, a body along the lines of an RFMO would be an improvement and help maintain squid populations: “Perhaps a body with some of its characteristics and with different structure, a new kind of conservation and regulation body can be possible with the agreement of the more involved states.”

Zhang Chun is a senior researcher at China Dialogue.

China is key to closing ports to illegally caught fish

The world's fishing superpower is set to ratify the Port State Measures Agreement in 2020



US Coast Guard Cutter Morgenthau steams alongside the Chinese Coast Guard vessel 2102 as they transfer custody of the fishing vessel Yin Yuan detained for illegal fishing. (Source: Alamy)

By **Todd Woody** | October 25, 2019

The United Nations has a straightforward solution to the illegal fishing that is decimating marine life and pushing some species toward extinction: close the world's ports to vessels engaged in the US\$23 billion black market.

Deprived of safe harbours to offload their illicit cargo, the economic incentive to plunder the seas would begin to evaporate. That's the idea behind the Port State Measures Agreement (PSMA), which came into effect in June 2016

and requires participating nations to restrict entry of foreign fishing vessels to designated ports.

Before allowing them to dock, countries must verify where the ship is registered, conduct inspections and take other actions to ensure they are not transporting illegally caught fish. That information is to be shared in real time among port states, casting an electronic net over pirate ships.

But for this remedy to this tragedy of the aquatic commons to be effective, all coastal countries must join the PSMA

and enforce its provisions. Otherwise, rogue vessels would likely still be able to find ports of call to get illegal, unregulated and unreported (IUU) seafood to market. To date, 62 nations plus the European Union are party to the PSMA. That leaves 77 coastal nations not yet involved, including the world's fishing superpower – China.

China deploys the world's biggest fishing fleet and catches the most fish. It also operates 14 of the 15 busiest ports, according to a study ranking the risk of illegally caught fish passing

through the biggest ports.

“Obviously, China is an important player,” says Dawn Borg Costanzi, an officer with the Pew international fisheries programme in the United Kingdom. “Neighbouring countries have already signed up to the PSMA so we need to close off the remaining gap as it’s important that they cannot look to China as a lax port they can enter with their IUU-caught fish.”

She noted that China’s participation is crucial for another reason.

The PSMA, which is administered by the UN Food and Agriculture Organisation (FAO), mandates that countries require vessels that fly their flag to submit to port inspections. If a port state denies a ship entry because of suspected illegal fishing, it must notify the flag state – the country where the vessel is registered. If the flag state is a party to the PSMA, that country then has the duty to investigate the vessel and, if it finds evidence of illicit fishing, take action to penalise the ship, such as by levying fines or revoking its registration.

The flag state must then report the result of that investigation and the actions it has taken to the FAO, relevant port states and regional fisheries management organisations.

With nearly 3,000 vessels, China’s overseas fleet is the world’s largest. “So having China even as a flag state is important for things like information exchange and inspection of Chinese vessels in other ports subject to the Port State Measure Agreement,” says Borg Costanzi.

The port study, which was conducted with financial support from the Pew Charitable Trusts, ranked China as among the countries most at risk of illegal fishing vessels passing through its ports. That’s both due to the volume of foreign-flagged ships and a lack of internal controls designed to detect illegal fishing.

“Surely it will be helpful for combating IUU fishing worldwide if China joins and implements the PSMA,” says Tang Yi, dean of the College of Marine Culture and Law at Shanghai Ocean University.

He says he expects China to ratify the

PSMA “no later than 2020.”

“I actually know that the Fisheries Bureau of the Ministry of Agriculture and Rural Affairs, which is the central government agency in charge of fisheries in China, is trying its best to promote China’s accession to the agreement,” he wrote in an email from New York City, where he was attending the UN negotiations to draft a treaty to protect the biodiversity of the high seas.

“Before China is ready to join the PSMA, the coordination mechanism between the fisheries agency and the maritime agency and the custom sector must be established,” he adds. “The possible ports [that] could be designated for the... entrance of the vessels not entitled to fly China’s flag are managed by the maritime agency.”

Coordination between the various agencies within countries with jurisdiction over fishing is one obstacle to the implementation of the PSMA. Another is the creation of an electronic information mechanism to share port inspection data in real time to prevent ships denied entry in one country from going “port shopping” in others.

“So far it’s still a challenge for port states to get in contact with some of the flag states to validate the information the vessels are providing,” notes Borg Costanzi. “When a port state finds something amiss, it’s not easy for other port states to know if the vessel shows up in their ports.”

A prototype of an online information-sharing system is set to be unveiled in May 2020.

Developing countries – particularly small island states – face financial challenges in implementing the PSMA, though the agreement does provide for the provision of resources to help those nations develop inspection and data systems.

According to the FAO, 40 countries are receiving assistance and US\$15.5 million has been allocated to 10 current projects to build the capacity of developing nations to carry out the PSMA.

A white paper issued in May by Stanford University’s Centre for Ocean Solutions and the World Economic

Forum concluded that: “Transitioning historically secretive and paper-based systems to ones that support near real-time data sharing ... is central to the PSMA’s effectiveness.”

So far, the pace of that transition is slowing the rollout of the PSMA, according to lead author Annie Brett. “Despite the PSMA’s increasing number of ratifications, there remain significant questions about how the agreement’s mandates to collect fisheries data and facilitate data sharing between countries can be carried out” she wrote in the paper.

Brett notes that some of the regional fisheries management organisations have already implemented electronic information systems that could serve as a model for the PSMA. The Indian Ocean Tuna Commission, for instance, operates a technology platform that allows its 32 member states to share data in real time.

Given the ongoing implementation of the PSMA, experts say it’s difficult to assess the agreement’s impact on illegal fishing to date. But when the Pew-funded researchers analysed 14 ports – two from each of the FAO’s seven geographical regions – they found that only three countries had legally identified ports for the entry of overseas fishing vessels.

Records of previous vessel visits could be found at only four ports. Ten ports, however, have put into effect the PSMA requirement that foreign fishing vessels provide advance notification before entering a harbour and only do so after receiving authorisation.

Jose Graziano da Silva, who recently stepped down as director-general of the FAO, has noted the rapid adoption of the PSMA, with 100 countries so far pledging to join the accord.

“The PSMA is only as strong as the number of ports it closes to IUU fishing; these numbers are crucial,” he said in a statement earlier this year. “When you consider that the parties to the PSMA comprise over 50% of total coastal states globally, this is a remarkable achievement in such a short time.” 

Todd Woody is a California-based environmental journalist who specialises in ocean issues.

Protecting 30% of the ocean is easier said than done

New marine biodiversity target a distant prospect, following failure of 2010 biodiversity targets and lack of high seas governance

By **Kong Lingyu** | May 13, 2020

Although there is no official word, it is highly likely the 15th Conference of the Parties to the Convention on Biological Diversity (CBD COP15), due to be held in Kunming this October, will be pushed back to next year, as the coronavirus epidemic has forced a number of preparatory meetings to be cancelled or delayed, stalling the already slow CBD negotiations process.

The epidemic makes the future of targets for global biodiversity – including in the ocean – even more uncertain. With economies suffering, how much money will there be for marine biodiversity? But some see opportunity. Li Shuo, senior global policy advisor with Greenpeace East

Asia, says recent epidemics have almost all originated in animals, and the coronavirus exposes the possible health risks that arise when the relationship between humanity and nature falls out of balance.

Calls for a “Thirty by Thirty” target – to make 30% of the global ocean marine protected areas (MPAs) by 2030 – have been increasing. The target is already in the zero draft for CBD COP15, and it is the clearest and most widely supported of the proposals to the conference.

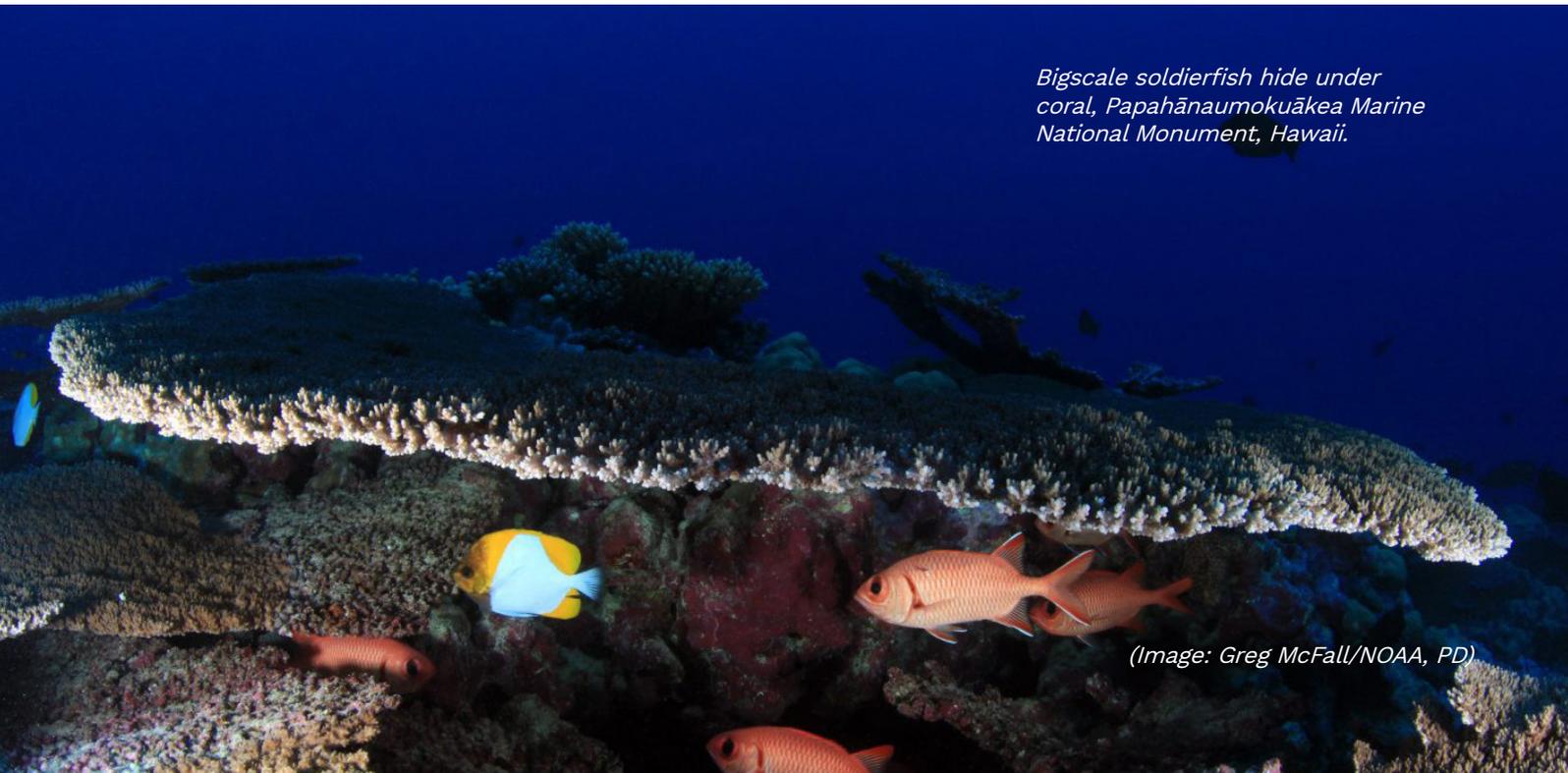
But the slow pace of progress over the last decade, often inadequate marine protection where it does exist, and the current precarious state of negotiations over mechanisms to protect the high seas all point to the huge challenge

of achieving the goal. Even if the political will to add it to the Kunming targets is there, actually fulfilling that commitment within the next ten years looks to be an impossible task.

Aichi failures

As early as 2000, scientists were calling for 30% of the ocean to be protected in order to preserve biodiversity. In 2003, the World Park Congress proposed strict protections for at least 20-30% of the ocean by 2012. Unfortunately, a lack of political will meant that parties to the CBD scaled back ambitions in 2010, calling for protection of only 10% of coastal and marine areas. That became Aichi Target 11, named for the Japanese prefecture where the 2010 talks took place.

Bigscale soldierfish hide under coral, Papahānaumokuākea Marine National Monument, Hawaii.



(Image: Greg McFall/NOAA, PD)

Marine Protected Areas cover 7.43% of the ocean

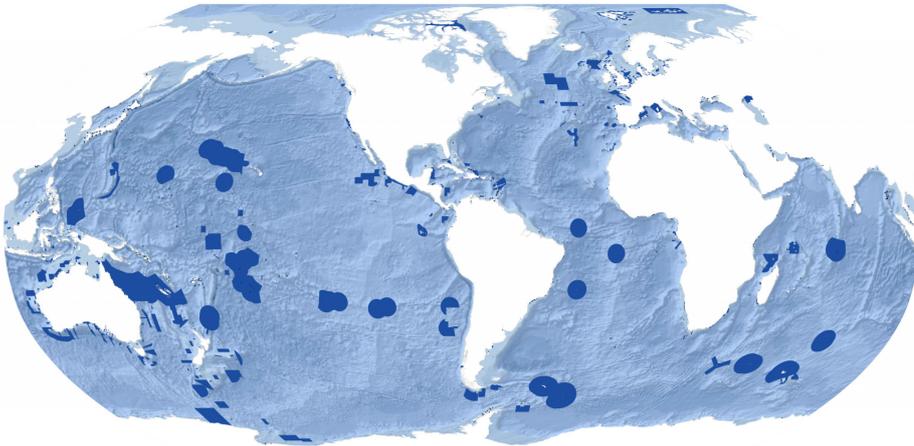


Image: UNEP-WCMC / IUCN

Ten years later, when reviewing the performance of the 196 parties to the CBD, there is no denying that even the 10% target has been missed. Although the CBD doesn't make official data on protected ocean areas available, the International Union for the Conservation of Nature calculated from national data that only 7.43% of the ocean worldwide was protected as of 12 April 2020.

The Aichi target was more concerned with the quantity of MPAs than the quality. It called for such areas to be "conserved through effectively and equitably managed, ecologically representative and well-connected systems." But much research has shown that MPAs are only effective when extractive practices such as fishing and mining are banned.

When you look at the quality of protections, that 7.43% achievement seems even less impressive. First, this is just a simple total of nationally reported figures, and many of the MPAs are "paper parks", existing only in government documents. Some are merely proposals, years away from implementation. Second, the vast majority of these MPAs still allow the use of various types of resources. After examining the data, the Marine Conservation Institute found that only 2.5% of the ocean could be classed as highly protected, with only light extractive activities allowed.

Kristina Gjerde, senior high seas advisor to the IUCN, told China Dialogue: "So to me the definition of MPA needs to talk about everything [being] managed for conservation, and MPAs today don't. They are just more like marine planning exercises." She explained that the IUCN places MPAs in one of six categories, according to the level of protection, with Category V and VI allowing the sustainable use of natural resources. "It means more sustainable use for local communities. It doesn't mean commercial fishing. And so if you start to scrutinise how many MPAs are open to commercial fishing, and said 'no, they should not be really qualified MPAs', your numbers will go way down."

Trouble on the high seas

Calls to implement the Thirty by Thirty target have gathered force among scientists, international organisations, the media and the public, and can no longer be ignored. But nor can two problems: First, given the lessons learned from the Aichi process, can we fulfil this goal? Second, how? This brings us to high seas governance.

The CBD aims to protect global biodiversity. But its signatories – sovereign states – can only create MPAs within their jurisdiction, not for the high seas. Aichi Target 11 did not specify if that 10% was to be in marine areas within national jurisdiction, or to cover the high seas. Currently, the vast majority of MPAs fall within national jurisdictions.

But only 39% of the ocean falls within national jurisdiction, with the remaining 61% being international waters. Thus, achieving the 30% protection target would require protecting almost 80% of domestic waters. This is clearly unrealistic.

In other words, the tools currently at the CBD's disposal do not allow it to reach the Thirty by Thirty target. Either it comes up with new mechanisms, or the 196 signatories achieve that target via other international platforms or tools.

There is no widely used method for managing MPAs on the high seas. In 2004, talks started on marine biodiversity beyond areas of national jurisdiction (BBNJ), under the UN Convention on the Law of the Sea. After 16 years of talks and three formal intergovernmental negotiations in the last two years, there is hope for a binding treaty on the high seas. The MPA articles of that treaty would be an important tool for the CBD in achieving its targets.

It is as if 196 people decided to cross an ocean over the course of a decade. Their aim is set but they have no means of transport. The first order of business is to find or fashion one. How long will that take? This is the crucial issue for high seas protection today. A BBNJ treaty looks the most plausible "boat" – but the coronavirus has forced a fourth intergovernmental meeting planned for March and April to be postponed.

The outlook for the BBNJ talks is unclear, said Zheng Miao Zhuang, associate researcher with the Ministry of Natural Resources' Marine Development Strategy Institute and deputy head of its Ocean Environment Resources Research Office. "Although there is quite a bit of consensus on MPAs, there are four topics that need to be resolved at once: marine genetic resources, including questions on the sharing of benefits; environmental impact assessments; capacity building and the transfer of marine technology. Even if progress is made on MPAs, there will be no agreement if the other three topics aren't also concluded."

What targets do we need?

Given the inadequacy of existing MPAs and the lack of high seas

governance mechanisms, is it possible to protect 30% of the ocean within ten years? And is it even a worthwhile target?

Many scientists are questioning such “numbers first” targets. Over the last decade, some countries have hastily set up MPAs to meet Aichi Target 11 – but with poor protections. According to Megan D. Barnes and others in a paper published in 2018, such targets result in a focus on establishing protected areas but give the false impression that conservation is actually taking place: “It would be inconceivable to monitor healthcare provision based on available beds (quantity) irrespective of the presence of trained medical staff (quality) or whether patients live or die (outcome).”

Although scientists have produced methods to better evaluate the effectiveness of a protected area, these rarely come up in international negotiations or make it into treaty texts. The detail and complexity of scientific research tends not to survive a policymaking process involving 196 parties. So while numeric targets may suffer from being a blunt instrument, this is also their strength. “Quantified targets are easy to report on and assess. In this sense, of all the Aichi targets, the one on the extent of MPAs is the easiest to understand and evaluate,” Li Shuo said. “Look at the first of the Aichi targets: ‘By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.’ What’s the point in a target when there’s no way to measure success?”

Observers generally think numeric targets are a powerful tool. The 30% aim remains bracketed in the Kunming zero draft, meaning it requires further discussion, but it is a start. Chen Jiliang, a high seas conservation researcher with NGO Greenovation Hub, doesn’t think it’s a choice between quality or quantity – both are necessary.

The Thirty by Thirty target has strong support from the UK, the EU, Canada, Costa Rica and the Seychelles. “Nobody has been explicitly opposed to it during talks. But a lot of countries haven’t commented on the actual number, and some of them may have reservations about it,” said Li Shuo.

More important is how the target will be implemented. The weakness of the CBD is that it lacks teeth. After the 10% target was announced, countries themselves decided what action to take, then submitted reports they produced themselves. It is as if students submit homework which never gets marked, but is just left on a desk to be read by anyone who might be interested. This has led to the CBD being described as toothless.

61%

the proportion of the ocean considered international waters



The weakness of the CBD is that it lacks teeth

“Setting conservation targets is one thing, implementing them is another,” said Zheng Miaozhuang. He thinks that while the Thirty by Thirty target has gathered plenty of political will, “if like the Aichi Target 11 it is never achieved or creates MPAs that exist only on paper and in words, it doesn’t matter how ambitious is it.”

But multilateral processes often set lofty targets which, though never met, result in progress during implementation. Kristina Gjerde told China Dialogue that while many protected areas aren’t well managed and may not be worthy of the name, encouragement is needed for improvement: simply pointing out these aren’t really MPAs won’t help.

Chen Jiliang thinks the parties to the CBD should support an ambitious target: “Without that target, there’s no reason to mobilise the resources to achieve it.”

During talks on marine conservation targets, China has always stressed feasibility and a combination of quality and quantity. Zheng Miaozhuang said the 5th Working Report of the CBD, originally due to be published in the first half of this year, would review national implementation of Aichi Target 11. This would help set targets for marine protection under the CBD’s post-2020 framework. However, the coronavirus means it will likely be delayed.

One researcher with the Ministry of Natural Resources who participated in the talks and has requested anonymity said that China is taking a conservative stance on a numeric target. He thinks clarity will be needed on what is meant by “ocean”, as the post-2020 targets cover marine areas under national jurisdiction – and two-thirds of the ocean is international waters.

Nor is Li Shuo particularly optimistic. “The negotiation process is more than halfway over, and everyone’s still talking about designing targets, with less discussion of implementation and funding. Is that going to convince people the Kunming process has learned lessons from Aichi?”

Enric Sala, marine ecologist and National Geographic explorer-in-residence, said in an email to China Dialogue that “COVID-19 has already changed the world, and everyone can realise that our relationship with nature is broken and that we have to fix it. This is why I hope that Kunming will change history not only by agreeing to ambitious targets for nature conservation, but also by establishing mechanisms to optimise and monitor conservation outcomes. We cannot make big announcements and promises without a real commitment to follow up.”

Kong Lingyu is a freelance writer covering environment and science. She was a journalist with Caixin Media, and a project manager with Guangzhou Green Data Environmental Service Center, a non-governmental organization in China.

Priceless poo: the global cooling effect of whales

The largest animals in the ocean play a critical role in helping our planet function, but remain under threat from a range of human impacts

By **Jessica Aldred** | April 24, 2020

Saving the whales may be more important than planting trees when it comes to tackling climate change and keeping our oceans healthy. The world's largest animals play a crucial role, helping fertilise the microscopic plants that absorb 40% of CO₂. They also capture vast amounts of carbon in their bodies before sinking to the bottom of the ocean when they die and locking it away, sometimes for centuries.

Last year, the International Monetary Fund (IMF) valued the role of whales in carbon sequestration and healthy ocean functions at more than US\$1 trillion. Based on scientific papers, it estimated a single great whale to be worth more than US\$2 million, given its contribution to carbon capture, fisheries enhancement and tourism.



A group of sperm whales gather to defecate together. The reason for this rarely documented behaviour is not known. It could be a defence mechanism, although in this case it's most likely a social activity (Image © Tony Wu)

But populations of whales in the world's oceans have been decimated in the last two centuries, falling from 5 million to 1.5 million today. More than 30 years after commercial whaling was largely banned in a bid to protect them, whales continue to suffer from human impacts in the form of plastic and noise pollution, ship collisions, fishing gear and global warming.

Whales and carbon capture

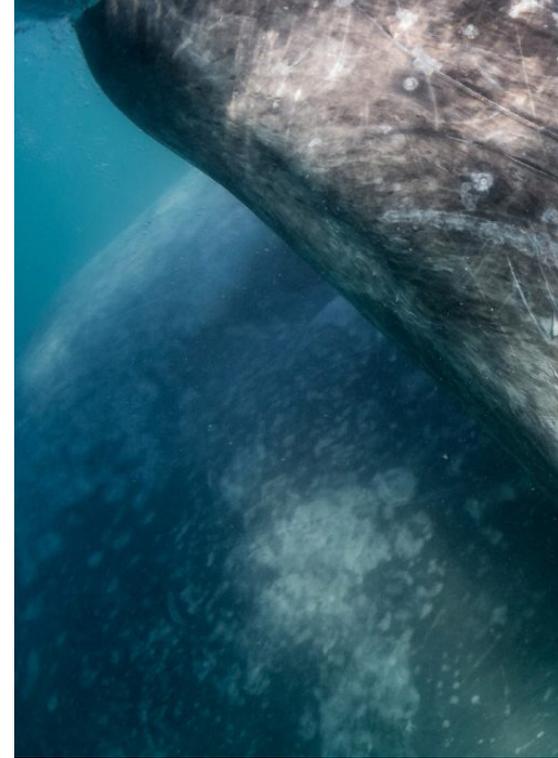
A whale accumulates carbon through feeding and stores it in its body during its long lifetime. Some weigh 200 tonnes and their average lifespan is 70 years. One species, the bowhead whale, is estimated to have a lifespan of 268 years.

When a whale dies, it sinks to the bottom of the ocean, where the carbon in its body stays. The IMF estimates that each great whale sequesters 33 tonnes of CO₂ on average, and that a tree absorbs only up to 22kg CO₂ a year. Tree-planting schemes are being seen as the cheapest and fastest method of taking CO₂ out of the atmosphere. The evidence suggests conserving and boosting whale populations also has great carbon-capturing potential.

Sunken whale carcasses take decades to decompose, becoming an entire ecosystem in themselves, supporting deep-sea species from large scavengers to microscopic bacteria with a huge and immediate source of food.

Priceless poo

Whales do more for carbon capture



An inquisitive grey whale calf (Image © Tony Wu)

when they are alive, however, thanks to their jumbo-sized poo. These “faecal plumes” contain enormous amounts of nutrients – including phosphorus, iron and nitrogen – that are essential for the growth of phytoplankton. When these microscopic plants photosynthesise, they consume carbon dioxide and produce oxygen. The IMF calculates that phytoplankton are responsible for capturing about 37 billion tonnes of CO₂, the same as 1.7 trillion trees, or four Amazon rainforests. They also contribute as much as 50-85% of the oxygen in the Earth's atmosphere. Sylvia Earle, the famous National Geographic ocean explorer, has estimated that they provide the oxygen for one in every five breaths we take.

Scientific research shows that whales have a “multiplier effect”, increasing phytoplankton production wherever they are found. As well as bringing nutrients from the ocean's depths to the surface through their vertical movement, known as the “whale pump”, they also distribute them laterally, the “whale conveyor belt”, on their vast migrations.

Whale behaviour

Humans have always found the behaviour of whales intriguing and endearing, perhaps because we have so much in common. Whales and dolphins live in tightly knit groups known as pods,



This humpback whale is entangled in longline fishing gear, impeding its movement. (Image © Tony Wu)

have complex relationships and talk to each other. A 2017 study compiled a list of behaviours that are similar to humans and primates including: working together for mutual benefit; teaching young how to hunt and use tools; using regional “dialects”; identifying individuals with unique sounds; looking after young not their own; and social play.

Ship strikes and entanglement

Many of the world’s busiest cargo and ferry lanes and ports directly overlap with areas where whales feed and breed or travel along migratory routes. Ship strikes have become a leading cause of death, with whales often simply unable to get out of the way in time. Noise from boats also interferes with their ability to navigate and communicate.

As fisheries respond to a growing global appetite for seafood, entanglement in fishing gear is also an increasing threat. Particularly affected is the North Atlantic right whale, found along the east coast of

North America from Florida to Canada, a region also home to lucrative lobster and crab fisheries. The long vertical ropes or “lines” used to connect traps on the ocean floor to floats on the water’s surface can be lethal to right whales. The ropes can constrict body parts and cut into flesh and bone, causing abrasion, infection and sometimes severance. Often whales can drag the heavy gear around for months, struggling to eat, swim, dive, breathe and



Humpback whales in Alaska have developed an ingenious method of fishing for herring known as “bubblenetting”, but their prey is under threat from ocean warming. (Image © Wade & Robyn Hughes)

reproduce. They lose energy and weight gradually, sometimes taking years to die.

Studies show that nearly three-quarters (72%) of diagnosed right whale deaths between 2010-18 occurred because of entanglements, and that 85% have been caught in fishing gear at least once. There are now just 409 remaining individuals, with less than 100 females of breeding age. Without intervention, they may be functionally extinct by 2040.

As well as live fishing gear, whales are also being killed in their thousands by “ghost gear”: abandoned, lost or discarded plastic fishing nets, ropes and lines in which they become trapped.

Climate change

Warmer ocean temperatures and melting sea ice pose serious threats to the survival of the world’s great whales. The reduction of sea ice cover is likely to impact belugas, narwhal and bowhead species for whom the Arctic provides habitat and feeding grounds. In the Antarctic, sea ice is also decreasing in certain areas, resulting in massive declines in krill, a primary food source for many species including whales.

The krill and plankton that form the foundation of the marine ecosystem are also being affected by the increasing acidification of the ocean as it absorbs more CO₂. Some species will be unable to form and maintain their protective calcium carbonate shells, threatening animals further up the food chain. Studies show that plankton populations could decrease by as much as 40% by 2050. Coral reefs and polar regions are on the frontline of the acidification crisis, with North Pacific salmon,

mackerel, herring, cod and baleen whales among the species under the most immediate threat.

Warmer seas will also affect the distribution of whales. If their prey moves as a result of climate change, they will likely follow. Mass movement of species to different habitats will result in increased competition for diminishing amounts of prey.

Pollution

Toxic chemicals banned decades ago could kill off more than half of the world's killer whale population in 30-50 years, scientists believe. PCBs (polychlorinated biphenyls) are manmade organic compounds once used in electrical equipment, flame retardants and paints until they were found to be so dangerous to human health that they were banned in the US in the 1970s and Europe in 1987. Resistant to heat, chemicals and natural degradation, the same things that made PCBs so attractive also makes them hard to destroy, and so they remain in the ecosystem decades later. Some were improperly stored or disposed of, or even directly discharged into soils, rivers, wetlands and the ocean. Entering the food chain, they have worked their way up to concentrate in top predators, causing cancers, altering behaviour, damaging immune systems and harming reproduction. European killer whale populations, along with dolphins and porpoises, are the most contaminated in the world, and sadly some of the most heavily exposed populations are not expected to survive the next few decades. 🔄

We are grateful to Tony Wu and Wade and Robyn Hughes for the use of their stunning photographs in this article.

Wade and Robyn's new book Looking for Whales is now available to order online.

Jessica Aldred is special projects editor for China Dialogue, focusing on globally important environment themes including the ocean and biodiversity.

RESTORATION

Tiaozini wetlands: once threatened by development, now a world heritage site

International recognition for Jiangsu's migratory bird habitats marks another victory for wetlands conservation in China

By **Zhang Chun** | December 17, 2019

It is the first autumn since the Tiaozini wetlands became a world heritage site. The artemisia halodendron, a hardy shrub cultivated for food on these briny mudflats, has changed colour, carpeting the brown in seasonal red.

The flats are host to millions of migratory birds that winter here, including the critically endangered spoon-billed sandpiper.

Despite Tiaozini's importance as a habitat, it was only included in the bid for world heritage site status at the last minute. Its inclusion should be considered "the biggest achievement of this application", according to Wang Songlin, secretary-general of the Qingdao Ocean Research Association. Just a few years ago, the area was under threat from land-reclamation projects.

How did Tiaozini escape this fate and win international recognition? And what can efforts to save other sites in urgent need of protection learn from it?

An essential stopover for migratory birds

The Tiaozini wetlands lie halfway along the East Asia–Australasia Flyway, a route taken by 50 million migratory birds of 200 species every year. Twenty-five of these are known to be endangered, of which 23 use the wetlands to overwinter, as their summer breeding grounds, or simply as a place of rest on their migrations. The spoon-billed sandpiper is one of these visitors. There are thought to be fewer than 500 mature individuals of this rare wader left. Up to 100 of them gather in Tiaozini to spend the winter.

The sandpiper's numbers have seen significant declines since the 1970s. According to Li Jing of the NGO Spoon-billed Sandpipers in China, a major cause of this has been development on its habitats. Reclamation of Jiangsu's wetlands has also threatened populations of 16 other migratory bird species that rely on intertidal habitats, she says.

Tiaozini is part of the Yancheng wetlands that UNESCO granted world heritage status in July, and is one of the few remaining refuges for these birds in China.



A spoon-billed sandpiper on wetlands near Tiaozini (Image © Chen Tengyi)



Spring-time visitors to Tiaozini (Image © Li Dongming)



Far from a wilderness, development encroaches on all sides of the Yancheng wetlands. Here, a herd of Père David's deer grazes in the northern part of the Dafeng Milu nature reserve. (Image © Li Dongming)

The wetlands include the wider circle of intertidal mudflats surrounding Tiaozini and a separate area to the north of the port of Dafeng. They take in five existing reserves, including two protected at the national level: the Yancheng rare birds reserve and the Dafeng Milu nature reserve. Together, the Yancheng wetlands make up the first phase of China's application to the World Heritage Committee to protect migratory bird sanctuaries along the coast of the Yellow Sea and Bohai Gulf. Phase two is set to be submitted in 2022.

The threat of land reclamation

Despite being part of the Yancheng rare birds reserve, Tiaozini was included in a plan to reclaim wetlands put forward in 2011 by the Yancheng municipal government.

Despite a lack of research on the link between bird populations and their stopover habitats, Li Jing warns: "Shrinking their habitats can have a devastating

effect on migratory birds. Half the wetland may not have been enough to support them."

Thankfully, the second phase of development was not approved.

Wetlands saved

Wang Songlin thinks the approval process for this second phase was slowed by interventions from Li Jing's NGO and fellow organisations like Let Birds Fly. These groups maintained a dialogue with both the local development and reform commission, which submitted the land-reclamation plans, and the State Oceanic Administration, responsible for approval or rejection.

Tian Yang, a former project officer with Let Birds Fly who took part in that organisation's investigation into the plans, says he was part of a broad effort to stop the development. "It was the result of work by academics, NGOs, members of the public and of the country's legislative and political advisory bodies. In particular, it was the result



A Far Eastern curlew on the Chongming wetlands near Tiaozini (Image © Chen Tengyi)



Sunset over the Tiaozini wetlands (Image © Li Dongming)



Autumnal Artemisia halodendron cultivated on reclaimed wetlands in Tiaozini.
(Image © Li Dongming)

of solid scientific research, legislative proposals and the world heritage application,” he said.

But there is general agreement it was broader circumstances that halted the plans – a shift in the winds in favour of environmental protection.

In October 2012, the State Council issued a document on setting marine ecological “red lines”. It called for the protection of 30% of the natural coastline of the Bohai Sea and for strict management of the region in accordance with its ecological value and vulnerabilities. In late 2016, as part of the implementation of these red lines, the State Council published a plan to protect and restore over 533,000km² of wetlands across the country.

“These changes meant previously planned land-reclamation projects would not be able to go ahead in the near term,” explains Wen Cheng, a member of both the International Union for Conservation of Nature’s (IUCN) Species Survival Commission and the National Forestry and Grassland Administration’s World Heritage Committee.

Mid-2017 ushered in the country’s toughest-ever environmental regime, with central government dispatching inspectors to hold local governments to account. Then in early 2018, inspectors cracked down on land-reclamation projects violating state regulations.

And so, the “near term” became more permanent for Tiaozini.

Applying for world heritage status

It was against this backdrop of national efforts to bolster the protection of coastal ecosystems that the application for world heritage status for Jiangsu’s wetlands was put together. Its success was far from assured, however. It initially failed on two of UNESCO’s three main assessment criteria, including existing environmental protection measures. Suggestions the application be delayed promoted China’s delegation to the World Heritage Committee to declare “a national commitment to the all-round protection of important coastal migratory bird habitats”, recalls Wen Cheng. He says this commitment, along with China’s clear acknowledgment of the importance of Jiangsu’s wetlands, meant the application ultimately passed by 18 votes to two.

As for Tiaozini’s last-minute inclusion in the application, this was requested by the IUCN expert committee responsible for assessing the bid, which called it critically important for bird conservation.

Wen Cheng says this had a lot to do with contributions from scientists and volunteers working in Tiaozini, whose transparent and objective research provided the evidence needed to prove the site’s importance.

Expanding conservation

World heritage status is not the end for Tiaozini and the Yancheng wetlands. Keen to further increase protections, the Yancheng municipal government is currently applying for “International Wetland City” status. It has also just hosted the Third Yellow and Bohai Seas Wetlands International Conference, and will seek new ways of developing that will protect the wetlands instead of reclaiming them for farms or construction.

The two sites protected under this first phase application to the World Heritage Committee is just the start. The second phase will include an additional 14 locations, most of them further north along the coast of the Bohai Sea and the Liaodong peninsula. Together with the wetlands of Jiangsu, they make up a vital network of habitats for migratory birds travelling along the East Asia–Australasia Flyway. China hopes coordinating conservation efforts across all these sites will be the most effective way of protecting them.

“Applying for world heritage status is a new way of encouraging local governments to protect their wetlands,” says Wang Songlin. China now has 14 natural world heritage sites, including the Jiangsu wetlands. In many cases, the ecological value or geological characteristics of these sites becomes a calling card for the local area. And with the Chinese government’s focus on environmental protection, a successful bid is also a feather in the cap of any ambitious official.

Much work remains to be done for phase two of China’s application to protect migratory bird habitats. Chen Yaohua, director of the World Heritage Research Centre at Peking University, has outlined the many steps involved in an interview with state media. He said the plan is to complete the application, as well as conservation and management plans for the 14 proposed sites, by June 2021. In September 2021, it will be sent to the World Heritage Research Centre for an assessment, and then it will be officially submitted by 31 January 2022, for inclusion in 2023.

“So, preparations for the application need to start next year. Time is very tight. There’s barely time to take a breath,” he said. 🇨🇳

Zhang Chun is a senior researcher at China Dialogue.

The natural solutions to climate change held in the ocean

Protecting and restoring mangrove swamps, salt marshes, seagrass meadows and kelp forests would halt biodiversity loss and soak up carbon emissions

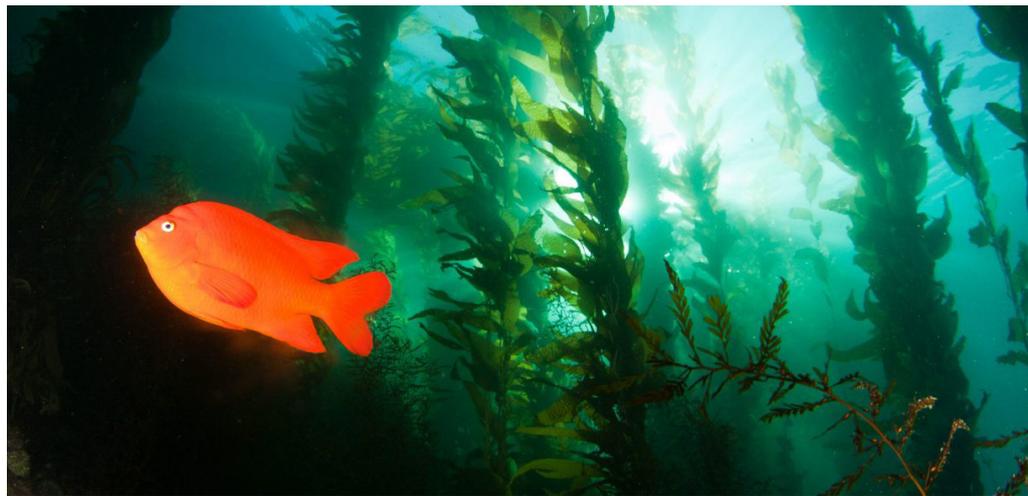
By **Fred Pearce** | November 26, 2019

Indonesia has turned 40% of its coastal mangroves into prawn ponds over the past three decades, exposing thousands of kilometres of coastline to storm surges and deadly tsunamis. A fifth of the salt marshes along the Thames estuary in England disappeared in the last quarter of the 20th century, haemorrhaging millions of tonnes of carbon into the air. California's offshore kelp forests are crashing, in the face of warmer waters and an invasion of sea urchins.

Scientists say such unheralded ecological catastrophes matter more for the climate than the headline-grabbing destruction of rainforests. Because, hectare for hectare, these coastal ecosystems hold more carbon than the lushest jungle.

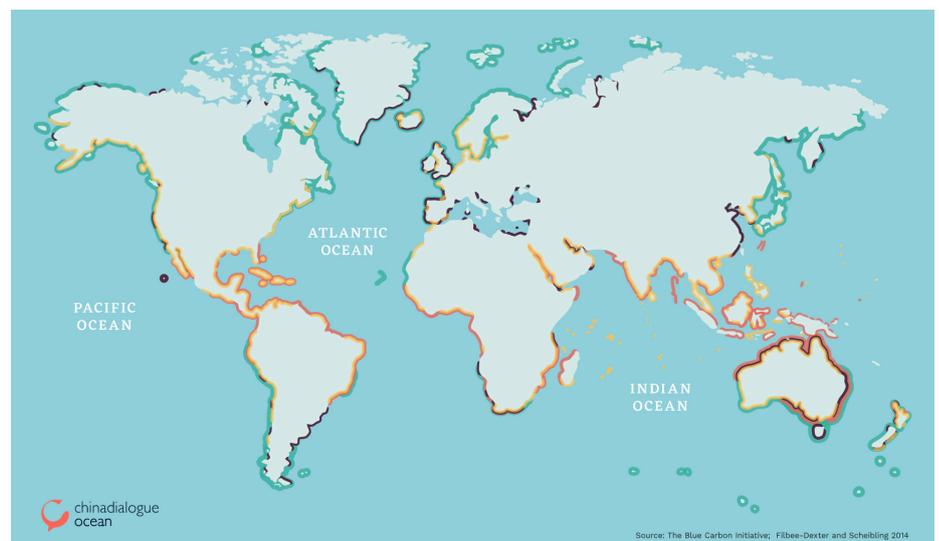
This year has seen a growing call among environmentalists to restore natural ecosystems as a win-win for the twin environmental perils of our times – the collapse of biodiversity and the runaway threat to humans and nature alike from the climate crisis.

The emphasis of this search for “nature-based solutions” has been on forests. Researchers claimed in July that there is still room on our crowded continents for a trillion more trees that could soak up some 200 billion tonnes of carbon dioxide – or five years of current global emissions. But an equally important route to climate salvation may lie with the mangrove swamps, salt marshes, seagrass meadows and kelp forests that stretch along many shores all the way from the tropics to the Arctic.



A garibaldi damselfish in a kelp forest, Santa Catalina island, California (Image: Adam Obaza / NOAA, CC BY)

The world's blue carbon ecosystems



Seagrass (orange), Kelp forest (Green), Mangroves (red), Salt marshes (Black)

Blue carbon: the CO₂ removed and stored by coastal ecosystems

Globally, these habitats are being lost at a rate of 1-2% a year



Mangroves

Extract around 30 million tonnes of carbon a year, provide critical habitats and absorb storm surges and rising tides.



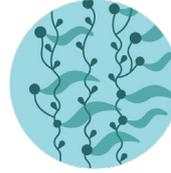
Salt marshes

Once cleared for grazing land, many are now being restored to provide valuable coastal defences.



Seagrass beds

These flowering, submerged plants are extremely carbon-rich, but also vulnerable to river pollution.



Kelp forests

Giant seaweed forests found in cold waters are being affected by rising sea levels and ocean warming.

Source: Blue Carbon Initiative; and Sanderman et al. *Environmental Research Letters*, 2018

Nature's carbon sinks

Coastal ecosystems typically sequester carbon dioxide from the air at a rate of between 12.5 and 8 tonnes per hectare each year – several times faster than the net rate by mature tropical forests. Despite their diminishing range, recent estimates suggest that surviving mangroves absorb from the air around 30 million tonnes of carbon a year, while salt marshes extract as much as 80 million tonnes and sea grasses maybe 100 million tonnes.

Nobody is saying we don't need to eliminate carbon-based fossil fuels from our energy system. Halting the billions of tonnes of carbon dioxide they emit each year remains the top priority for stabilising climate. But, with temperatures already 1C warmer than in pre-industrial times, the UN's Intergovernmental Panel on Climate Change (IPCC) has warned that meeting the commitment of the 2015 Paris climate conference to halt that warming well below two degrees will also require restoring nature's ecosystems, so they can draw more carbon dioxide from the atmosphere.

The potential of coastal ecosystems to store "blue carbon" was due to take centre stage at this December's UN climate negotiations in Santiago, Chile. COP25 has now been relocated to Madrid, Spain, after the Chilean government cancelled its hosting role amid civil unrest.

First we have to stop the rot. The IPCC, in a report in September on climate and the oceans, estimated that nearly half

of all coastal ecosystems had been lost over the past century due to construction, drainage for agriculture, conversion to fish ponds or climate change. As much as 1 million hectares of coastal wetland ecosystems are still being lost annually, according to the Blue Carbon Initiative. A recent study by the US National Academy of Sciences put the resulting emissions at around 500 million tonnes of carbon dioxide per year.

Yet global attention to the fate of these ocean carbon hotspots remains fitful at best. While the upsurge in deforestation in the Amazon transfixed the world over the summer, who was calling out the equally rapid rate of coastal ecosystem loss?

An ocean of solutions

Mangroves are tropical trees that grow in salt water between high and low tide. Their roots extend deep into coastal sediments. They flank something like 140,000 km² of tropical coastline, in more than 100 countries, and flourish best where rivers bring plenty of sediment to the shore. The trees and the thick carbon-rich sediments maintained by their roots may hold as much as 6.4 billion tonnes of carbon, and capture 30 million tonnes more each year.

These oxygen-deprived sediments typically hold onto carbon for centuries, unlike oxygenated forest soils which release carbon dioxide into the atmosphere within a few decades.

Besides storing carbon, the tangled mangrove roots shelter complex

ecosystems of sponges and worms, shrimps and sharks, while acting as important nurseries for fish. Combined with dense foliage, those roots are also immensely good at absorbing the energy of storms and tidal surges. A 100-metre wide strip of mangroves can reduce the destructive force of waves by 90%. Field research in Indonesia's Aceh province after the 2004 Indian Ocean tsunami found that mangroves in front of villages reduced casualties by an average of 8% – representing 13,000 lives saved.

They also hold back routine rising tides. Their effect becomes very clear when they are removed. Since mangroves have been replaced by prawn ponds on the northern shore of Java, the sea has washed inland for several kilometres in places, swamping ponds and villages and filling inland rice paddies with salty water.

Away from the tropics, where it is too cold for mangroves, shallow coastlines are often populated by waterlogged masses of grasses and herbs, known as salt marshes. Just as farmers in the tropics have in recent times taken over mangroves for prawn and fish ponds, so landowners have often drained salt marshes to create grazing land.

But salt marshes are almost as good as mangroves as natural coastal defences. So they are changing tack. Faced with the inordinate cost of raising ever higher sea walls, governments in the Netherlands, UK and elsewhere are now starting to restore salt marshes by tearing down dykes and plugging up drains.

Flowering submerged marine plants known as seagrasses are found below low-water mark around all continents except Antarctica. The seagrass meadows they inhabit may cover some 30-60 million hectares, according to the National Academy of Sciences. They are, by some assessments, the most carbon-rich coastal ecosystems of all. Yet there have been no thorough surveys of their global extent. While they escape the ravages of coastal development, they are susceptible to pollution from rivers.

Similarly unmapped are the lush



Coral growing under mangroves, West Papua, Indonesia.

(Image: Alamy)

underwater expanses of kelp forests. Kelp is giant seaweed. It is among the fastest growing of all plants, capable of growing by more than half a metre a day and reaching up to 45 metres high, spreading a canopy of foliage just below the water surface.

Kelp forests are widely found in Mediterranean and cold waters from California to Alaska and Australia to the Russian Far East. Some studies suggest they may flank a quarter of the world's coastlines. As the oceans warm, they are expanding into the Arctic, while disappearing from warmer temperate waters.

Besides changing ocean temperatures, coastal ecosystems are potentially vulnerable to rising sea levels. But the evidence is that they are good colonists. Provided they have sufficient sediment to rebuild, they are generally capable of climbing up beaches as fast as the current rate of rising tides.

These days that adaptability is often compromised. As they head inland, they often find their way barred by sea walls, highways or other infrastructure, leaving them squeezed and with nowhere to go. Studies suggest that a

50cm rise in sea levels by 2100 would result in the loss of more than half of current coastal wetlands.

Push for restoration

So their future health is likely to depend on active intervention – not just to protect what remains but to restore what is being lost. That chimes with the wider agenda for the restoration of natural ecosystems. The UN has designated the 2020s as the Decade of Ecosystem Restoration. Its Convention on Biological Diversity will establish a framework for action over the coming decade when it meets in Kunming next year.

Climate negotiators are joining the restoration party, too. At the Paris climate conference in 2015, 28 countries said they intend to meet their emissions targets in part by capturing carbon in coastal ecosystems. Among them was Indonesia. It could “sail through” its Paris pledges simply by conserving its 3.8 million hectares of mangroves and seagrasses, according to Daniel Murdiyarto of the Center for International Forestry Research, based in Bogor, Indonesia.

The upcoming climate conference in Chile – now to be held in Madrid – was due to receive a portfolio of ideas for

nature-based solutions, including “blue carbon”, collected by a working group chaired by China and New Zealand.

Help nature do its own restoration

But turning ecological aspiration into reality may not be easy. Planting mangroves, sea grasses and salt marsh species has a generally poor record of success. There is a chicken-and-egg problem. To grow successfully, they require the stable shores that only established ecosystems can provide. According to Wetlands International, a Netherlands-based NGO, attempts round the world to re-establish mangroves have usually failed.

A study in Sri Lanka in 2016 found that of 23 sites where mangrove restoration had been attempted, only three showed more than 50% survival rates, and at nine sites inspectors could find no surviving plants at all. Other countries did little better. “Tens of millions of euros of public and private conservation funds has gone to waste,” says the NGO.

Another recent international review found that, while conservation of existing coastal ecosystems could successfully avoid emissions of carbon dioxide and was very cost-effective, “restoration of vegetation to increase CO₂ capture has a very low cost-effectiveness.”

Rather than planting, it may be better to help nature do its own restoration, Wetlands International has concluded. In Indonesia, it is currently pioneering the installation of brushwood barriers along the shoreline of northern Java. The hope is that the barriers will reduce coastal erosion and allow seeds to settle and germinate in stabilised sediment.

The project is in its early days. But the prize for successfully demonstrating how to restore coastal ecosystems such as mangroves to store carbon will be high. According to the National Academy of Sciences, restoring and creating coastal wetlands has the potential to “more than double” the current rate of carbon capture of these vital ecosystems. 🔄

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Mineral prospectors may push to start seabed mining before an international code is finalised.

(Image: Alamy)

COVID-19 & OCEAN

Covid-19 throws seabed mining negotiations off track

The delay in talks has one company considering invoking a rule to compel approval of mining plans

By **Todd Woody** | May 7, 2020

It was meant to be a pivotal year for deep-seabed mining. But the coronavirus pandemic is threatening to upend the drafting of regulations on the nascent industry.

The International Seabed Authority (ISA), an autonomous United Nations organisation that governs seabed mining, had set 2020 as the deadline to adopt a “mining code”. Those regulations would permit extraction of cobalt, nickel and other minerals in the deep ocean beyond national jurisdiction. Delegates had been expecting to make substantial progress on the mining code at the ISA’s annual meeting in July, as well as to vote on the re-election of the secretary-general, Michael Lodge, for another four-year term.

To add to the uncertainty, mining company DeepGreen is considering invoking a never-used rule that would compel the ISA to allow mining to proceed within two years under whatever regulations are in place at that time.

Earlier this month, the ISA was still planning for the July meeting at its headquarters in Kingston, Jamaica, despite international travel bans and the cancellation

of every other major UN conference. “Our important work is continuing largely uninterrupted,” an ISA spokesperson said at the time.

But on 19 May, the ISA announced it was postponing its meeting until October.

“The secretariat ... will continue to work closely with the government of Jamaica to ensure that the work of ISA can proceed as efficiently as possible,” said Lodge in a statement.

The postponement will likely intensify disputes among the ISA’s 168 member states, mining contractors and conservationists over how to proceed with writing regulations, particularly environmental protections.

“It is crucial to ensure that the current crisis is not used as an excuse to ‘fast-track’ any decision-making by curtailing the prevailing norms of due process, inclusivity and good governance,” says Duncan Currie, an international lawyer and member of the Deep Sea Conservation Coalition, which holds observer status at the ISA.

The ISA has issued 30 contracts to state-backed companies, multinational corporations and start-ups to explore more than 1.3 million square kilometres of the seabed. China holds

five contracts, more than any other country, that give it the right to explore and potentially exploit 238,000 square kilometres (almost the size of New Zealand).

“We want the mining code finalised,” says Gerard Barron, chief executive of DeepGreen, a Canadian-registered company that holds three contracts to prospect the Pacific Ocean seabed for polymetallic nodules. “We as a contractor hope to be in operation in 2023 and we’re going out on a limb because of the extensive work and money we’re investing now. Investors want to see certainty.”

That has led DeepGreen to consider triggering the so-called two-year rule, or what some observers have dubbed the “nuclear option.”

Under the UN Convention on the Law of the Sea, the sponsoring state of a mining contractor can notify the ISA Council that a contractor intends to apply for approval of a plan to begin mining. The Council then has two years to finalise mining regulations. If it doesn’t, the Council must “provisionally approve such plan of work” under whatever regulations are in place at the time.

“It’s something that’s consistently under review – it’s not off the table, that’s for sure,” says Barron of triggering the two-year rule. He stressed that doing so would depend on gaining the support of a majority of the Council, the 36-member policymaking body within the ISA that is drafting the mining code.

DeepGreen holds exploration contracts sponsored by three small South Pacific islands – Nauru, Kiribati and Tonga – and one of those nations would have to officially invoke the two-year provision.

A dangerous step

Conservationists fear catastrophic environmental consequences.

“If the two-year provision is invoked, and DeepGreen’s application is approved based on the current draft regulations, the impacts for deep sea biodiversity and ecosystems would be huge,” says Kristina Gjerde, a close observer of the ISA who serves as senior high seas advisor at the International Union for Conservation of Nature. “We need a far better understanding of the deep ocean environment and the impacts of deep-seabed mining on ocean life and ocean systems before commercial-scale mining should be approved.”

Currie says such a move would “shatter the reputation of the ISA itself. It is hard to believe that DeepGreen, or any sponsoring state, would be so irresponsible.”

This week, a new report from a coalition of non-profit organisations warned that mining for nodules in the Pacific would cause irreversible damage to the marine environment.

The pandemic is also slowing scientific research into little-explored deep sea ecosystems. The ISA needs that data to draft environmental regulations that fulfil its dual if contradictory mandate to facilitate mining and protect deep sea ecosystems. (An investigation last year by National Geographic magazine found that mining companies have so far failed to collect sufficient biological data to assess the environmental impact of mining.)

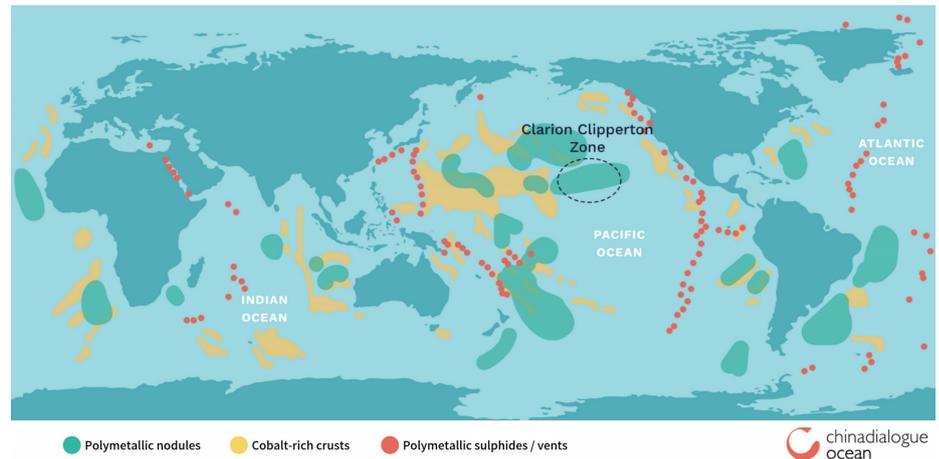
Stay-at-home orders have kept marine scientists like Dr Diva Amon locked out of their labs. Amon, a deep-sea biologist at the Natural History Museum in London, has been identifying new species discovered in areas targeted for seabed mining. She can do some but not all of that work from home using images taken by remotely operated vehicles.

“I’m working on two species descriptions from mining contract areas, which have been held up as we are unable to get into the labs to do the genetic analyses,” she says.

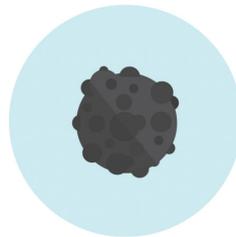
Shut-down orders and travel bans are also keeping scientists off research expeditions to the deep ocean, which have been delayed due to the pandemic, and away from now-cancelled conferences where they would share their discoveries.

“We were about to embark on a very large environmental ocean research campaign,” says

Deep-sea minerals: what could be mined and where



Deep-sea mineral deposits and the metals they contain



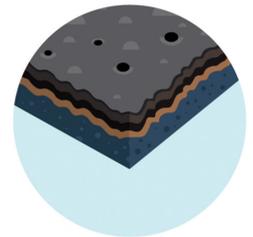
Polymetallic nodules

Source of nickel, cobalt, copper and manganese



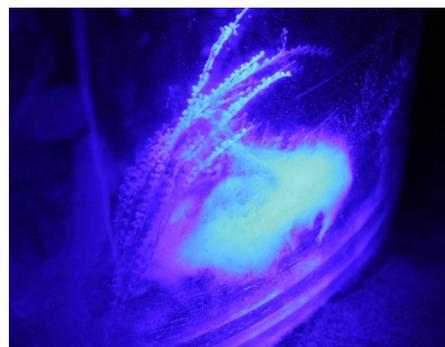
Polymetallic sulfides

Copper, lead, zinc, gold and silver



Cobalt-rich crust

Cobalt, vanadium, molybdenum, platinum and tellurium



Bioluminescing coral and perhaps a sponge, North Atlantic (Image: NOAA, CC BY)

Barron, noting the expedition will likely be delayed for at least several months.

What happens next?

In an ISA meeting in February delegates expressed opposition to video conferencing.

“The negotiations should be postponed until a time when all interested parties feel it is safe and appropriate to meet together,” says Matthew Gianni, a co-founder of the Deep Sea Conservation Coalition.

Barron, on the other hand, says the ISA should take advantage of the pandemic to develop more innovative ways of meeting its obligations. “I could see how you could make more progress by being forced to work remotely,” he says.

Amon takes a more philosophical view of the postponement of numerous high-level ocean conferences due to the pandemic. “While I worry about the ocean sphere losing momentum,” she says, “perhaps this period will afford us some time to reflect on the path forward.”

Todd Woody is a California-based environmental journalist who specialises in ocean issues..

Coronavirus delays hope of fishing subsidies deal

Disruption caused by the pandemic makes it unlikely the WTO will reach an agreement to end harmful subsidies this year

By **Fermin Koop** | June 15, 2020

Recognising the problem of overfishing, the 164 member countries of the World Trade Organization (WTO) have been trying for more than two decades to reach an agreement on eliminating harmful fishing subsidies.

Of the US\$35 billion of public subsidies that went into supporting global fisheries in 2018, \$22 billion were classed as harmful because they increased fishing capacity, largely through fuel tax exemptions.

The deadline for agreeing a deal to end such subsidies, in accordance with the UN Sustainable Development Goals (SDGs), is this year. But meeting it will be highly difficult, experts agree.

The WTO has already cancelled its Ministerial Conference, scheduled for June in Kazakhstan, and negotiations are now on hold until measures to curb the pandemic are further lifted.

Keith Rockwell, WTO spokesperson, said the ability of many Geneva-based delegations to liaise with their home nations and other delegations has been “restricted” due to the outbreak – which has now become the priority for them over other WTO-related matters.

Ambassador Santiago Wills of Colombia, who leads the fisheries subsidies talks at the WTO, has not yet presented a consolidated draft of the agreement. He has tried to maintain talks online, but that has proven difficult for several national delegations, slowing progress.

In a recent webinar hosted by NGO Chatham House, Wills said he was still hopeful of a deal this year but that there are “still many issues to resolve”. Though coordination between delegates “has



Chinese fishing trawlers off Pohnpei, Micronesia

been difficult” due to the pandemic, he confirmed that the commitment of all delegations to reaching an agreement remains strong.

Isabel Jarrett, manager of the Pew Charitable Trusts programme to reduce harmful fishing subsidies, said: “Members have to get down to drafting the text. But as negotiations can’t take place in person and virtual negotiations are difficult we don’t have a clear sense of timeline for the rest of the negotiations.”

Remaining challenges

For Enrique Sanjurjo, senior ocean manager at WWF Mexico, countries had been making progress in the negotiations before the coronavirus outbreak. Now the situation looks bleak and he dismisses the possibility of a deal this year.

“Countries have come to an understanding on some areas. For example, they now agree illegal fishing shouldn’t be subsidised, as well as fishing of overexploited species,” he said. “But there’s disagreement



There's a wide debate now regarding what the aid packages of the Covid-19 crisis should contain. The discussion on fishing subsidies is part of that."

Remi Parmentier,
director of environmental
consultancy the Varda Group.



(Image: Alamy)

over definitions, such as what actually is illegal fishing or an overexploited species."

Further differences remain over the impact that eliminating subsidies would have on artisanal, or small-scale, fishers in developing countries. They rely on pay-outs and exceptions, which is why India and other nations have been strongly pushing for special and differentiated treatment.

Remi Parmentier, director of environmental consultancy the Varda

Group, added another complication to the list. In the midst of the pandemic, countries have been providing aid packages or subsidies to the fishing industry. For example, the US set aside US\$300 million of its US\$2.2 trillion stimulus bill just for fisheries.

"There's a wide debate now regarding what the aid packages of the Covid-19 crisis should contain. The discussion on fishing subsidies is part of that. It's an opportunity to change mindsets and paradigms," he said. "Many say we shouldn't support fossil fuel subsidies and the same can be said with fisheries."

All proposals from countries now on the table include the prohibition of subsidies linked to unreported and unregulated fishing and to the exploitation of already overfished stocks. Nevertheless, they vary on the methods of implementation and reform limits.

China, which operates the world's-largest fishing fleet, pitched a proposal last year to cap and reduce subsidies over time. Jarrett said that while the country has been "quiet" at the negotiations, the fact that it filed a proposal shows its "willingness," highlighting the changes already made to

subsidies for its domestic fleet.

The WTO rules require decisions to be made by consensus. For Jarrett, we aren't there yet. "We need high-level political engagement of all decision-makers as that can help shift some positions," she said.

The European Union, Japan, China, the United States and Russia spend the most on fishing subsidies.

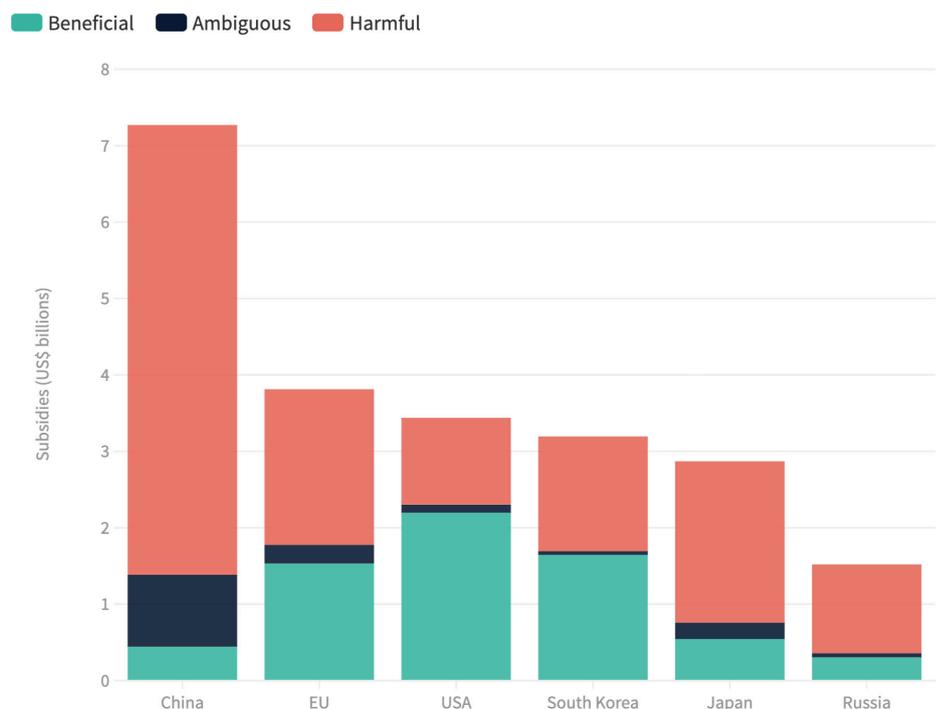
As a result of the expansion of industrial fishing fleets over time, 90% of fish populations are fully exploited, according to the UN Food and Agriculture Organisation (FAO).

"If we don't set aside our differences in these negotiations, the boats will go out one day to find that there are no longer any fish over which to argue. Actually, that has already happened in some places and continues to happen today," added Rockwell.



Fermín Koop is an Argentine journalist, specialising in the environment with experience across diverse publications such as the Buenos Aires Herald, Clarín, *Ámbito Financiero*, Buena Salud and *Notio Noticias*.

Top countries/blocs by fishing subsidies in 2018 (US\$ billions)



Source: A global dataset on subsidies to the fisheries sector, Data in Brief, 2019

Coronavirus hits sustainable aquaculture

Tilapia are now mature enough to process in China, but Covid-19 has delayed orders from major importing nations



A farmer collects oysters at low tide, Xiamen, Fujian province.

(Image: Alamy)

By **Zhang Chun** | March 31, 2020

The damage to China’s aquaculture sector caused by coronavirus could be far-reaching as customers from the US and elsewhere hold off on orders. Companies that specialise in sustainable aquaculture products look to be especially affected because they rely most on exports.

Two major industry events have already been postponed: Seafood Expo North America, the largest such exhibition in the continent, was due to take place in Boston mid-March, and Seafood Expo Global was planned for Brussels in April.

“Every year we get 40-50% of our orders confirmed at that [first] exhibition,” Chen Sheng, general manager of the Maoming Evergreen Aquatic Product Co. Ltd. told China Dialogue. In 2019, almost 200 Chinese firms had a presence there, including all the major ones. He says that maintaining relationships and negotiating with customers has shifted online.

The delay may offer China’s

producers temporary relief from questions about safety and supply stability from over-anxious international buyers. But problems remain for producers of aquatic products such as tilapia – a freshwater fish originally from Africa – who rely heavily on overseas markets.

Export problems

With transportation cut off in China, public spaces closed and people forced to stay at home to contain the virus, there have been fewer domestic buyers for aquatic products and almost nobody eating at restaurants. By 11 March, a month and a half after the Wuhan

lockdown, a survey of 55 major markets in Beijing, Shanghai and Guangzhou showed aquatic sales had recovered to just about half of normal levels.

The effects quickly trickled down from retailers to hatcheries, farms and processors – and eventually, as the coronavirus spread overseas, exporters.

Japan, Korea, the EU and the US have been the main destinations for China’s aquatic exports for over a decade. “Currently, all exports to Korea are on hold, and exports to Japan, the EU and the US have fallen”, said Cui He, head of the China Aquatic Products Processing and Marketing Alliance, in a 9 March article. China’s seafood exports are, he said “facing their biggest ever test”. One example of the gravity of the situation is Chinese tilapia, half of which is usually exported.

Tilapia, a freshwater fish with delicate flesh and few bones, has been farmed in China for almost three decades, mostly in the southern provinces of Hainan, Guangdong and Guangxi.

Large tilapia farming firms work closely with small-scale farmers – often

60%
the proportion of the world’s aquatic products that China produces

household operations – by providing juvenile fish and technical guidance, then buying up the mature fish.

In a WeChat conversation on 21 March, Chen Sheng told China Dialogue that the pandemic had resulted in customers delaying more than 40% of the orders that were due in March by about two months. They had been bound for the US, Canada and the Philippines.

Two other major tilapia producers, Hainan Xiangtai Fish and Hainan Qinfu Food, are facing similar situations, with delays mainly to orders from the US.

The US buys about one third of China's annual tilapia exports, making it the major importer.

For Hainan Xiangtai Fish, the figure is higher still: the US buys about half of its tilapia exports. Liu Zidan, the firm's new retail and ecommerce director, said that in early March a shipment of tilapia was held up at US customs in order to check the vessel had left port at least 14 days prior (long enough for any coronavirus present in the crew to have run its course). By 10 March, the US Food and Drug Administration had replaced most overseas inspections of US-bound imports with sampling at the border or checks of information shared by foreign governments, with the measures expected to last until April and slow trade further.

Workers at the three companies mentioned were able to restart work around 20 February, thanks to measures taken to prevent infections. Hainan Qinfu Food has a full overseas order book for April, but the pandemic means regular customers are unable to confirm orders after May or June.

"With no orders or intended orders, we can't work," says Chen Sheng. "We make different types of products, to different standards, for different markets. There's no guarantee we could find alternative markets for anything we produced without an order."

Meanwhile, the tilapia in the fish farms are getting big enough to be processed and exported. But if processors don't buy them, the farmers can't start the next cycle and the entire flow of the industry will be disrupted for



Chinese fishermen catch tilapia at a farm in Qionghai city, Hainan island. (Image: Alamy)

the coming six months. To free up the fish ponds, the Ministry of Agriculture held a video conference in late February to coordinate fish processors getting back to work.

There are usually two tilapia farming cycles a year. Han Han, founder of Hainan NGO China Blue, notes a survey by the Hainan Tilapia Sustainability Alliance that found one in ten of Hainan's tilapia farmers hasn't been able to clear their ponds of mature fish and add new young.

"If the delays go over two or three months, the pressure will shift to the processors and exporters," Chen says. The third quarter is when large quantities of his company's export products go on sale, with the entire processing industry boosting consumption and production. Processing and exports are vital links in the industrial chain.

Sustainable producers rely on exports

China produces over 60% of the world's aquatic products. Alongside supplying an ever-expanding domestic market, about 20% of its output



To win market trust, some producers are trying new methods, such as moving to less-intensive shrimp-farming techniques, which require less antibiotic use."

is exported. Because of tougher overseas customs rules and buyer requirements, higher environmental and management standards are often applied when products are intended for export.

Fang Qing is China manager for the Aquaculture Stewardship Council (ASC), a sustainable seafood certification body. He says 20% of China's large aquaculture firms are certified by third parties such as the ASC, Best Aquaculture Practices or ChinaGAP. These schemes focus on, respectively, protecting biodiversity

and water resources, ensuring food safety, and traceability. They produce aquaculture standards accordingly. Certification is voluntary but offers credibility on the international market and increased competitiveness. Fang told China Dialogue that while there is no publicly available data, certified aquaculture firms mainly produce seafood for export.

He explained that when the smaller operations are included, less than 1% of all aquaculture producers have certification. China gets high yields from its aquaculture sector – but it is also troubled by outbreaks of disease arising from intensive farming and the overuse of antibiotics, issues which cause international concern. To win market trust, some producers are trying new methods, such as cutting down on the use of foam buoys in oyster farming and moving to less-intensive techniques for farming shrimp, which require less antibiotics. Tilapia farming and processing firms, which have built up techniques and capital over many years and acquired certification, are a highlight of sustainable aquaculture in China.

The industry still faces uncertainty in its overseas markets, as well as competition from other products. China has long supplied about 70% of US tilapia imports but sales have slid in the last five years. According to an Undercurrent News report, the US-China trade war and other factors saw 2019 exports fall 16% on the previous year – and that was the smallest drop among the nine major seafood categories which China exports to the US. Shrimp exports fell 60%. A potential agreement on tariff removal has been delayed due to the coronavirus, and with US elections due in November the 25% punitive tariffs on tilapia may yet stand for another year.

Other producers are keen to fill the gap. A report on China's tilapia trade released by the Global Aquaculture Summit, a platform established by Chinese organisations, said of the US market that “competition is appearing from other low-cost products”. These include the basa, from Vietnam, and US-produced cod. The report went on

to say that “competition in the tilapia market will be price-focussed” for some time to come. Clearly bad news for Chinese tilapia producers.

China is the world's largest tilapia producer, accounting for about 25% of global output. Its share of the market is safe in the short term, but current price trends are pushing fish farmers to the brink of unprofitability. In 2019, Chinese tilapia was only slightly more expensive than the lowest-cost producer, Taiwan. “Overall, the farmers aren't making anything, and some are losing a little money,” Zhou Qinfu, president of Qinfu Food, said in a phone interview.



A potential agreement on tariff removal has been delayed due to the coronavirus, and with US elections due in November the 25% punitive tariffs on tilapia may yet stand for another year.”

A focus on domestic sales

As Fang Qing of the ASC says, the duration and impact of the coronavirus could have effects on the aquaculture sector not just for three to five months, but three to five years.

In an industry meeting conducted online, Lyu Wei, head of Dalian Fugu Foods, said Covid-19 will result in “a shake-up throughout the industry. Consumption of fresh fish may fall, and we could see some aquaculture products fail”.

That also applies to firms certified as sustainable. Fang Qing said that for one shellfish farming company on the Yellow sea coast, February to May is a key period for planting out oyster “spat” – larval oysters ready to settle.

If the workers can't do that, two years of harvest will be lost. Thankfully, the firm was able to get back to work and domestic demand is recovering, but overseas demand will depend on the pandemic.

To minimise the effects of the export slump, Chen Sheng's firm is planning to reduce tilapia exports by 10% and focus on more highly processed products, while developing convenience foods for the domestic retail market. In general, tilapia producers are looking to expand domestically, while maintaining international sales. In the two weeks after resuming work, Xiangtai saw orders from Chinese ecommerce merchants up threefold on the previous year.

“We're definitely going to push domestic sales in the future,” Zhou Qinfu said. According to him, tilapia produced for export come with quality guarantees and are cheap – a frozen tilapia bought on an ecommerce site costs around 32 to 40 yuan (US\$4.50 to 5.60) per kilo; and while Chinese people traditionally prefer fresh fish, younger consumers are more accepting of frozen varieties.

The last two years have seen China's aquatic imports grow, while traditional exporters have been expanding domestic sales. Zhanjiang Guolian Aquatic Products, a BAP-certified firm, saw 50% of its sales take place within China in 2019, up from 20%. Company head Li Zhong said in an interview in late February that this trend would continue in 2020.

In 2016, China's product quality authorities encouraged food exporters to use the same production lines and standards for their domestic products, in an attempt to boost the quality of food sold in China to match exported equivalents. This will encourage all firms to adopt better standards and practices and improve the industry overall, which Zhou Qinfu thinks will help better the quality of domestic aquaculture products. 🍷

With thanks to Qingdao Marine Conservation Society for its assistance with the research for this article.

Zhang Chun is a senior researcher at China Dialogue.

A healthy ocean can help fight pandemics

Marine life is full of potential treatments, including the first antiviral approved for Covid-19 patients

A healthy coral reef in Indonesia

(Image: Alamy)

By **Zhang Chun** | March 31, 2020

Covid-19 is forcing the world to rethink our economies, supply chains and science. Widespread inconsideration of biology and ecology in planning have in part led to the challenging circumstances we are now in.

We must think about how we emerge in a new and more sustainable post-crisis world that places living resources at its heart. When thinking about life on Earth, there is no better place to start than the ocean. Life was born here, it produces 70% of Earth's oxygen, and three-quarters of all animal biomass.

There is a long history of ocean organisms contributing to biomedical science and biotechnology. Electrical impulses in the nervous system were understood by studying squid; livers and the immune system were illuminated by sharks; secrets of fertilisation and sight revealed through horseshoe crabs. New laboratory techniques have also been developed: the near-universal marker of gene expression, green fluorescent protein (GFP), was derived from jellyfish. Enzymes from sea sponges and deep-sea vent worms have been used to start and stop reactions, while horseshoe crab blood reagents are commonly used to test for bacteria.

Tens of thousands of unique biochemical compounds have been isolated from sea creatures, many of which have led to the development of life-saving therapies. Species like sponges, anemones and corals are

soft-bodied and don't move much, leaving them open to predation. In response, they have developed strong toxins and poisons to keep predators away – making them remarkably potent medicines. So far, the US Food and Drug Administration has approved ocean-derived drugs for HIV, herpes, cancer, pain and cardiovascular disease, with more on the horizon.

Some are already being explored for use against Covid-19 – like M101 (Hemarina) derived from beach worm haemoglobin to increase oxygenation in patients in respiratory distress, or remdesivir (Gilead) as an antiviral. Remdesivir is a nucleoside analogue, a class of drugs only developed after being found in sea sponges.

Marine-derived bioproducts also show considerable potential in other medical areas, and have a faster and cheaper development pipeline. Jellyfish collagen for tissue engineering, cod skin for wound treatment, and coral for bone matrices are just a few examples.

Beyond medicine, marine species have remarkable potential to disrupt other biotechnology-dependent industries. In response to the plastic pollution crisis, some innovators have turned to seaweed to create biodegradable plastic products. Algae are used for energy, nutrition supplements and livestock feed. Aquaculture is harnessing a spectrum of marine-derived innovations for fish feed and fish health. And a recent ocean sampling study has uncovered a new universe of complexity in the marine

microbiome, sequencing billions of base pairs, and hinting at virtually boundless potential for genomic applications.

For several years, countries have been negotiating a treaty through the United Nations to protect marine life on the high seas – areas outside national jurisdiction that make up two-thirds of the world's oceans. The final round of these negotiations was due to take place at the United Nations in New York in March, but was postponed after the outbreak and rapid spread of the coronavirus. At the centre of the negotiations – with a wide divergence of views – are the rights surrounding marine genetic resources, aiming to ensure the biodiversity that is enabling scientific advancement remains protected and that everyone gets a fair deal in accessing and sharing the benefits.

Collectively, “living ocean” contributions to humans are of incalculable value. By recognising our dependence on them, we can better develop ocean-based solutions to prevent pandemics and deliver health and wellbeing aligned with nature. 🌊

Torsten Thiele is founder of the Global Ocean Trust and Research Associate at IASS-Potsdam.

Marie-Christine Imbert is a molecular biologist and co-founder of Emergent Ocean

Timothy Bouley is co-founder of Emergent Ocean and CEO of BioFeyn Biotechnology



The Polarstern research vessel embedded in the Arctic ice.

(Image: Alfred Wegener Institute/Marcel Nicolaus, CC BY)

RESEARCH FRONTIER

Arctic exploration: drifting with the ice

Fresh from the North Pole, scientist Lei Ruibo talks to Wang Yan about MOSAiC, history's largest Arctic research expedition, and China's contribution

By Wang Yan | March 2, 2020

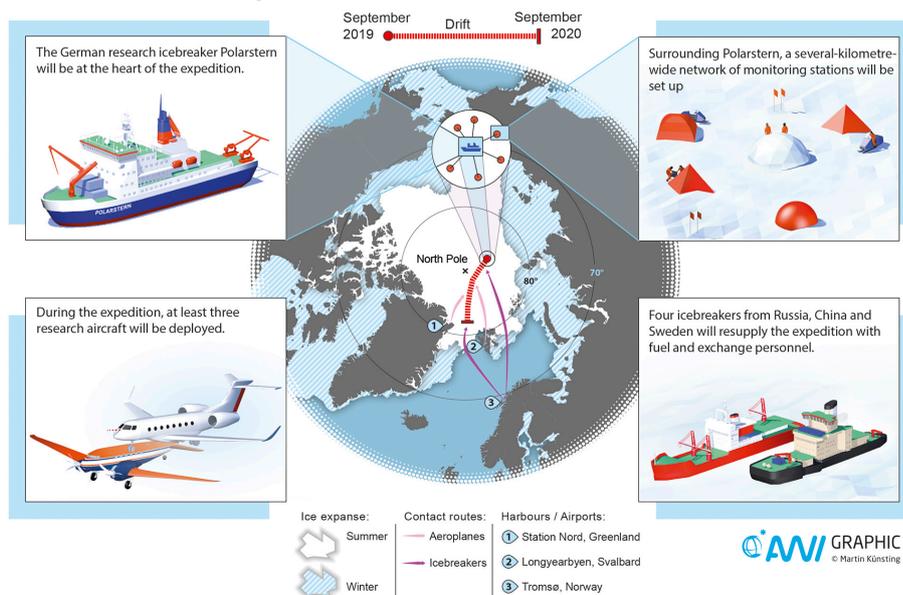
In September last year, the largest polar expedition in history set sail from the Norwegian port of Tromsø, bound for the central Arctic where it would anchor in the sea ice and drift for a year.

The MOSAiC expedition (Multidisciplinary Drifting Observatory for the Study of Arctic Climate) is led by the German icebreaker research vessel Polarstern, supported by four other icebreakers from Russia, China and Sweden. It involves a rotating team of 600 experts from 17 different countries.

At the launch of the expedition, MOSAiC's chief scientist Markus Rex, from the Alfred Wegener Institute, said that the Arctic is the epicentre of global climate warming and has already undergone dramatic changes. "For the first time we will be able to measure the climate processes in the Central Arctic in winter. And so for the first time, we will be able to understand this region and correctly represent it in climate models," Rex said.

Scientific research indicates that the Arctic has warmed at twice the speed of the rest of the globe, resulting in rapid loss of sea ice. The year-long expedition to gather data is crucial for the study of Arctic climate change and its role at the global

The route the Polarstern icebreaker is expected to follow as it drifts with the Arctic ice past the North Pole



(Image: Alfred Wegener Institute/Martin Künsting, CC BY)

scale, including impacts on the weather and climate of the high or mid latitudes.

Eighteen Chinese scientists are scheduled to participate in different legs of the MOSAiC. Among them are 12 researchers who participated in the first leg of the expedition, from organisations including the Polar Research Institute of China; the two institutes of oceanography

of the Ministry of Natural Resources; the Ocean University of China; Zhejiang University; Beijing Normal University; and Taiyuan University of Technology.

During the first leg – from late September to mid December 2019 – the Polarstern, anchored to an ice floe on which much of the research is being conducted, drifted 200 kilometers toward

the North Pole from its starting point.

Lei Ruibo, a sea ice physicist from the Polar Research Institute of China said they had witnessed the aurora borealis – better known as the northern lights – encountered potential threats from polar bears and dealt with harsh weather, equipment failure, lack of fresh food and homesickness. Some scientists, including Lei, suffered from severe frostbite.

Of course, there is also fun to be had on the long and tedious journey. Written on the door outside a temporary bear guard post on the aft deck of the Polarstern, were the words: “You are now entering the MOSAiC circus. Have fun and enjoy the show”. According to Lei, the joke captured the scene of expedition members on the ice conducting their various tasks in clusters. “Some are sampling ice cores, some are measuring the snow pit, some are distributing equipment, some are launching the weather balloon, some are driving snowmobiles, some are cleaning the ice cave, very much like the diversified programmes arranged in a circus show,” wrote Lei in his journal.

After his return in late January, I interviewed Lei by telephone about the current progress of the expedition. He had participated in many expeditions in the Arctic and Antarctica in the past decade. This time, he was appointed coordinator for the Chinese team in the MOSAiC.

What is the goal of the project and the significance of the main research compared with previous Arctic expeditions?

Lei Ruibo: The goal of MOSAiC is to gain urgently needed in-situ data on the interactions among the atmosphere, ocean and sea ice, as well as on the ecosystem, so as to better understand changes in Arctic climate and its role at the global scale.

The MOSAiC expedition is not the first to attempt an ice drift. In the late 1800s, the Norwegian explorer Fridtjof Nansen froze his ship into the Arctic ice in an attempt to reach the North Pole. Soviet and Russian scientists have also established research bases on drifting ice floes since the late 1930s. But operations to establish drifting research stations were stopped in 2013 due to the heightened danger from unstable thin ice in recent winters.



Scientists work to set up “Ocean City”, one of MOSAiC’s many research sites.

(Image: Alfred Wegener Institute/Esther Horvath, CC BY)

Although international cooperation on Arctic research has been going on for a long time, and data sharing is commonly practised among international scientists in this field, there’s never been an expedition at such a scale with this level of logistical support before. Financial investment for this voyage from participating countries is unprecedented. The logistics budget for the expedition is roughly 140 million euros. Also, despite there having been a few similar year-long ice drifting expeditions to study the Arctic – most recently in the late 1990s – sea ice conditions have changed significantly in the past two decades. Data collected earlier can no longer fill in the gap of knowledge for present understanding of the sea ice, and we are unable to describe the physical changes in the sea ice that have occurred along with the process of climate change in recent decades.

The main objective is to gather data on five disciplines including the atmosphere, sea ice, ocean, ecosystems and biogeochemistry to enhance understanding of the interactions of various components of the climate system. In addition, with the most advanced monitoring technology and equipment, as well as professional experts on Arctic science from across the world having joined the expedition, it provides the most comprehensive opportunity to better learn about the Arctic in human history.

What’s the focus of your work this time and can you share with us how it interacts with other disciplines?

My focus is on sea ice physics, or the processes of ice cover evolution, in the polar regions, and the development of technology and equipment for sea ice observatories. Based on the studies on the changes in sea ice and the interactions in the Arctic between the atmosphere, sea ice and ocean, we want to reveal the impact and feedback of sea ice on climate change. A warming climate can affect the formation and seasonality of sea ice, while changes in sea ice can further affect marine ecology. Studying sea ice physics also helps the study of the circulation of greenhouse gasses, including CO₂ and methane, in the atmosphere, snow, sea ice and ocean.

As an example, by deploying buoys on the sea ice we can study the annual cycles of sea ice thermodynamics, kinematics, and dynamical deformation, as well as their responses to atmospheric forcing such as heavy storms.

Despite the scientists coming from a variety of different academic backgrounds, the special areas they are investigating are closely linked. For example, physicists focus on the physical structure of an ice core sample to depict the impact of climate change on the formation of the ice, while biologists focus on the microorganisms contained

within it and study the impact on such organisms under climate warming. Scientists focusing on geochemical circulation will study the existence of greenhouse gases contained within the ice to explain the gas exchanges between atmosphere and ocean through the snow and ice. All these achievements, once combined, can thoroughly explain the interactions that are influencing the climate system and life in the Central Arctic.

What are the challenges involved in this type of field work?

The whole process was not easy right from the start. It really took us a long time to find ice thick enough for our main ice camp since the region is dominated by thin first-year sea ice of less than one metre. The two primary dangers are encountering polar bears and storms. Due to the polar night, without sunlight, it is challenging for even the professional polar bear guards to spot them using the lights from the ship when there is only limited vision. Since late September, we saw polar bears a few times, including sightings of lone bears and of mother bears with one or two cubs, but fortunately, they were not very close and nothing dramatic happened. When researchers go on to the ice floe to work, one polar guard accompanies them. If a bear is spotted, the team must immediately return to the ship. If escape is impossible and the bear is within 30 meters, a flare gun will be used to scare off the bear.

Another challenge for our work, more than bear visits, is the powerful winter storms. We had projected that sea ice would be more stable in winter, but in reality it was not. Normally, scientists can work if the wind speed is lower than 17 metres per second. Apart from delaying work, when a storm sweeps over the ice, it can tear new fractures or cracks across the ice floe, destroy ice-based instruments, and the resulting rescue and repair work means extra days of work. For example, a huge storm in mid November felled a 30-metre-high meteorological mast in the Central Observatory of our main ice station.

How do the scientists cope with such hostile working conditions?

Considering the heavy investment of participating countries, it is of paramount



MOSAIC scientists setting up meteorological equipment on the ice. (Image: Alfred Wegener Institute/Esther Horvath, CC BY)

importance for scientists to maintain the safety of our monitoring instruments. Of course, we also need to cope with other normal challenges like no sunlight, extreme low temperatures and a long time away from our families. Following the German organiser's instructions, we underwent rigorous training programmes before the expedition, including on how to fight a fire, abandon ship, escape the frigid water should you fall in, and cope with polar bear attacks.

We were told to try not to run from polar bears, or at least not to run in a straight line. That's because if polar bears, due to their heavy weight, run and try to turn at the same time, they can easily fall over, thus buying time for your escape. As well as this special training, eight professional polar bear guards were employed to ensure our safety. Most of them are professional explorers or hunters from Arctic countries who can deal with polar bear attacks. But for most of the scientific activities carried out on the ice floe, we still need to rely on our own awareness and safety measures.

What are the new findings so far, and what's the plan to share the data?

Despite the extremely challenging conditions, we have tried to maintain a steady flow of scientific data in all the disciplines. However, it is not yet quantifiable since there are still five more legs to go. There is one common understanding during the winter

expedition so far among scientists. Contrary to our previous belief in the relatively weak dynamics of Arctic sea ice during winter, it is in fact highly dynamic and unstable, especially during raging storms. That's because the ice is unusually thin, most of it less than one metre. This also posed extreme difficulties in choosing a proper ice floe thick enough for the construction of the ice stations.

Previous research found that the frequency of extreme high temperatures is increasing in the Arctic in winter, which has even resulted in some sleet weather when the air temperature increases to near 0C. In the first leg of the expedition that I took part in, the temperature was overall normal, with a high of -4C and a low of -34C.

We have a data-sharing platform and the information collected from this expedition will ultimately be a common legacy for all human society. For the first step, researchers participating and contributing to this expedition can get real-time data through the shared platform. All the data will be open to the public by 2023 after the quality control. Scientific analysis and climate modelling, once completed, will provide evidences to renew public perception on the overall conditions of planetary climate change.

Can you give us some details about the timeframe and people involved?

There are six legs of the MOSAiC expedition, from late September 2019 until late October 2020. As planned, 18



*The Chinese scientists joining the MOSAIC expedition are part of a rotating team of 600 experts from 17 different countries
(Image: Alfred Wegener Institute/Esther Horvath, CC BY)*

Chinese researchers from all five subareas – ocean, sea ice, ecosystems, atmosphere, biogeochemistry – will join five of the six legs. By 13 December, after exchanging scientists and crewmembers, the first leg of the project which I participated was successfully fulfilled.

Professor Liu Hailong, a physical oceanographer from Shanghai Jiao Tong University, joined the second leg to continue the work along with the more than 60 scientists from across the world.

What is China's role in the project and current achievements in Arctic research?

Apart from Germany, the US is a big contributor to the project, due to their existing expertise in Arctic studies. China, Sweden and Russia also play important contributing roles. The expedition is being carried out mainly by German ice breaker the Polarstern. Four additional ice breakers from Sweden, China and Russia are scheduled to help transfer people and supplies to and from the MOSAIC ice camp throughout the year. China's new polar research vessel the Xuelong 2 will carry scientists and supplies between the fifth and sixth legs in August 2020.

The whole MOSAIC drift programme is composed of one Central Observatory, three L (Large) sites, eight M (Medium) sites, and some 50 P (Position note) sites, a total number of more than 60 observatories in a 40-kilometer radius around the Polarstern. During the first leg, China contributed

instruments for the construction of the distributed observatories network by deploying one unmanned ice station, 5 oceanic profilers, 16 sea ice mass balance buoy and 20 ice drifters. Most of the buoys were designed and built in China.

Through international cooperation, we will collect data from all the observatories, which will definitely promote dynamic and thermodynamic studies on Arctic sea ice and improve the weather and sea ice forecasting in the Arctic region.

China's first national Arctic expedition was implemented in 1999 and there have been 10 up to now, but none in winter. Prior to 1999, some Chinese scientists had taken part in Arctic expeditions organised by other countries. China did not have an expedition icebreaker vessel until 1993 when it bought the Xuelong from Ukraine and upgraded it into a polar research vessel. Before 2008, China had only conducted Arctic expeditions in 1999 and 2003. Since 2008, also the fourth International Polar Year, we've done biennial expeditions in the Arctic area, and from 2018, the expeditions became an annual scientific undertaking. In July 2019, China's first self-built polar icebreaker, Xuelong 2, was launched to boost China's polar research and expedition capabilities. With additional funding in the future, we expect more expeditions in the autumn and winter seasons.

Any personal achievements so far from the expedition that you can share?

My research which focuses on monitoring the changes in the sea ice can be obtained mainly through data collected from the deployed buoys during the first leg of the expedition that I joined. More buoys have been deployed than my previous expeditions to the Arctic because of the strong logistics support capability of MOSAIC and so far the survival rate of these buoys is relatively high. More importantly, the buoy distributed network can be maintained throughout the whole year, and more buoys can be deployed in the coming legs through cooperation with the scientists from other countries, ensuring high quality data can be continuously collected.

Considering the unprecedented logistical and financial support this project has enjoyed, I can't really say whether there will be similar large-scale expeditions often, but there will certainly continue to be joint studies on climate change and the Arctic. The MOSAIC provides an outstanding example for humans studying the Arctic climate together. 🍷

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How AI is identifying illegal trawlers in Africa

Satellites and artificial intelligence are helping to pinpoint foreign fleets exploiting fish in the waters of African nations

A buoy fitted with a trackable transponder collects fishing data off the coast of West Africa. (Image: © Tommy Trenchard /Greenpeace)

By **Todd Woody** | February 11, 2020

Africa is a hotspot for illegal fishing by foreign fleets, and now for the first time, researchers have pinpointed where that illicit activity is happening around the entire continent – and identified the culprits.

Based on their map, which uses satellite technology to track boats' movement and artificial intelligence to interpret it, researchers at Global Fishing Watch have singled out industrial trawlers operating unlawfully in inshore waters reserved for small-scale “artisanal” fishers.

Their findings show these big, foreign ships are targeting certain countries. For instance, 93% of industrial fishing in Somalia between 2012 and 2016 occurred in a banned area – a zone stretching 24 nautical miles from the shore that had been set aside for small, local fishing boats.

All those industrial trawlers were flying South Korea's flag, according to a new paper documenting the research. Other large vessels most often making

incursions into the inshore waters of African countries were flagged to the European Union (Greece and Spain) and China.

With the World Trade Organisation (WTO) missing a deadline in December to reach an agreement banning subsidies that fuel such industrial fishing, the technology could give African officials and other regulators an important tool to combat the marine crime that robs their citizens of food, livelihoods, and in some cases, their lives.

“People are getting poorer,” says Dyhia Belhabib, the lead author of the paper and the principal fisheries investigator at non-profit Ecotrust Canada. “Every year, 300,000 jobs are lost to illegal fishing.”

She noted that overseas fleets often target small foraging fish that are a staple of some African diets. “The very fish that are caught to feed farmed salmon in the West are eaten by people in Africa, and often it's their only source of protein.”

Belhabib's research has also found that collisions between small fishing boats and industrial trawlers illegally operating

in nearshore waters has resulted in the deaths of hundreds of African fishers.

“We hope countries will use this data to hold their own fleets accountable, whether we're talking about China or Europe,” she says.

How does the system work?

The International Maritime Organisation requires vessels of a certain size to carry a transponder that broadcasts their live location to satellites. This Automated Identification System (AIS) is designed to help ships avoid collisions. Global Fishing Watch taps this and other location data to identify and track fishing boats across the globe, then analyses their movements to determine if they're acting suspiciously.

“This is the first time we've looked at likely illegal activity around an entire continent,” says David Kroodsma, director of research and innovation at Global Fishing Watch. “The thing I like about this study is that it's part ‘Big Data’ and part really detailed policy research. When you combine those things you can say something really useful.”



Belhabib and her colleagues reviewed laws and regulations governing inshore fishing in 33 African nations that border the Atlantic and Indian oceans, identifying zones where foreign industrial trawlers were partially or completely banned.

Then, to determine country of origin, Global Fishing Watch compared the AIS vessel locations between 2012 and 2016 with official ship registries. That accounted for 75% of the trawlers fishing in prohibited waters. The researchers then identified the remaining 25% as industrial fishing boats using an algorithm to analyse their movements. The algorithm, which recognises fishing behaviour, is more than 90% accurate in spotting trawlers, according to the paper.

In Africa, 5.9% of industrial fishing occurred where it is prohibited, and 3% occurred where it was partially banned. “I was really expecting much more than that,” says Belhabib.

However, the numbers were significantly higher in certain countries. In addition to Somalia, where 93% of large-scale fishing occurred in restricted waters, 46% of such fishing was detected in Eritrea and 38% in Equatorial Guinea.

The researchers noted that those numbers may be conservative, given that trawler captains are known to turn off their AIS transponders when fishing illegally.

Why is this data needed?

Trying to ascertain who is actually profiting from illegal fishing is part of the challenge. In Ghana, for instance, 28% of industrial fishing between 2012-16 occurred in waters where trawlers were banned. Researchers found that 95% of those big boats were registered to Ghanaian companies. But a 2019 China Dialogue Ocean investigation revealed that Chinese corporations are the ultimate beneficial owners of most of them.

“In our analysis, Somalia, Equatorial Guinea, Eritrea and Ghana, where vessels spend a significant amount of their time fishing in prohibited zones, have either a limited capacity to monitor their coastal waters (Somalia and Eritrea), or have limited willingness” because of relationships with foreign fleets, the researchers wrote.

Isabel Jarrett, manager of the Pew Charitable Trusts programme to reduce harmful fishing subsidies,

hopes the new research puts pressure on WTO negotiators to reach a deal to prohibit subsidies that promote illegal, unreported and unregulated (IUU) fishing.

“It provides further evidence for the need for ambitious fishing subsidies rules,” she says. “A lot of IUU activity is taking place off the coast of Africa by fleets largely from developed and big developing countries. If you have an agreement on subsidies, you’ll no longer encourage that type of activity.”

The WTO has been negotiating the harmful fishing subsidies ban for nearly 20 years. Jarrett attributes the failure to meet its December deadline in part to the resignation in July 2019 of the chair of the negotiations. His successor was not chosen until November.

A new deadline has been set for June 2020, when the organisation holds its biennial ministerial conference in Kazakhstan. The WTO operates on consensus, meaning that all 164 member states must agree on the terms of a fishing subsidies ban.

Still, Jarrett is hopeful an agreement will be struck, noting that the pressure will be mounting as the UN will be holding its second Ocean Conference in Lisbon, Portugal, the week before the WTO meeting begins. And China, a significant player in the WTO negotiations, is hosting a high-profile meeting of the UN Convention on Biological Diversity in October, giving it further impetus to show environmental leadership by helping conclude the fishing subsidies negotiations.

The monitoring method deployed by Global Fishing Watch could also prove key in helping ensure compliance with a fishing subsidies agreement. Kroodsma says the organisation’s maps are updated every three days but that it could be possible to detect illegal fishing in near real-time.

“It shows the real promise of this type of technology,” says Kroodsma. “Developing countries need cheap ways to monitor their waters.” 🍷

Todd Woody is a California-based environmental journalist who specialises in ocean issues.



RESEARCH FRONTIER

How finance can protect ocean resources

Introducing sustainability criteria into both bank loan agreements and stock exchange listing rules could help save the ocean's life

By **Jean-Baptiste Jouffray**
November 5, 2019

Can finance contribute to seafood sustainability? This is an increasingly relevant question given the projected growth of seafood demand and the magnitude of social and environmental issues associated with its production.

Since the 1960s, aquaculture has been the world's fastest-growing food sector. Rates of fish consumption have been increasing twice as rapidly as population growth, and fish has become one of the most traded food commodities.

Today, more than 90% of the world's fisheries are either overexploited or fully exploited, and the sector is plagued with unsustainable practices, ranging from illegal fishing and habitat

destruction to overuse of antibiotics and forced labour.

Making sure that seafood is both socially and environmentally sustainable has therefore become a key concern for governments, academics and civil society organisations.

In a recent article published in the journal *Science Advances*, my colleagues and I explored what role finance could play in promoting a sustainable seafood industry and where leverage points may lie to redirect capital towards better practices.

We found the two most promising levers to be introducing sustainability criteria into both bank loan agreements and stock exchange listing rules. Whereas shareholder activism is a less powerful force than might be expected.

A green financial system

While numerous green bonds and other impact investment tools have emerged in recent years, they represent less than 1% of global financial flows. The Principles for Responsible Banking, launched in September 2019, show that the financial sector is waking up to its role in steering businesses towards sustainability. But putting the six principles into practice remains a challenge.

As pressures on the ocean mount, what is missing are norms and regulations that can redirect mainstream finance. Green bonds and green finance initiatives are good for starters but what we really need is a green financial system where sustainability criteria are systematically integrated into traditional financial services.



Today, more than 90% of the world's fisheries are either over-exploited or fully exploited. (Image: Alamy)

<1%

Green bonds and other impact investment tools represent less than 1% of global financial flows



As pressures on the ocean mount, what is missing are norms and regulations that can redirect mainstream finance.”

The power of banks

Bank loans are a main way seafood companies finance their operations. Loans come with covenants – agreements between the bank and the borrower stipulating what the borrower can or cannot do.

By incorporating sustainability criteria into loan covenants and binding companies to sustainable practices, banks could play a prominent role in accelerating transformation towards better practices, not just in seafood but across all ocean-based (and arguably other soft commodity) industries.

For example, in May 2019 the agriculture giant Louis Dreyfus Company agreed with its lenders a US\$750 million loan for which the interest rate is linked to the company's sustainability performance, as measured by a reduction in its carbon dioxide emissions, electricity consumption, water usage and solid waste sent to landfill. If the sustainability rating goes up, the interest goes down, and vice versa.

Likewise, Rabobank recently arranged a US\$100 million “green and social” loan with Chilean company AgroSuper, the country's leading salmon company and the second-largest salmon producer in the world. The loan agreement contains several environmental and social conditions that AgroSuper must comply with, such as a commitment to reduce antibiotic use and increase the number of eco-certifications.

The rapid growth of sustainability linked loans proves this can be done, but such criteria and incentives need to become the norm rather than the exception.

Stock exchanges as gatekeepers

To open its ownership to the public, a firm has to get listed on a stock exchange. Companies do so to access capital, gain exposure to broader markets and enhance their brand reputation. This creates an opportunity to scrutinise firms and take sustainability into consideration.

In 2014, for instance, the company China Tuna filed for an initial public offering (IPO) to the Hong Kong Stock Exchange. As part of their risk analysis,

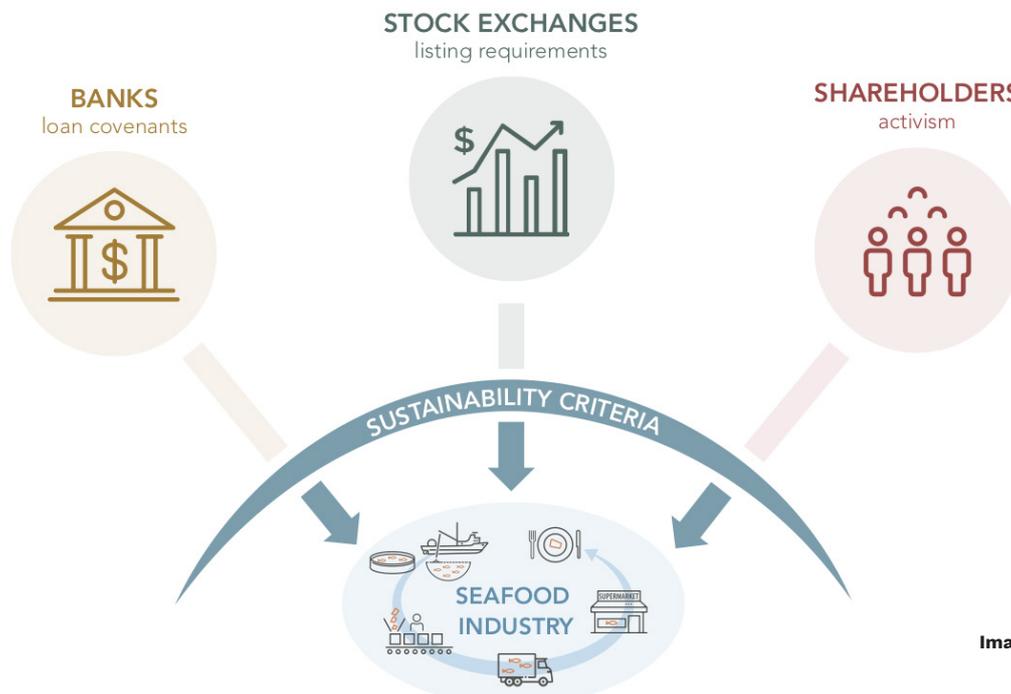


Image: Science Advances

the firm indicated that vessels under the Chinese flag had year on year exceeded the catch limits allocated to China but that noncompliance penalties were either non-existent or not upheld. In particular, it mentioned that because the Chinese government had not set any quotas with respect to individual fishing companies or vessels, there was no risk of them being held responsible.

Greenpeace filed a complaint saying that China Tuna used outdated data and overlooked environmental risks. They also reached out to China's Bureau of Fisheries, which strongly condemned the company's actions as "gravely misleading investors and the international community", and to Deutsche Bank – the sole sponsor of the IPO – which declined to comment and thereafter suffered reputational damages.

Remarkably, the majority of large publicly listed seafood companies are listed on just a handful of stock exchanges. The Tokyo Stock Exchange alone concentrates 53% of the combined revenue of the world's top 45 listed seafood companies, while the exchanges of Tokyo, Oslo, Korea and Thailand together account for 86% of revenues.

More stringent sustainability criteria in the listing rules of just a few stock exchanges could therefore have big effects on the seafood industry.



Will finance become a major force in promoting a transformation towards ocean sustainability? The jury is still out, but levers have been identified and now await action."

Shareholder activism

Once a company gets listed, the percentage of stock ownership determines the share of voting rights and the extent to which any one investor can affect corporate decisions. Shareholder activism is the third financial lever of influence we investigated by analysing more than 3,000 shareholders and 160 seafood firms.

Even though it is often promoted as an important way to affect company policies, we found its influence may have limitations in the seafood sector. The majority of large fishing and aquaculture firms are privately owned, and in the publicly listed ones no single investor has substantial shares across many different companies. In addition, large shareholders are mainly individuals or

nonfinancial companies.

Shareholder activism therefore appears to currently hold limited potential for financial institutions to encourage sustainable practices in the seafood realm.

Looking ahead

Identifying leverage points is one thing. Implementing them is quite another. In an epoch when considerable efforts and technologies are deployed to track fishing vessels in near real time, following the money is no less important and deserves increased attention from both scholars and policymakers.

Sustainability screening and industry-specific considerations should become the norm for investments, in the same way as financial auditing currently is. Pressure from governments, civil society organizations and the general public will be important to improve awareness and drive such regulatory changes.

Will finance become a major force in promoting a transformation towards ocean sustainability? The jury is still out, but levers have been identified and now await action. ↻

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