

Research confirms trawl ban substantially increases the abundance of marine organisms

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CityU's Director of SKLMP Professor Kenneth Leung Mei-ye, Professor Qiu Jianwen from HKBU and Dr Tao Shiru, Postdoctoral Research Fellow of SKLMP, demonstrate some of the fisheries in Hong Kong waters after the trawl ban. Credit: City University of Hong Kong

Biodiversity is of crucial importance to the marine ecosystem. The

prohibition of trawling activities in the Hong Kong marine environment for two and a half years has significantly improved biodiversity, an inter-university study led by City University of Hong Kong (CityU) has found. Research results showed that the trawl ban could restore and conserve biodiversity in tropical coastal waters.

The research team was led by Professor Kenneth Leung Mei-yee, CityU's Director of the State Key Laboratory of Marine Pollution (SKLMP) and Chair Professor in the Department of Chemistry. The findings were published in the journal *Communications Biology*, titled "Recovery of tropical marine benthos after a trawl ban demonstrates linkage between abiotic and biotic changes."

Trawling captures animals of all sizes

Trawling is the practice of dragging fishnets across the seabed to sweep up fishes. "Trawlers capture animals of all sizes and cause severe damages to the seabed. Also, trawling raises plumes of sediment from the seabed and induces their suspension in the water. Therefore, organisms living on the seabed which feed on those sediments would be lack of food, and biodiversity loss has resulted," said Professor Leung.

Since December 31, 2012, the Hong Kong SAR Government has implemented a territory-wide trawling ban in Hong Kong waters with the hope of rehabilitating the marine benthic habitat. To investigate whether such intervention can facilitate ecosystem recovery, the research team led by Professor Leung collected sediment samples with five replicates from each of 28 locations in Hong Kong waters in June 2012 (half a year before the trawl ban) and two and a half years after the trawl ban and then examined for physicochemical properties of the sediment and diversity of benthic animals (usually live at the bottom of a body of water).

Substantial increases in richness of species and abundance of benthic marine organisms

The results of this study suggested the trawling ban has reduced pressure on the [marine environment](#) from fishing and has led to substantial increases in the richness of species and the abundance of benthic marine organisms.



Benthic marine organisms such as crustaceans, polychaete worms, sea urchins, sea cucumbers, bivalves, and gastropods are commonly found in the sediment of the marine environment of Hong Kong. This research finds that after the trawl ban, their abundance increases. And they can be found in more sediment collection locations. Credit: SKLMP

Compared to the survey conducted in 2012, the average amount of

suspended solids was reduced by 1.36 mg/L, a reduction of about 25%, in the water column while the average amount of total organic matter was increased by 1.6 mg/L (an increase of about 29%) in surface sediment after the ban, indicating decreased disturbance on marine benthic habitats.

In addition, there were significant increases in abundance and species richness of benthic organisms after the ban. The average number of benthic species found in sediment samples increased from 27.5 to 48.3 species (an increase of 76%). In each 0.5 m² of the sampling area, the average amount of all benthic organisms found in sediment samples increased from 253 to 848 individuals (an increase of 235%). Such increases were more prominent in polychaete worms and bivalves.

Rapid recovery in benthic marine ecosystem

"These small benthic organisms actually play a very crucial role as they are the main source of food for fishes, crabs and mantis shrimps. Because of the trawl ban, their abundance increases lead to an increase in the abundance of the bigger creatures, hence rehabilitating the fisheries resources," said Professor Qiu Jianwen from Hong Kong Baptist University (HKBU), one of the corresponding authors of this paper and a member of SKLMP.

Parallel studies conducted by the team revealed that fish and crustacean stocks in eastern and western waters in Hong Kong had recovered after comparing their diversity before (2004 and 2012) and after the trawl ban (2013 to 2016). It is revealed that in each km² sampling area, the average number of predatory crabs increased 5 times from 86 in 2004 to 516 individuals in 2015 to 2016 in eastern waters, while in western waters, the number of predatory crabs greatly increased 12 times from 157 to 2101 individuals. Similarly, the number and weight of all fishes or all predatory fishes also increased in eastern and western waters after the

trawl ban.



The procedures of the team's survey on examining benthic animals. The photo at the bottom right-hand corner shows the benthic organisms collected in Hong Kong waters. Credit: SKLMP

"After the trawl ban, the mantis shrimps samples we collected were longer and heavier than the previous ones. Moreover, the biomass of fish and crustaceans in the eastern and western waters has increased, which is encouraging. Our study suggested a rapid recovery of Hong Kong's benthic ecosystem and the fisheries resources in 3.5 years after the trawl ban," stressed Professor Leung.

The team conducted over 100 times of on-site survey. A postdoctoral fellow, four Ph.D. students and a master student helped in the species

identification and numeration of a large number of samples, as well as data processing and analysis.

Multi-pronged approach to promote ecosystem restoration

"Our results are highly encouraging and supportive of the Hong Kong SAR Government's trawl ban policy. Gratifyingly, Hong Kong has provided such a good example of successful management intervention for promoting sustainable fisheries development and marine biodiversity conservation. We hope that other countries, especially those in the tropics, will refer to our study and join forces to prohibit destructive trawling activities," said Professor Leung.

He described this study as "rare but essential" because their investigation only represented the second trawl ban study carried out in the tropics among the 71 relevant studies in the world. He hoped that the results of this research could draw the attention of governments around the world to the impact of trawl fishing on [marine ecosystems](#). After the paper was published, Professor Leung was invited by Sciaena, a marine science and cooperation organization in Portugal, to share the findings. He was also interviewed by the staff of the Food and Agriculture Organization of the United Nations.

"Apart from trawl ban, a multi-pronged approach can promote ecosystem restoration. For example, stop illegal trawling by increasing enforcement, improve water quality, impose a fish moratorium, control fishing gears, restrict the size of harvested fishes, establish fishery protection areas, and also minimize marine construction works," elaborated Professor Leung.

More information: Zhi Wang et al, Recovery of tropical marine

benthos after a trawl ban demonstrates linkage between abiotic and biotic changes, *Communications Biology* (2021). DOI: [10.1038/s42003-021-01732-y](https://doi.org/10.1038/s42003-021-01732-y)

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