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Leveraging AI to detect and retrieve ghost fishing gear: ‘It’s a global problem’

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By Bonnie Waycott

AI-powered initiative in Germany uses sonar data to detect and remove ghost fishing gear, helping to protect marine life and seafood safety

Conservationist Harry Chan calls the oceans "the world's dumping ground for ghost gear." For the last decade, Chan has been retrieving abandoned or lost fishing nets and other debris from the waters and beaches around Hong Kong in an effort to clean up the mess. Photos shared with Harry Chan's permission.

There have been significant steps in the world of artificial intelligence (AI) recently, and the technology is becoming commonplace. Although hotly debated since its arrival on the world stage, AI has undoubtedly become a cornerstone for various industries, propelling them into an era of increased efficiency and innovation.

It could also prove to be key in matters of ocean conservation. **GhostNetZero.ai** (https://ghostnetzero.ai)is a collaboration between **WWF Germany** (https://www.wwf.de), **Microsoft AI for Good Lab** (https://www.microsoft.com/en-us/research/group/ai-for-good-research-lab/) and the AI consultancy **Accenture** (https://www.accenture.com/gb-en/services/data-ai). It's part of an initiative in Germany to deploy AI to locate abandoned, lost or discarded fishing gear (ALDFG), also known as "ghost gear." The platform uses existing high-resolution sonar data from the seabed to detect where ghost fishing gear is likely to be found.

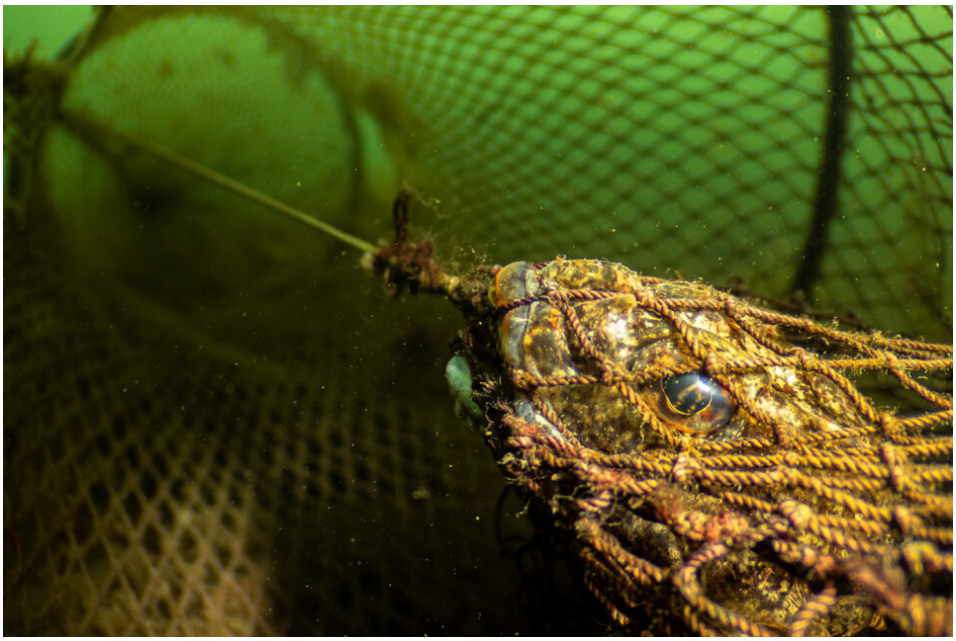
"Ghost gear is a major contributor to ocean pollution with extensive social, economic and environmental impacts," Gabriele Dederer, research diver and project manager at WWF Germany, told the *Advocate*. "This is concerning, especially as the ocean faces other threats such as climate change and acidification. In the German North Sea, 30 percent of all litter is related to fishing gear, while in the Baltic Sea the figure is around 15 to 20 percent. We need to know more about ghost gear, but due to its nature, it's difficult to obtain accurate numbers."

Dederer and her colleagues began their work in 2016, going out to sea with fishermen to locate ghost gear. Soon, they discovered a more effective way to do this – side scan sonar, a tool that is designed to detect and image objects on the seabed. Side scan sonar helped the team increase its coverage areas

and proved effective in waters with very low visibility, like the Baltic Sea. Having retrieved approximately 245 fishing items from the Baltic Sea, the team started working with federal agencies to establish pilot programs for ghost gear location before coming up with their AI platform.

Using AI developed by Microsoft, GhostNetZero.ai analyzes existing sonar images specifically for ghost gear. These images are collected worldwide – for example, by federal agencies to secure shipping traffic or by offshore wind power companies to explore locations prior to turbine or electric cable installation.

Once the images are analyzed, the locations where ghost gear is likely to be found are marked on the platform. The marked areas are then checked for validation. AI can also distinguish between genuine ghost gear and similar-looking structures such as cables, detecting subtle differences across various sonar data formats.



Fishing nets don’t stop fishing – even when lost at sea – turning into deadly traps for fish, seabirds, turtles and marine mammals. Photos used with Harry Chan’s permission.

“Side scan sonar can be used at various depths and works well in every condition from murky water to strong currents, giving us wide areas to explore,” said Dederer. “Our side scan sonar has a frequency of 600 kilohertz and is towed behind our boat, 5 meters above the seabed. This gives us the best resolution. The sonar works in a big area over a very short space of time, helping us find ghost gear much earlier, and reducing any damage to the seabed.”

"We are re-using data that's already been processed for other purposes, and can also be used for our purpose," said Mareen Lee, project manager at WWF Germany. "Side scan sonar has significantly enhanced the efficiency of our work. By distinguishing between different underwater structures, it has eased the burden of having to examine the images manually, and the technology enables us to locate structures like nets very precisely. This is extremely important in areas like the Baltic Sea where visibility is particularly low."

Such breakthroughs are vital to tackling ghost gear: Every year, an estimated **2 percent of all fishing gear and more than 25 million pots and traps** (https://www.science.org/doi/10.1126/sciadv.abq0135#T1) are lost to the ocean. These decompose into smaller pieces and fibers, exacerbating microplastic pollution and creating an environment where harmful bacteria and pathogens can thrive. This can contaminate fish and other marine life that humans consume, increasing the risk of food borne illnesses.

Fishing nets don't stop fishing – even when lost at sea – turning into deadly traps for fish, seabirds, turtles and marine mammals. Conservationist Harry Chan calls the oceans "the world's dumping ground for ghost gear." For the last decade, Chan has been retrieving abandoned or lost fishing nets and other debris from the waters and beaches around Hong Kong in an effort to clean up the mess.

"Many people assume that ghost gear is a regional issue, but it's a global problem with far-reaching consequences that are difficult to quantify," said Chan. "Ghost gear can drift for extended periods – days, weeks, even decades – potentially carrying bacteria or disease that may impact seafood safety. Fishing nets, a major component of ghost gear, can easily entangle boat propellers and anchors, causing significant operation disruption and heavy financial loss."

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Chan’s efforts have had positive impacts over the years. For example, ghost gear has been successfully removed in areas that were blocking fish from swimming toward shallow water. But although Chan and his team have collected over 80 tons of ghost gear, winning their battle is still a challenge. In this sense, Chan welcomes the role of AI.

“AI allows us to monitor ocean conditions more effectively, helping to detect ghost gear, identify new species, and uncover other underwater phenomena,” he said. “Since AI models are trained on verified data, they generate precise results and can rapidly process vast amounts of oceanographic information. Perhaps in future, we will establish large-scale operations to retrieve ghost gear in heavily fished areas thanks to AI.”

Chan’s views are also being echoed in Japan, where fisheries consultancy **UMITO Partners** (https://umitopartners.com)recently became the first Japanese private sector company to join the Global Ghost Gear Initiative (**GGGI** (https://www.ghostgear.org)). UMITO Partners is working to establish sustainable fishing and aquaculture practices across Japan while promoting nature positivity at sea. Shunji Murakami, CEO and founder of UMITO Partners, says that AI is a promising tool that can further advance the search for ghost gear.

“We have seen how difficult it is to manage the unintentional loss of fishing gear at sea and understand the importance of improving the situation,” he said. “Japan has a long-standing reputation as a country with a strong technology industry that can provide scalable solutions like AI.”

Murakami said UMITO Partners, through its GGGI membership, aims to foster business collaborations between governments and tech start-ups to address the ghost gear issue with AI-driven solutions.

“Such collaborations can not only make it possible to locate ghost gear and take action more swiftly, but they could also help to anticipate the loss of fishing gear in advance,” he said. “We also want to create opportunities for fishing communities, local governments and the tech industry so that they can make economic and environmental impacts in scalable ways.”

The hidden cost of ghost gear lost by fishing and aquaculture

Abandoned, lost or discarded fishing gear can inflict damage on marine life and the ocean, but what’s the economic cost of ghost gear?

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To prevent fishing gear from becoming ghost gear, Dederer said that it’s important to ensure that it doesn’t end up in the ocean in the first place. Harbor facilities where fishermen can return old and unwanted nets could be a way forward, she said, along with tools that allow them to quickly report lost gear for prompt retrieval.

Other strategies include alternative fishing materials or swapping items (like dolly ropes) with less harmful options. Dederer also notes that greater support from authorities when fishing gear is lost could also encourage fishermen to report missing equipment.

“Tackling the problem from all sides, together with fishermen, conservationists, researchers and other supporters, could go a long way,” said Dederer. “AI may be drawing a lot of attention, but it’s important that we work with fishermen and fishing communities when locating ghost gear. They can provide information on areas that may contain ghost gear, or how to retrieve items safely and effectively.”

“The key is collaboration and making sure that fishermen are not afraid to get in touch if they lose their nets,” said Lee. “From fishermen and authorities to research organizations and stakeholders that give us data, we must all work together to address ghost gear. Our role is to use technology in the right way for nature conservation, all the while proving that our technology works.”

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Correspondent Bonnie Waycott became interested in marine life after learning to snorkel on the Sea of Japan coast near her mother’s hometown. She specializes in aquaculture and fisheries with a particular focus on Japan, and has a keen interest in Tohoku’s aquaculture recovery following the 2011 Great East Japan Earthquake and Tsunami.