

Qingdao, a bustling coastal city in northern China with over 10 million residents, carries a rich history of German and Japanese colonization from the last century. Nowadays, the city is known for its vibrant seafood and beer culture, attracting both locals and tourists alike.

Just an hour's ride from Qingdao lies Qigou Village- where I spent a lot of memorable time growing up.

In such a fishing village, like many others, life revolves around the sea. The locals, including Lao Wang, an oyster farmer, rely on the ocean's bounty for their livelihood. The community engages in the traditional aquaculture of species like oysters, scallops, clams, kelps, abalones, and sea cucumbers.

Lao Wang uses traditional farming methods involving drilling holes in scallop shells, threading them, and deploying them into offshore waters in July. The oysters then rely on wild spat to attach naturally, after which they are harvested over the following months based on market demand.



Lao Wang and his workshop for oyster aquaculture in Qigou Village.  
Some unfinished longlines with scallop shells are on the ground.

Lao Wang's family-run aquaculture business is just one of many in the village that have sustained the community for generations.

In China, these small-scale aquacultures do more than provide livelihood for millions of families—they're a major source of our aquatic food, crucial to our dietary patterns and nutritional intake, providing a valuable source of micronutrients such as minerals and vitamins, offering numerous health benefits, and maintain a diverse enough industry for sustainable use of our ocean, if managed properly.

Particularly, non-fed offshore aquaculture is generally considered to have lower greenhouse gas and nitrogen-phosphorus emissions compared to other forms of aquaculture. This may also well provide a potential resolution for the mitigation of climate change.

In the local community, aquaculture products are a staple, and the four-month fishing ban, imposed after years of overfishing, hits hard. These businesses all together contribute to the world's largest national aquaculture production, accounting for more than half of the global total.





Scallop aquaculture preparations at Jiuguan Town involve loading floats with the help of a tower crane. More than 20 like this are situated along the beach.



A worker from an aquaculture firm in Jiuguan Town preparing floats.



A couple in Qigou Village preparing to deploy floats with longlines for oysters, representing the family-based small-scale aquaculture in the community.



In places like Jiuguan Town, which is a two-hour ride from Qingdao, aquaculture has seen significant expansion through the formation of cooperatives and corporate farms that employ dozens or even hundreds of workers. These operations are highly organized, utilizing fleets, tower cranes, and excavators to meet the growing demand for aquatic products at both local and regional levels.

Similarly, in Rushan Town, also near Qingdao, triploid oysters are primarily cultivated. These oysters, bred with three sets of chromosomes, are sterile, significantly reducing their reproductive efforts and allowing their metabolism to focus on growth and fattening.

Growing triploid oysters requires a substantial investment, with seed costs typically ranging from ten thousand to several hundred thousand dollars, depending on the farm's size.

"Chinese always say those who live on a mountain live off the mountain, and those who live near water live off water," Lao Wang told me. "Our livelihoods are at the mercy of the weather."



A Dragon King Miao Shrine in Qigou Village, part of the local folklore where community members pray for safe travels on the ocean and a good harvest.





An aquaculture worker paints a boat in Rushan. While tourism has grown in economic importance, places like this can be found right next to public beach playgrounds crowded with tourists.



A merchandise seller on a public beach in Rushan, only 5-minute walk from nearby aquaculture sites.



Qigou Village, situated across the bay from the city, faces changes as urbanization and ecological restoration have led to the loss of sea cucumber aquaculture in the village.



However, low-intervention offshore aquaculture comes with its own set of challenges. With minimal controls over the cultured species, these systems are prone to environmental degradation, including water pollution from wastewater discharge, nutrient depletion due to high cultivation densities, and algal bloom.

In recent years, farmers have faced mass die-offs of oysters and scallops in the fall—a natural occurrence that has become more frequent and severe, with reasons still unknown, leading to significant financial losses.

Despite these challenges, factors like urbanization, marine ecological restoration efforts, and high investment risks remain some of the most prominent influences pushing existing fishing villages to seek new ways to sustain themselves or adapt to coexist with the evolving environmental and economic landscape.

"I often wonder if businesses like ours are even included when the authorities do the statistics for aquaculture production," Lao Wang said. "We are at the margins of society."



A worker cleaning the macroalgal bloom in Qingdao. The bloom is destructive for certain types of aquaculture, and some believe it results from overcrowded seaweed aquaculture.



Discarded foam and polyethylene float balls washed ashore.



Group of workers gathering to rest after cleaning macroalgae bloom on a public beach.





A yacht ticket office on a public beach in Qingdao. Now the city attracts millions of tourists from all over the country each year.



Mr. Yu, an oyster farmer, preparing hundreds of floats during dusk.



Tourists in the central city of Qingdao.



“Eat more fish to become smarter.” “Eating fish will improve your vision.” Growing up, I often heard these sayings from my parents.

Indeed, the community values aquatic products not just for their umami taste but for their irreplaceable nutritional value in local diets. Many believe that eating seafood can lead to “longevity,” “disease prevention,” “boosted immunity,” “delayed aging,” and “anti-inflammatory benefits.”

However, many factors influence people's choices of seafood, including price, preparation time, household size, dietary preferences, and socioeconomic status, making it nearly impractical to evaluate everyone’s decision comprehensively.

Nevertheless, we are facing tremendous challenges regarding food safety, which have raised concerns within the community about issues such as heavy metals, pesticides, antibiotics, and the recent controversy over Japan's Fukushima nuclear wastewater discharge.

The discharge of nuclear wastewater has significantly undermined the import of aquatic products from Japan, leading to broader impacts on the local aquaculture sector. This situation has caused many individuals to consider reducing or even stopping their consumption of aquatic foods, thus many aquaculture workers have reported a sudden downturn in their business.

How executive and legislative branches, such as the Ministry of Ecology and Environment, responsible for such affairs, should inform community members about these incidents remains unanswered.



An owner of a local seafood restaurant, who has been operating the place for over 30 years. Many local restaurants feature variety choices of seafood.



A plate of uncooked sea cucumbers, which have long been prized in the ocean for their nutritional value.



A sea cucumber retail store modified from a shipping container in Qigou Village.

To this day, we still lack comprehensive or even community-based advisories on selecting aquatic foods, including dietary recommendations for vulnerable populations such as children, pregnant women, or individuals with gout. Such advisories could help determine how much and which types of aquatic food to consume to minimize health risks while maintaining adequate micronutrients intake, considering that different species have varying nutritional and risk profiles.

Ensuring safe and sufficient nutritional sources from aquatic foods remains a significant, unresolved issue. Although food safety incidents have been addressed and rectifications made, the path to securing these food sources is still challenging.





Kelp farmers harvesting in Rongcheng City, with an annual production of 1.7 million tons, one of the world's largest kelp farms. The aquaculture industry is commonly labor-intensive.



Women workers at an oyster farm in Rushan City preparing for the floats, most of whom are between the ages of 40 and 60.



Two workers in Rongcheng City loading seaweed, with one controlling the crane.

Aquaculture in Qingdao and its surrounding areas presents both opportunities and challenges. As the industry evolves, it could significantly contribute to substantial nutritional sources, reduce reliance on livestock and red meat, and mitigate climate change through more sustainable and carbon-neutral practices.

Our communities are intricate webs, inextricably linked to our environment, society, and each individual. Years ago, the Food and Agriculture Organization (FAO) promoted the One Health framework. This initiative aims to integrate sustainable aquaculture, food safety, food security, nutrition, livelihoods, and human health—ambitious goals we continue to strive towards.

But here's the burning question: How do we maintain an aquaculture industry that produces safe and sustainable outputs while minimizing environmental impacts and staying resilient in the face of diverse challenges?

Advised by Dr. Christopher Golden and supported by the Rose Service Learning Fellowship, I had the privilege of collaborating with the Yellow Sea Fisheries Research Institute (YSFRI), Chinese Academy of Fishery Sciences, and various stakeholders in the local aquaculture industry. This work involved engaging with individual aquaculture farmers, contractors, wholesalers, workers, and seafood export companies, aquaculture experts, as well as gathering community feedback on public perceptions of consuming aquatic food. This collaboration afforded me a profound understanding of the intricate challenges inherent within the local aquaculture sector, underscoring its pivotal role in ensuring the sustainability of essential nutritional resources to maintain a robust and equitable public health system.





A captain who spent more than 20 years on the ocean, standing on a discarded boat.



