

A Tsunami is Coming!

Local fishers played an important role in keeping rural coastal economies alive after the worst tsunami in Japan's history

At 14:46 local time on 11 March 2011 the collision of the North American and the Pacific tectonic plates resulted in the most powerful earthquake (9.0-9.1 Mw) in the history of Japan. The epicentre was about 70 km from the Oshika peninsula and left behind its wake more than 19,000 casualties, 7,000 people missing or injured and significant damage throughout the Japanese northeastern coast. The Oshika peninsula, where oyster, seaweed farming and fishing are the main economic activities, suffered

unprecedented sets of challenges, and the role they played in restarting Oshika's local rural economies, while the national government's reconstruction efforts were mostly focused in more urbanized areas. Our essay is based on our own interviews with fishers in the region during February 2017.

Fishing and sea farming in the Oshika peninsula before the tsunami

The Oshika peninsula is located within the Miyagi prefecture, one of the 47 prefectures of Japan, and has an extension of about 20 km of coastline, comprised of small bays dominated by rocky or sandy bottom environments. Rivers flow to the ocean from forests with an elevation of up to 500 m, providing nutrient-rich waters to coastal inlets, making them excellent sites for fishing and aquaculture activities like oyster and seaweed farming.

Communities are generally isolated from one another, and local festivals and other events are considered important opportunities for the creation and reaffirmation of community social ties in the region. About 30 fishing communities and a total of 3,000 people were estimated to live in the peninsula and all of the full-time fishers were originally organized in eight independent fisheries co-operative associations (FCAs). By 2007, however, seven FCAs had consolidated into one large prefectural FCA. The consolidation of small fishing co-operatives into larger ones has been taking place throughout Japan since the first consolidation law was enacted in 1967, driven by the needs of smaller co-operatives to gain more market power or attain financial stability,

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extensive damages from the tsunami. Communities had to bear irreparable losses, and surviving fishers lost their boats, their farming and fishing gear, and all related coastal infrastructure (that is, wharfs, ice houses, fully-equipped processing plants, vehicles, other machinery, etc.).

Moreover, fishers told us about ecological impacts that soon became evident, such as changes in the abundances of species. From our review of the literature, though, it remains unclear if these changes resulted from a reduction of fishing effort in the area closest to Fukushima and the nuclear plant or from a change in the structure of the benthos in the region.

Six years after the tsunami, fishing activities have almost entirely been restored. This essay briefly describes how fishers reacted to these

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among other reasons. For instance, during a field trip we made in 2013 to visit FCAs in the Boso peninsula, a co-operative president mentioned the main reason his co-operative decided to consolidate was due to the debt acquired after the purchase of a large vessel for mackerel fishing and the disappointing catches that resulted from this investment in the subsequent years.

Since the 1940s, farming of oyster (*Crassostrea gigas*) and wakame algae (*Undaria pinnatifida*) have been the major source of income for local households and co-operatives in the western coast of the peninsula. Nationally, this region is one of the most important production areas for oysters, and the production cycle typically takes two years, while wakame can be harvested after six months. Oyster spat collection starts in July-August and growth to market size takes about 24 months, with harvesting typically starting in October and lasting until May. Women and other members of the community at the co-operative-owned facility shell and pack the raw oysters for marketing by the co-operative. The production cycle of wakame algae starts at roughly the same time as that of oysters, yet harvesting starts as early as December and can last until March. The processing of wakame algae requires boiling the algae, salting it, and packing it. Sporophyl, the reproductive part of wakame, can be marketed raw, however, and in Japanese is called 'mekabu.'

During the farming off-season (roughly April, May and June), fishers in Oshika have traditionally relied on a variety of fisheries and fishing gear to complement their income. Among the main species of bottom and pelagic fish harvested with gillnets are flounders (*Paralichthys olivaceus*, *Microstomus achne*, *Tanakius kitaharae*, *Verasper variegatus*), Japanese rockfish (*Sebastes* spp.), green ling (*Hexagrammos otakii*), and squilla (*Oratosquilla oratoria*). Longlines are mainly used for Japanese sea bass (*Lateolabrax japonicas*), and fish traps for conger

eel (*Conger myriaster*). Sand lance (*Ammodytes personatus*) are harvested using dip nets. Set nets catch Japanese anchovy (*Engraulis japonicas*), mackerel (*Scomber japonicas*), and salmon (*Oncorhynchus keta*). Flounders are also caught by trawling.

For the most part farming and fishing is organized around kin-based relationships, with the exception of the dip-net and set-net fisheries, which are typically operated by salaried captains and crews not related by kin.

The post-tsunami reality: The role of fishers in restarting local rural economies

Fishers immediately knew a strong tsunami was coming upon feeling the strength of the earthquake that spring afternoon in March, and many of them tried to save their boats by motoring offshore. At least half of the fishing fleet was lost, and farming and fish-landing and processing facilities were heavily damaged or completely lost. Fishers living in low-lying areas lost their houses and had to move into schools' auditoriums and other designated shelters. All oyster and wakame farming production completely came to a halt, making fishers entirely reliant on shelters for housing and food for the first few weeks.

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Makinohama in the Oshika peninsula, two days after the tsunami. The Oshika peninsula is located within the Miyagi prefecture, one of the 47 prefectures of Japan

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Ayukawa fisherman showing a species of flounder (*Paralichthys olivaceus*) that became more abundant in the region after the tsunami

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The first post-tsunami income opportunity for fishers came two months later as the Fisheries Bureau was seeking to hire cleaning crews tasked with the disposal of the tons of debris littering the coast and inlets. This activity provided fishers with a modest income (around 12,000 yen per day or around US\$100) to support daily living expenses, but allowed fishers to remain in their communities and not migrate to urban areas in search of new jobs. During our 2017 visit, we interviewed fisherwomen at retirement age who had returned to work in oyster-farming activities after leaving to stay with relatives in urban areas; some of them are still debating whether to return and settle permanently back and start all over again. A strong motivation to return, they said, is the dislike of the urban lifestyle

and missing the sight of the ocean every day.

While the national government offered to subsidize 90 per cent of the expenses related to the purchase of new farming and fishing gear and generally support re-building efforts, the acquisition of new gear that would allow fishers to start generating income and stay in their communities was significantly delayed because of shortages in nationwide supply of fishing supplies from the unprecedented demand that followed the earthquake.

Fishers recovered some gear like buoys and other farming equipment that washed to shore through the clean-up process and with the help of volunteers who came to help from all over Japan. Other fishers who had salvaged their boats and fishing equipment were eager to get back into operation. Yet they were constrained by the damages to the landing and post-harvesting infrastructure. For instance, many landing sites were inundated during high tide due to the land subsidence effects. In June, three months after the tsunami, fishing boats gradually started operating but were limited to sites

where landing was possible during low tide. Catches provided food for families in the area and income from small-scale selling to volunteers that came from other parts of Japan, among other sources. Such activities paid for operating costs to go fishing again and keep a constant cash flow in these isolated areas. For the most part, processing the catch was not feasible, and rebuilding of ports, processing and packaging facilities would have to wait until appropriate landfilling in land-subsided areas could take place.

Throughout the coast, restoration of large-scale ports received the highest priority from the national government, and communities in the Oshika region reliant on smaller-scale ports received relatively less attention. Thus, local self-governance and voluntary activities played a significant role in the re-building effort of landing and processing infrastructure in Oshika. For instance, in the port of the Onagawa community, considered one of the central ports of the Miyagi prefecture for the landing of the set-net fishing fleet, the local fisheries co-operative and buyers associations, the municipal government, and the local engineering companies organized together to build temporary cold containers to appropriately store the catch. In the smaller port areas in Oshika peninsula, the fishing co-operative transported ice from urban areas, enabling landing and market auctions to take place in their own communities and generate local employment. In Japan, where local brands and their reputations are one of the most important forms of branding and niche-marketing, restoring local production and linkages between producers, marketing middlemen, and retailers as soon as possible was paramount so as not to lose nationwide consumers to other brands.

Limited fisheries production in Oshika provided fishers, marketers, and co-operative staff with time and minimal income to remain on site and organize the restoration of farming activities, the main source of income in the area. In some communities,

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the lack of oyster farming equipment and infrastructure forced fishers to shift their operation to the farming of wakame. It also made sense to focus on wakame, given its shorter production cycle (and thus quicker return on investment), and particularly on the production of its sporophyll or *mekabu*, a part of the wakame algae that is edible and requires less infrastructure to process and market. Wakame production has a starting date in early fall, which allowed fishers time to get ready. Volunteers from urban areas throughout Japan played a key role in assisting communities to re-start their wakame aquaculture activities through salvaging rope, buoys and other materials needed for farming, seeding the culture and building temporary storage houses on the beach. Finally, a private philanthropic entrepreneur set up a small office to co-ordinate the matching of volunteers to work with fishers. These arrangements allowed fishers to re-start wakame production quickly with minimal capital.

The tsunami also forced fishers to modify the way they harvested and marketed their oysters for the fresh de-shelled market. Without appropriate facilities to de-shell and package fresh oysters, they had lost access to that market. On top of that, fishers noted that, perhaps because of changes in ecological conditions, oyster seeds grew faster than anticipated, yet the reconstruction of their oyster processing facilities would still take two years to be completed. Fishers needed to adapt to the new post-tsunami reality. This was the case of the Makinohama community, where one of the fishers decided to contact the FCA in Hokkaido, in the northern-most region of Japan. After collective discussions, Makinohama fishers decided in May 2012 to ship their oysters live, before reaching market size, to farms in Hokkaido. In this manner, they could sell their oyster without shelling and packing. Oysters in estuaries of Hokkaido grow faster and bigger, and Hokkaido oysters are a recognized regional brand, usually fetching high market prices.

Fishers from Makinohama also continue selling their products directly to consumers in urban areas through the network of volunteers that came to help. This was another channel that allowed fishers to sell live oysters without shelling or packaging. Live oysters in shells have a much smaller market compared to de-shelled fresh oysters for their increased transportation costs and the extra effort for the consumer to de-shell them for eating or cooking. Selling through the network of volunteers was a new way to access niche markets in urban areas.

Fishers as agents of local resilience in rural coastal communities

Altogether, the fishers' ability to engage in a number of different economic activities allowed them to provide food and a minimal income stream, while the assistance from the central government was deployed, letting them remain in the region while slowly re-building their communities and fishing activities. Fishers in Makinohama told us they estimated that by 2014 oyster production had recovered to the same levels before the tsunami. In addition, new forms of production had been established and continue to this date, like the relationship with the Hokkaido FCA. Wakame production continues to be an important economic activity, and some species like flounder have become more abundant. Communities like Omotehama, where small-scale fisheries recovered quickly, have attracted a younger generation of fishers, perhaps for its robustness and sustainable income. While some important challenges remain to be addressed in the future, the example of the Oshika peninsula helps reaffirm the tenacity, resilience and impressive adaptive capacity of the fisherfolk. The role they can play in restarting or maintaining rural coastal economies after catastrophic events like the tsunami of 2011 informs their importance and value as part of a modern vibrant civic society in these areas.



Fisherwomen of retirement age declumping oysters in the community of Makinohama, Japan

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For more



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Disaster Extent Map Overview— Japan, Oshika Peninsula— Earthquake/Tsunami

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Impacts of the 2011 mega- earthquake and tsunami on abalone *Haliotis discus hannai* and sea urchin *Strongylocentrotus nudus* populations at Oshika Peninsula, Miyagi, Japan