Tsunami Recovery

The tsunami that hit the Juan Fernández islands of Chile has tested the resilience of the traditional tenure system of the fishing community of the area

Some time in October 1704, the 16-gun buccaneer galleon *Cinque Ports* reached the uninhabited Más a Tierra Island, about 415 miles off central Chile, for restocking food and fresh water. There, sailing master Alexander Selkirk got into an argument with Captain Thomas Stradling about the seaworthiness of the vessel. Selkirk, an ill-tempered Scot, was left on the island with a musket, gunpowder, carpenter's tools, a knife, a Bible, some clothing and rope. He was rescued four years and four months later; his story inspired Daniel Defoe's fictional character Robinson Crusoe. During his long period of isolation, Selkirk learned to make use of whatever resources were available to him—digging for roots, hunting feral goats and boiling lobsters.

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Two centuries later, the plentiful lobster stocks became the backbone of the economy of the island, or, more precisely, of the Juan Fernández archipelago. Más a Tierra and Más Afuera (located 100 miles further offshore) were renamed as Robinson Crusoe and Alexander Selkirk Islands, honouring, respectively, the fictional character and his real-life counterpart. The islands correspond to the peaks of two members of an impressive chain of sea mounts that rises from abyssal depths in the southeastern Pacific, spreading over approximately 230 miles in the east-west direction. The rough landscape of the islands, of imposing beauty, consists of a mosaic of volcanic rock ridges and densely vegetated ravines, harbouring a rich endemic flora. The islands were designated by Chile as a National Park in 1935, and by the United Nations Educational Scientific and Cultural Organization (UNESCO) as a World Biosphere Reserve in 1977, making them part of humanity's natural heritage. San Juan Bautista (population approximately 770), the only permanent settlement, is located on Cumberland Bay, facing northwards on the north coast of Robinson Island.

Most fishing activity takes place around Robinson Crusoe and Santa Clara islands. Eight to ten boats operate in Selkirk, where fishers stay with their families between late September and mid-May, while a few fishermen operate sporadically in the Desventuradas. The basic design of the 8-11-m double-ended fishing boats has been virtually unchanged since at least 1915 and may be traced to whaling during the 19th century. Most were built in Robinson Crusoe Island with local woods and are powered by 15-hp outboard motors. Traps are made of wood, and baited with a mix of white fish and moraine eel meat.

Modern fishery

Commercial fishing dates to the 19th century. The modern fishery took shape after a French company started to operate in 1914, largely as a result of the introduction of motors. Before 1959, fishermen were employed by the fishing companies (*apatronados*).

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The last *apatronados* subsisted through approximately 1970; since then, all fishermen have worked independently.

The first two vessels built to be owned by independent fishers were significantly named *Libertad* and *Independencia*.

A co-operative was created in 1964, with a membership that included about 90 per cent of the fishers, but it foundered eight years later and was formally terminated in 1980, as a result of administrative mismanagement and a political climate unfriendly to co-operatives. As Chile returned to democracy, fishermen organized themselves into 'syndicates', but remained economically dependent on middlemen who provide cash advances and an assortment of supplies before the start of the fishing season. In 1999, a group of fishermen started a small private venture with support from a government agency and non-governmental organizations (NGOs), with the purpose of facilitating marketing and circumventing intermediaries. In recent years, the main syndicate started its own marketing of lobsters through exports, with the aim of increasing and stabilizing prices by entering European markets directly.

Nominally, the fishery has been managed by a centralized administration of regulations that cover legal size, a closed season and the release of egg-carrying females. Yet, as Antonie de Saint-Exupery wrote in *The Little Prince*, "the essential is invisible to the eye": an effective but unwritten sea-tenure system, established by tradition, has put a cap on the size of the fishing force, and regulated access for decades, even in the absence of a formal limited-entry regime or other access controls.

Each fisherman or fisherman's family member may 'own' a certain number of fishing spots, known as *marcas*, where lobster traps are deployed, one per spot. Most of those spots have been discovered and claimed over decades, although new ones are still being identified with the help of technological aids like echo sounders. *Marcas* are identified by alignments of land features; each fisherman knows by heart the location of his *marcas*, and of those belonging to others. Use and transfer of rights

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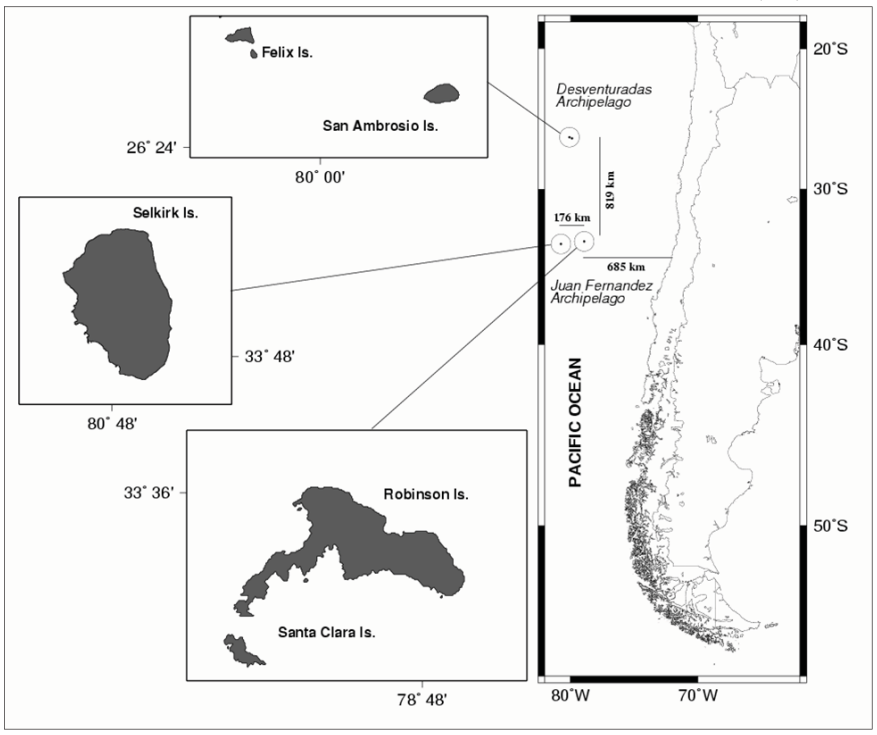

Archipelago of Juan Fernández islands, off central Chile.
Lobster stocks are the backbone of the economy of these islands

over *marcas* are regulated by informal, but well-established, internal rules. *Marcas* are not sold but can be transferred with a boat if the latter is sold; they can be inherited by family members, and are often lent to other users under a variety of arrangements. In the event of a fisherman being unable to harvest in his *marcas*, others are expected to do so, but the *marcas* return to the 'owner' once he goes back to fishing. This complex and highly structured traditional tenure system enjoys high compliance.

As part of a project initiated by the Juan Fernández syndicate, we mapped the location of all *marcas* around the islands with global positioning systems (GPS), and recorded their 'owners'. The total number of *marcas* identified near the Robinson Crusoe and Santa Clara Islands was 3,762.

While the *marcas*' tenure system has been completely ignored by the administration until very recently, scientific input to agency managers has consisted of discontinuous stock assessments projects and equilibrium models leading to total allowable catch (TAC) recommendations. Introduction of a TAC, however, would require the transition from an informal but tightly structured territorial tenure system to some form of quota allocation, likely to be socially disruptive.

Seeing the need for improved advice, the Juan Fernández syndicate acted to develop its own indicators of stock status and fishery performance. Fishermen perceive stock abundance through catch per trap haul or per fishing trip, so some form of catch per unit effort (CPUE) would be a natural indicator, one which fishermen can monitor themselves, and understand. Monitoring and analysis require a format for the provision of scientific or technical advice that operates from the bottom up. A collaborative effort between the syndicate and independent scientists, taking advantage of technical skills available within the fishing community and with the support of conservation-oriented NGOs, led to the design and implementation of a cost-effective logbook sampling programme. The indicators monitored, together with the empowerment of the fishermen's organization, gained through implementation of the process, are expected to lead to management strategies based on simple decision rules.

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Early in the morning of 27 February 2010, the orderly and almost idyllic life of Robinson Crusoe Island and its fishing community came to an end. A train of three tsunami waves, 12-15 m high, hit Cumberland Bay. The exposed sectors of San Juan Bautista were devastated. Flooding progressed horizontally over approximately 300 m, reaching a maximum height of 20 m. The tsunami led to 16 fatal casualties, nearly 50 families were affected, and serious damage to the infrastructure of the community occurred: the municipal hall, the post office, the coast guard detachment, a gymnasium, the parks service office, the cemetery, churches, sport clubs, the museum and library, the geriatric home and communications equipment were completely destroyed. It was almost miraculous that the tsunami did not hit the temporary fishing village of Selkirk Island, 100 miles westward. The waves passed south of the island. Had the tsunami struck the island, the consequences might have been devastating, as the houses there are built near the beach, at the foot of a deep gorge.

An assessment of damage to the fishing infrastructure and fleet in the aftermath of the disaster revealed that the two fishing coves (in the north and south) had been damaged. Sheds and winches used to beach the boats were totally destroyed. The facilities of the fishers' association, built with great effort and pride, were completely wiped out. Gone were the office building, the showroom for display of marine products, and the 50 lockers where

The Honour of *Marcas*

Julio Chamorro, a member of the Juan Fernández syndicate and the son of a local island boatbuilder, responded via email to questions put by Ramya Rajagopalan of ICSF, and translated by Billy Ernst:

Could you tell us something about the origins of the marcas system?

Marcas were established during the onset of the lobster fishery in Juan Fernández archipelago around 1893. During the early years, the fishery operated in shallow inshore waters using baskets; each boat had its own delimited fishing area. Later on, the fishing expanded progressively to deeper areas, and traps were introduced. The best fishing spots to fish for lobster are rocky outcrops or small shallow reefs. These were located by setting adrift a buoy, line and weight rig; once a reef was hit. fishers recorded the spot using landmarks and leading lines.

How has the syndicate developed its own indicators for the lobster fishery?

In October 2006, at the beginning of the 2006-2007 lobster season, the Syndicate of Independent Workers Artisanal Fishermen of the Juan Fernández Archipelago (STIPA-JF), in collaboration with the University of Concepción, started to implement a monitoring programme for the fishery. Fishermen themselves systematically collected basic information on catch and effort, which was used to estimate how much effort was exerted, as well as where and when the lobsters were being caught. This continuing exercise allows for a detailed temporal and spatial analysis of catch per unit effort (CPUE).

How are fishers involved in the monitoring?

Fishermen are committed to collaborate in the collection of basic fisheries data, primarily through logbooks in which are recorded information on the total catch of commercial and non-commercial lobsters in each trap hauled, and the estimated total weight of the bait. The objective is to improve the quality of basic fisheries information, and also to follow up on previous projects like the survey of *marca*s conducted during the 2004-05 and 2005-06 seasons.

Are these indicators recognized by scientific and formal management institutes?

The indicators have been analyzed at the end of each fishing season by the Department of Oceanography of the University of Concepción. For the last four seasons the programme has produced CPUE estimates by statistical areas. Since the 2006-07 season the results have been recognized by the Undersecretariat of Fisheries and by the National Fisheries Service. We have since worked together with the National Fisheries Service by providing fisheries data. But these data have not yet supported formal management regulations.

Do marcas have a legal status in Chilean fisheries legislation?

No. The *marca*s system does not have legal status, nor is it formally accepted by the Chilean central fisheries authority. The system is used only in the Juan Fernández lobster fishery, and is broadly respected. Ownership of *marca*s is honoured even after the prolonged absence of a fisherman from the archipelago. To give one example: Hugo Gonzales, a fisherman who moved to the continent and returned 40 years later, fishes today using his old *marca*s.

fishermen kept their gear and supplies. The spacious and neatly kept workshop of the boatbuilder was totally destroyed. Out of the 41 boats that operate in Robinson Crusoe Island, eight were completely lost and 11 damaged; one-third of the outboard motors were lost. The loss of boats, gear and equipment amounted to around half a million United States (US) dollars.

Fifty minutes before the tsunami hit Robinson Crusoe Island, central

Chile had been shaken by an an 8.8-magnitude earthquake that generated waves that hit approximately 550 km of the continental Chilean coastline with great intensity. Warning systems did not work (see "Seismic Shock" by Brian O'Riordan in *SAMUDRA Report* No. 55, March 2010). When the tsunami hit the island, before 5 a.m., most of the islanders were still sleeping. Unusual bobbing of the boats in the bay—the first sign of the impending disaster—went ignored. Then Martina Maturana, the 12-year old daughter of a police officer, heard about the earthquake from her grandfather on the mainland. She ran down to the town plaza and rang the emergency bell, providing warning to some of the island's residents.

The tsunami's death toll in continental Chile was proportionally much smaller than in Juan Fernández, apparently because of the long experience of artisanal fishers with earthquakes and their consequences. Tsunamis had hit the Juan Fernández islands earlier—on 25 May 1751, when 35 persons (including the Spanish governor) died, and on 20 February 1835. Yet, the frequency of tsunamis has been too low to produce a preparedness for natural hazards among the islanders.

The fishery started to recover remarkably soon after the tsunami hit Robinson Crusoe Island. The syndicates began discussions with the central fisheries administration, and resumption of fishing operations, announced by the governor on 13 March (just two weeks after the tsunami), became effective by the end of that month. Fishermen shared boats and motors to compensate for lost equipment, and fishers with operating boats checked the traps left unattended by relatives who had lost their gear. The Selkirk Island teams returned to Robinson Crusoe Island to help in the recovery. Initiation of the 2010-2011 season fishing was advanced by one month to compensate for the fishing days lost after the tsunami, specially in Selkirk Island. The traditional tenure system survived intact, and was clearly a determinant factor in the orderly resumption of fishing operations.

Solidarity from external sources was remarkable. The Food and Agriculture Organization of the United Nations (FAO) contributed with the acquisition of eight new boats. Four of them were built with laminated wood, in the traditional design of the archipelago, thus merging technological innovation with cultural identity. The North Pacific fishing industry raised US$85,000, which were used to replace lost fishing gear and supplies such as outboard motors, winches, batteries, buoys, lines, radios and raincoats. The Robinson Crusoe Lobster Fishery Relief Fund, started by a conservation biologist, brought in money to reconstruct the two winch houses needed to harbour the powerful winches donated by the Alaska crabbers. There is an initiative to rebuild the headquarters of the main syndicate with financial assistance from the Slow Food Foundation. The Japanese company Honda donated 15 outboard motors, while the Japan International Co-operation Agency (JICA) has offered US$100,000 to rebuild 50 gear lockers.

The resilience of the fishery to the unpredictable natural disaster was a result of several factors: most of the members of the tightly knit local community belong to fishermen families; fishers are well organized; and the unwritten rules of the traditional tenure system helped the orderly return to fishing activity.

The case of Juan Fernández offers some important lessons. While a centralized warning system proved dysfunctional, the community was effective in emergency response: assessment of impact and immediate needs, reconstruction, and sustainable recovery.

For more

en.wikipedia.org/wiki/Juan_Fernández_Islands
Juan Fernández Islands

www.oikonos.org/fishing.htm
Juan Fernández Islands Conservancy

www.slowfood.com/slowfish/pagine/eng/pagina.lasso?-id_pg=117
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