Fisheries in Transition

50 Interviews with the Fishing Sector

Report commissioned by The Prince's Charities' International Sustainability Unit

February 2012

charlottetindall
SUSTAINABLE FISHERIES & SOCIAL DEVELOPMENT

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AQUAVISION CONSULTING

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50 Interviews with the Fishing Sector

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Acronyms

APRI	Indonesian Blue Swimming Crab Association
BRDs	Bycatch Reduction Devices
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CEFAS	Centre for Environment, Fisheries & Aquaculture Science
COLTO	Coalition of Legal Toothfish Operators
CORAL	Coral Reef Alliance
CPUE	Catch Per Unit Effort
DARD	Ben Tre Department of Agriculture and Rural Development
DWF	Distant Water Fleet
EEZ	Exclusive Economic Zone
EJF	Environmental Justice Foundation
EU	European Union
FADs	Fish Aggregating Devices
FEDECOOP	Federación Regional de Sociedades Cooperativas de la Industria Pesquera Baja California
GDP	Gross Domestic Product
ICES	International Council for the Exploration of the Sea
IEZ	Inshore Exclusion Zone
IFQ	Individual Fisheries Quota
ISU	The Prince's Charities' International Sustainability Unit
ITQ	Individual Transferable Quota
IUU	Illegal, Unreported and Unregulated fishing
MPAs	Marine Protected Areas
MCS	Monitoring Control and Surveillance
MEABRs	Areas for the management and exploitation of benthic resources (Chile)
MEY	Maximum Economic Yield
MSC	Marine Stewardship Council Certification
MSY	Maximum Sustainable Yield
NGO	Non-Governmental Organisation
NTZs	No Take Zones
PNA	Parties to the Nauru Agreement
QMS	Quota Management System
RAC	Regional Advisory Council
SADSTIA	South African Deep Sea Trawling Industry Association
SFP	Sustainable Fisheries Partnership
SSB	Standing Stock Biomass
TAC	Total Allowable Catch
TNC	The Nature Conservancy
TURFs	Territorial Use Rights in Fisheries
US	United States
VDS	Vessel Day Scheme
VMS	Vessel Monitoring System
WCS	Wildlife Conservation Society
WSC	Wild Salmon Center
WWF	World Wildlife Fund

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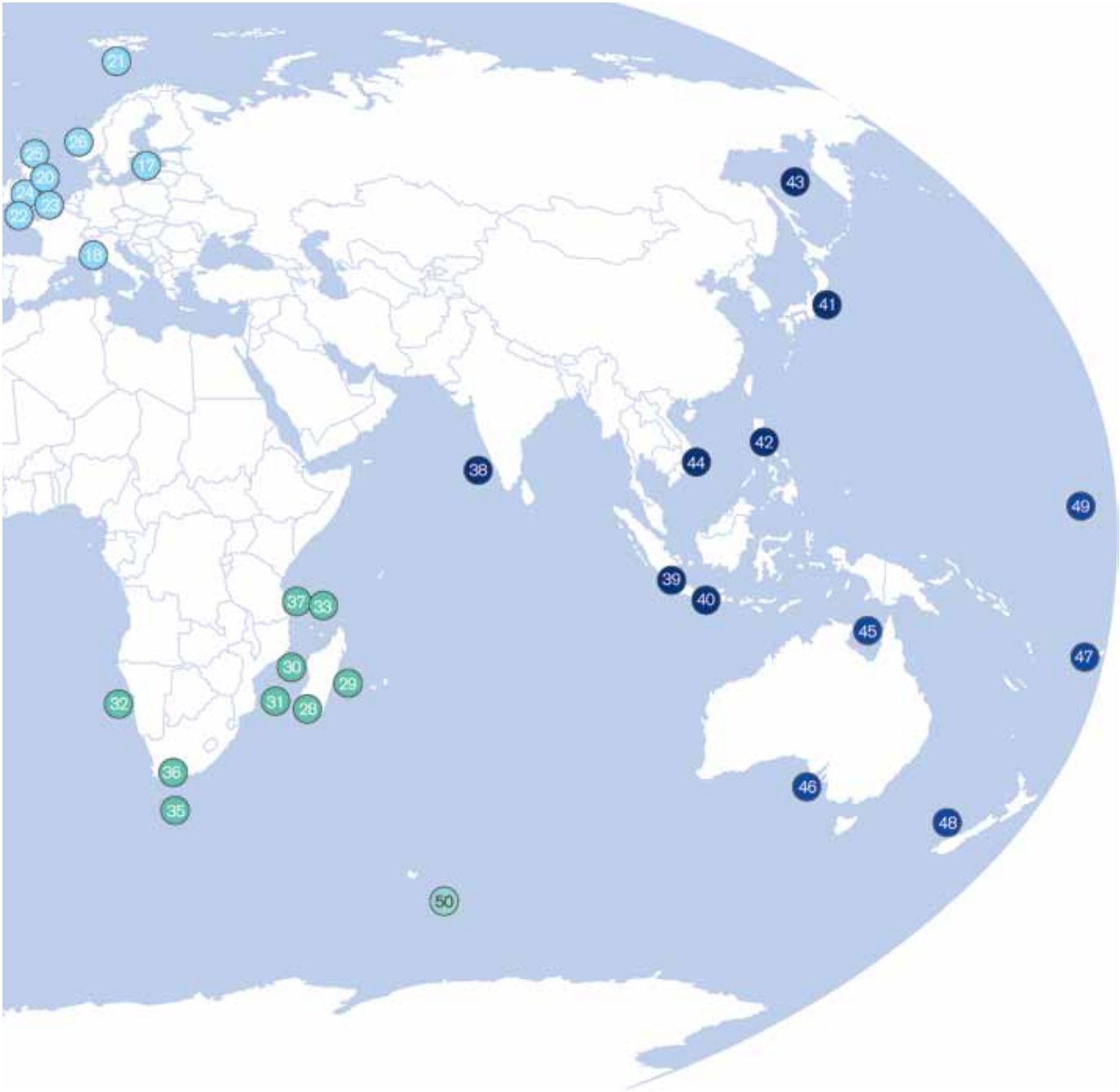

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Summary

This report provides 50 interviews from fisheries that are moving towards sustainability. It takes the approach of speaking to those who are directly involved in fishing, earn their livelihoods on a daily basis from fishing and often work at the sharp end in dangerous conditions. These are the people, together with partners, who are working to change their fisheries from ones characterised by over-exploitation or poor management to sustainable fisheries using innovative management measures and a great deal of hard work.

The Prince's Charities' International Sustainability Unit commissioned this work as part of their overall aim to facilitate consensus on how to address key challenges facing wild fisheries. In the wider discussion on marine fisheries, there is often considerable focus on the problems but less air time given to examples where there have been successful transitions made towards sustainability. The ISU was therefore interested in showcasing examples where improvements have been made and learn from how the changes took place, what the real drivers were behind the scenes, and the resulting benefits and costs in environmental, economic and social terms.

The result is a set of 50 interviews from marine capture fisheries in transition towards sustainability and the themes that emerge. The case studies are told from the perspective of the fishing sector and provide a rich body of experience from a variety of fisheries around the world.

There are significant challenges to address in marine capture fisheries, but interviews from these 50 fisheries provide much encouragement. The personal accounts – across a range of fisheries, from around the world using different gears and targeting different species – illustrate that it is possible to make changes towards sustainability and that the benefits are tangible.

The interviews highlight the vital role of the fishing sector itself. Change appears to be most effective where fishers and the fishing industry are organised, have their voices heard and are involved in designing solutions to the challenges. It has often been the personal commitment of key players in the fisheries that has pushed through the changes.

There will always be competing demands on a fishery, and one of the key challenges is balancing social, economic and environmental objectives. However, these numerous examples show that through clever design, realigning incentives and involving stakeholders it is possible to achieve objectives and mitigate impacts.

Each fishery is different, and there is no end point to the quest for sustainably managed fisheries. It may be the constant fight against IUU or the adaptation of management of environmental variation; in all cases sustainable global fisheries need investment in their future and participants.

This report is split into two parts:

- Part I: Themes
- Part II: Interviews from 50 fisheries

Approach

Fisheries were selected based on indications that they have made some progress in the transition towards sustainable management, but may not have necessarily achieved full sustainability. There was an attempt to provide a range of interviews representing small and large fisheries, different countries, a range of fishing gears and a variety of species but there may be many other fisheries making progress that have not been included here.

Each account was prepared based on interviews. Where possible a fisher or representative from the catching sector was interviewed, but where there were constraints or language barriers the interviews were undertaken through intermediaries or views taken from a range of stakeholders. For the most part the case studies are from the perspective of one person within the fishery, and do not attempt to represent all the view-points or stakeholders. It is recognised that there are likely to be a range of views and opinions outside of these personal accounts.

The maps provided in the case studies give a general location of the fisheries but should not be considered as precise fishing areas.

Part I

Interview Themes

This section provides an overview of the themes that emerged from the personal accounts of the fifty fisheries and covers:

- Benefits of change
- Drivers of change
- Tools for change
- Enablers of change

This overview only touches the surface and the reader is pointed towards the full interviews (found in Part II) that are rich with experience and knowledge.

1 Benefits of change

The changes in sustainability documented in the interviews were a result of a range of measures. All the cases, however, shared a sense of positive benefits from making these transitions.

1.1 Economic, social and environmental benefits

While interlinked, the benefits can be categorised into economic, social and environmental terms, and many interviewees stressed the importance of tackling all three. As Jeremy Brown commented on the North Pacific Halibut Fishery, "In biological terms the Pacific halibut fishery was never unsustainable but it was from a social, economic and safety perspective."

It is almost impossible to capture the full range of benefits experienced, but Table 1 picks out a few examples:

- Economic benefits: increased prices; improved Catch Per Unit Effort (CPUE); increased quota values; improved market access; increased revenues
- Social benefits: increased jobs; better social conditions; improved association organisation; improved wages
- Environmental benefits: ecological regeneration; stock improvements; reduced by-catch

What is interesting to note is that the entry points differed. In many cases, the starting point was rebuilding stocks, but in others the focus has been on improving quality of fish or market access. For instance, in the Bahia Solano Community Fisheries in Colombia, the aim at the outset of the MarViva project was to improve access to markets for local fishers and help reduce poverty in these remote communities. The project has set up marketing contracts between fishing associations and a restaurant in the capital that pays more for fish caught using low-impact fishing techniques. In this way the project has been able to achieve the original aims, while also reducing ecological impacts of fishing. In many developing country contexts, it is necessary to address poverty reduction alongside sustainable fisheries management.

1.2 Trade-offs

There were of course costs to making the changes and in some cases trade-offs for the benefits experienced. For instance, in the Peruvian anchovy fishery it was necessary to significantly reduce the fleet capacity through a quota system. This resulted in improvements in the state of the resource and the value of the fishery, but also required a reduction in crew members of 2,100. However, mitigation measures within fisheries legislation ensures that crews are compensated for redundancy and receive support for training in a new skill. A key message is that there will be winners and losers from changes but in some circumstances it is necessary to take tough decisions and it is possible to design mitigation measures that reduce negative impacts.

Table 2 overleaf illustrates the direction of the changes in environmental, economic and social terms for each of the 50 fisheries as described within the interviews. While there are some common patterns, such as a reduction in fleet sizes improving economic and environmental impacts, this is not a universal truth. In some cases, it has been possible to increase the value of the fishery without the need to reduce capacity. For instance in the Ben Tre Clam Fishery in Vietnam, the number of people fishing for clams has increased but the cooperative structure keeps harvest levels in check and MSC certification has greatly improved the prices received by clam gatherers.

Table 1 – Examples of the range of benefits recounted in the interviews

Main Market	Fishery	Benefits		
		Economic	Social	Environmental
Subsistence	Fijian Subsistence Fishery	CPUE improvement Increased rent	Increased jobs Education opportunities	Ecological regeneration Increased fish biomass
	Zanzibar Village Fishermen Committees	Increased revenue from tourism	Improved social conditions	Stable stock
Domestic	Gulf of Mexico Red Snapper Fishery	Increase in quota value	Quota ownership reduced but no. people involved in the fishery increased through leasing	Stock no longer overfished
	Kyoto Prefecture Snow Crab Fishery	Increased value of catch	Improved revenues for individual fishermen	Stock rebuilding
	Colombian Community Coastal Fisheries	Improved prices	Improved association organisation	Fishing techniques more environmentally friendly
Regional	Baltic Sea Cod Fishery	IUU fishing reduced Improved market access	Increased wages (although some fishermen have left fishery)	Stock increases
International	PNA Tuna Fishery	Value of license revenue increased	Increased employment	Skipjack healthy and blue-fin rebuilding
	Patagonian Toothfish Fishery	Increased prices	Improved wages	Seabird by-catch reduced by 99%

Table 2 – Direction of environmental, economic and social changes

Key

⇧ Positive ⇩ Negative ⇨ Stable – No information ⇩ Blue arrow: small change ⇩⇧ Both positive & negative (winners & losers)

	Fishery	Country	Economic impact	Social impact	Environmental impact	Fleet impact
1	Australian Northern Prawn Fishery	Australia	⇧	–	⇨	⇩
2	Australian Spencer Gulf Prawn Fishery	Australia	⇧	⇨	⇨	⇨
3	Patagonian and Antarctic Toothfish Fisheries	Australia	⇧	⇧	⇧	⇩
4	Bahamian Spiny Lobster Fishery	Bahamas	⇨	⇧	⇨	⇧
5	Canadian Spiny Dogfish	Canada	–	–	⇧	⇨
6	Chilean Loco Fishery	Chile	⇧	–	⇧	–
7	Bahia Solano Community Fishery	Colombia	⇧	⇧	⇧	⇨
8	Baltic Sea Cod Fishery	Denmark	⇧	⇩⇧	⇧	⇩
9	Ecuadorian Mahi-mahi Fishery	Ecuador	⇩	⇩⇧	–	⇩
10	Fijian Subsistence Fisheries	Fiji	⇧	⇧	⇧	⇨
11	Prud'hommes de la Pêche	France	⇧	⇨	⇨	⇨
12	Gambian Red and Black Sole Fishery*	Gambia	–	–	–	–
13	Icelandic Groundfish Fishery	Iceland	⇧	⇩	⇧	⇩
14	Ashtamudi Short Neck Clam Fishery	India	⇧	⇨	⇧	⇨
15	Indonesian Blue Swimming Crab Fishery*	Indonesia	–	–	–	–
16	Indonesian Sardine Fishery*	Indonesia	–	–	–	–
17	Isle of Man Scallop Fishery	Isle of Man	–	–	⇧	–
18	Kyoto Prefecture Snow Crab Fishery	Japan	⇧	–	⇧	⇩
19	Malagasy Octopus Fishery	Madagascar	⇧	⇧	⇨	⇧
20	Malagasy Shrimp Fishery	Madagascar	⇨	⇩⇧	⇨	⇩
21	Baja California Red Rock Lobster Fishery	Mexico	⇧	⇧	⇨	⇨
22	Mozambican Fisheries Surveillance*	Mozambique	–	–	–	–
23	Mozambican Shallow Water Shrimp Fishery*	Mozambique	–	–	–	–
24	Namibian Fisheries	Namibia	⇧	⇧	⇧	⇩⇧
25	New Zealand Sanford Fisheries	New Zealand	⇧	⇩⇧	⇧	⇩
26	Norwegian Discard Ban	Norway	⇧	⇧	⇧	⇩
27	Peruvian Anchovy Fishery	Peru	⇧	⇩⇧	⇧	⇩
28	Negros Island Community Fisheries	Philippines	⇧	⇧	⇧	⇨
29	PNA Tuna Fishery	PNA Countries[1]	⇧	⇧	⇨	⇧
30	Russian Sakhalin Salmon Fishery	Russia	⇧	⇧	⇧	⇩
31	Seychelles Hook and Line Fishery	Seychelles	⇧	⇧	–	⇧
32	Sierra Leone Community Fisheries	Sierra Leone	–	⇧	–	⇨
33	South African Hake Fishery	South Africa	⇧	⇧	⇨	⇩
34	South African Rock Lobster Fishery	South Africa	⇧	–	⇧	⇩
35	Lira Coastal Community Fishery	Spain	⇧	⇧	⇨	⇧
36	Surinamese Atlantic Seabob Shrimp Fishery*	Suriname	–	–	–	–
37	Zanzibar's Village Fishermen Committees	Tanzania	⇧	⇧	⇨	⇧
38	Brixham Beam Trawl Fishery	United Kingdom	⇧	⇧	⇧	⇩
39	Cornish Sardine Fishery	United Kingdom	⇧	⇧	⇨	⇧
40	Scottish Groundfish Fishery	United Kingdom	⇧	–	⇧	⇩
41	Scottish Pelagic Fishery	United Kingdom	⇧	–	⇧	⇩
42	Alaskan Bering Sea Crab Fishery	United States	⇧	⇧	⇨	⇩
43	Alaskans Own	United States	⇧	⇩⇧	⇩	⇩
44	California Morro Bay Groundfish Fishery	United States	–	⇧	–	⇨
45	Gulf of Mexico Red Snapper Fishery	United States	⇧	⇧	⇧	⇩
46	New England Groundfish & Scallop Fishery	United States	⇧	⇧	⇨	⇨
47	New England's Eliminator trawl	United States	⇧	–	–	–
48	North Pacific Halibut Fishery	United States	⇧	⇧	⇩	⇩
49	West Coast Pacific Albacore Tuna Fishery	United States	⇧	–	⇧	⇨
50	Ben Tre Clam Fishery	Vietnam	⇧	⇧	⇨	⇧

* These fisheries are as yet too early in the transition process for concrete results
The direction of the changes are based on information provided in the interviews.

1 Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu

2 Drivers of change

The huge value of speaking to people directly involved with the fisheries was finding out what went on behind the scenes and what was really needed to make changes for sustainability. In some cases it was the threat of a crisis that propelled stakeholders into action and in others it was progressive education or the potential of improved returns. Many fisheries profiled here have been fortunate to have committed people determined to make the transition and it is thanks to their leadership that changes were made.

2.1 Crisis

A looming crisis was often the main driver to take action. In many of the fisheries it was the threat or experience of a crash in fish stocks that led to a radical rethink on management – a real sense that if approaches were not changed there may not be a commercial fishery left. This was the case with the Australian Northern Prawn fishery where over-capacity put the future sustainability of the fishery into jeopardy. As Annie Jarrett, CEO of the Northern Prawn Fishing Industry Association, explains, "I won't say that the decommissioning programme hasn't been controversial, but we realised that something had to be done or the whole industry would collapse."

However, by the same token there were plenty of advocates of making pro-active changes. For instance, Cornish fisherman Stefan Glinski feels strongly that "the time for controls should be when fisheries are thriving, well before they start to decline." Likewise in the Baltic Sea Cod Fishery, Michael Andersen of the Danish Fishermen's Association commented that, "It is easier to agree on management measures when stocks are increasing," suggesting that while low-pressure stocks may not seem to be the priority it is prudent to put management measures into place to secure their value in the future.

2.2 Awareness

While crisis was what was needed in some examples, there were also cases where pro-active education and increased awareness led to a change in mindset. For example, in the red snapper fishery in the Gulf of Mexico fishers were taken to British Columbia and New Zealand to see for themselves the benefits of a catch share system. In Zanzibar, education was a vital step in mobilising fishing communities, as Mohammed Sulieman Mohammed from the Fumba Village Committee, describes, "Before the Village Fishermen Committees were formed we used to think that the marine resources belonged to the government. No one took any care and they were not worried if they saw somebody using destructive fishing methods. After the formation of the Village Fishermen Committees and after attending a series of classes on environmental education every fisher believed that the marine resources were his and had to be used sustainably."

Simple and clear messages within education programmes appear to have great merit, for instance the '*size matters'* campaign in the Bahamian lobster fishery appeared to capture everyone's imagination and has helped reduced harvest of immature lobsters.

NGOs often played an important role in raising the profile of fisheries issues, either through red-listing unsustainable species or through increasing media scrutiny. Within the Patagonian Toothfish Fishery, NGOs were instrumental in communicating the significant extent of the IUU (Illegal, Unregulated and Unreported fishing) problem in the Antarctic and the huge seabird mortalities caused by illegal long-liners. However, fisheries are often left with the legacy long after the problems have been solved – for while IUU of Patagonian toothfish has been reduced by 98% it remains on a number of NGO consumer guidance 'Fish not to eat' lists. This highlights the need for ongoing dialogue between fisheries and NGOs and the importance of regularly updating consumer-facing advice.

2.3 Market demand

Retailers and buyers are not immune to media attention, and as a result of the heightened awareness of challenges in fisheries, markets are increasingly demanding products that have been sustainability and responsibly sourced. This pressure from the market was frequently seen throughout the interviews, for example in the case of the Mozambican Shallow Water Shrimp Fishery where demand from the European market for shrimp caught in a sustainable way has been a key driver to improve management and pursue certification.

Some buyers are so large that they can have huge influence over fisheries through their purchasing decisions. For instance, the Danish processor Espersen has greatly assisted in efforts to reduce catches of illegal cod in the Baltic Sea by insisting that suppliers sign assurances that they do not handle illegal produce and take part in audits to prove it. In other cases, as for the Balinese Sardine Fishery in Indonesia, it is necessary for buyers to unite and agree to shared standards. As Arianto Yohan, of Central Protein Pima, explains, "We need to get the rest of the industry on board if this is going to work – if we stop buying locally produced fishmeal, someone else will."

2.4 Sustainability for future generations

'For the next generation' was a term repeated often, and it became increasingly apparent that many fishers were concerned for future sustainability and that fishing should remain an attractive occupation for the young. As Mia Isaacs from the Bahamas Marine Exporters Association suggests, "We all want a healthy and sustainable [lobster] fishery so Bahamian families and the local economy can benefit for many generations to come." This sentiment was echoed by Shaun Gibbs, a Beam Trawl skipper in Brixham, Devon: "You look at fishing ports around the country, the likes of Lowerstoft, Grimsby and Hull. They were once huge and now they are gone. We want Brixham to continue in the future."

3 Tools for change

While many people interviewed were at pains to point out that 'one size doesn't fit all' and each system needs to be designed specific to the fishery, it is still insightful to mention some of the key tools for change.

3.1 Rights-based fisheries management

Rights-based approaches appeared in a number of examples (Table 3), ranging from long-term concessions awarded within the Sakhalin Salmon fishery in Russia through to the ITQ system in Iceland and area rights allocated to bi-valve fishers in Vietnam and Chile.

Each of these examples shared a sense that the move towards rights-based management had been the single most significant step, and while there were some costs along the way, they had been worth it. Many people also felt that while there are other ways of managing fisheries, rights-based methods help to get the fishing sector on board. Kristján Þórarinsson, from the Federation of Icelandic Fishing Vessel Owner, explains, "You can attribute [the improved biomass] in part to good fisheries management, but you also need buy-in from the fleet and incentives for vessel owners – and you have to align those incentives with objectives. That is what makes the ITQ system so practical and compelling."

One of the important elements of a rights-based approach to fisheries management is that it gives the fishing industry security. As João Marcos Mangave, representative of the shrimp fishery in Mozambique, says, "A rights-based system would give us security and significantly increase our willingness to invest and participate in initiatives to protect the fishing ground. We would know that even though we may not be able to fish this year, we would be able to fish in future years and reap the benefits."

By changing the incentives, it is within fishermen's interests to help manage the resource for the long term. In many of the interviews, introduction of a rights-based approach changed the culture from one where fishers were often at loggerheads with managers to a more collaborative environment. Richard Ball, of the South Coast Rock Lobster Association in South Africa, suggests that "the limited number of operational groups in the industry coupled with the long term rights to the fishery has ensured that fishers have a sense of ownership over the resource, and do not fall prey to the 'tragedy of the commons.'"

There are often knock-on benefits of reducing a '*race to fish*'. Prior to establishing a catch share system in the North Pacific Halibut Fishery, over-capacity in the fishery had forced managers to progressively reduce the length of fishing seasons. While this kept the resource within sustainable limits, it meant there was a derby style 'race to fish' within the short time the fishery was open. Not only did this mean the market was flooded with fish during a short period, driving down prices, it also led fishers to take immense risks. "You had no choice on whether to go out or not, and half the time it was blowing a gale. All of us knew people who didn't come back," says Jeremy Brown a halibut fisher based in Seattle.

This is a similar story to the US Bering Sea Crab Fishery where allocating catch shares rather than a restricted season has eliminated the race for the resource. In the derby days, boats were piled high with pots and the extreme cold conditions often caused everything to freeze, making boats top heavy and at risk from capsizing. Five to seven men were being lost at sea per year, a devastating statistic. Not only has the death rate reduced significantly to one in five years, the changes have also enabled fishers to be more selective, enhancing the resource and the wider ecosystem. Edward Poulsen, of the Alaska Bering Sea Crabbers, says, "by slowing down our fishing, we have much longer soak times. When we lift the pots, all the bait has gone and juvenile crabs have moved out of the pot so that we have minimum by-catch."

Table 3 Examples of different rights-based approaches

Rights-based approach	Examples
Transferable Quota systems	▪ Alaskan Bering Sea Crab Fishery ▪ Gulf of Mexico Red Snapper Fishery ▪ Icelandic Groundfish Fishery ▪ British Colombian Spiny Dogfish Fishery ▪ Peruvian Anchovy Fishery ▪ New Zealand Sanford Fishery
Time-limited concessions	▪ Baja California Red Rock Lobster Fishery ▪ South African Lobster Fishery ▪ Russian Sakhalin Salmon Fishery
TURFs (Territorial Use Rights in Fisheries)	▪ Chilean Loco Fishery ▪ Ben Tre Clam Fishery
Vessel-day schemes	▪ PNA Tuna Fishery

Table 4 Common benefits emerging from rights-based approaches

	Benefits from rights-based approaches
Economic	▪ Quality and prices can improve as the pace of fishing is slowed ▪ Fishers able to take rational business decisions on when to fish depending on the price and market ▪ Fuel costs can reduce if it's possible to slow the pace of fishing
Social	▪ Crew safety often improved when the 'race for fish' incentive is removed ▪ Quota holders have an asset to pass on to the next generation
Environmental	▪ Effective means of reducing over-capacity ▪ Fishers have more time to invest in research and selective fishing, thereby reducing by-catch and discards ▪ Incentives for fishers to support management for the long term

Area-rights appeared effective in protecting stocks and increasing the economic returns to communities adjacent to the resource. These appear to be particularly successful where resources were relatively sedentary and readily defined. For example in the Chilean Loco Fishery, changing the situation from an open access fishery has given communities the ability to manage harvests leading to a recovery in stocks in these areas.

Some of the common benefits of rights-based approaches are given in Table 4.

Socio-economic implications

Rights-based approaches are not without their socio-economic implications. As Linka Behnken, from Alaskans Own, says, "The IFQ programme has been a key piece of improving sustainability for our fisheries, but I don't know any catch share system that hasn't had pretty significant socio-economic impacts." For instance, the price of quotas can increase dramatically over time, making it difficult for new entrants. This is a particular issue for communities that are dependent on fishing, and where there are limited other employment opportunities.

Mitigating impacts

What became immediately apparent from the interviews is that there is a whole host of different designs within the term 'rights-based approaches' and it is possible to tailor the system to achieve certain objectives and mitigate impacts. For instance, in the North Pacific Halibut Fishery ownership caps were put in place as well as rules on leasing to ensure it essentially remained a fisher-owned enterprise. As Jeremy Brown explains, "We want boots and not suits in our fishery."

The key seems to be ensuring that these design elements are included at the outset of a rights-based approach. As Linda Behnken explains, "It is important to anticipate the impacts and plan for them. If we had taken action the first two to three years and had affordable loans in place before quota prices increased, we would be in a completely different place today."

Financing is an important element to allow a fair access to quotas, and specific support on these terms has been hugely beneficial. For instance in the New England Groundfish and Scallop Fishery a community trust has been set up where low-interest loans were used to buy quota, which are leased to community fishers at half the unrestricted market cost. "Without the Cape Cod Trust, up to two thirds of our 12 scallop businesses would have liquidated that part of their operation or moved out of fishing," says Paul Parker of the Cape Cod Commercial Hook Fishermen's Association.

David Krebs, from the red snapper fishery, reinforces the view that each system needs to be specific to the fishery, "You don't want to get hung up too much on the detail. Each catch share system needs to be tailored to the fishery and the participants. I think we have enough knowledge now that you can decide what you want the fishery to look like and then design the system."

3.2 Marine Protected Areas (MPAs)

Marine Protected Areas are a management mechanism that can easily divide opinions. In some interviews, people felt that they were just not suitable for fisheries management. For instance the Brixham trawl fishers explain that, "We fish for over 31 different species, targeting different species in different areas at different times of the year, thereby allowing areas to recover." Their concern with MPAs focuses on a restriction on this rotation style fishing forcing them to concentrate effort in particular areas.

Equally MPAs were found to be successful tools for change in other fisheries (Table 5). In some cases the aims of MPAs are to protect biodiversity and provide tourism revenue (Philippines and Fijian Coastal Fisheries), while in others protected areas are used as a fisheries management measure to increase catches (Kyoto Prefecture Snow Crab Fishery, Malagasy Octopus), or simply to take responsibility of the resource. Christian Decugis, Prud'homme, describes the benefits of a local MPA to fishers in St Raphaël, "We have seen benefits of the reserve, and scientific studies have shown that fish are twice as large within the reserve, and are left in peace to spawn contributing to the rest of our fishing grounds. We have also noticed some reserve spill-over effects, but this is difficult to prove. What is more certain is the reserve has enabled us to show to the authorities that as fishermen we take our custodian responsibilities seriously."

MPAs have also recently been established for the first time within high-seas areas within the Pacific Ocean through the Pacific Nauru Agreement. These innovative closures exist in areas between the PNA states'[2] Exclusive Economic Zones (EEZs). While the Parties to the Nauru Agreement (PNA) have no legal jurisdiction over the high seas, if a boat fishes within the 'closed area' it immediately disqualifies it from a PNA licence. This

Table 5 Examples of Marine Protected Areas given within the interviews

Fishery	Details
Malagasy Octopus Fishery	Temporary closed areas improve octopus catches
Negros Island Community Fisheries, Philippines	Marine reserves and reducing illegal fishing has increased catches and provided tourism revenue
Fijian Subsistence Fisheries	
Kyoto Prefecture Snow Crab Fishery, Japan	Areas closed to trawling to protect key snow-crab habitat by the placement of evenly spaced concrete blocks
Prud'hommes de la Pêche, France	Local organisation able to use authority to close a 450ha area to preserve marine biodiversity
Lira Coastal Community Fishery	Marine protected area where fishing is restricted by license using traditional and low-impact fishing methods
PNA Tuna Fisheries	High seas closures protects biodiversity and reduce illegal fishing

2 Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu

effectively closes the area to any vessel that wants to access the much richer waters within the EEZs. Not only has this had benefits ecologically, the closed area has also significantly reduced Illegal, Unreported and Unregulated (IUU) activity.

3.3 Improved selectivity

"So, for a relatively small cost changing gear technology and a bit of thinking; you catch less, make a bit more and save on fuel," says Alex Philips, a vessel owner in Brixham, as he explains how improving selectivity of trawling vessels has had numerous benefits. This was the result of a collaborative project between scientists at CEFAS and fishers, which resulted in a 50% reduction in discards. The reduced drag of the trawls also reduces fuel consumption by 20%; improves the quality of fish and reduces impacts on the benthic environment.

Improved selectivity was a common theme throughout a number of fisheries which, in conjunction with other management measures, was an important part of the sustainability puzzle and in many instances helped to reduce bycatch and protect the wider ecosystem. As Steve Hall, a fisherman in the Suriname Seabob Atlantic Shrimp Fishery explains, "In the beginning we thought the bycatch reduction devices wouldn't work. After the tests we found we didn't lose much seabob but bycatch was reduced by a third. For me and my crew, that's less sorting on the back deck."

3.4 Addressing IUU

Illegal, Unreported and Unregulated fishing is a significant challenge for marine fisheries, capturing benefits, often using destructive fishing techniques and increasing uncertainty on the true state of the resource. Addressing IUU fishing was an important step in many of the fisheries, not least in the Patagonian Toothfish Fishery. As Martin Excel, chair of the Coalition of Legal Toothfish Operators (COLTO), describes, "Around 1999, illegal fishing was at a level that no one government could keep pace with. The illegal operators had almost a military-style approach positioning boats focused around the zone to provide the rest of their fleets with warnings if a naval operator was spotted. Since 1996 – and through collaboration between legal operators, governments and NGOs – we have reduced IUU fishing by 97%, with illegal catches down from 32,000 tonnes a year to about 1,000 tonnes. That's a huge achievement." Similarly, in Sierra Leone, information from artisanal fishers has helped the government to address IUU, as Thomas Siddiqui a fisher, explains, "We alert the vessel to any irregular activity and they record that activity and collect evidence that is used towards the arrest and hopefully prosecution of illegal fishers."

While the catching sector has a key part to play in sharing information, government needs to plays its role enforcing regulations. For example, in Mozambique the arrest of an IUU fishing vessel and re-use as a patrol vessel has sent a strong signal to illegal operators, and in the South African south coast lobster fishery, illegal fishing was reduced through robustly pursuing prosecutions including fines and imprisonment with the assistance of third countries.

Monitoring control and surveillance (MCS), in a number of fisheries, has now reached levels where there is really no opportunity for fishers to avoid playing by the rules – with on-board filming, log books, observers, VMS (Vessel Monitoring Schemes) and checks on landed fish there is a general acceptance that every move is watched and often it is the industry itself that funds this high level of observation. As Maurice Brownjohn, the Commercial Director of the PNA, puts it, "With all the checks in place, we have gone from a situation where vessels were telling us what they wanted to know, to a situation where we can tell them what happened."

3.5 Certification

The role of certification in transitioning fisheries is significant, with the main benefits being more stable markets or access to high-end markets. For many, certification was also a driver for change or a means of recognising achievements.

Marine Stewardship Council (MSC)

The most common certification mentioned was the Marine Stewardship Council (MSC), even for fisheries that have not yet undergone assessment. "The great value of the MSC pre-assessment is that it provides a route-map for achieving sustainable management," explains Dr. Kathy Castro of the University of Rhode Island, who have been supporting improved fisheries management in the Red and Black Sole Fishery of Ghana.

MSC labelling can attract a price premium, as in the Scottish Pelagic Fishery, or improve access to markets. For instance in the Isle of Man, MSC certification of the scallop fishery has helped to keep the door open to European markets, while in Madagascar there is the promise of new markets for certified octopus. "Already, we have had enquiries from a Dutch and a Spanish importer who heard of the fishery through Blue Ventures' work towards gaining MSC certification. Several international import companies did not know that Madagascar produced octopus before this work began," says Sophie Benbow of Blue Ventures Madagascar.

However, the cost of certification can be a barrier. The initial certification costs of the Cornish Sardine fishery were supported by a major retailer, but members of the Cornish Sardine Management Association are concerned that with only four to five operating boats they will not be able to sustain the cost of re-certification in three years' time.

Other certification and marketing initiatives

As well as MSC, there were also other schemes designed for local markets such as the Gulf Wild Scheme (in the Gulf of Mexico Red Snapper Fishery), Alaskans Own, local certification of the Seychelles Hook and Line Association's catch and marketing of community fishing catches in Spain. These local marketing initiatives provided an opportunity for fisheries to sell their fish as niche products and allow them to tell their story, secure markets, improve prices and be rewarded for using low-impact fishing techniques.

Many of the certification schemes also allow for improved traceability. The Gulf Wild scheme involves a tag on each fish, whereby the final consumer can look up where the fish was caught, by whom and by what boat. David Krebs, red snapper fisherman, explains, "I was unloading one of the boats in Destin the other day and had tourists walk up and say, 'Wow I ate a fish last night at Lulus that came off this boat'. We're seeing a great response."

4 Enablers of change

As well as key management measures, there were certain elements mentioned throughout the interviews that facilitated change.

4.1 Partnerships

The innovative and sometimes surprising partnerships highlighted in these interviews were a key factor facilitating change.

- Collaboration between fishers and NGOs: although an unlikely alliance, as in the Californian Morro Bay Groundfish Fishery, partnerships between fishers and NGOs have helped to change practices and rebuild fisheries' reputations. As Bill Blue, fisherman in the California Morro Bay Groundfish Fishery, explains, "As fishers we realised the only way we could keep our fishing industry was through working with environmental groups to try different approaches to fishing. It's an unlikely alliance, but so far it has worked well for us. We share the aim of creating a fishery that can sustain fishers and revitalize our community as well as protect the ocean's resources."
- Collaboration between catching and marketing sectors: can enhance quality and value in the fishery. In Madagascar the rotational system of temporary octopus closures would not work without the collaboration of the collectors.
- Collaboration between fishers and scientists: the most beneficial results came from where fishers were given the opportunities and incentives to lead research and solve problems for themselves. For instance in the Scottish Pelagic Fishery, the involvement of fisheries in data collection, research and analysis has improved acceptance of management requirements. "In the past, ICES (the International Council for the Exploration of the Sea) and fisheries managers would tell the industry what was going on. Now the process is largely stakeholder-led. This cooperative approach has been the biggest single change in the pelagic fishery in the past 10 or 12 years," says Ian Gatt of the Scottish Pelagic Sustainability Group.

4.2 Governance

Although people interviewed within these fisheries never mentioned the word 'governance', many of the enabling factors they mentioned, such as having backing of the law, having their voice heard, or contributing to the cost of management can be conveniently grouped under this heading.

4.2.1 Legislative framework

Having the necessary legal backing was often mentioned. For example in the US, the Magnuson-Stevens Fisheries Management Act provides the government with legal responsibilities for sustainable stocks and to take action if management is failing. As David Krebs, President of the Gulf of Mexico Reef Fish Stakeholders' Alliance and fisherman of 30 years, describes, "In the 1990s the government recognised that there were some serious issues with the red snapper stock and the Magnuson-Stevens Act required some rebuilding timelines." In Namibia, development of a policy and legal framework allowed the government to introduce a rights-based system and allow for greater ownership by Namibian nationals, as Donovan Hawes a hake fisher explains, "In 1992 a new policy and legal framework was introduced. These stated a clear and transparent process for allocating fishing rights based on criteria that ensured Namibians had a fair chance to enter the industry, and facilitated the empowerment of previously disadvantaged groups."

The lack of a legal framework is often felt keenly by fishers and stakeholders who need the support of the government to protect their resources. In Fiji, while the non-legal nature of the Kubulau reserve network allows for more flexibility – for example changing boundaries in response to climate change – it also means a lack of enforcement and support from the government to prevent illegal fishing.

4.2.2 Participation and representation

Participation

The fishing sector in general appreciates being involved in the decisions that affect them. In effect, there needs to be a forum where fishers have a voice and can influence the design and review of management measures. As Edward Poulsen of the Bering Sea Crabbers suggests, "A key reason our catch share system has been so successful is that it was driven from the bottom up". In many US fisheries, fishers are members of fisheries councils and have had the opportunity to help design management measures.

Likewise in Europe the establishment of Regional Advisory Councils (RACs) allow for stakeholders to share ideas with the Commission. In the Baltic Sea Cod Fishery, the fishing industry, processors, scientists, NGOs and managers were able to discuss management options through the RAC. This meant that by the time the management plan was agreed by EU Ministers in 2008 it had been fully debated, enhancing support from stakeholders to make it work.

Co-management

Co-management is a form of participation that involves passing some responsibilities for management from the government to fishers or the fishing industry. There are many grades of co-management ranging from limited participation, to shared responsibilities all the way through to self-governance.

The Australian Northern Prawn Fishery is an example of quite an advanced form of co-management, where the industry has taken

on a number of functions on behalf of government, for example running the observer programme and collecting and analysing catch data, as well as investing significantly in buy-back schemes to reduce capacity. Annie Jarrett, the CEO of the Northern Prawn fishing industry association comments, "We've been lucky that we have had a partnership approach with the government and researchers and we've also had some very strong leaders over the years".

"Most importantly we are working with communities to educate fishers and involve them in co-management so they have a stake in their own fisheries" says Cuk Edy, President of the Indonesian Blue Swimming Crab Processors Association. Involving the fishing in management decisions helps to foster a sense of responsibility over the resource. As Ty Tate of the Gulf of Mexico Reef Fisheries Alliance concisely states, "If fishermen are able to vote on new systems, they cannot be pushed on them."

4.2.3 Organisational development

"Fishers now have a sense of pride in their area, they are empowered by ownership and better organised – and it's difficult to organise hunters!" says Juan Carols Castilla describing the change he has witnessed in the Chilean Loco Fishery. This goes to the heart of the matter. Stakeholder engagement in fisheries is often not effective unless stakeholders are organised, and this may be a first step in allowing the needs and concerns of the fishing industry and fishing communities to be represented. Facilitation and empowerment of fishing associations is a particularly important step in many developing country situations where capacity and literacy levels can be low.

When the Albacore Tuna fishers along the West Coast of the US realised they needed to do something to sustain their industry for the long term, the first thing they did was set up an association. There are also often knock-on effects of this representation as Christian Decugis explains, "There are wider benefits of the Prud'homme structure. It provides representation at the national and EU level and a voice in local developments or wider policy change."

4.2.4 Cost recovery

'Who pays for management?' is an important question within fisheries and a key to their future sustainability. In catch share systems in the US, the industry contributes up to 3% of the dockside value of fish towards management. David Krebs, Fisherman and President of the Gulf of Mexico Reef Fish Stakeholders' Alliance comments, "Last year, my company paid close to $60,000 to the government as part of the cost recovery. I have been in business more than 50 years, and previously I haven't had to pay anything more than $400 for my annual license! I think it is helping to offset the costs of setting up the catch share system and actually saving tax-payers money."

Other innovative cost-recovery mechanisms highlighted in the interviews included a system of diver-tags, as used in the Kubulau reserve in Fiji and in the Philippines, where tourists pay to dive within marine reserves and the revenue is put back into monitoring fishing grounds or supporting community-based initiatives.

4.3 Recognition for fishers

"Fishermen are often seen as the bad guys, and they often felt in the past that if they had changes to improve sustainability who would have thanked them? Giving them recognition for the changes they have made has been really important" explains Andy Revill, 50% project manager who led CEFAS's contribution to reduce discards in the Brixham Beam Trawl Fishery. The interviews reiterate this point again and again. As Beatty Hoarau from the Seychelles Fishing Boats Owners Association concludes, "We have improved the image of artisanal fishing in the Seychelles as a noble profession, one which provides food security for our national, thus encouraging young people to join the industry."

5 Conclusions

There are considerable challenges to address in marine capture fisheries, but interviews from fifty fisheries in transition presented in this report provide much encouragement. The personal accounts – across a range of fisheries, from around the world using different gears and targeting different species – illustrate that it is possible to make changes towards sustainability and the benefits are tangible.

The interviews highlight the vital role of the fishing sector itself in leading the charge. Change appears to be most effective where fishers and the fishing industry are organised, have their voices heard and are involved in designing solutions to the challenges. It has often been the personal commitment of key players in the fisheries that has pushed through the changes.

There will always be competing demands on a fishery, and one of the key challenges is balancing social, economic and environmental objectives. However, these numerous examples show that through clever design, realigning incentives and involving stakeholders it is possible to achieve objectives and mitigate impacts.

Each fishery is different, and there is no end point to the quest for sustainably managed fisheries. It may be the constant fight against IUU or the adaptation of management of environmental variation; in all cases sustainable global fisheries need investment in their future and participants.

Part 2

Interviews from 50 fisheries

Important caveats

For the most part the case studies are from the perspective of one person within the fishery, and do not attempt to represent all the view points or stakeholders. It is recognised that there are likely to be a range of views and opinions outside of these personal accounts.

This report does not cover all the possible examples of progress towards sustainable fisheries, and it is likely that many more exist. For the examples that are highlighted here, it is recognised that many of them are in transition towards sustainability.

Within each interview a table is given which highlights the benefits and costs of the changes that have been made. These need to be read with care given that they include point data and there is likely to be a range of factors that led to these impacts, and economic data will be affected by inflation. All the monetary figures are approximate and have been converted into US$ which may not take exchange rate fluctuations into account. The maps provided in the case studies give a general location of the fisheries but should not be considered as precise fishing areas.

Index

Key

Species

Coral reef fish

Crab

Demersal

Dogfish

Flatfish

Large pelagic

Lobster

Mollusc

Octopus

Salmon

Shrimp

Small pelagic

Mixed

Gear

Diver caught

Dredge

Hand gathered

Handline

Longline

Net

Pole & line

Traps

Trawl

Mixed

Tonnage

0-100t

100t+ - 10,000t

10,000t+ - 100,000t

100,000t+ - 1milliont

1milliont+

INDIA

SPECIES FISHING GEAR TONNAGE

Ashtamudi Short Neck Clam Fishery

Interviews with stakeholders from the fishery

Species: Short neck clam (*Paphia malabarica*)

Fishing gear: Hand gathered and hand dredged (rakes attached to nets mesh size 30 mm)

Country: India

Ocean: Arabian Sea

Fishery tonnage: 20,000t (2002)

Markets: Vietnam, Gulf States

The Ashtamudi Estuary is the second largest estuarine system in Kerala a designated Ramsar Site and connected to the Arabian Sea through a perennial opening allowing salt water to defuse into the estuary. Clams have been hand-gathered for many years, piled into open-topped canoes. Up to 4,000 fishers in the area rely on the clam resource and another 3–4,000 are involved in cleaning, processing and trading the clams. This traditional fishery has been effectively sustained through the use of low impact fishing techniques using rakes and nets rather than mechanical dredges. However, a crisis point was reached 20 years ago when fishermen noticed a reduction in clam abundance.

"The problems began with the over-harvesting of small clams for use in cement production," explains Vinod Malayilethu of WWF India, "which resulted in a sharp decline in catches." The situation caused significant alarm to local fishing communities and led to the clam fishers and district administration to sit down together to decide on key management measures. "The significant aspect of this fishery," says Vinod "is that the fishers agreed with the administration to put in place a self-imposed seasonal ban on catching clams during the spawning and spat settlement period. They also introduced a minimum net size for nets." This meant that small clams could no longer be caught and has led to a significant recovery of the clam population. While stock levels were around 3,200t in 1996, they were estimated to be around 20,000t in 2002.

In recent years, the fishery has taken management a step further by entering the MSC certification process, and completing a pre-assessment in 2010. As Joseph Silvester, a clam fisher of 30 years, explains, "We are hopeful that in the future the resource will be fully sustainable through MSC certification and we will attract new buyers".

"The significant aspect of this fishery is that the fishers agreed with the administration to put in place a self-imposed seasonal ban on catching clams during the spawning and spat settlement period"

An important step has been the establishment of a governing council to formalise partnerships between fishers and managers and provide a local body authorised to take management decisions. "Traditionally fishers met when something went wrong with the fishery," says Vinod, so the governing council provides an opportunity to take proactive measures to safeguard the fishery and livelihoods. Joseph says, "The governing council will be able to monitor the resource; enforce the seasonal closure of the fishery during its breeding, spawning and spat fall; regulate the number of fishers in the fishery; and look into the welfare of the clam fishers. In short the governing council provides a control over clam fishing, ensuring sustainability of the resource. One big lesson we have learnt is that unless we exploit the resource in a sustainable manner, it cannot be conserved for the future."

Before intervention/s – Prior to 2007				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
–	–	Estimated 3,200t in 1996	–	–	▪ 10,000t in 2008 ▪ Increased	Stable	Increased	Stable 3–4,000

INDONESIA

SPECIES FISHING GEAR TONNAGE

Indonesian Blue Swimming Crab Fishery

Interview with Cuk Edy, President, Indonesia Blue Swimming Crab Processors Association (APRI)

Species: Blue swimming crab (*Portunus pelagicus*)

Fishing gear: Collapsible trap, gill net and mini trawl

Country: Indonesia

Ocean: Java sea

Annual tonnage: 30,000t

Markets: United States

"Our association was formed in 2007 to make processors aware of the importance of harvesting blue swimming crab in a prudent, ethical and sustainable way. It's my duty to make sure those goals are met. The species has been harvested commercially here since the 1990s, when Phillips Seafoods Indonesia (a subsidiary of the largest crabmeat importer in the US) started the ball rolling. Now, up to 30 companies process blue swimming crab in Indonesia, supplied by more than 65,000 artisanal fishers working from small boats, with or without engines, or some with no boat at all. Perhaps 13,000 family members are employed as 'pickers', separating the crabmeat from the shell.

"We are working with communities to educate fishers and involve them in co-management so they have a stake in their own fisheries"

The problem for fishers is that the crabs have got smaller over the years and the harvest quantity has gone down, reducing their income. Many still use gillnets with a small mesh size, so they inevitably catch juveniles. The capture of females with eggs has also been an issue, negatively affecting recruitment.

Switching to a larger mesh size would have an effect, of course, but that requires investment which the fishers don't have. Instead, we are developing access restrictions on the size and sex of the crabs caught. We have also created protected areas around spawning grounds and are starting to monitor them. Most importantly, we are working with communities to educate fishers and involve them in co-management so they have a stake in their own fisheries.

One obstacle has been that, while catch data is available for blue swimming crab, no stock assessment has been conducted for the species by the Fisheries Ministry. With this knowledge gap in mind, we approached the Marine Stewardship Council and entered the fishery for pre-assessment in 2009. That process was a valuable tool in identifying areas for improvement.

As a result, we have selected five priority areas – Jakarta Bay, plus others in Java, Madura and Sumatra – for a project in which time series data will be collected for stock assessment and a pilot fishery management plan implemented. This work is ongoing, funded by the Crab Council of the National Fisheries Institute (the US trade body) and ALLFISH (a public-private partnership) and supported by the Indonesian government. In March this year, the NFI Crab Council recommended a minimum size for harvested crabs of 8cm carapace width, again endorsed by the government. In July, APRI members agreed to abide by the 8cm policy. Another important milestone came in November, when a policy took effect restricting the purchase of berried females, giving them more of a chance to release their eggs.

We hope such measures will provide a sustainable income for fishers and their families, and a sustainable supply for APRI and the US market. As stock levels improve and the size and quality of the catch increases, perhaps fishers will see higher prices. Already we are benefiting from research and a better understanding of biology and the ecosystem, raising the prospect of a continuous season in which different areas are fished at different times of year."

Before intervention/s – Current				Transition	After intervention/s – Too early to see changes			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Total value of catch: 30,000,000kg @ Rp 30,000 per kg (US$99m)	▪ 65,000 artisanal fishers ▪ Average wage per trip = Rp150,000 (US$16)	▪ Protected spawning areas ▪ Reduced minimum size to 8cm carapace width ▪ Declining stocks	65,000 artisanal fishers (32,000 boats)	APRI project support: US$200,000 for 5 locations	–	–	–	–

INDONESIA

Indonesian Sardine Fishery

SPECIES FISHING GEAR TONNAGE

Interview with Arianto Yohan, Central Proteinprima (CPP)

Species: Sardines *(Sardinella lemuru)*

Fishing gear: Purse Seines

Country: Indonesia

Ocean: Java Sea

Fishery tonnage: 4 – 5 million tonnes

Markets: Fishmeal and local human consumption

"We are the largest shrimp aquaculture business in Indonesia, and use fishmeal as an ingredient in the feed we prepare (it makes up approximately 10-15%). We have a total sustainability programme where we aim to achieve sustainability throughout the cycle including hatcheries, farming, processing and what we are talking about here: feed production.

We source the majority of our fishmeal from Peru and Chile from members of the Global Standard and Certification Programme for the Responsible Supply of Fishmeal and Fish Oil (IFFO RS). However, we also source 10-20% from local fishmeal producers in Indonesia which is made up primarily of Bali sardines. We want to make sure that this element is also sustainable and our buyers, such as Sainsbury's in the UK, are very supportive of this aim. Furthermore, in order to fulfil certification for GlobalGAP and BAP (standards often requested by EU retailers) we have to fulfil requirements on the sustainability of our inputs. The future sustainability of fishmeal is a growing concern.

Fishing for Bali sardines is highly seasonal and centred in East Java, between Java and Bali islands. A large proportion of the catch is sold on local markets for human consumption. Regulations have been agreed by the local governments of both islands, which include controls on the number of fishing licenses and fishing gears. The concern is how these regulations are enforced. The number of effective licenses has been twice the recommendation for the past 15 years, and only 45% of catch is recorded.[3] There is a management plan which outlines potential for further action but no management body to implement changes. It is also clear there are still many research questions to answer: when would be the best time for a closed season? Or what would be the quota if such a system was introduced?

We have therefore started to work with Sustainable Fisheries Partnership (SFP) to raise awareness within the rest of the industry and propose further research on the status of the stock. We are planning to hold a workshop next year to bring all the feed producers together to discuss how we can promote sustainability in the fishery. We need to get the rest of the industry on board if this is going to work – if we stop buying locally produced fishmeal, someone else will.

The government is interested to support us but also faces challenges. There are probably around 2.7 million households involved in the fishery, and it is therefore difficult to change policies that affect so many people. Fishermen have had a tough year with bad weather meaning it has been difficult for them to get out fishing. This has affected their livelihoods and makes the political and economic situation more sensitive.

However, we think that through partnerships we can effect change. We eventually want to set up a policy for our purchasing department when sourcing fishmeal, so that we can be specific on what species are included and how they have been caught and managed. We are a fully integrated company and to complete the total cycle we have to ensure that our fishmeal supply is always there."

Before intervention/s – 2010				Transition	After intervention/s – Too early to see changes			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ Prices of fishmeal are increasing due to general increases in commodity prices and reduced supply. ▪ Uncertain if these increases are passed onto fishermen.	2.7 million households involved	▪ Some estimates suggest the stock is over-fished ▪ Estimated that only 45% of catch is reported	No. boats reducing over past 5 years due to fuel costs	–	–	–	–	–

3 http://www.sustainablefish.org/fisheries-improvement/small-pelagics/bali-sardinella

JAPAN

SPECIES FISHING GEAR TONNAGE

Kyoto Prefecture Snow Crab Fishery

Interview with Mr Takashi Hamanaka, Kyoto Danish Seine Fishery Federation

Species: Snow crab (*Chionoecetes opilio*)

Fishing gear: Danish Seine net

Country: Japan

Ocean: Japan Sea

Fishery tonnage: 97 tonnes (2009)

Main markets: Japan

© Kyoto, prefectural Agriculture, Forestry and Fisheries Technology Centre

"Our fishery federation was set up in 1944 and represents 15 Danish Seine trawlers. We all know each other and meet on a regular basis which forms the basis of our mutual trust. Almost half our income comes from snow crabs so they have always been critical to our federation. They are known as 'pine needle' crabs in Japanese due to the shape of their legs, and are a very popular delicacy with tourists visiting our region (Northern part of Kyoto Prefecture) and throughout Japan. The snow crab season lasts from November to the end of March, and in other seasons we catch a range of other fish including soles and flounders.

Fishing for snow crabs off our coastline began around the 1880s, but peaked in the 1960s when we were landing more than 500t each year. Sadly this situation didn't last, and the stock decreased sharply in the 1970s so that we were not catching more than 100t/year by 1978. One of the contributing factors was by-catch of snow crabs out of season, which was unintentionally destroying 45-60% of the stock. This often resulted in the catch of soft-shelled crabs that had not yet matured into hard-shelled crabs.

"Our snow crabs stocks are slowly recovering and we are hoping for a full recovery in 10 years"

Total allowable catches for snow crab were set in 1997, as well as quota allocations for the different regions including Kyoto Prefecture. This helped immensely, but as an industry association we went further and, beginning in 1983, have established six no-take zones representing critical habitats such as reproductive areas and specific male or female crab habitats. We were given invaluable advice on where to site these areas by the scientists at the Fisheries Technology Centre and supported by the government to put in place 3m length concrete blocks at regular intervals to ensure that no trawling can take place.

The Danish seine is a gear type that does not have heavy chains associated with many other forms of trawlers that have impacts on seabed ecosystems. However, we have further improved this gear by including a crab-exclusion system to prevent catching snow-crabs out of season. Furthermore, we have restricted any trawl activity within 230-250m depth in the spring and 220-250 in the autumn, outside of the snow crab season.

Our snow crabs stocks are slowly recovering and we are hoping for a full recovery in 10 years. We are still being precautionary and catching around 100t/year, but we have been helped by increased prices from 2,206JPY/kg (approx US$28/kg) in 2000 to 3,241JPY/kg (approx US$40/kg) in 2009. There are many factors affecting the price, but one of them has been our ability to catch a greater proportion of hard-shelled rather than soft-shelled crabs which fetch 10 times the price.

In 2008 we were awarded Japan's and Asia's first MSC certification. The reputation of the fishery has improved and we now have many visitors to see the success of our fisheries management system. Due to our achievements with the snow-crab, there has been an increased sense of resource stewardship amongst stakeholders and we are now taking our experience to improve management of other species."

Before Intervention – 1983 (before closed areas)				Transition	After intervention (current)			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ 86t ▪ Value: 6,000,000 JPY (US$2m)	26,184,000 JPY per boat (S$335,000)	Declining	27 vessels	Cost of management measure and introducing closed areas	▪ 97t (2009) ▪ Value: 5,000,000 JPY (US$4m)	34,694,000 JPY per boat (US$445,000)	Increasing gradually	12 vessels

Source: Makino, M (2011) Fisheries Management in Offshore Areas in Fisheries management in Japan: Its institutional features and case studies; Fish & Fisheries Series 31

PHILIPPINES

Negros Island Community Fisheries

Interviews with stakeholders from the fishery

SPECIES FISHING GEAR

Species: Demersal, Small and Large Pelagics

Fishing gear: Mixed e.g. Gill nets, Hook and Lines, Traps

Country: Philippines

Ocean: Eastern Sulu Sea

Fishery tonnage: Data deficient

Markets: Subsistence, local and national markets

The town of Dauin on the island of Negros in the Philippines is the location of one of the world's first no-take zones. Apo Island was established in the early 1980s, and formed part of a wider array of measures taken by the local government to protect the communities' fisheries resources and support sustainable development in the form of eco-tourism. The area had suffered for many years from incursions by industrial fisheries into community fishing areas. It was also one of the province's poorest towns and was in need of an economic revival.

The Philippines have natural resource laws that are decentralised to the Local Government, which allows them to take decisions at this level. As Honourable Rodrigo A Alanano (Mayor of Dauin until 2010) explains, "When I was elected in 2000, I had a vision of 'improving the quality of life of communities that depend on coastal resources, while maintaining biological diversity and productivity of environmental ecosystems'. There was much to be done and we started by developing a policy to ban entry of commercial trawlers. We then trained fisheries law enforcers and together with the police conducted patrols and began arresting illegal fishers. From the fines we were able to provide salaries for the law enforcers. We went on from this to organise fishers into associations and help them to establish their own No Take Zones (NTZs) and allowed for cost recovery by charging diving fees."

These initiatives have had a marked success. Fishers' catches have improved three fold. Roland Table, the Fisheries Association President of Masaplod village, says, "It used to take us 6 hours or more using a hook and line to catch 2-3kg in 2000 and sometimes you could catch nothing. Now we can catch 6-8kg in the same fishing time or more if the fish are happy!"

Tourists come from around the world to dive in Dauin's famous no take zones. The resorts have brought in significant employment and foreign earnings and have grown from 3 to over 20 fully fledged local resorts. From an initial income of 100,000 peso (US$2,300) in 2002, the local Government recouped 7 million pesos (US$160,000) in 2010 from illegal fishing penalties, fishers' registration fees and revenues from the NTZs.

Rosabelle Sanchez, the Municipal Development and Planning Coordinator for the town, explains further, "Once we had the model NTZs working in several of the villages, the rest followed suit. We still have a lot of work to do yet as there are still a further two villages to include and pursuing the illegal fishers is always a game of cat and mouse, but we are getting there."

Honorary Neil B Credo took over as Mayor in 2010 and continues the ethos of the previous Mayor (and now Vice-Mayor) to promote sustainable development of the town. "I want our town to be business friendly but ensure that revenues from resorts are used to improve the quality of our town's services and that the tourism industry is a sustainable one."

Before intervention/s – 2002				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ Fisher CPUE: 2-3kg/day ▪ Local government income from marine resources in 2002: US $2,300	Some jobs within tourism: 3 tourist resorts	Declining due to incursions from industrial trawlers	1,000 subsistence fishers with non motorized boats; 200 subsistence fishers with motorized boats; 10 (approx) Commercial fleet	▪ US $250,000 (approx) direct costs covered by Local Government and Assisting Organizations ▪ Significant political will!	▪ Fisher CPUE: 6-8kg/day ▪ Local government income from marine resources in 2010: US$160,000	▪ Jobs within tourist industry ▪ No. local resorts: 20 +	▪ Fishing stock appears to have increased ▪ Protected areas have considerably improved coral reef health	800 subsistence fishers with non motorized boats; 500 fishers with motorized boats; 150 ex-fishers operating dive and tourist boats

RUSSIA

SPECIES FISHING GEAR TONNAGE

Russian Sakhalin Salmon Fishery

Interview with Vladimir Smirnov, Commercial fisherman, Chairman of Smirnykhovsky Regional Fisheries Association

Species: Pink Salmon (*Oncorhynchus gorbuscha*)

Fishing gear: Stationary trap nets

Country: Russia

Ocean: Sea of Okhotsk, North Pacific Ocean

Fishery tonnage: Median catch: approximately 150,000 metric tonnes

Markets: Russia, China

"I started fishing for Russian crab, but the whole system is built in illegality and is extremely difficult to change. So I switched to salmon fishing, bought a company and started fishing at the mouth of the Langeri River. We use stationary trap nets that are set up in the coastal areas where the rivers flow into the sea. I saw an opportunity to affect positive change, because salmon fishing gear is passive and the salmon runs are abundant.

However, when we arrived in the Smirnykhovsky region of Northeast Sakhalin, illegal fishing was out of control. Poachers were very well organised. After they stripped females for red caviar, they would bury the carcasses in the ground using tractors and then cover the hole so the police couldn't find it. One time, a tractor ran over an old hole and fell in as all the fish had rotted away!

We started work with other companies to defend the rivers from poachers. It took seven years to unite the fishermen but now five out of eight companies participate in the anti-poaching work, which involves monitoring the rivers and sharing information with the authorities. Much of our efforts to fight poaching and support the legality of Russia's salmon fisheries became possible with the participation of NGOs in the project, such as Sakhalin Environmental Watch, Wild Salmon Center (WSC), and Sakhalin Salmon Initiative.

A significant change has been the award of long-term rights to the rivers (25 years) and since 2008 the government has allowed us to set our own catch limits rather than having artificially low quotas. These had previously forced fishermen to hide their harvests and pay salaries under the table. Today we can set our catches based on realistic commercial harvest levels and it is within our interest that these are sustainable. Everyone openly shows their harvest figures and many have started to pay their employees official salaries.

Poaching is nearly eliminated from our region. As a result, we have seen major increases in our fish returns. Further, the federal authorities take us seriously and listen to us. We have been able to stop hatcheries from being set up in our river to preserve the diversity of wild salmon populations. We are also fighting to stop commercial licenses for fishing within rivers which easily leads to over-harvesting (rather than just within the coastal zone which is how we fish sustainably now). An important success has been the end to dumping of wastewater from a gold mine in the upper reaches of the Langeri River. This has, without a doubt, improved conditions of the river and the welfare of the salmon.

The future looks good. Three regional pink salmon fisheries on Sakhalin have entered full MSC assessment and we hope we will be awarded the certification in the near future. For the first time, in 2011, the full cost of fighting poaching and supporting sustainability was paid for by the fishing companies. This is a big accomplishment as three years ago you couldn't even imagine this. It illustrates how fishermen's responsibility for the resource has increased. That's how it should be."

Before intervention/s – 2004				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
–	–	–	–	▪ 2002: Anti-poaching activity: ▪ Personal investment by Vladimir Smirnov – 1.5 million rubles (US$50,000) plus 1.5 million rubles from WSC ▪ 2011: Industry contribution of 5 million rubles (US$155,000)	▪ Price of fish increased by 28% between 2010 and 2011 ▪ Peace of mind of having long-term leases ▪ Poaching for caviar no longer profitable for illegal operators	▪ Increased influence with federal authorities ▪ Previous illegal operators have sought work with legal Organisations	▪ Fish catches in NE Sakhalin have more than doubled over the last ten years ▪ Improvement also related to environmental conditions	No. of fishing companies decreasing

VIETNAM

Ben Tre Clam Fishery

Interviews with stakeholders from the fishery

SPECIES FISHING GEAR TONNAGE

Species: Lyrate hard clam (*Meretrix lyrata*)

Fishing gear: Hand rake

Country: Vietnam

Ocean: South China Sea (Mekong River deltas)

Fishery tonnage: 6,000 – 9,000t

Main markets: Europe, Japan and domestic

"If we harvested large clams instead of returning them to the sand flats, we would die of hunger," says Vo Thi Binh, a clam fisher from one of the Rang Dong cooperatives who has been collecting bivalves in the Mekong delta for more than 20 years. "We must leave them so they can spawn and we have more clams in the future. If we caught them now, what would we catch later?"

Initially the fishery was open-access but following increased demand for clams the government created cooperatives between 1995 and 1997. Although these cooperatives were defined by area, fishers were not restricted and catch declined rapidly between 2003 and 2005. In 2006, the cooperatives' area rights were strengthened so they were able to restrict fishing to only those within their own communities. With secure rights over their resources the cooperatives have been able to set harvest limits with an eye to future sustainability.

"We have also brought in a number of important measures to protect the stock," says Nguyen Van Buoi, Vice Head, Technical Division, Ben Tre Department of Agriculture and Rural Development (DARD), "For example in 1999 we established some clam sanctuaries to protect very large clams that were found to be providing an important source of broodstock". Under cooperative rules, clams must be harvested by hand using a rake 35cm wide, often with a net attached. The net's 30mm mesh size ensures that only clams of commercial size are retained, while smaller ones escape. The largest are returned to the sand flats to breed.

Harvest levels haven't returned to the levels seen in the early 2000s but have reached a stable level of between 6,000 and 9,000 tonnes and cooperatives have become more organised at selling their catch. As Vo Thi Binh explains, "Before, I would collect clams and working from morning to late afternoon I would fill two baskets. Yet there was a limited market, and if I was unable to sell the clams I would have to return them to the sea. Since the cooperative has been established, the harvest is planned according to contracts with the processing plants, so every day that I go to work I get paid and I don't have to worry about selling the clams."

In November 2009, the Ben Tre clam fishery was certified by the Marine Stewardship Council providing a milestone in improved management. "DARD was already advanced in managing the fishery, but to achieve the standard of the MSC management it has evolved further", says Nguyen Thi Dieu Thuy of WWF Vietnam who supported the fishery through MSC certification.

"Eight months after MSC full assessment, the price increased by 20-30%" explains Thuy, "and the total value of landings increased by 165%". The value of the clam is now much higher than it was five years ago and wages have increased five fold since 2007. This increased value means the fishery can support more people without overexploiting the stock. Today, nearly 13,000 households are involved, compared with fewer than 9,000 in 2007. Many are now able to pay their children's school fees and support them through vocational training, boosting their chance of a better future.

Before intervention/s – Main interventions: 1990s – introduction of cooperatives; 2007 strengthened rights of cooperatives; 2008/9 MSC certification				**Transition**	**After intervention/s – Current**			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Catches: 9,506t (2005)	1,450,000 VND/ worker/year (US$70) (2007)	Stable	8744 households (2007)	▪ Costs of improving fisheries management: ▪ 2.5 billion VND (approx US$120,000) plus 1.45VND/ year on ongoing costs (approx US$70,000) ▪ Costs of MSC certification: WWF – US$68,380 ▪ DARD/Cooperatives: 1.0 billion VND (over 4 years) – (approx $US47,000)	▪ Catches: 9,890t (2009) (fluctuates between 6000-9000t)	▪ 6,990,000 VND/ worker/ year (2010) (US$333) NB Only two harvests a year	▪ Stable ▪ Fishable biomass: 15000-20000t/year	12,943 households (2010)

AUSTRALIA

SPECIES FISHING GEAR TONNAGE

Australian Northern Prawn Fishery

Interview with Annie Jarrett, CEO of the Northern Prawn Fishing Industry association (NPF Industry Pty Ltd)

Species: Brown tiger prawn (*Penaeus esculentus*); Grooved tiger prawn (*P. semisulcatus*); Blue endeavor prawn (*Metapenaeus endeavouri*); Red endeavor prawn (*M. ensis*); White Banana prawns (*Fenneropenaeus merguiensis*); Red legged banana prawns (*Fenneropenaeus indicus*)

Fishing methods: Twin, triple and quad otter trawl (with seawater hoppers to reduce by-catch)

Country: Australia

Ocean: Pacific

Fishery tonnage: In 2010 tiger prawn catches were 1,628mt, endeavor prawn 429mt and banana prawn 5,642mt

Markets: Australia, Japan & China

"If you can believe it, I began working as a cook and deckhand on trawlers throughout the Northern Prawn fishery in 1980 and through this cast my lot into the fishing industry. This led to a life-long career working in the seafood industry and I now represent the owners of 52 boats within the Northern Prawn Industry.

Commercial fishing for northern prawn began in the early 60s, and expanded quickly in the 1970s. From the 70s onwards, the fishery suffered from too many licenses. By the mid-80s we had 302 licenses in that fishery and declining stocks. Industry-funded buy-back schemes and compulsory acquisition of licenses reduced the number of licenses from 302 to 130 between 1986 and 1993. This was followed by further industry-funded capacity reduction between 2000 and 2005, and a government funded buyout the following two years bringing the number of boats down to 52.

Since 1985 there has been around US$155 million invested by the industry, making this one of the few examples worldwide where the industry has taken a lead role and paid for the majority of the restructuring process. It has taken 20 or 30 years, but we now have the fishery at a stage where the stocks are rebuilding and we are on track with our MEY (Maximum Economic Yield) target. That, together with fewer boats, means that catches per vessel have increased substantially in the past four years and we are now able to withstand the fluctuations in profits caused by changes in stocks, prawn prices and fuel costs.

I won't say that the decommissioning programme hasn't been controversial and difficult for many in industry, but we realized that something had to be done or the whole industry would collapse. We are quite unlike a number of fisheries around the world in the sense we don't have any explicit social objective and manage our fisheries to maximize economic yield. However, saying that, everyone leaving the fishery was financially compensated and communities have enjoyed the benefits that flow more broadly from a more profitable fishery.

By the mid-90s the public started to be interested in issues of by-catch, and again we proved ourselves as a progressive fishery by developing a plan to minimize by-catch and improve the survivability of released species. One of the most significant measures has been the introduction of the seawater hopper that increases survival rates of discarded by-catch from 30-95%.[4]

We've been lucky that we have had this partnership approach with the government and researchers, and we've also had some strong leaders over the years. We set up a joint management advisory committee comprised of government, researchers and industry very early in the 80s but have now got to a point where the industry is actually undertaking a number of functions on behalf of government. We are responsible for a voluntary crew-member observer programme, which collects by-catch data; and for managing catch and effort, and economic datasets.

There will always be people who believe that trawling is too damaging. However we trawl on soft muddy bottom, and while our fishing area covers 770,000km we only fish around 8% of this entire area, and for a maximum of 6 and a half months of the year. We have done a great deal to minimize our footprint on the marine ecosystem and are proud of our environmental performance in the Northern Prawn Fishery."

Before intervention – Early 1980s				Transition: 1985 – 2007	After intervention – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Profit at full equity[1]: US$73,900 (1985/86)	–	Declining stocks	302 boats	▪ US$155 million from industry ▪ US$70 million from government	▪ Profit at full equity: US$308,091 (1997/98) ▪ GDP estimates at US$95 million for 2010/11	–	▪ Stable stocks operating to MEY target & MSY as limit ▪ Bio-economic assessment in 2011 suggests the fishery will achieve stock status at MEY by the 7 year target.	52 boats

Table sources include: Jarrett, A. (2001) Changes in Fleet Capacity and Ownership of Harvesting Rights in Australia's Northern Prawn Fishery. Chapter in Case Studies on the effects of transferable fishing right on fleet capacity and concentration of fleet ownership, FAO

4 MRAG (2010) Towards sustainable fisheries management: international examples of innovation.

AUSTRALIA

SPECIES FISHING GEAR TONNAGE

Australian Spencer Gulf Prawn Fishery

Interview with Simon Clark, Executive Officer, Spencer Gulf and West Coast Prawn Fishermen's Association

Species: Western king prawn *(Penaeus latisulcatus)*

Fishing gear: Otter-board trawl

Country: Australia

Ocean: Australian Bight

Fishery tonnage: approx 2,000 tonnes

Markets: Mainly domestic, also Asia and Europe

"Six months ago I was developing marine parks for the South Australian government, so I'm new to this – but I've come to a fishery with a long history of being managed sustainably. In 1976, the number of boats was capped at 39 and remains so today: 39 operating under license, using gear adapted to maximise the survivability of by-catch – blue crabs, fish, small sharks and rays.

Obviously, some mistakes were made early on. Fishing effort peaked in 1982 and catches declined in subsequent years, which was attributed to the harvesting of smaller size classes of prawn in the immediately preceding years. This prompted a gentleman's agreement among the fleet which led to self-imposed closures and eventually our first management plan in 1998, updated in 2007. We have a constitution and a management committee, including a government scientist and manager, so we sit around a table making decisions with the fishermen.

One key element of the plan is real-time fisheries management. The fishers survey the Gulf three times a year, to establish harvest strategies for the following session. They have what they call a bucket – 7kg of prawns – and count how many prawns are in it. That helps estimate the average size. Part of the strategy is to fish only areas with 220 or 250 prawns or fewer per bucket, depending on the time of year. The fishers say, 'That's our fishing area, everywhere else is closed' – and they'll monitor it on a nightly basis.

If small prawns flood into the area on the tide, the Committee at Sea (nine of the 39 boats) will close that area to fishing. The Coordinator at Sea notifies the fisheries manager, and changes are made within an hour. In the past six years, small prawns have comprised less than 7% of the catch, compared with up to 40% before, while the number of lucrative XL prawns has doubled.

"Our boats fish only at night, on the dark of the moon, for 50 nights a year compared to 280 when the fishery started"

There have also been voluntary closures to avoid interactions with pipefish, sea dragons and seahorses. Our boats fish only at night, on the dark of the moon, for 50 nights a year compared to 280 when the fishery started, yet the number of participants has remained stable – about 160 jobs at sea and many more in the community. Catch per unit effort has increased dramatically over the years while stock has remained the same, if not increased slightly.

The big risk to the fishery now is economic. Fuel and other costs have been rising but prices have remained steady. That's one reason why we became MSC-certified in August 2011, supported by WWF with funding from the Packard Foundation. It's too early to comment on prices, but the MSC has and will provide access to markets that otherwise would not consider our products. We're now undertaking work in Europe that wouldn't have happened without the MSC. Fishers are benefiting from the investment made by their fathers and grandfathers. It's put them in a position where they are sustainable and can make sound decisions to keep the fishery going. That culture doesn't come in a generation; it's something that develops over time."

Before intervention/s – 1998 Management Plan				Transition	After intervention/s – 2009			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ Value of catch: US$21 million ▪ CPUE: 64kg/hr	160 jobs	▪ Catch: 1,647t ▪ Biomass: Variable	39 vessels	▪ License fees: US$668,030 (1996/7) ▪ US$945,343 (2009)	▪ Value of catch: US$28 million ▪ CPUE: 101kg/hr	160 jobs	▪ Catch: 2,361t ▪ Biomass: Stable for past 5 years	39 vessels

SPECIES FISHING GEAR TONNAGE

Fijian Subsistence Fisheries

Interviews with stakeholders of the Kubulau community-managed marine reserves

Species: Mixed reef species (e.g. snapper, grouper, and emperors)

Fivshing gear: Hand-lines, gill nets, spearguns

Country: Fiji

Ocean: South Pacific Ocean

Fishery tonnage: Approx. 5 tonnes per annum

Markets: Subsistence or local markets

Kubulau is an area of Fiji with extensive mangrove forests and highly diverse coral reefs. It is home to the largest and most diverse marine reserve in Fiji. Prior to the reserve, communities had witnessed a decline in resources. "By the 1990s we were not receiving what we should from our waters, and there was too much poaching from the commercial fishing boats," explains the District Chief from Nadi.

Action was taken on two levels: Chiefs refused licenses to commercial vessels and in 1997 worked collaboratively with the Wildlife Conservation Society (WCS) and the Coral Reef Alliance (CORAL)[5] to set up and run 17 village-managed areas (*Tabus*) and three no-take reserves at the district level. The largest of these is the Namena reserve covering 60km^2. "The *Tabu* is good, but nothing new," explains Sirolo Dulunaqiro, a field liaison officer and originally from Kubulau. "This tradition of closed areas was already there with the communities, but has been combined with scientific approaches."

Communities observed immediate benefits. As Paulo Kolikata, chair of the local resource committee, describes, "Before we would spend all day fishing, but now we can fish for 2-3 hours and catch the same amount of fish." This is backed up by ongoing monitoring, "There has been a clear increase in fish numbers and size within the reserves compared to adjacent areas open to fishing, says Stacy Jupiter, Director of the WCS Fiji Program, "and in 2009 we saw an increase in the open areas."

Tourists pay US$16 per tag dive within the Namena reserve, which realises an income of around US$13,500 per year. Revenue is allocated by the resource committee to support management; community development projects, and a scholarship fund. 130 children have been supported to attend university or college. As Paulo explains, "Many village children have received tertiary education and the community sees that this work is worthwhile."

In 2009 the village chiefs endorsed a *ridge to reef* management plan which covers the reserves and also accounts for impacts from freshwater runoff. Following the signing ceremony, the Chief of Kubulau District remarked, "I strongly believe in the partnership we have started here. This will not just benefit an individual or a village, but the whole district. I am very happy because this initiative has united the people of Kubulau."

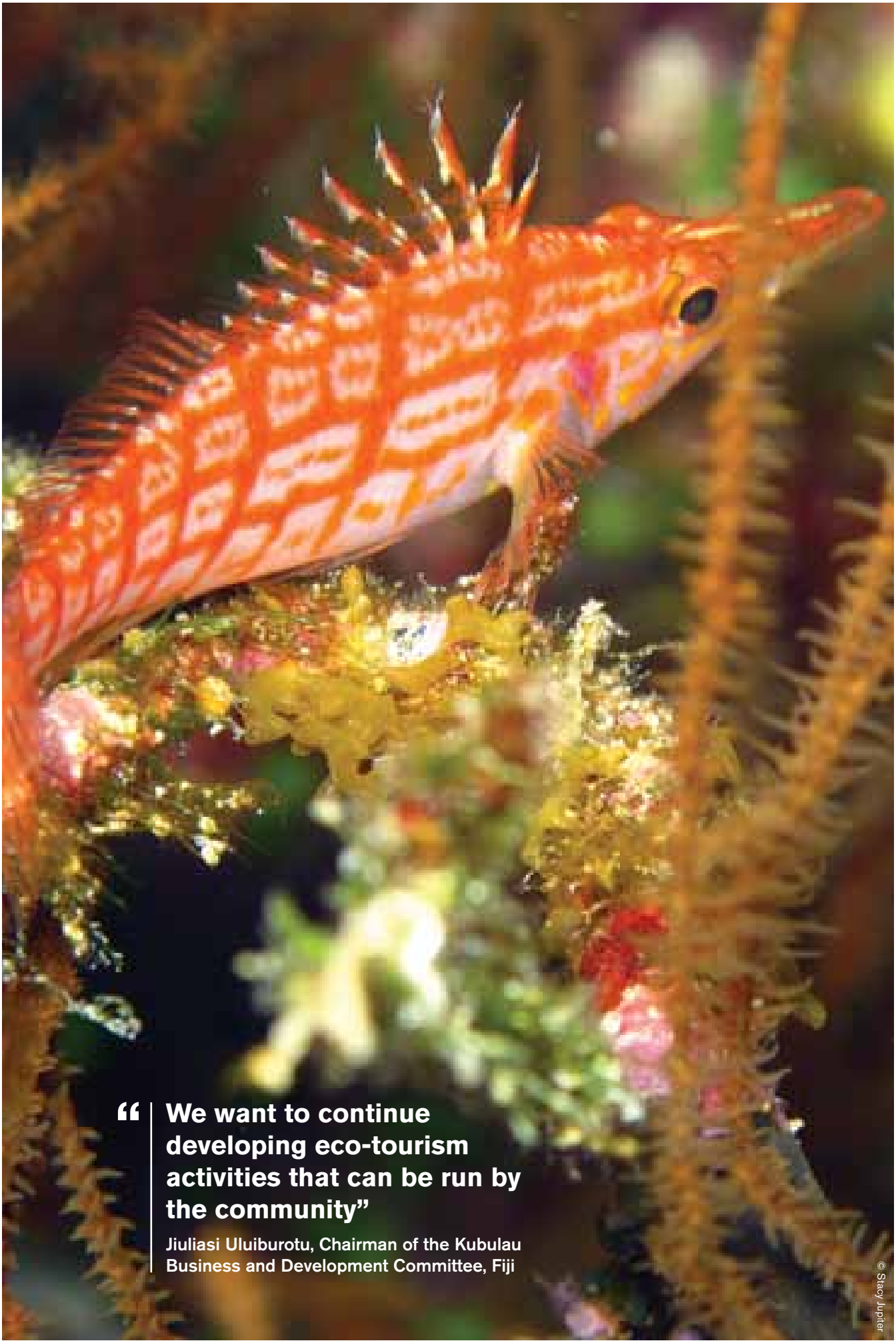
Challenges remain as the success of the reserves has attracted poachers. "From where the village is located it takes almost 2 hours in our patrol boat to reach the outer Namena reef, says Jiuliasi Uluiburotu, Chairman of the Kubulau Business and Development Committee, "so we are considering RADAR system to help detect poachers and would like to discuss this with the Fisheries Department."

However, getting support from the authorities is difficult as the reserves are not legally recognised. As Stacy explains, "On one hand it means that the reserves can be readily adapted, such as making adjustments in response to climate change, but it also means limited support for enforcement. We are therefore looking at opportunities to change this."

Jiuliasi describes the aims for the future, "We want to continue developing eco-tourism activities that can be run by the community." Already 34 members have been trained by CORAL and graduated from the University of the South Pacific as tour guides, but Jiuliasi believes there is scope for much more.

Before intervention/s – 2004				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
–	–	Stocks declining	–	US$720/year in support costs	▪ CPUE doubled ▪ US$13,500/ year available to the community to support management and community development	▪ 130 children received tertiary education ▪ 34 people trained as tour guides ▪ Community partnership and ownership over resources	Monitoring suggests an increase in fish biomass within the reserves in 2007 & 2008, and in areas open to fishing in 2009	Remained stable

5 WCS supported the initial set up of the reserves and CORAL joined the initiative in 2001 to strengthen the running of the reserve by attracting tourists and setting up a funding mechanism through diver fees.

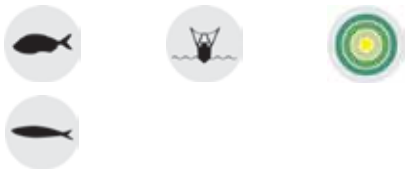


> **We want to continue developing eco-tourism activities that can be run by the community”**
>
> Jiuliasi Uluiburotu, Chairman of the Kubulau Business and Development Committee, Fiji

New Zealand Sanford Fisheries

Interview with Eric Barratt, Managing Director, Sanford Limited, New Zealand

SPECIES FISHING GEAR TONNAGE



Species: More than 100 species e.g. hoki and hake

Fishing gear: Various (for Hoki: Mid-water trawling and bottom trawling)

Country: New Zealand

Ocean: South Pacific, Tasman Sea

Annual tonnage: 500,000 to 600,000 tonnes

Markets: Worldwide

"We've been operating since 1881, and today have the largest and most comprehensive range of species you can get, numbering over 100. In 1998 we adopted the motto 'Sanford Ltd – sustainable seafood', and the basis of that sustainability is New Zealand's quota management system (QMS).

When 200-mile exclusive zones were declared around the world, New Zealand found itself with one of the largest and needed to put in place a system very quickly for managing it. There were too many vessels chasing too few fish. In 1986, we went from a license-based system to a QMS in which every fisherman got a quota, allocated by the Fisheries Ministry in perpetuity.

What that did was place an incentive on quota owners to protect the sustainability of the resource. Suddenly, there was huge interest in the size of the biomass and how it was changing. People began to ask: 'What can we do to protect this biomass? What can we do to make sure everyone plays by the rules?' We went from a focus on volume to a focus on quality, because if you don't look after every fish, that is a waste of quota. It heralded a new era of compliance and reporting, producing a scientific database that is huge.

Another big benefit has been a shift in focus to maximise the value of the quota: avoiding smaller and damaged fish, selecting the right hook size and net size in the snapper and squid fisheries, and targeting only areas where there are larger fish. For instance we have some closed zones on the Chatham Rise to prevent catch of small fish in the hoki fishery.

There is no question the resource is healthier. Hoki is the largest fishery in New Zealand, and that suffered a major decline six years ago, from a 250,000-tonne catch to a 90,000-tonne catch. That has subsequently recovered up to about 120,000 tonnes. This year the minister increased the TAC to 130,000 tonnes but Sanford and others in the industry opposed it, pending the outcome of research into a particular component of the fishery. The fish are in the bank, it's cheaper to leave them there. That's our attitude.

In some fisheries, we have had three generations of fish, three breeding cycles since we started, and we are seeing increased populations. Fish are getting easier to catch, and we catch them quicker. It's not unrealistic to expect a 10% improvement in stock each year, for the next five years. That stability will last indefinitely. We can therefore provide much greater certainty to our staff, to our factories and our markets. Our customers are confident the trend will continue, so they are prepared to invest in that market channel.

We've seen market advantage, too, in having hoki certified by the Marine Stewardship Council. Many retailers say they will only stock MSC-certified fish or its equivalent, and we can access those premium markets. New Zealand hoki continues to command higher prices than Chilean and Argentinian hoki. That's partly to do with the MSC, partly to do with quality. Whichever way you look at it, it's because New Zealand has sustainable, well-managed fisheries."

Before intervention/s – 1986: QMS established				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Value of quota: NZ$1b (US$793m) e.g. Snapper quota: NZ$15,000/t (US$11,900/t)	–	▪ Catch: 90,000t of hoki (2007) ▪ Stocks under pressure	2,500 vessels	▪ Government: US$40m in buyout of quota ▪ Industry: US$40m in buyout of uneconomic operations	Value of quota: NZ$4b (US$3.2b) e.g. Snapper quota: + NZ$50,000/t (US$40,000)	Fewer jobs inshore; more jobs in deepwater vessels (from 100 to 1,000)	▪ Catch: 120,000t of hoki ▪ Stocks stable	1,000 vessels

SPECIES FISHING GEAR TONNAGE

Parties to the Nauru Agreement (PNA) Tuna Fishery

Interview with Maurice Brownjohn, Commercial Director of the PNA

Species: Skipjack tuna (*Katsuwonus pelamis*), Yellowfin tuna (Thunnus albacares), Bigeye tuna (*Thunnus obesus*)

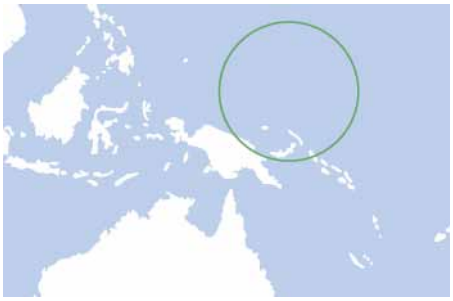
Fishing gear: Purse seine

Country: Pacific Islands – Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu

Ocean: Western Central Pacific Ocean

Fishery tonnage: 900,000t skipjack; 150,000t yellowfin; 65,600t; bigeye (2009)

Markets: International (including: US, Japan, Taiwan, EU, etc)



"The PNA agreement was established in 1982 between eight Pacific Island states who realised that their 200nm Exclusive Economic Zones (EEZs) formed an almost continuous block covering almost half of tuna catches in the Western and Central Pacific Ocean. For these countries, besides tuna, sunshine and seawater, there is not much else. Yet, historically it has been distant water fleets (DWF) e.g. Japan, US, Taiwan who dominated the catch and reaped the benefits. There was therefore a common interest to set conditions for long-term sustainability and economic security.

As PNA, we have led conservation in the pacific purse seine fishery, progressively introducing a raft of measures. These include compulsory transhipment in port; 100% observer coverage; satellite tracking; 100% catch retention of tuna (no dumping or high-grading); and innovative closures of high sea areas that exist between the states' EEZs. We have no legal jurisdiction over the high seas, but if boats fish there it immediately disqualifies them from a PNA licence. The benefits are not just as a refuge for fish; but the closures have also stopped illegal fishing, misreporting and promote economic benefits for the pacific states. With all these checks in place, we have gone from a situation where vessels were telling us what they wanted us to know, to a situation where we can tell them what happened.

While all these conditions are complementary, I would say that the single most significant intervention has been the vessel day scheme (VDS). When we only had a vessel limit it inferred some rights to the resource to DWF nations, but setting a limit of around 34,000 days per year has effectively created competition. This has been good for stock conservation but also for creating a market for licences. The value to the nations in terms of access has increased from $50million/year before the scheme to $150million today.

Through these measures, we have been able to keep the skipjack stock healthy. Catches are increasing but it could take a doubling of effort without any problems. There has been pressure on the big-eye tuna stock, which is caught by long-liners and as by-catch by purse seiners targeting skipjack around Fish Aggregating Devices (FADs). However, the scientific advisory body for the region[6] has indicated that with the PNA measures alone the region will achieve a 30% reduction in catches over the long-term.

In 1995 there was no significant employment from the tuna sector, no transhipment and minimal processing. Today, 10,000 people are employed in processing in Papua New Guinea alone. 500 Pacific Islanders are employed as observers, and from 2012 a minimum of 10% of crew must be from the region.

The PNA office is self-funded through a conservation levy of $6,000 per foreign vessel and $3,000 per domestic vessel fishing regionally. In perspective $6,000 is equivalent to 3 tonnes of fish for vessels that may be easily catching 5 – 10,000 t/year.

A really exciting development has been our recent co-branding programme (Pacifical[7]), which linked to MSC certification will allow traceability of a can of tuna back to the vessel, factory and our islands. I would like to see a day when the islands run the entire chain from catch to market, so rather than just selling access they contract the whole process in a vertically integrated system. This would totally turn the tables."

Before intervention/s –1995				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator:**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ Minimal processing ▪ No transhipment ▪ Value of licences: US$50 million	No significant employment	▪ Skipjack healthy ▪ Yellowfin: sound ▪ Big-eye: undergoing overfishing	205 vessels	To run PNA: ▪ Initially $60,000/ year ▪ Now an office: US$1-2million/year	▪ Processing plants in ▪ Port and infrastructure development ▪ Value of licenses: US$150million	▪ Employed in processing plants: 10,000 in PNG; 400 in Solomon Islands; 400 in Marshall Islands. ▪ 500 employed as observers ▪ 10% employment on vessels	▪ Skipjack: healthy ▪ Yellowfin: sound ▪ Big-eye: stock being restored	265 vessels

6 Secretariat of the Pacific Community
7 http://www.pacifical.com/

SPECIES FISHING GEAR TONNAGE

Bahamian Spiny Lobster Fishery

Interview with Mia Isaacs, President of the Bahamas Marine Exporters Association

Species: Spiny Lobster (*Panulirus argus*)

Fishing gear: Casitas/traps, hooks, compressed air

Country: Bahamas

Ocean: Atlantic

Fishery tonnage: 6,977 tonnes

Main markets: US, Europe, Canada

"The Bahamas spiny lobster fishery was an artisanal fishery until 70 years ago when it was transformed into a commercial fishery for processed and frozen lobster tails. This commercialisation brought with it the many benefits associated with exporting products to international markets, but also a range of problems. These included destruction of the coral reef and sea grasses; division within the fishing community; and the fear of exploitation which together, if not managed properly, could result in diminishing catches and damage to the lobster stock.

It was our position, as a major supplier of lobster tails to the global market, that gave us impetus to work towards mitigating these negative impacts. With major supermarket chains in the US and Europe committed to buying only from countries that can prove their fisheries are sustainable, we realised MSC certification would be required to maintain market access for the Bahamian Spiny Lobster.

This led to the rapid and wholehearted transition of the fishery through a process kick-started by the Department of Marine Resources working in partnership with WWF, in 2009, to implement a Fisheries Improvement Project. This included the creation of the Bahamas Marine Exporters Association to bring together stakeholders, including the critical involvement of NGOs such as The Nature Conservancy and Friends of the Environment in Abaco.

A raft of different management measures have been introduced or strengthened. For example, we have always had a closed season but there are now increased efforts to enforce this. A catch certification programme has been implemented and we are now in the process of improving data collection which will aid decision making both now and in the future. An initial stock assessment has just completed and is being peer reviewed. There are indicators the stock is healthy, but this needs to be substantiated by scientific findings.

"The awareness for change is ever increasing – and the catch phrase 'Size Matters' has really caught on as a means to highlight the importance of protecting the juvenile lobsters – it has motivated the whole fishery!"
– Mia Isaacs, Bahamas Marine Exporters Association

We have involved the whole community by holding local meetings with fishers and other stakeholders to demonstrate the positive impact of following the management regulations that protect our fishery. The awareness for change is ever increasing – and the catch phrase '*Size Matters'* has really caught on as a means to highlight the importance of protecting the juvenile lobsters – it has motivated the whole fishery!

It has been truly inspiring to see all the different players so rapidly unite, in an effort to improve the management of the fishery; bringing a shared understanding to a common goal and promoting the importance of sustainability. We all want a healthy and sustainable fishery so Bahamian families and the local economy can continue to benefit for many generations to come."

Before intervention/s - (2009)				Transition	After intervention/s - Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Exports: US$69.33M (2007)	More steady/ reliable income	Catches decreasing and fear of damage to stocks	365 (2000)	Ball park figure: US $766,000	Exports: US$67.25M (2010) Stable	Average crew wages increased and more stable	Appears to be looking sustainable and stable	386 (2002)

CANADA

SPECIES FISHING GEAR TONNAGE

British Columbian Spiny Dogfish Fishery

Interview with Michael Renwick, Executive Director of the British Columbia Dogfish Hook and Line Industry Association

Species: Spiny dogfish (*Squalus acanthias*)

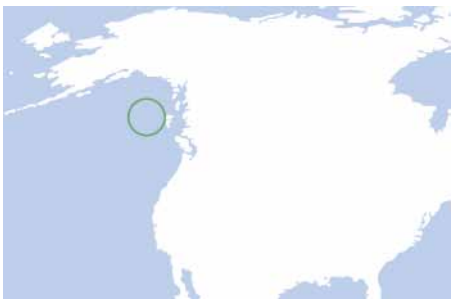
Fishing gear: Hook and Line

Country: Canada

Ocean: North Pacific

Fishery tonnage: 3,000 tonnes (2009)

Main markets: EU, Asia



"Our industry association has brought together fishers and processors who share the desire to make our fishery both sustainable and economically viable. We are a relatively low volume, well managed and highly regulated fishery with few participants.

Spiny dogfish have been caught commercially in our waters for over 100 years, for a range of reasons and purposes. Initially, in the 1920s the dogfish was caught for the manufacture of vitamin supplements but following the shift in the 1940s to synthetically derived vitamins, the fishery stopped. Then in the 1990s with the collapse of the European and US spiny dogfish stocks our fishery re-opened.

In the early 2000's Canada's Department of Fisheries and Oceans introduced an integrated fisheries management plan for all the 69 commercially caught groundfish species that are managed by total allowable catches, of which spiny dogfish is one.

As part of this plan, individual vessel quotas were introduced in 2005 and a pilot monitoring scheme was also launched. The monitoring scheme included the installation of video cameras on board every vessel, with the cameras being triggered each time the fishing gear is deployed and recording all catch as it arrives on the vessel. All boats were fitted with vessel monitoring systems (VMS) to transmit their position, course and speed via satellite; information that was particularly helpful in monitoring closed areas. Landing inspections verified the landed catch and allowed cross-checking against the video footage, while the VMS information and the fishers' logbooks provided a highly integrated and monitored system.

This pilot project was formally adopted in 2008, and this means that we have 100% accountability in our fishery with monitoring of all fish caught as well as that discarded. This rigorous monitoring has provided us with a comprehensive database of information that was vital in our ability to gain Marine Stewardship Council (MSC) certification of the spiny dogfish fishery in September 2011. We started the process towards certification back in 2007, when the pilot monitoring scheme was underway, and we are just now shipping the first MSC certified dogfish products to the EU.

"Our fishery is thriving, and although it's too early to know whether the certification will have a positive effect on the price we get for our fish, we do know that without it, we would find it harder and harder to sell fish into the European market"

There is no question that the new regulations, the high level of surveillance and the process towards certification have contributed towards an extremely healthy fishery, but of course this has not come for free. The cost has been borne by the fishers, the government, and other supporters such as the Sustainable Fisheries Fund, but we think it has been worth it. Our fishery is thriving, and although it's too early to know whether the certification will have a positive effect on the price we get for our fish, we do know that without it, we would find it harder and harder to sell fish into the European market where concerns about sustainability are of paramount importance to seafood buyers, consumers and conservation groups."

Before intervention/s - Late 1990s				Transition	After intervention/s - Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Annual catches of 5000 tonnes in the late 1990s	–	Vulnerable	100 vessels in late 1990s	• MSC Certification process: US$148,600 • Monitoring costs: US$1.9m/year	3,000 tonnes (2009)	–	Certified as sustainable in September 2011	15–230 active vessels

MEXICO

Baja California Red Rock Lobster Fishery

Interviews with stakeholders from the fishery

SPECIES FISHING GEAR TONNAGE

Species: Red Rock Lobster (*Panulirus interruptus*)

Fishing gear: Baited wire traps

Country: Mexico

Ocean: Pacific (North-West Mexico)

Annual tonnage: 1,400 tonnes

Main markets: Mainly Asia, also France and the US (90%); domestic (10%)

Sustainability isn't new, argues Felipe Camacho, a retired fisherman who has for years helped out at the general store in Bahía Tortugas, a fishing town on the Pacific coast of Baja California, Mexico. "The way to protect the fishery and our fish has been passed down through generations," he explains. "We learn from our fathers and our sons learn from us. It's like a chain reaction."

The shop where he works is run by the local fishing cooperative, is one of 10 belonging to FEDECOOP (the Federación Regional de Sociedades Cooperativas de la Industria Pesquera Baja California) which helps fishers with their production, sales and exports. In the 1930s, the Mexican government established cooperatives along the Pacific coast as a way to manage the country's fisheries and keep them under national control.

"The government grants each cooperative access rights to an exclusive fishing area," says Mario Ramade, head biologist at FEDECOOP. "It's a long-term license, and in return the communities manage their area and look after its resources." One valuable species is red rock lobster, harvested by more than 500 artisanal fishers from the cooperatives, operating 232 vessels (motorised skiffs up to 30ft long) and setting about 15,300 traps each season.

In November, the low-impact red rock lobster fishery was re-certified by the Marine Stewardship Council, which had first certified it as sustainable and well-managed in 2004. Since then, under the MSC improvement programme, a new management plan has been drawn up with an emphasis on ecological interactions, and research has been carried out by a PhD student into the impacts of lobster traps on habitat, the amount and composition of by-catch and bait, and the extent of ghost fishing mortality caused by lost traps. The fishery is now required to refine its stock assessment model and do further surveillance.

The MSC process has fostered a more scientific approach to what Baja communities were doing already – protecting their area's diverse aquatic life and bird species. Cooperative leaders believe formal recognition of their sustainable methods will make renewing their permit to fish these waters easier in years to come. It is Mario Ramade's view that the international acclaim surrounding certification persuaded the federal government to give the cooperatives a seat on the committee of the fisheries department; provide subsidies for fuel; supply coastal communities with mains electricity (replacing diesel generators); and resurface crumbling access roads to the villages.

"Certification gave us international recognition," Javier says. "Re-certification gives us reassurance that we will continue to have a good yield in the future"

"We wanted our community to be more connected to the outside world," says Javier Ruiz, a lobsterman who runs a team responsible for patrolling day and night to prevent illegal fishing in their waters. He thinks the new road will be good for business, allowing quicker access to markets. In that respect, too, certification has helped. While exports to Asia make up the bulk of business, fishers have been able to interest buyers in France and the United States. "Certification gave us international recognition," Javier says. "Re-certification gives us reassurance that we will continue to have a good yield in the future."

Before intervention/s				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
CPUE: ▪ 1999/2000: 0.57 ▪ 2000/1: 0.78	–	Stocks healthy	2002: 228 active vessels	–	CPUE: ▪ 2006/7 - 0.8 ▪ 2007/8 - 0.60	Improved electricity and road services	▪ Stable ▪ Reproductive biomass stable around 30%	2008: 222 active vessels

US

SPECIES FISHING GEAR TONNAGE

Alaskan Bering Sea Crab Fishery

Interview with Edward Poulsen, Alaska Bering Sea Crabbers

Species: Snow Crab (*Chionoecetes opilio*) and Red Kind Crab (*Paralithodes camtschaticus*)

Fishing gear: Crab pots

Country: US

Ocean: Pacific

Fishery tonnage: 45,500t

Main markets: US, Japan

"My father was one of the pioneers of the crab fishery and I am now involved in the industry in a multitude of ways.

Prior to the catch share scheme, the season would open for a few days but close when the quota was caught (and sometimes exceeded). In some years the fishery didn't even last 3 days. Now, the fishery opens in October and runs to January for Red King Crab and until May for Snow Crab.

Our bread and butter fishery, snow crab, crashed in 1999 with catches falling from 185m lbs in 1999 to 26m lbs in 2000. Quotas remained low between 2000 and 2005, and many people were forced out of the fishery due to bankruptcy. The industry came to the conclusion that without something dramatic we were going out of business. There was near unanimous consensus for a catch share system, but we had to convince over half of the fishermen to accept processing quota in addition to harvesting quota. Once we overcame that hurdle we got buy-in from the processors and from the remote communities where their operations are based.

A key reason our catch share system has been so successful is that it was driven from the bottom up. The shares are wholly transferable and there is flexibility built in. However, we don't want see the fishery owned by outside investors. Anyone buying quota has to have owned a boat that initially received quota, has himself worked on deck or partnered with someone who has. We also made sure that quota ownership was capped at 1% (although for local communities this is higher at 5%).

One of the biggest positives is safety. Between 1990 and 2000, we were losing five to seven men a year. There was such a race to fish that people would overload their boats, and when it gets cold and everything freezes it is easy for boats to capsize. Since our catch share program, we have lost one man between 2005 and 2011.

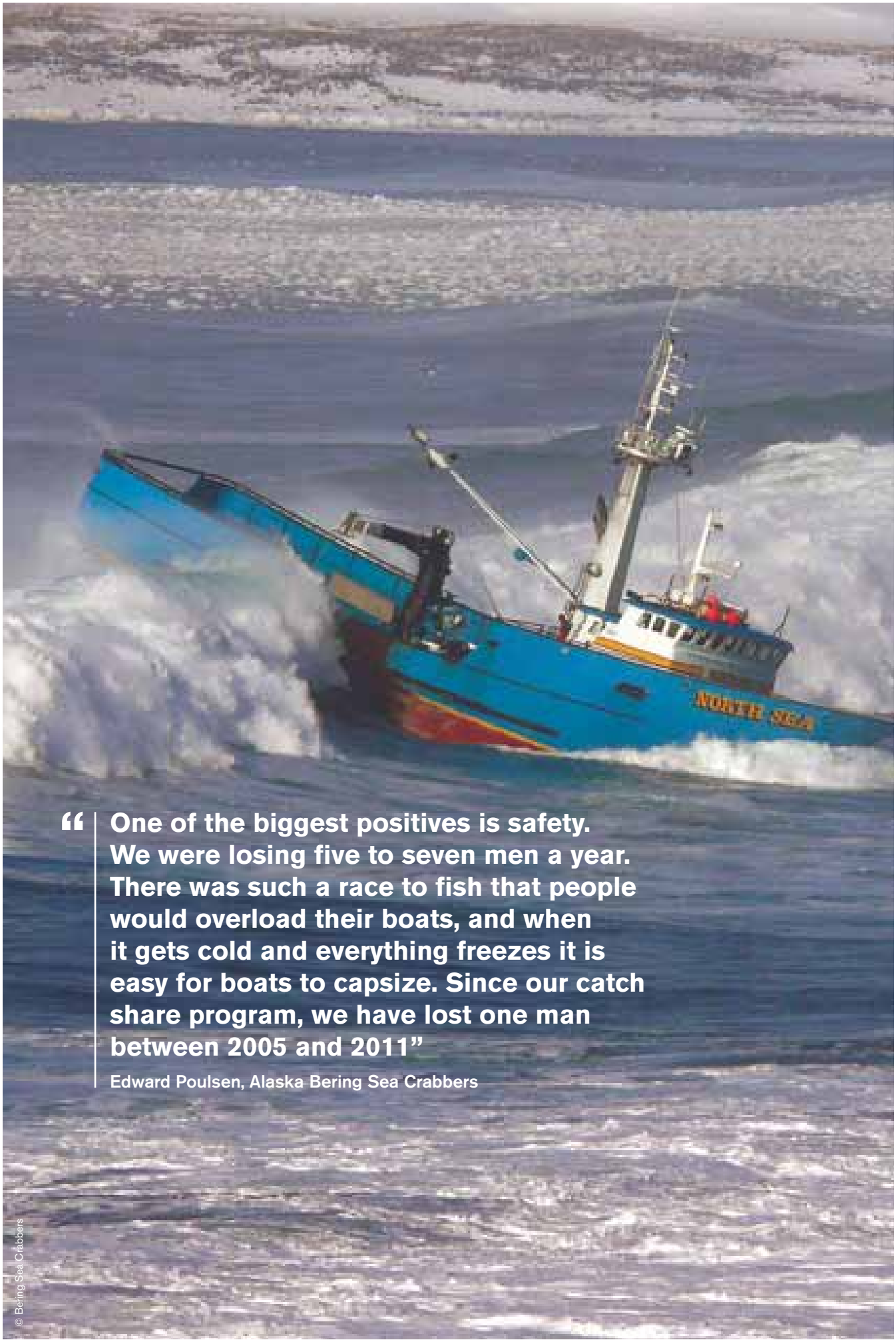
Economically we can now make rational decisions before we go fishing, and crew are doing well too. Previously they earned between US$20-30,000/year while today many are making well over US$100,000/year. We've also reduced the amount of fuel per pound of crab, and generally our vessels are better equipped, safer and more efficient.

By slowing down our fishing, we are able to increase the soak times of our crab pots. When we were rushing to fill quota we were lifting after eight to twelve hours while there was still bait in the pots. Now we have soak times as long as five to seven days when running to town between trips. All the bait has gone and juvenile crabs have moved out of the pot so that we have minimum by-catch.

What is surprising is that after so many years of competition, we now have a cooperative. The opportunities to work together are tremendous, such as opening new markets in China. There have also been benefits for local communities in Alaska. These communities owned hardly anything in crab 20 years ago and now have 30% of the quota.

Our snow crab fishery rebuilt this year and we are starting to have increased quotas. However, it is hard to isolate the benefits of the catch share system versus environmental shifts. Recruitment is low in the king crab stocks due to an influx of warmer water five to ten years ago. Quota had to be cut in half, but I didn't hear anyone say that was inappropriate. People are in the fishery for the long haul; this is a big change in mentality."

Before intervention/s – Prior to 2007				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
King crab prices (2008) $5/lb	▪ Safety: Lost 5-7 men a year ▪ Annual wages: US$20-30,000	▪ Stocks declining ▪ Snow crab quotas reduced from 180m lb to 30m lb in 1999.	▪ 250 vessels fishing in 2004	▪ Up to 1.5% of gross revenues – covers entire administration costs ▪ Some people missed out during allocation	▪ King crab prices (current) US $10/lb –mainly due to reduced competition ▪ 10% return on leasing shares ▪ 15-20% return if fishing owned quota	▪ Have only lost one man between 2007 – 2011 ▪ Annual wages: US$100,000	▪ Snow crab stocks recovered in 2011 – quota increased in 2011 ▪ Snow crab quota: 90m lbs	Approximately 80 vessels fishing with over 500 quota share owners



> **One of the biggest positives is safety. We were losing five to seven men a year. There was such a race to fish that people would overload their boats, and when it gets cold and everything freezes it is easy for boats to capsize. Since our catch share program, we have lost one man between 2005 and 2011”**
>
> Edward Poulsen, Alaska Bering Sea Crabbers

US

SPECIES FISHING GEAR TONNAGE

California Morro Bay Groundfish Fishery

Interview with Bill Blue, Central Coast Sustainable Groundfish Association

Species: Black cod

Fishing method/gear: trawl, long line, traps

Country: USA

Ocean: Pacific

Fishery tonnage: 125t (2006)

Main markets: Asia, USA

"I have been fishing for 36 years, since I was 18 years old. The West Coast fishery has had some serious problems with groundfish stocks declining in the 80s and 90s leading to area closures and a 75% drop in our catches. Our fisheries have been amongst the most restricted in the world with catch limits and closures to protect fish habitat including a rockfish conservation area – a strip covering the water from 30-150 fathoms along the coast – as well as Marine Protected Areas that restrict other fisheries.

At the time when The Nature Conservancy (TNC) got involved in Morro Bay the fish processors had left and most trawl vessels had moved north. In 2005 TNC purchased seven trawl permits and four trawlers (two were demolished), the plan was to retire the permits on the basis that trawling is unsustainable.[8] But, in the course of working in Morro Bay, they came to the realisation that trawling is a necessary component of the fishery here – it's a year-round activity, bringing much needed business which supports the dockside infrastructure. The loss of those boats was a real knock to our small community, so we began to look at how trawling could be continued in a more sustainable manner.

As fishers we realised the only way we could keep our fishing industry was through working with environmental groups to try different approaches to fishing. It's an unlikely alliance, but so far it has worked well for us. We share the aim of creating a fishery that can sustain fishers and revitalize our community as well as protect the ocean's resources.

We formed the Central Coast Sustainable Groundfish Association to help build a cooperative relationship between local stakeholders. By working with fishers in Half Moon Bay and Fort Bragg we have now formalised a 'pool of quota' for specified 'overfished' species that helps fishers to manage their catch. This helps protect each of us against a 'lightening strike' catch that would take us over an individual quota and thereby put us out of business.

We are also using technology to preserve fish stocks. The e-catch system allows fishers to share real time data on encounters with overfished species – a few years ago it would have taken weeks to circulate this information – now it's instantly accessible via iPads provided by TNC. There has also been increased monitoring of fishing activity with the introduction of observers, video monitoring and 100% catch accountability.

"As fishers we realised the only way we could keep our fishing industry was through working with environmental groups to try different approaches to fishing"

In 2007 I was one of three fishers selected by TNC to fish for groundfish under a special permit to fish with fixed gear (long lines and traps) that reduce by-catch and habitat impacts. In addition, another trawl vessel is testing and improving a low-impact trawl net that has a lighter foot rope to further reduce impacts.

Individual Transferable Quotas were introduced in 2011 – these are based on annual stock assessments and each fisher is allocated a total tonnage with flexibility on when it is caught. I now operate my vessel under an annual permit and hope that there is an opportunity for a longer term lease. We also hope that TNC continue to be involved in the fishery – they have helped secure a future for our trawl quota to be landed in our community. It's too soon to be able to show that our fishery is thriving, but we have high hopes for the future. To our own surprise we've formed really strong partnerships – this has been a real learning process for us all."

Before intervention/s - 1990				Transition	After intervention/s – current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Black Cod 870,000 lb (1990)	–	–	–	–	Black Cod 275,000lb (2006)	–	–	4 Vessels

8 One permit is currently not being used, but has not been retired, so it is hoped that another Morro Bay fisher will get chance to use this in the future.

US

SPECIES FISHING GEAR TONNAGE

Gulf of Mexico Red Snapper Fishery

Interview with David Krebs, Fisherman and President of the Gulf of Mexico Reef Fish Stakeholders' Alliance

Species: Gulf red snapper (*Lutjanus campechanus*)

Fishing gear: Longline, Vertical line

Country: US

Ocean: Gulf of Mexico

Fishery tonnage: 3 million lbs (2010)

Main markets: US (Domestic)


© Gulf Wild

NORTH AMERICA

"I have been fishing for red snapper for almost 30 years. In the 1990s stocks were declining and the fishery was initially closed, then reopened with a limited season. We started to see stocks recover, but fish flooded onto the markets for only 2 months and prices fell from US$2.50 to 75 cents/lb. The quota system that followed still led to a race to fish and waste. It was dangerously assumed that discarded fish would survive, and our Catch per Unit Effort (CPUE) – the amount we were catching in a defined amount of time – fell dramatically from 1997 to 2004.

There was overwhelming support from fishermen for a catch share system, and it passed at referendum by over 80%. In the first two years of the catch share the quota was reduced from 9 to 5 million lbs. However, as stocks have been rebuilding so has our quota. Now the fishery is thriving. There are red snapper everywhere, even in the eastern part of the gulf where you haven't seen them for 30 years.

There has been a tremendous reduction in discards. We have slowed down the pace at which we fish which has also improved the quality. If you can imagine during the derby years it was a race to pile up the fish, get to the dock, unload and back out for another trip. Much of the time the fish didn't have proper icing. Now we can take our time and focus on a high quality product, available to the customer all year. It has certainly given fishermen the ability to pick and choose when to go fishing, plus we've reduced our fuel bills.

Prices have stabilised to around $4.50/lb and we're able to work out when is the best time to go fishing, making sure there is a good price and the fish are going to sell. I would say that during the derby years the average deck-hand was earning US $25–30,000/year; whereas now it has near enough doubled to US$45–50,000/year.

The value of the catch shares has increased from US$10/lb to US$30/lb. You're looking at a 10% return if all you did was lease the fish. There is discussion on how to prevent it becoming an investor fishery. There is an ownership cap at 6%, for example, but I think this should have probably been set lower. However, the leasing element means there are actually more vessels participating in the fishery than there were 10 years ago. It also allows fishermen to lease out shares in the event of an illness or a vessel breakdown.

We have built on this sustainability through our Gulf Wild programme. Every fish that comes on board is tagged to tell you where, when and by whom it was caught. There are currently 30 boats participating but we are aiming for 150. Fishermen sign conservation covenants to say they are not going to discard anything, and we're about to install cameras to prove it. Already we are rebuilding markets and starting to see interest in Europe.

Our reputation is changing and Monterey Bay is considering moving Gulf Wild red snapper *off* the 'fish to avoid' list. I was unloading one of the boats in Destin the other day and had tourists walk up and say, 'Wow I ate a fish last night at Lulus that came off this boat'. We're seeing a great response."

Before intervention/s – Prior to 2007				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Average price paid per 1lb equivalent of shares: US$6.74	–	▪ Overfished ▪ Quota in 2007: 3,315,000lb whole weight But reduced to 2,550,000lb in 2008 & 2009	No. shareholders in IFQ system: 546	3% of actual ex-vessel of red snapper reinvested into management. This has been: US$250 – $300,000 per year over the past 4 years.	Average price paid per 1lb equivalent of shares US$19.94[1]	▪ No. stakeholders in IFQ system reduced by 22% mainly due to a reduction in small share ownership; ▪ Some shifts in distribution with slightly more shares held by fishermen residing in Florida	▪ Stock assessment in 2009 predicted stock would no longer be overfished. ▪ Quota in 2010: 3,542,000lb	No. shareholders in IFQ system: 425 (22% reduction)

Source of data: NOAA (2011) Gulf of Mexico 2010 Red Snapper Individual Fishing Quota Annual Report. (SERO-LAPP-2011-09)
Notes: [1] Price data has not been adjusted for inflation.

US

New England's Eliminator trawl

SPECIES FISHING GEAR

Interview with Mike Matulaitis, New England Groundfish fisherman

Species: Haddock (*Melanogrammus aeglefinus*) (eliminating cod)

Fishing gear: bottom trawling

Country: US

Ocean: Atlantic Ocean

"I had my doubts at first," says skipper Mike Matulaitis, speaking by phone from the Rose Marie, an 87ft fishing vessel based in New Bedford, Massachusetts. "When I started using the Eliminator trawl two seasons ago, I thought we wouldn't catch enough, that it would eliminate everything!"

The Eliminator won WWF's SmartGear competition in 2007 for innovations in fishing gear that reduce ecological impacts. It reduces by-catch of cod and other non-target species in groundfish fisheries. "The trawl travels just off the bottom, and works primarily on fish behaviour," says Matulaitis. "Cod, plaice and skate swim down and go through the large 8ft meshes on the lower face of the trawl. Haddock behave a little bit differently – they follow the twine into the cod end and are caught. There's very little by-catch of unwanted species, probably less than 1%."

The development of the eliminator is an example of the rewards of collaboration between fishermen, net makers and scientists. Originally, New England fishermen James O'Grady, Philip Rhule Snr and Phlip Rhule Jnr wanted to avoid catching other species, especially cod, when targeting haddock and approached the net maker Jon Knight of Superior Trawl, to develop a prototype. They then worked with Laura Skrobe and David Beutel of the University of Rhode Island to perfect and trial the design. The team members collectively brought practical experience, design expertise and a scientific approach to the table – it turned out to be a winning combination.

© WWF Smart Gear

"If you use the traditional type of trawl, you have to sort out all the by-catch on deck … We can get through a pile of fish a lot faster using this new gear; it's real clean. We spend less time sorting and more time fishing. It's all done as you go along"

In field sampling by researchers from the University of Rhode Island, the Eliminator's haddock catch equalled that of a traditional trawl, but the new gear reduced by-catch of cod by 81% and flounder by 95%. "We get a few skate and dogfish once in a while," Matulaitis says, "but far less than we did." Contact with the seabed is also minimised because the Eliminator is relatively light.

For skippers like Matulaitis, this has brought clear benefits. "If you use the traditional type of trawl, you have to sort out all the by-catch on deck," he explains. "We can get through a pile of fish a lot faster using this new gear; it's real clean. We spend less time sorting and more time fishing. It's all done as you go along." This experience is backed up by trials which suggest a threefold reduction in sorting times. Because vessels are hauling haddock, not by-catch, longer tows are possible – meaning crews spend less time hauling and resetting their nets, boosting efficiency further.

In the marketplace, too, there are advantages. "The fish aren't damaged at all," Mike Matulaitis explains. "Haddock are typically a soft fish, a delicate fish; if you bring them in with skate and other stuff, they're all scuffed up. Ours is a beautiful product. We haven't seen a price premium yet, but other guys have – and you earn less money if you have to have a lot of scalers cleaning up the catch."

An intriguing example of the benefits when the industry and science work together – with a US$30,000 prize as the bait!

US

New England Groundfish & Scallop Fishery

Interview with Paul Parker, Cape Cod Commercial Hook Fishermen's Association

SPECIES FISHING GEAR TONNAGE

Species: Cod, plaice, flounder, yellowtail, haddock, hake, pollock, redfish (groundfish); scallop

Fishing gear: Gill net, longline and trawl (groundfish); dredge (scallop)

Country: US

Ocean: North Atlantic

Annual tonnage: Groundfish: 35,000t and Scallop: 23,000t

Main markets: Groundfish: domestic; Scallops: Europe, Asia and Global

NORTH AMERICA

"I studied fisheries management and have worked in the policy arena for seven or eight years. Most of that time I've been a crewman on a longline boat or had other jobs with the local fleet. Our members fish for scallop and groundfish, and both have had their problems over the years. For scallops there was an annual quota but there were too few pounds to go round the number of small boats trying to catch it. With groundfish, there was overfishing and a continual reduction in the number of days fishermen were allowed to go to sea.

In 2005 it became clear that a quota system was planned for many of the New England fisheries. We became concerned that smaller boats wouldn't be competitive under that system. Once quota is allocated, the market begins to trade, and the rising cost of shares creates an uphill capital struggle for small businesses and new entrants, such as younger fishermen.

That's why we set up the Cape Cod Fisheries Trust. We began raising capital through loans, donations and foundation grants in 2005 and started to buy up quota in 2008. We lease quota shares to fishermen in our community at a preferential rate, pegged at one half of the unrestricted market cost. Scallop quota, if you can get it, costs US$3 a pound; our rate is around US$1.

Two-thirds of the US$3m we've raised is in low-interest debt, which we pay back with the cash flow from the lease. Most of the quota was purchased from Cape Cod fishermen who were retiring, or selling one quota to buy another.

The appreciation of the asset is immaterial to us – though it is significant. Between 1996 and 2009, groundfish quota was going up by 20% a year and is likely to double or triple in value over the next five years. In less than 24 months, scallop quota has increased from US$6 a pound to US$20 a pound.

We measure our success not in how much quota is worth, but in how many fishermen we are able to support, how many jobs we retain on Cape Cod, and how we are able to stimulate the next generation of fishermen to start new fishing businesses. Without the Trust, up to two-thirds of our 12 scallop businesses would have liquidated that part of their operation or got out of fishing. In the past two years, we've leased two million pounds of quota to 50 fishing vessels and 120 captains and crew. That's a lot of jobs. Another thing we do is provide a suite of free business services, helping fishermen with the financial aspects so they become more bankable and less reliant on the Trust.

Now we're looking at the idea of conservation covenants. Already we have leasehold covenants, conditions upon which quota is leased, the main one being compliance with the quota. There could be others, such as having to be part of a by-catch avoidance programme or using trawls that don't catch cod."

Before intervention/s – 2005				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ Scallop: US$2–3 million catch value ▪ Scallop quota: US$3–6/lb ▪ Groundfish quota: US$1–2/lb	Crew wage – satisfactory	Increasing stock	12 vessels part of association	▪ US$2 million capital ▪ US$200,000 Operation	▪ US$5million catch value ▪ Scallop quota: US$20/lb ▪ Groundfish quota: US$3–5/lb	▪ Crew's wages improved ▪ Cape Cod Fisheries Trust leases out at US$1.25/lb ▪ Over past 2 years leased to 50 vessels & 120 captains and crew	Stable stock	12 Scallop fishing businesses stayed in business

US

West Coast Pacific Albacore Tuna Fishery

SPECIES FISHING GEAR TONNAGE

Interview with Natalie Webster, Director of Operations, American Albacore Fishing Association (AAFA)

Species: Albacore tuna (*Thunnus alalunga*)

Fishing gear: Trolling (N and S Pacific) and Pole-and-line (N Pacific)

Country: US

Ocean: North Pacific and South Pacific

Fishery tonnage: 10,000 tonnes

Main markets: United States and worldwide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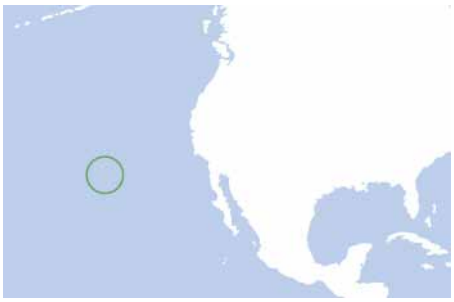


"My father and grandfather skippered tuna boats, and my husband Jack is a tuna fisherman too, so I know all about the ups and downs. In the 1980s, imports of cheap tuna put most of the San Diego canneries out of business and, by the 1990s, the tuna fleet had begun to shrink. We thought the fishery would cease to exist because most fishers were in their mid to late 50s. The next generation wasn't coming through because of instability and low prices.

The first thing we did, in 2004, was set up our association to give a voice to pole-and-line, and troll[9] tuna fishers. Both fishing methods we use are 'clean', catching one fish at a time. By-catch is rare, but any there is can be released quickly from barbless hooks. Despite this, we were going nowhere. The fishers didn't think they had true representation of their sustainable harvest method.

We knew that, if we told our story, we could find new markets and stabilise prices. Ours was a niche product, but it had never been pushed. US buyers just rolled it into tuna commodity trading programmes and we were left short.

At about that time, we heard about the Marine Stewardship Council. We believed it would be one of the building blocks in telling our story to an international forum, so we entered the programme and got certified in 2007.

Even before that, we'd built good relationships in Europe, educating buyers about the uniqueness of our fishery, the families and the human story behind it. Confident of a market, we set a stable price of US$2,260 per tonne for the whole season, instead of US$1,700 on the volatile dockside market. Before, fishers never knew what price they would get until they returned to harbour.

It was an example of people unifying and saying, 'We need to create a better future, we need to be able to repair our boats in the off season so we and our crews can be safe'. We couldn't have done that without the MSC.

Five years later, all the big UK supermarket chains stock our products and we have market penetration in Switzerland, Germany and France. Those products include not just canned tuna and frozen whole round tuna, but also smoked tuna and blast-frozen steaks, medallions and sashimi-grade loins. The more markets we build, the more we are creating stability for our fishery.

"It was an example of people unifying and saying, 'We need to create a better future, we need to be able to repair our boats in the off season so we and our crews can be safe'. We couldn't have done that without the MSC"

By preserving our livelihood, we are preserving one of the least intensive fishing methods – and fishing pressure is well below levels likely to cause overfishing. At the last annual surveillance, albacore stock was determined to be at high abundance and stock biomass was well above precautionary limits.

It's an incentive for other fisheries to take a look at their harvest methods and say, 'Hey, what can we do?' Let's at least have the conversation with MSC, or WWF or another NGO, so we can bring our fishery into the realm of sustainability, market that, and be part of the new chapter in seafood."

Before intervention/s – (1990s)				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ Value of fishery 2007: US$21.5 million ▪ Volatile price around: US$1,700/t	–	At or near full exploitation (2004)	Vessels: 652-870 (pre-2004)	Cost of MSC certification	▪ Value of fishery 2010: US $29.5 million ▪ Stable price of US $2,260/t	–	Recent stock assessment (Sept 2009): high abundance & above precautionary limits	Vessels: 651 (2010)

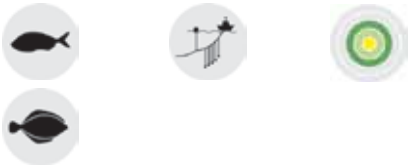
9 Trolling is a method of fishing where one or more fishing lines, baited with lures or bait fish, are drawn through the water.

US

Alaskans Own

Interview with Linda Behnken, Executive Director of the Alaska Longline Fishermen's Association (ALFA)

SPECIES FISHING GEAR TONNAGE



Species: Pacific halibut (*Hippoglossus stenolepis*); Sablefish/Black cod (*Anoplopoma fimbria*)

Fishing methods: Longline

Country: US

Fishery tonnage: Pacific halibut: 24,000t; Sablefish: 18,100t

Markets: US

"I started fishing in 1982. I have fished pacific halibut, black cod and rock fish; caught crab way out into the Bering Sea; and trolled for salmon. I now share a boat with my husband and our children often join us on fishing trips.

The catch share systems for halibut and black cod have been one of the most important interventions to support sustainability of our fisheries, but not without its side effects. I don't know any catch share system that hasn't had pretty significant socio-economic impacts. We worked hard so that elements were in place to prevent over-consolidation in the fishery, for example limits on quota ownership. These have helped, but even so the fleet has been cut in half and the price of quota has gone up 500%. This has created challenges for people based in small fishing communities where there are limited opportunities for other employment.

"Fishermen have really jumped in on this project, and have also been the ones to solve some of the complex data challenges"

We started the Alaska Sustainable Fisheries Trust almost 3 years ago to support our community based fisheries. One of initiatives, 'Alaskans Own', markets fish from boats that have signed up to sustainability criteria. We do this through a local subscription scheme. All the fish is portioned and vacuum packed and when people pick up their monthly box they get a newsletter telling them all about our work, recipes and a profile of one of the fishermen. The scheme has worked really well. Subscriptions are up 300% from the first year, and we are now supplying monthly boxes of fish to 235 households within South-East Alaska. Our aim is to generate a revenue stream to support our conservation work.

All our fishermen are working in MSC certified fisheries, but we go above and beyond these requirements. One of the most exciting pieces of research has been our innovative project to map by-catch rates simultaneously with bathymetric mapping of the seabed. As a result, fishermen have brought down our by-catch rates significantly (for example: 20% reduction in rockfish by-catch in the halibut fishery). Fishermen have really jumped in on this project, and have also been the ones to solve some of the complex data challenges.

Some of us get the big picture and know that if you don't go the extra mile to protect the resource you can't be assured of it in the future. For others it has been the recognition that we received, from consumers, managers and scientists, which is important. Research funding has also supported our association and its ability to represent fishermen on a range of issues, none less than the catch share system. Many of our fishermen would not be able to sustain high membership costs and we are very grateful to funders such as the OAK foundation.

For the future, we are looking to secure a funding mechanism that will provide affordable down payments to afford fishing access privileges. Many loans require a 20-30% deposit which is out of reach for many young entrants. The catch share system has been vital in protecting our resources for the future and has given us the time to fish carefully, but if we had these mitigation measures in place in the beginning we would be in a completely different place today."

Before intervention (Prior to 1995)				Transition	After intervention Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Halibut prices: Price: <US$1.50/ pound	–	Stable	4,000	Alaskans Own & Fisheries Conservation Network = US$100,000/year	▪ Halibut prices: US$7-7.5/pound ▪ Catch: 24,000t (Halibut) ▪ Quota prices increased by 500%	More difficult to enter the fishery	Pacific Halibut stocks currently in cyclical low abundance.	2,000

> **“We were incredibly fortunate on how we designed the catch share system. Fishermen thrashed this out themselves, literally around the bar drawing on paper napkins, until we could reach a consensus.”**
>
> Jeremy Brown, Halibut Fisher, Seattle

US

SPECIES FISHING GEAR TONNAGE

North Pacific Halibut Fishery

Interview with Jeremy Brown, Halibut fisher based in Seattle

Species: Pacific halibut (*Hippoglossus stenolepis*)

Fishing gear: Longline

Country: US

Ocean: Pacific

Fishery tonnage: 24,000t

Markets: US

"In biological terms the Pacific Halibut fishery was never unsustainable but *it was* from a social, economic and safety perspective. By the 1980s, with increasing effort, managers were forced to reduce the fishery to 24 hours to protect the stock. You had no choice on whether to go out or not, and half the time it was blowing a gale. All of us knew people who didn't come back.

The catch share system has completely altered the fishery. It was previously a derby fishery and a free for all. There would be a lot of preparation gearing up 4,000 boats, and with the opening of the fishery the fervour was immense. Yet it was brutal and incredibly dangerous and fundamentally not a good way to manage a fishery. Today, fishermen can take their time and it has turned from a part time to a full time fishery.

We were incredibly fortunate on how we designed the catch share system. Fishermen thrashed this out themselves, literally around the bar drawing on paper napkins, until we could reach a consensus. We realized that we had to change, but we made sure that quota could only be held by fishermen who had spent time on deck and it was not possible to lease quota.[10] We wanted to make sure it was boots and not suits involved in the fishery.

In the first four years of the catch share system the fleet has been cut by half. There were winners and losers, and not everyone received quota. Some people took the windfall, and cashed in straight away. For others, like myself, it was necessary to buy quota. Government loans freed up a source of funding and have pushed up the value of the quota. It had an inflationary impact but it is what it took to capitalize the fishery.

There have been a number of significant economic benefits of changing to a catch share system. During the derby days we would be lucky to get US$1/pound and retailers would get a 900% mark up; but today there has been a shift of economic and political power towards the fishermen. We are getting a large piece of the pie at around US$7/pound which is then sold for a more modest 185% mark up.[11]

Exploitation rates have reduced from 30% to 20% of the catchable biomass; and the fishery is easier to manage. It had always been a battle for the managers to reduce days at sea, but now fishermen often vote for lower quota, especially as we've recently been through a downward cycle in abundance due to oceanic changes. There are now some strong year classes coming through but we agree with the management that we need a couple of good recruitment years before we put the quota back up. This is a huge mind-shift towards long-term stewardship of the resource.

The significant increase in the sport fishery for halibut is a concern; and on derby days we would all have to spread out whereas today there is more of a tendency to concentrate our fishing leading to localized depletions. However, we are doing a lot right and are now an MSC certified fishery. We didn't need the label, but the guys felt they deserved it."

Before intervention/s – (Before 1995)				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Price: <US$1.50/ pound	Crew's wages: US$0-20,000 highly variable	Stable	4,000	3% of gross landing value is collected as a management fee	▪ Catch: 24,000t ▪ Price: US$7 – 7.5/pound	Crew's wages: (on a full season halibut boat) US$60-100,000	▪ Reduced exploitation rate from 30% to 20% ▪ Pacific Halibut stocks currently in cyclical low abundance	2,000

10 Retired fishermen who received initial allocations are allowed very restricted leasing.
11 For round weight: fillets

CHILE

Chilean Loco Fishery

SPECIES FISHING GEAR TONNAGE

Interview with Juan Carlos Castilla, Professor in Marine Ecology, Catholic University of Chile

Species: Loco, *Concholepas concholepas*

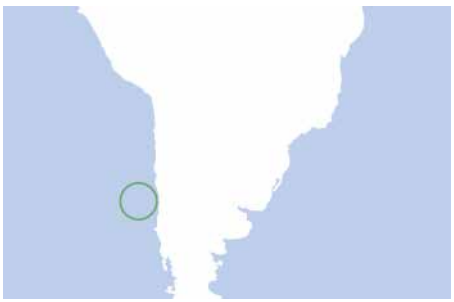
Fishing gear: Diver-caught

Country: Chile

Ocean: South Pacific

Fishery tonnage: 3,000 to 5,000t

Markets: Japan, Hong Kong and Korea (two-thirds); domestic (one-third)



SOUTH AMERICA

"I'm a scientist, not a fisherman, but I've spent my life studying the small artisanal fisheries of Chile. There are perhaps 14,000 commercial divers registered here, and many more who are not, and most are harvesting locos – *Concholepas concholepas*, a snail-like mollusc – which are a delicacy in the Far East. In the early 1980s, under Pinochet, small-scale fisheries were open-access. As the markets opened up widely and demand from Japan increased, it caused a surge in fishing effort. Divers moved along Chile to fish for locos. By 1989 the fishery had collapsed and the government closed it.

In 1982 I set up a reserve where fishing was banned to study natural re-stocking and changing ecology. With this research, I persuaded the government to allocate to two small-scale diver communities the exclusive rights to fish a closed area of seabed – not just for locos but sea urchin, limpets, crabs, etc. This formed the basis of legislation introduced in 1991, to create MEABRs (areas for the management and exploitation of benthic resources) from 1995.

"The main benefit for fishers has been better market prices. Since the policy change, export values have ranged from US$15,000 to US$25,000 per tonne, more than double what they were during the open access period"

Twenty-five years later, there are 500 of these little areas (60-200 hectares each). Communities pay for a science-based stock assessment every year, conducted by a third party. They then go to the Undersecretary of Fisheries and say, 'OK, we've 100,000 locos in our area, and their allowable catch will be about 25% of that under a harvest control rule'. They also pay an annual fee of US$20 per hectare for the exclusive right to manage and fish.

Before stocks collapsed, fishers were landing up to 25,000 tonnes a year. Since the 1991 Act was applied, they've extracted no more than 5,000 tonnes a year. Consistent harvests suggest stocks are stable at three times catch level or more. The number of locos is higher inside closed areas – as is the mean size of individuals – meaning catch per unit effort has increased.

The main benefit for fishers has been better market prices. Since the policy change, export values have ranged from US$15,000 to US$25,000 per tonne, more than double what they were during the open access period. Our research shows that biodiversity is richer inside MEABRs than outside. Rock fish are more plentiful because nobody is catching them.

There has been a social benefit, too. This system has put an end to 'the tragedy of the commons': when things belong to everybody and nobody cares. Fishers now have a sense of pride in their area, they are empowered by ownership and better organised – and it's difficult to organise hunters!

One of them – the President of AG San Pedro, a syndicate of fishers in central Chile – says his organisation favoured MEABRs even before they formally existed. 'We'd been looking after our sector here since 1991,' he tells me, 'before the MEABR regulation was put into place we had an MEABR commission. That's why we were ready in 1995 to engage immediately with MEABR policy.' People were hungry for change, and that was a key driver."

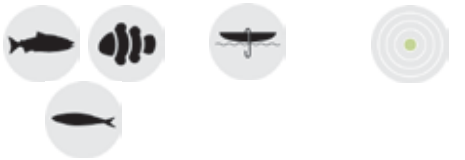
Before intervention/s – No previous data available				Transition	After intervention/s– Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
–	–	–	–	–	Export value: US$15,000 to US$25,000 (Doubled from open access period in 1980s)	–	500 TURFS established (60-200ha each)	14,000 commercial divers

COLOMBIA

Bahia Solano Community Fishery

Interviews with stakeholders of the MarViva Project

SPECIES FISHING GEAR TONNAGE



Species: Mixed species (tuna, snapper, jacks, mackerel)

Fishing methods: Handline

Country: Colombia

Ocean: Pacific Ocean

Fishery tonnage: 18t/year

Markets: Colombia (domestic)

© Giovanni Melo, MarViva

"The fishing communities of Bahia Solano within the Eastern Tropical Pacific corridor are surrounded by significant marine biodiversity. Whales, sharks, turtles, and over 1,000 species of fish species, as well as rocky-coral grounds occur in their coastal waters. However, these afro-communities are poor, have limited access to electricity and no road access to Bogota.

José Díaz, of the local NGO MarViva, explains how they have supported an initiative to link communities to markets. "It all started with a marine spatial planning project to map out activities within this ecosystem and determine conflicts between industrial fisheries, artisanal fishers and tourism. We realized that artisanal fishers had no direct access to markets. They were selling to intermediaries for poor prices and over-fishing to make ends meet. We developed a commercial alliance with the restaurant chain 'Wok' in Bogota that specializes in Asian food. The fishermen agreed to supply certain sizes, within the right season and using the right gears; and in return the restaurant pays a better price and provided training on quality practices and basic accounting skills. Fishermen receive at least $3.5/kg more and their fishing association has made a profit for the first time this year, enabling them to reinvest in community projects."

Ricardo Macia and Benjamin Villegas from Wok explain why they were so interested in the initiative, "We made a decision some years ago to source local produce where possible. Fish is a major ingredient on our menu and we were keen to work with local fishermen. The benefits to us have been significant. We have been able to secure a supply of fresh local fish and our customers associate us with good environmental practices and a philosophy of sustainability."

Logistically the project has been a challenge given that the area is only accessible by plane, but the fishermen have been motivated to make the project work. Bertha Bedoya, a committee member of the fishermen's association explains, "There have been benefits for our community on many levels, not just the commercial development of the cold chain itself but we are also strengthened as a group. It is such a change to work with a trading partner who is not only interested in buying but is concerned for how we grow as an association. Now that we are paid a fair price we don't overfish and only catch types of fish that are not at risk. We have stopped fishing with small nets to protect smaller fish and species that have no commercial value but are important for the equilibrium of the ecosystem. We are clear about our commitment to sustainable fishing and this distinguishes us from neighbouring communities who still over-exploit marine resources."

"The benefits to us have been significant. We have been able to secure a supply of fresh local fish and our customers associate us with good environmental practices and a philosophy of sustainability"

José explains how there is also ongoing work in Bahia Solano to support the communities through their transition, "We are monitoring daily catch to ensure compliance with sustainability practices and status of the stock, and working with women to ensure an even distribution of benefits. However, we feel that this project shows that we can support sustainable fisheries and generate development in a very remote place."

Before intervention – 2009				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Prices paid by intermediaries US$1.5-2/kg	–	–	56 fishermen in 2009	US$20,000 plus MarViva staff costs	Price increase by US$3.5/kg	▪ Improved organization of association ▪ Association profits reinvested into community development projects	▪ Improved fishing practices ▪ Ongoing monitoring to see an improvement in stock	56 fishermen

ECUADOR

Ecuadorian Mahi-mahi Fishery

SPECIES FISHING GEAR TONNAGE

Interview with José Conforme, a fisher from San Mateo

Species: Mahi-mahi (*Coryphaena hippurus*)
Fishing gear: Longline
Country: Ecuador
Ocean: Pacific
Fishery tonnage: 3,875 tonnes (2009)
Main markets: US


© Pablo Guerro

SOUTH AMERICA

"I have been a fisherman since I was 13 years old. We used to leave each day at dawn and return to the shore at noon as we had no way of keeping our catch cool. In those days we only had to travel 10-15 miles from the shore, but now we have to travel much longer distances to reach the fishing grounds. Our catch, the mahi-mahi is caught both from our artisanal boats but also from large industrial boats.

Over the last 40 years I have seen some bad things happen in the fishery, the stocks have been overfished and this has meant that we have to search longer to find our catch. Some years ago, when we were still using old fashioned hooks on our longlines we used to catch turtles and this was probably the main cause behind a massive decline in the loggerhead and giant leatherback turtle populations.

As fishers we wanted to catch fish, not turtles, so we realised that things had to change. It was about five years ago when the changes began, firstly by encouraging those involved in the fishery to participate as part of a broad coalition that included local, national, and international fishers' unions, co-operatives, industry groups, government and inter-governmental bodies, and environmental groups.


© Pablo Guerro

"Of course it is not all good news; due to stricter controls some jobs have been lost. However, as a community we believe that the new management regime will benefit us all"

One of the big changes we made was the introduction of circle hooks to help us to not catch turtles. This, along with training in how to release turtles that had been caught, has massively reduced the by-catch of turtles. Our government has also been working with us to bring in new measures to make our fishery more sustainable. We know that this is needed, not only to ensure that we can sell our mahi-mahi product overseas, but also because we want to keep the mahi-mahi resource safe for the future – for our children.

Our National Plan of Action on the conservation and management of the mahi mahi was introduced in 2011 as well as a fishery observer program which will make sure that fishers comply. Some of these measures have already been in force and we are pleased with many of them. For example there is better monitoring of fishing activity, we have a minimum size restriction, and as fishers we have been taught more about the fish that we catch. We now understand about the biology of the mahi mahi and can see why it was so important to have a closed season to allow the mahi mahi to grow and spawn. Of course it is not all good news; due to stricter controls some jobs have been lost. However, as a community we believe that the new management regime will benefit us all."

Before intervention/s - Mid 2000's				Transition	After intervention/s - 2009			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Average annual catch of 7000 tonnes	Crew: US$1,785 per season	Data not available	2500 vessels	US$694,440	3,875 tonnes valued at US$26 million	• Crew: US$3,570 per season • An increase but some loss of jobs	Data not available	There was a reduction in the number of vessels in the fishery

PERU

SPECIES FISHING GEAR TONNAGE

Peruvian Anchovy Fishery

Interview with Adriana Giudice, CEO
Austral Group S.A.A

Species: Anchovy (*Engraulis ringens*)

Fishing gear: Purse Seines

Country: Peru

Ocean: Pacific Ocean

Fishery tonnage: 5 – 6.5 million tonnes

Markets: China (also Germany, Japan and Vietnam)

"We catch anchovies and process them into fishmeal and fish oil, as well as canning fish. Peru is fortunate in having one of the richest oceans in the world. The most important resource is the anchovy stock but management has always been a challenge. The fishery is affected by the El Nino phenomenon every three to four years, where warm water inflows have a negative impact on the biomass.

Since the 1990s, we have had a stable system of setting total catches based on stock assessments conducted by the Peruvian Institute of the Sea, IMARPE. However, this system brought a major increase in the fleet, which required a reduction in the fishing season to 50 days per year. Catching five to six million tonnes meant some days 150,000t of fish were fished, putting the biomass under pressure and leading to risky working conditions for crew members in this race for the resource.

In 2009 the government introduced an individual quota system, supported by most of the companies and workers from the sector. The fishing season has been extended to 190 days and average catches per day reduced to 30,000t. This has been a really positive measure, meaning there are not so many boats crowded in bays at the same time. Austral now owns 7% of the quota for the northern stock, and 4% of the southern stock. We have reduced our vessels from 38 to 22 and it costs us less to catch the same amount of fish. Meanwhile, crew members have safer working conditions, reflected in the smaller number of accidents.

There have been quality improvements too. The fish we catch arrives fresher as there is no need to catch fish intensively and boats do not need to queue to come into port for unloading. Before, 40% of our fishmeal production was super prime and prime quality; but this has now increased to 70%. This has a significant impact on the bottom line given that the gap between standard and prime fishmeal is now US$200/tonne.

"We have reduced our vessels from 38 to 22 and it costs us less to catch the same amount of fish"

The changes have required capacity reduction. In the entire industry the number of fishing vessels has reduced from 1,172 to 868, meaning a reduction of 26% in fishing power. The number of crew has also dropped by 2,500, yet for those who remain wages have increased by 40%. The fisheries law ensured that there were mitigation measures in place to address social issues from moving to the quota system. Crew could only be made redundant voluntarily, and receive over 1.5 times usual redundancy payments. We are also required to support them through a training programme for a new career. This covers the cost of training for up to three years and 20% of their previous salary to help with living costs. Furthermore, companies pay US$1.95/t into a pension fund for crew and, over a three year period, have invested around US$29million.

I think the industry's confidence is illustrated by its investment in environmental quality. This has already improved with the decrease in vessels, but the industry is investing a further US$465 million on meeting new targets to reduce air and water emissions by 2015."

Before intervention/s – 2008				Transition	After intervention/s – 2011			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ Estimated overinvestment of US$1,000 million ▪ Higher Production of FAQ fishmeal	▪ Fleet surplus approx: 5,700 workers ▪ Hazardous working conditions due to the race for the resource.	▪ 9.8 m tonnes (Biomass 2008) ▪ Quotas: 1st season : 3 million ▪ 2nd season: 2 million	1,172 (excess of 40% hold capacity and 400 vessels)	Industry invested: ▪ US$50m in redundancies & training programmes ▪ US$1.95/t into a pension fund for crew – total US$29 million over three years ▪ US$465 million up until 2013 on reducing air/water emissions	▪ Increased prime quality from 40% to 70% ▪ Prime quality receives higher price (up to US$200/t more than standard quality)	▪ Crew reduced by 2,100 ▪ Crew's wages increased by 40% ▪ Lower number of accidents ▪ Investment in training	▪ 10.6m tonnes (Last report Oct 2011) ▪ Quotas: 1st season: 3.7 million ▪ 2nd season: Quota fixed at 2.5million tonnes	868

SURINAME

Surinamese Atlantic Seabob Shrimp Fishery

Interviews with stakeholders of the fishery

SPECIES FISHING GEAR TONNAGE

Species: Atlantic seabob shrimp (*Xiphopenaeus kroyeri*)

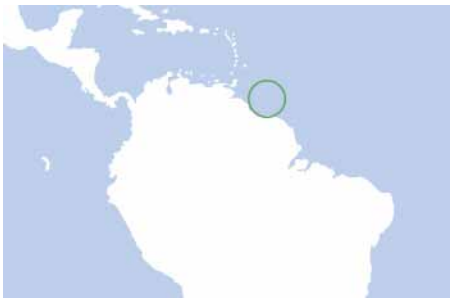
Fishing gear: Twin rig otter trawl

Country: Suriname

Ocean: Western Atlantic

Annual tonnage: 8 –12,000 tonnes (2001– 2010)

Markets: Europe and the United States



SOUTH AMERICA

Poised to set their trawl from a motorised outrigger off South America, the seabob shrimp fishers of Suriname have wider grins than usual. In November 2011, theirs became the first tropical shrimp fishery in the world to be certified by the Marine Stewardship Council. "The only job I know how to do well is catching seabob," says George Abrams, skipper of the Noble Star. "To know that the MSC will make the stock sustainable for a very long time is good news for us. My crew and I know we will have jobs and be able to maintain our families."

Established in 1995, the seabob fishery was a departure from traditional practices; fishers had hitherto harvested the larger, higher-value *penaeus* prawn. "When catches went down, the alternative was the smaller Atlantic seabob," says Chris Meskens of the Heiploeg Group, the European company that owns 10 vessels in the 20-strong seabob fleet. "This presented us with a market opportunity. Tropical prawns are a big part of our business, but they suffered from a negative image. Seabob gave us a chance to change that."

In 2007, Heiploeg set up a project to "lift tropical prawns out of that spiral of negative perception by doing something positive". One priority was a stock assessment – Suriname's first – to provide a baseline. MSC assessment followed in 2009. Before that, there were closed areas, restricted licenses, VMS and turtle exclusion devices. To meet the MSC standard, a code of conduct was drawn up for the fleet and by-catch reduction devices (BRDs) with escape panels were introduced.

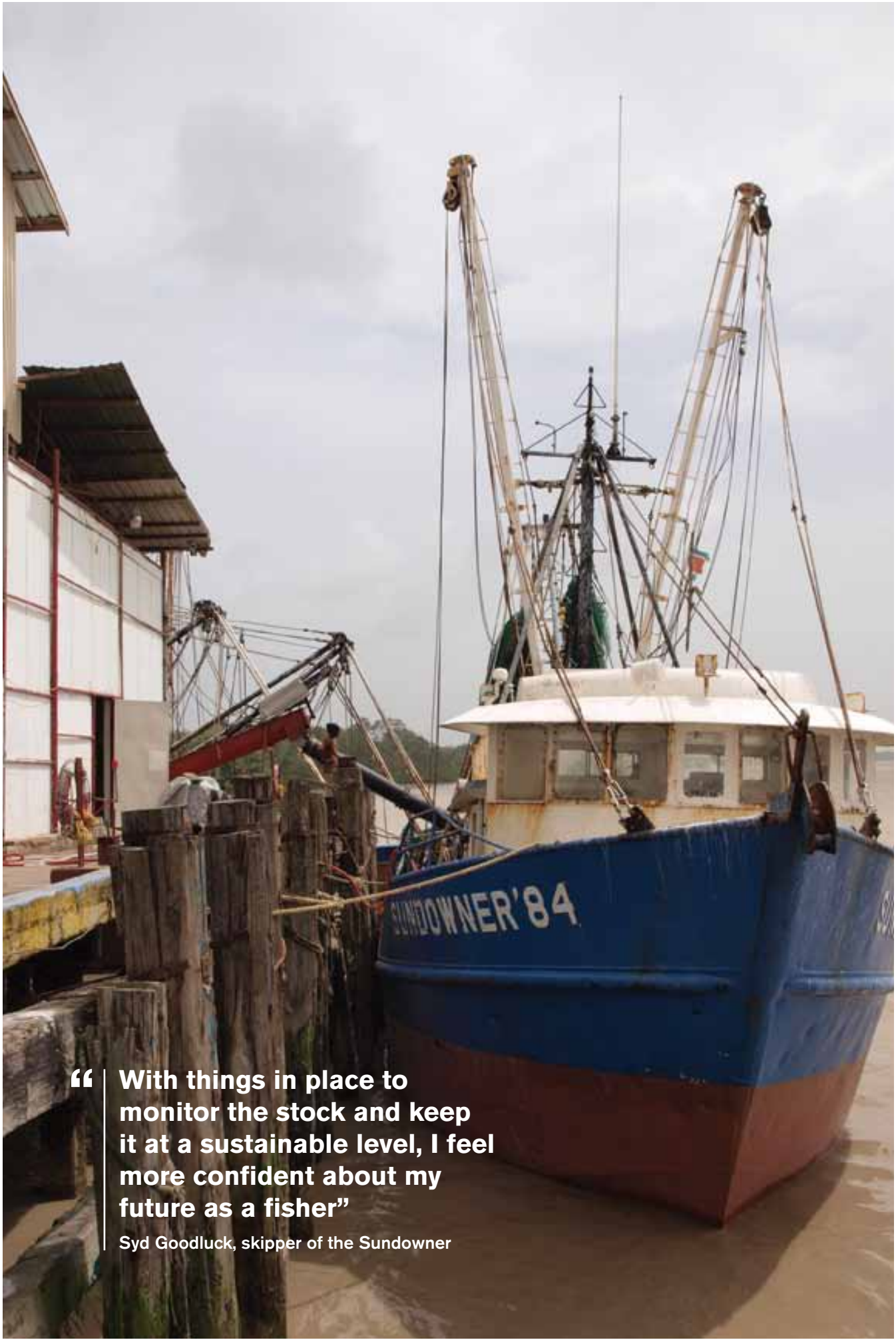
Surveys show this has reduced by-catch by 24% to 34%, a boon for fishers as well as fish. "In the beginning we thought BRDs wouldn't work, that we would lose seabob," recalls Steve Hall, skipper of the Neptune 6. "After the tests we were happy because we didn't lose much seabob but by-catch was reduced by a third. For me and my crew, that's less sorting on the back deck."

It is too early to talk about price premiums, but there have been benefits for the wider fishing community. Inspired by the MSC process, the Surinamese government has set up a seabob working group of artisanal and commercial fishers, industry partners, fisheries department staff and an NGO. Satisfied with progress, it intends to adopt the model for all fisheries in Suriname. The country has also had its first ever fishery-specific management plan implemented, for which seabob was the precursor.

Further work needs to be done on the role of seabob in the ecosystem and the impact of trawling on the seabed. In September, a PhD student was appointed to conduct research, with funding from the Belgian government.

"With things in place to monitor the stock and keep it at a sustainable level, I feel more confident about my future as a fisher," says Syd Goodluck, skipper of the Sundowner. "Soon, everyone will prefer to buy seafood from a company that is fishing in a sustainable manner like us. The MSC logo proves we are."

Before intervention/s – Current				Transition	After intervention/s – Too early to show benefits			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Current yield: 8,224t	–	▪ MSY: 6–10,500t ▪ By-catch reduced by 24%	20 vessels	–	–	–	–	–



“With things in place to monitor the stock and keep it at a sustainable level, I feel more confident about my future as a fisher”

Syd Goodluck, skipper of the Sundowner

DENMARK

Baltic Sea Cod Fishery

Interview with Michael Andersen, Danish Fisherman's Association

SPECIES FISHING GEAR TONNAGE

Species: Atlantic cod (*Gadus morhua*)

Fishing gear: Demersal trawls, long lines, Drift-nets

Country: Denmark

Ocean: Baltic Sea

Fishery tonnage: 368,000t (estimated for 2012)

Markets: Europe

"I used to work as a fisheries biologist, but now advise the Danish Fisherman's Association. We represent all Danish fishermen, including those fishing for cod in the Baltic Sea.

In the mid 1980s the stock levels were strong, but by the early 1990s stocks had dramatically declined and the situation continued into the 2000s. The decline was driven by high catch levels, but environmental conditions also played an important role. However, as environmental conditions improved again during the early 2000s, the stocks did not increase. A key problem was illegal catch, particularly in Poland. It was not just a Polish problem, but controls here were particularly weak and initially there was limited political will to change the situation.

Legal fishermen in Poland were fed up with the illegal operators and the effect it had on the reputation of their fishery. The German, Swedish and Danish fishing industries also felt they were not operating on a level playing field. Collaboration between the fishing industry, fish processors, scientists, NGOs and managers at the national and EU level put pressure on Poland to improve controls and action was taken. The results have been impressive and illegal catches fell from 20,000t in 2004 to 5,000t in 2007 and are now near zero.

At the same time, we developed a multi-annual fishing plan to reduce fishing mortality and allow the stock to recover. Everyone saw the benefits of doing this but it was a question of, 'How do we ensure that if we put money in the bank it will not be taken by someone else?' The fishing industry, NGOs and other stakeholders were all represented at the Baltic Sea Regional Advisory Council where the plan was discussed. By the time it was agreed by Ministers it had been fully debated. There were compromises but it was a pragmatic way forward.

Spawning stock biomass has increased significantly from 60-100,000t in the mid 1990s to an estimated 368,000t for 2012. This has been helped by saline inflows from the North Sea which is required for successful recruitment.

"Baltic cod has not been sold in Sweden for many years, but they are reconsidering this and McDonalds has started buying again"

Another benefit of the reduction in illegal and unreported fishing has been the improved data availability for stock assessments. The reputation of the fishery has also improved. Baltic cod has not been sold in Sweden for many years, but they are reconsidering this and McDonalds has started buying again. We also received MSC certification in 2010. For fishermen still in the fishery, wages have improved but many have had to leave the industry, particularly drift-netters but also some larger boats.

Much has changed in the fishery since the mid-90s. We have 50% fewer vessels in Denmark alone as a result of decommissioning and ITQs. There has also been the compulsory introduction of more selective gear. We feel that it is going the right way for cod, but that future management need to be more flexible. We are currently tied to a maximum TAC increase of 15% per year and as a result we are currently under exploiting the stock. A better problem to be faced with however and we are hopeful for the future."

Before intervention/s				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
–	–	▪ Illegal catches: 20,000t (2004) ▪ SSB: 60-100,000t (mid 1990s)	–	▪ Cost of increased control in Poland ▪ Cost of decommissioning programmes ▪ Cost of preparing multi-annual fisheries management plan	Prices improved with better market access	▪ Average wages increased ▪ Many fishermen left the fishery – some compensated (decommissioning, ITQ) but others bankrupt in 1990s and early 2000s	▪ Illegal catches: 0 (2007) ▪ SSB: 368,000t (estimated for 2012) ▪ TAC increased by 15% each year	Cut by 50%

FRANCE

SPECIES FISHING GEAR TONNAGE

Prud'hommes de la Pêche: Community fisheries along the Mediterranean Coast

Interview with Christian Decugis, Prud'homme

Species: Mixed (flatfish, sea bream, scorpion fish, wolf fish, hake, eel and shellfish)

Fishing gear: Longlines, nets and traps

Country: France

Ocean: Mediterranean

Fishery tonnage: 100t (2010)

Main markets: Local markets

"The Prud'homme institution was officially recognized in 1859 – so we have a long history. We are professional fishermen elected as representatives with responsibility to sustain fisheries within our territorial seas. There are 33 Prud'homme committees along the Mediterranean coast, representing 1,650 fishermen.

Following the industrialization of fishing in the Mediterranean in the 1980s we almost lost out but succeeded in reorienting ourselves towards providing high quality local seafood. We fish in small boats from 6 to 12m using longlines, nets and traps to catch: flatfish, sea bream, scorpion fish, wolf fish, hake, eel and shellfish. We leave the species of less value – such as sardines and anchovies – to the industrial sector.

One of the major challenges we face is ensuring that national and European regulations are relevant to our small-scale fleets. We have to defend our interests from a European-wide reduction in the artisanal fleet, which may be relevant to other Mediterranean countries, but is not here where the government has already capped the number of licenses and we have our Prud'homme institution to oversee fisheries management.

In 2006 following the EU technical regulations for the Mediterranean we reviewed and adjusted our local regulations. In St Raphael we took a number of steps to make our regulations more stringent. For example, the EU regulation allows 6km of net, whereas we only allow 5km. We have also banned trawling and while the EU allows lobster fishing throughout the year we limit this to four months. In the case of an infraction, we may first give a warning but can follow this up with a fine and even suspend fishing licenses.

A significant development was the creation of a reserve in 2004. This covers 450ha – the largest marine reserve in France. The reserve is incredibly rich in fish and biodiversity, but is also an area that is difficult to access. There were some fishermen from Cannes who were unhappy with the reserve, but as it is within our territory we had the right to close it, and our fishermen unanimously voted for the closure.

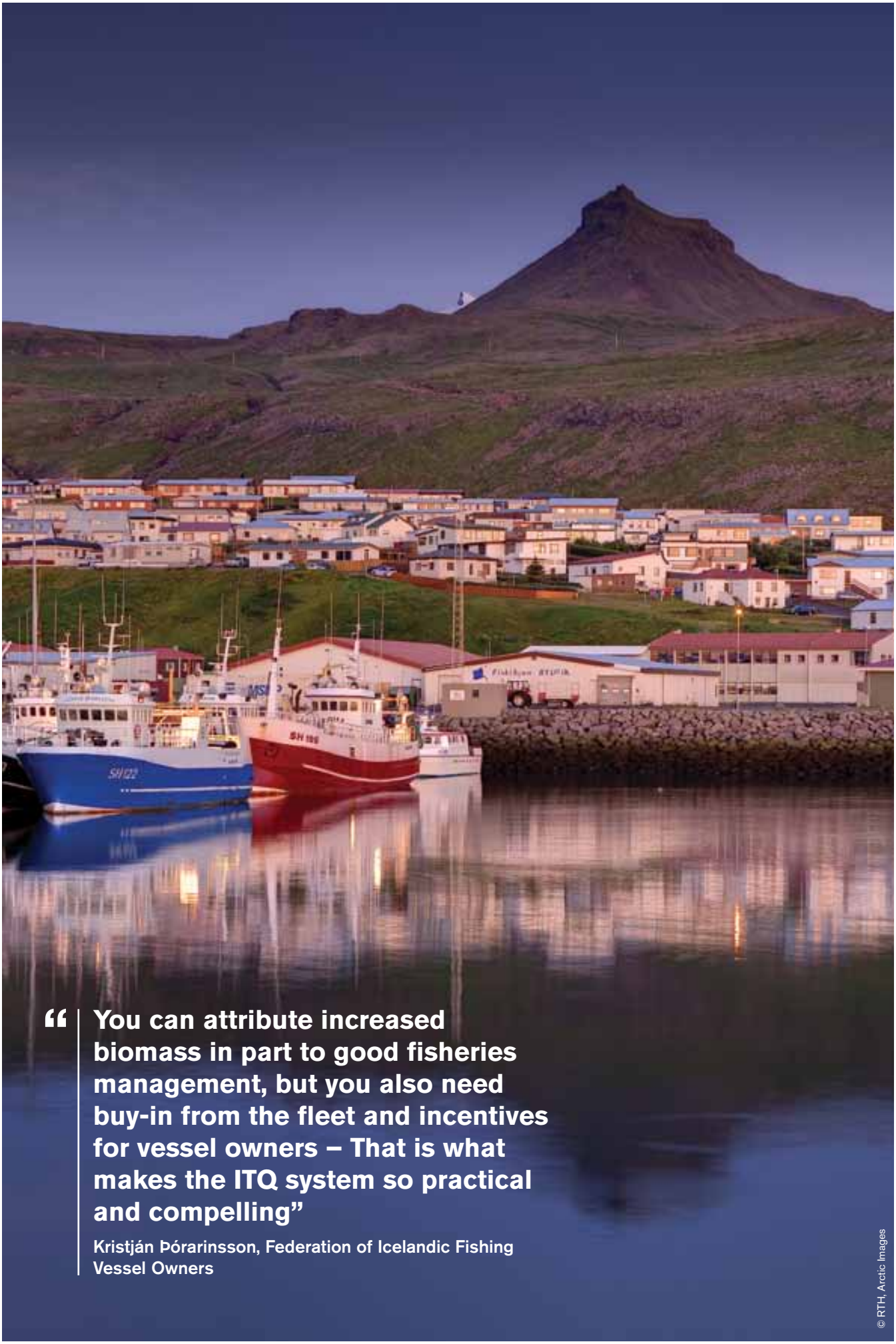
We have seen benefits of the reserve, and scientific studies have shown that fish are twice as large within the reserve, and are left in peace to spawn contributing to the rest of our fishing grounds. We have also noticed some reserve spillover effects, but this is difficult to prove. What is more certain is that the reserve has enabled us to show to the authorities that as fishermen we take our custodian responsibilities seriously.

There are wider benefits of the Prud'homme structure. It provides representation at the national and EU level, and a voice in local developments or wider policy changes. Fishermen also benefit economically. As we have been gifted a number of buildings over our long history, we can rent them out to realise revenue. This is put back into our profession by providing equipment and ice free of charge to our members.

For the future, we want to ensure that our institution is recognised by the European Union so that we have a voice in EU policy. We need to avoid a one-size-fits-all approach, and continue to set our regulations specific to our local area."

Before intervention – 1990				Transition	After intervention – Current (2010)			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
–	–	Stable	30 boats	▪ St Raphael Prud Homme revenue from renting building assets: €3,000/month (US$3,800) ▪ In addition receive subsidies from government and EU for improvements to infrastructure e.g. cold rooms, ports etc	Total catch: 100t/year Increased value of catch by 20% over the past 20 years.	Stable	Stable	Stable 30 boats

EUROPE



> **“You can attribute increased biomass in part to good fisheries management, but you also need buy-in from the fleet and incentives for vessel owners – That is what makes the ITQ system so practical and compelling”**
>
> Kristján Þórarinsson, Federation of Icelandic Fishing Vessel Owners

ICELAND

Icelandic Groundfish Fishery

Interview with Kristján Þórarinsson, the Federation of Icelandic Fishing Vessel Owners

SPECIES FISHING GEAR TONNAGE

Species: Cod, haddock, saithe, redfish, flatfish

Fishing gear: Bottom trawl, longline, gill net, Danish seine, handline

Country: Iceland

Ocean: North-east Atlantic

Fishery tonnage: 169,000 tonnes (cod only, 2010)

Markets: Worldwide

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"I'm an ecologist working for the fishing industry. Part of my job is to aid communications between scientists and fishing vessel owners. The owners need to understand what the scientists are saying, and there is a corresponding need for scientists to understand what vessels are doing at sea, and why.

Historically we had foreign fleets on our fishing grounds – French, German, British – as well as Icelandic vessels, and there was overfishing of cod after the Second World War. During the 1950s, the catch for a number of years exceeded 500,000 tonnes, compared to less than 200,000 tonnes now, leading to high mortality rates. Female cod over 10 years old are the most fertile, but they weren't being given the time to grow.

In 1975, an exclusive economic zone (EEZ) was declared, and in 1976 the foreign fleet was expelled. That gap was quickly filled by Icelandic vessels and overfishing of cod continued. We knew we had to restrict the catch, allow the fish to grow older and build the stock higher, but also have a profitable industry.

Among the proposed measures were individual transferable quotas (ITQs), adopted in stages from 1984 to 1991. You get scientific advice by species, based on management goals. Then a total allowable catch is set. Each boat has a percentage share of that, but you can trade quotas with other vessels and sell to the market. Discarding is illegal and this is an important part of the solution.

Vessel owners know from the start of the year how much they can fish, so they can plan operations, sales and marketing. What's more, the long-term objectives of fisheries management, based on scientific advice, are aligned with those of vessel owners. The owner who sacrifices part of his catch today has a known share in the benefits that will generate in the future. As the stock grows, so does his quota of fish. That is effective management.

Since ITQs were introduced, we've seen clear economic benefits. The fleet operated at a loss before; now it is in profit, despite lower catches. Under this system, you start merging quotas, scrapping vessels, operating one boat that can catch the quota of many. Under others, you often have too many boats with smaller and smaller quotas each, all operating at a loss and requiring subsidy.

Underpinning the TAC for cod is the harvest control rule, which Iceland was among the first to adopt. Four years ago, we reduced our annual target from 25 to 20% of stock and we are seeing improvements in spawning stock biomass. The smallest was 125,000 tonnes in 1993; it now exceeds 300,000 tonnes, with an increased proportion of larger, older fish. You can attribute that in part to good fisheries management, but you also need buy-in from the fleet and incentives for vessel owners – and you have to align those incentives with objectives. That is what makes the ITQ system so practical and compelling."

Before intervention/s– Introduction of ITQs in stages from 1984 to 1991				**Transition**	**After intervention/s – Current**			
Economic indicator/s (e.g. Total value of catch, or fish prices/kg)	**Social indicators e.g. (Average wage – of crew; no. of vessels)**	**Environmental indicators e.g. (Status of stock)**	**Fleet indicator: number of vessels or licenses**	**Cost of interventions (Estimate of the financial costs)**	**Economic indicator/s (e.g. Total value of catch, or fish prices/kg)**	**Social indicators e.g. (Average wage – of crew; no. of vessels)**	**Environmental indicators e.g. (Status of stock)**	**Fleet indicator: number of vessels or licenses**
▪ Catches: 1990 – 335,390t of cod ▪ Total mixed fishery: 650-700,000t	–	Spawning stock biomass (smallest in 1993): 120,000t	–	–	▪ Fleet previously operating at a loss – now in profit even though catching less ▪ Catches 2010 – 169,153t cod; Total mixed fishery: – around 400,000t ▪ Quota and planned operation eliminated race to fish; focus is on quality rather than volume; better quality commands higher price per kilo.	Fewer employed directly in fishing and fish processing; better jobs in sector, better working conditions and better pay.	Spawning stock biomass: 300,000t	No. boats reduced

SPECIES FISHING GEAR TONNAGE

Isle of Man Scallop Fishery

Interview with Frankie Horne, Scallop Fisherman

Species: Queen Scallops (*Aequipecten opercularis*)

Fishing gear: Otter Trawl

Country: Isle of Man

Ocean: Irish Sea

Fishery tonnage: 2000 tonnes (2007)

Main markets: EU: Italy, Spain and France

"I have been fishing for over 30 years, and my son is also a fisherman here in the Isle of Man. We mainly fish for scallops, but at times will also target Dublin Bay Prawns.

The jewel in the crown of the Isle of Man fisheries is the Queenies. In most parts of the world these are dredged from the sea bed, but here we use an otter trawl which is much kinder to the sea bed and produces a more marketable product.

The scallop fishery hasn't always been such a positive story as it is today. The 1980s saw the introduction of the first closed fishing area which was introduced to preserve the scallops and to allow the scientists at the Marine Biological Station to undertake research. The fishers were not too pleased with this move and fought against the decision as they thought their livelihoods were being taken away. Some fishers continued to poach scallops from this area. It took many years for the realisation that this closed area was for our benefit and now 99.9% of the fishers not only respect the closed areas but also support them being there.

"The benefits to the fishing community have been good – the curfews have helped restore stocks and mean that we now have a working day and are back on the island in the evening, which gives us a far better lifestyle"

The 1990s saw a big drop in the stock levels around the Isle of Man with effort having to increase massively to maintain a catch of 10–12 sacks per trip, the amount needed for the fishers to make a living. As a result of the increased fishing effort, a curfew was introduced in the three mile inshore area that is under the Isle's direct control, limiting fishing to the daytime between six and six. The benefits to the fishing community have been good – the curfews have helped restore stocks and mean that we now have a working day and are back on the island in the evening, which gives us a far better lifestyle.

These management measures took a few years to show results, but then the recovery began and the Isle of Man Scallops have never looked so healthy. We have never seen as many Queenies in the sea as there are nowadays. The health of our fishery was demonstrated when we achieved MSC certification in 2011. This has helped to keep the door open to our main European markets. There hasn't been a significant increase in the price, but it certainly stops doors closing on us.

The Isle of Man is fortunate in the dialogue that it has with politicians and decision makers. Being a small island and a close-knit community has meant that fishers have good access to decision makers and so can raise concerns and issues in a very direct manner. We also have better relations with the scientists, and the Scallop Fisheries Science Workshop held in 2011 has helped establish an understanding that we are working towards a common good.

There are now several marine protected areas around the Isle of Man and these are viewed positively by the fishers: marine life is so obviously thriving in and around these areas. Of course, it's easy for us to be positive about the restricted areas while times are good but the true test will come if there is ever a downturn in the quantity and quality of scallops available."

Before intervention/s – 1980's – Introduction of first closed fishing area; 1990's – Introduction of curfew				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
7800 tons (1972)		Over exploited		▪ Implementing closed areas ▪ Implementing curfew	▪ 2000 tonnes (2007) ▪ Decrease in the annual catch		Healthy stock levels	25 vessels

NORWAY

Norwegian Discard Ban

SPECIES FISHING GEAR TONNAGE

Interview with Torfinn Pettersen, Norwegian Fisherman

Species: Cod (*Gadus morhua*)

Fishing method/gear: Demersal trawl, gillnet and long line

Country: Norway

Ocean: Barents Sea

Fishery tonnage: 283,310 tonnes (2010)

Markets: EU, China, Brazil

"I have been fishing for 30 years, first on trawlers, but now I have my own boat: a 12 metre gillnet and long line vessel that I use to catch cod and haddock in the Barents Sea.

The discard ban was introduced for cod and haddock in 1988. Before the ban some 30% of fish caught were thrown back into the sea. It was terrible. We were bought up not to throw away.

The ban was mainly directed at trawlers to stop these discards, while other measures were introduced to protect juvenile fish. Now when boats come to an area with an abundance of small fish the Directorate closes the area and the boats have to move to another area to fish. We also fill in log books on a haul by haul basis so that the type and size of fish can be monitored. Everyone knows this makes sense; we don't want to catch ten fish but discard nine under-size ones for the sake of keeping the one marketable sized fish.

One of the incentives for us to report honestly and to keep all the catch on board is a compensation scheme. This works by the government paying us for the part of our catch that does not meet management regulations, such as undersized fish or over-quota fish. The payment does not cover more than the cost of fishing, so we do not make a profit from it. But it is good that everything is taken to shore and used in some way and this system has made a big difference to the groundfish stocks. 'High-grading'[12] doesn't happen anymore, mainly because we are more aware of the damage it causes and due to the monitoring systems in place.

Of course this process has not been easy. At the time when the cod stocks collapsed in the late 1980s and the ban was introduced everyone felt the burden of the changes. Many of those who had not contributed to the collapse lost their fishing rights and many thousands of small vessels had to stop fishing.

"We fill in log books on a haul by haul basis so that the type and size of fish can be monitored. Everyone knows this makes sense; we don't want to catch ten fish but discard nine under-size ones for the sake of keeping the one marketable sized fish"

Generally the management of our fisheries is now good. We realise that the regulations have been introduced to preserve the fish stocks for our benefit as well as for future generations. The observers and inspectors make sure that everyone is following the rules. Sometimes restrictions have been brought in that have not worked. Fortunately the Directorate listens to us, and when we say that there is an issue they will negotiate with us to make sure that we can fish, while at the same time making sure that the fish stocks are not damaged.

The cod have now, finally come back. Ten years ago I had to go far away and it took me a long time to reach my quota, even if it was small. Now my quota for cod is twice as big and I fish it faster. There are a lot more fish in the sea. The discard ban is one of the reasons for this."

Before intervention/s - 1988				Transition	After intervention/s – current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
US$287M (1988)	US$37,000	Over-exploited	Norway 17,391 vessels (1990)	Monitoring by the coastguard (approx. 2,200 boat inspections per year) at an annual cost of c.US$132M	US$540M (2009) and is expected to increase with the TAC increase set by ICES in 2010.	US$58,850	• Dramatically improved since 1990. • Based on simulations, ICES concludes that the plan, if fully implemented, is expected to lead to further significant rebuilding.	6,309 vessels (2010)

12 The practice of keeping bigger fish that they caught while discarding smaller, but still legal sized fish

EUROPE

SPAIN

Lira Coastal Community Fishery

Interview with Juan M Blanco Gomez, Project Coordinator, Lonxanet Foundation for Sustainable Fisheries

SPECIES FISHING GEAR TONNAGE

Species: Octopus, spiny spider crab, barnacle, velvet swimming crab, sea urchin

Fishing gear: Handline, traps and gillnets

Country: Spain

Ocean: Atlantic

Annual tonnage: 90,000t

Main markets: Regional, local and national

"I come from a fishing family and have worked with artisanal fishers in coastal communities since 1995, training them and developing a code of conduct for responsible fisheries. One key project has been in Lira, a fishing village in Galicia, where the fishermen faced an uncertain future in the late 1990s. Erratic prices and lack of a guaranteed market drove many out of business, and young people didn't want to go into fishing any more. The community was silently disappearing.

In 2000, the fishermen pre-empted a crisis by setting up their own marketing company. Their aim was to obtain a decent, stable price that was fair for both fisher and consumer, rather than a higher price based on a wildly fluctuating market. The next step was to raise awareness of the fishers' lives and culture through fishing tourism projects, such as guided tours of the port.

Then in 2003 they began a process of creating marine protected areas to further guarantee the fishery's future. With the Foundation's help, the fishermen submitted a document to the authorities in charge of regional fisheries management, setting out the benefits of co-management. The idea was that fishers should have a stake in managing all the resources in their area. That proposal is now formalised under a statute in which responsibilities are split 50-50 between fishers and public administrators.

Most MPAs are set up by states or environmental organisations without the involvement of those who live there and have helped maintain the ecosystem. At *I Miñarzos*, as our fishery reserve is called, there is an active management plan designed and implemented by the community that serves as custodian.

In the protected area, fishing is restricted under license. Artisanal methods are already highly selective, so by-catch and discards have been virtually non-existent and impacts from ghost fishing (where lost gear continues to trap marine life) is negligible. The benefit of co-management is that, when fishers are involved in the process or are themselves the managers, the data they provide is real rather than abstract. The best barometer of biodiversity is daily observation.

"Fishers have been able to differentiate their products from others, on the basis of coming from a sustainable, well-managed fishery and this has opened up niche markets"

The economic situation is much better now than it was four years ago. Before, it was hard for two fishers to survive on sales of barnacles, for instance. Now, 20 families are able to live all year on sales of this species alone. What's more, the value of licenses to fish in the protected area has increased by 500%, boosting income further. Fishers have been able to differentiate their products from others, on the basis of coming from a sustainable, well-managed fishery and this has opened up niche markets.

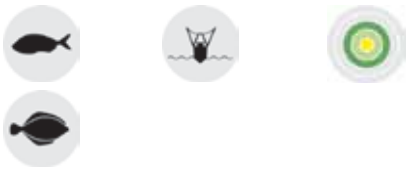
The result is a successful methodology for self-financing or co-financing the entire community structure – a model that can be replicated throughout Spain and on other continents. This is bound to influence fisheries policy-makers. The biggest benefit is that fishers have regained recognition for a profession that was socially marginalised. There are more boats, more crew per boat, and more young people wanting to fish. That was one of our main objectives."

Before intervention/s – 2003				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Fluctuating prices	Barnacle fishery supported 2 fishers	–	–	–	▪ Value of licenses to fish in the reserve increased by 500% ▪ Prices stabilised	▪ Today: Barnacle fishery supports 20 families ▪ Increase in boats, crew & more young people wanting to fish	Reduced by-catch, discards & ghost fishing	Increase

UK

Brixham Beam Trawl Fishery

SPECIES FISHING GEAR TONNAGE



Interview with Alex Philips, Vessel Owner and Shaun Gibbs, Skipper of Barentszee trawler

Species: Mixed species. Plaice, lemon sole, whiting, cod and haddock

Fishing gear: Beam trawls

Country: UK

Ocean: Channel, North Sea, Atlantic

Fishery tonnage: 12,800t

Markets: France, Spain, Italy (China)

"We fish for 31 different species, targeting at different times of the year: Dover sole, plaice, lemon sole, monk fish, whiting, cod and haddock. There used to be 45 beam trawlers 15 years ago but after decommissioning this has been reduced to 20. It has been a good thing; the boats that are left are good at what they do with a mind to the future.

Over the past five years, we have seen the need for change. You look at fishing ports around the country, the likes of Lowestoft, Grimsby and Hull. They were once huge and now they are gone. We want Brixham to continue in the future.

One of the most significant changes we've made is improving the selectivity of our gear. We started working on different net designs, but the 50% CEFAS project helped to get other fishermen on board and give us recognition. The project allowed fishermen to design their own nets, share ideas with scientists and move it forward. Now 90% of the fleet are using modified nets, and as the name suggests we've reduced our discards by over 50% across the fleet.

The new nets create less drag in the water, save us 20% on fuel and reduce contact with the sea bottom. We only catch fish of marketable size and let the smaller fish escape allowing them to grow and breed again. We used to get 8-10 months out of a normal trawl and are now seeing them last up to 14-16 months. So, for a relatively small cost changing gear technology and a bit of thinking; you catch less, make a bit more and save on fuel.

Normally the crew would be on deck for over an hour per trawl but that is down to half an hour now as they don't have to sort through heaps of small fish. Their wages have improved as well. Just taking the fuel savings alone, the crew are probably taking home an extra £200 per week.

We are also getting more saleable sizes out of the nets and therefore maximising the value of the catch. Sole prices have increased from £6/kg to £18/kg and Dover Sole from £13/kg to £25/kg over the past two years. Some of the other less marketable fish, such as Gurnards, have gone up 300% from 20-30p/kg to 60-80p/kg.

A proportion of these price increases is due to improved selectivity (around 5%), for instance the new trawls allow unwanted benthic species and rocks to pass through the larger mesh size nets, which in turn creates less abrasion in the trawl and improves the quality and hence value of the fish. However, there have also been other factors, for instance smaller catches focusing on higher quality, a weaker pound helping exports, and the regenerated market at Brixham have all helped. We have also been working with the supermarkets to improve marketing of under-utilised species.

"Normally the crew would be on deck for over an hour per trawl but that is down to half an hour now as they don't have to sort through heaps of small fish. Their wages have improved as well. Just taking the fuel savings alone, the crew are probably taking home an extra £200 per week"

We're still working to further reduce drag and impact on the sea bed. We're also participating in a camera catch share scheme, where we get more quota for having a camera on board and landing all our catch. The reports they are getting back are really good. Out of 100 hauls in seven days, some of the traditional trawlers are landing 40-80kg of smaller fish. Our unmarketable catch is literally measured in numbers of fish."

Before intervention/s – 15 years ago				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
–	–	–	45 trawlers (15 years ago)	£2000–3000 (US$3000–4000) for new nets	▪ Increased value of catch: 5% due to quality improvements ▪ 20% saving on fuel	Increased wages by up to £200/week (US$300)	Reduced discards by over 50%	20 trawlers

EUROPE

Cornish Sardine Fishery

SPECIES FISHING GEAR TONNAGE

Interview with Stefan Glinski, Cornish Fisherman

Species: Sardine (*Sardina pilchardus*)

Fishing gear: Ring nets (and drift nets)

Country: UK

Ocean: Celtic Sea, Atlantic Ocean

Fishery tonnage: 1,000 – 3,000t/year

Markets: UK, Europe

"I used to handline for mackerel but noticed shoals of sardines that no one was doing anything with. I saw the opportunity but there was a marketing problem. We could catch sardines, but there wouldn't be any buyers. That was ten years ago, and now we've built up the fishery and the market, making sure that we are using highly selective gear and minimising any contact with the environment.

Obviously sardine fishing did have a history in Cornwall with a large pilchard fishery in the 1800s (pilchards and sardines are the same thing, just different labels). The pilchards were preserved in salt and packed into wooden barrels. However, the fishery began to die out in the 1900s. Some people put it down to declining stocks driven by environmental factors, but I think there were probably economic reasons. There was a small revival in the fishery between 1950 and 1970, but they found it difficult to get year-round supply.

I could see that the traditional technique of gill-netting sardines was labour intensive and produced a poor quality of fish; whereas ring netting could provide much better quality and the volumes needed to get a market going. I studied the technique and applied what I knew from my own experience. We thought through all the processes so that when we first trialled the net we got it 99% right; but have been tweaking it ever since.

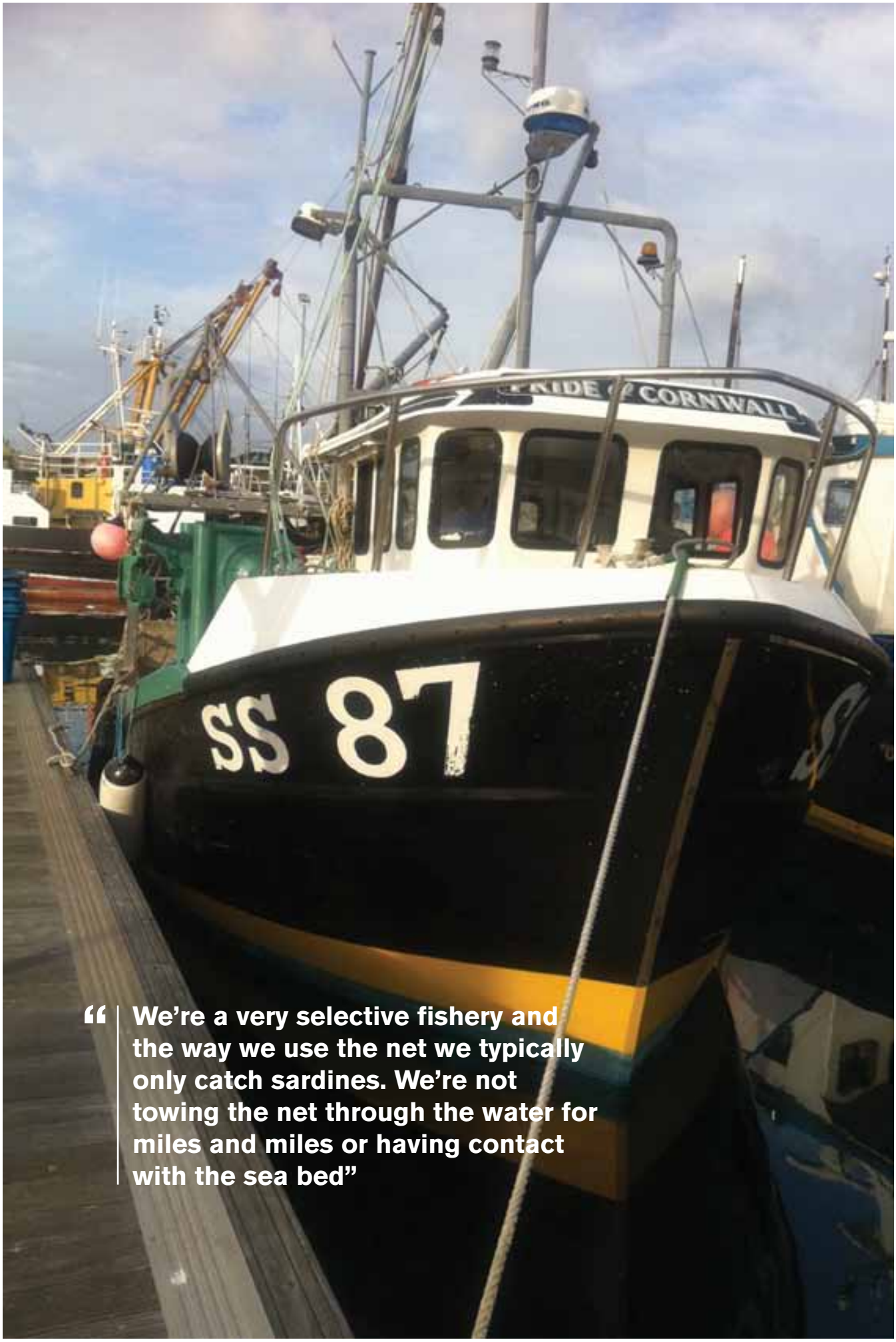
We're a very selective fishery and the way we use the net we typically only catch sardines. We're not towing the net through the water for miles and miles or having contact with the sea bed. Over the past 10 years I have perfected the use of sonar so it is possible to tell by the signature what fish are shoaling and their size. You can avoid going after other species and small sardines. The beauty of it is you can also easily let out the net in the water to release fish unharmed.

"I studied the technique and applied what I knew from my own experience. We thought through all the processes so that when we first trialled the net we got it 99% right; but have been tweaking it ever since"

Prices have risen from the early days, but as volume goes up prices come down. We were catching 500-700t ten years ago and 3,000t this year. We always try to produce the best quality to maintain price and we were awarded MSC certification in 2010. While this hasn't made a difference to international markets, it has helped for the UK retail market. They have to buy MSC certified fish because their customers demand it. The problem for us as a small fishery is keeping up with the cost. There are only six sardine ring-netters but annual audit costs are around £4,500 and it will be over £30,000 for recertification in three years time.

The Cornish Sardine is classed as a non-pressure stock, so it is not considered a priority for management. There are some controls in place but the number of vessels should be limited. I think the time for controls should be when fisheries are thriving, well before they start to decline."

Before intervention/s – 10 years ago (1991)				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Total catch: 500t	–	Non-pressure stock	▪ 1 ring netter ▪ 12 drift netters	▪ Cost of ring-netting gear/boat? ▪ MSC certification: £30,000 (US$46,000) for certification; £4,500 (US$6,900) annual audit costs	▪ Catch 2010: 1,400t ▪ Catch: 2011, 3,000t	▪ Increased slightly ▪ Drift netters getting lower prices for sardines as poorer quality	Non-pressure stock	▪ 6 ring netters ▪ 12 drift netters (Drift netters phasing out of sardines & catch other species)

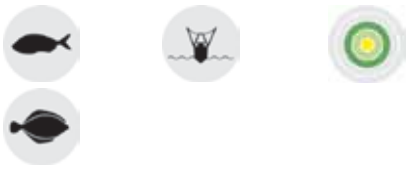


> **“We’re a very selective fishery and the way we use the net we typically only catch sardines. We’re not towing the net through the water for miles and miles or having contact with the sea bed”**

Scottish Groundfish Fishery

Interview with Mike Park, CEO, Scottish White Fish Producers Association (SWFPA)

SPECIES FISHING GEAR TONNAGE



Species: Mixed: e.g. Cod, haddock, megrim, hake

Fishing gear: Bottom trawling

Country: UK (Scotland)

Ocean: North Sea, North-east Atlantic

Annual tonnage: 60,000 to 70,000 tonnes

Markets: Cod & Haddock: UK; Others: Europe

"I started fishing at the age of 10, skippered my first boat at 21 and built my own business at 30. Now I'm working for the largest fishermen's association in Europe, with 230 vessels and a collective turnover of £256m (US$389m).

At our peak in the 1970s, we had too many vessels and too many subsidies (from the European Commission); we never decreased the fleet in line with diminishing stocks. Something had to give. When I was a young skipper, we were landing 120,000 tonnes of cod a year; now it's 15,000 tonnes. We crashed the stocks, and now we are rebuilding them. Our target is to remove only 15 to 17% of the cod each year, compared to 70 or 80% in the 1990s.

The first step towards sustainable fishing in Scotland was decommissioning, in 2001 and 2003. We spent £75m (US$117m) and took out 140 vessels. Then came the EU's Cod Recovery Plan, which reduces effort by taking away days at sea. Within it are derogations saying that, if you do good things, you can draw down extra effort from the Commission. The big innovation in Scotland has been the Conservation Credits Scheme, which rewards vessels with days at sea in return for reductions in cod mortality, so they can still make money from other species. It's a way of incentivising the industry, not punishing it.

In 2007 we put in place five seasonal closures for cod to protect spawning aggregations. We now have 11 or 12 real-time closures in any month – sometimes more and 170 this year, covering 40,000 square miles. Every time a vessel enters one, it loses five days at sea. This has reduced the capture of all cod significantly, although the seasonal closures specifically focus on spawning cod.

There are also buy-backs for using bigger mesh cod ends. The basic size is 120mm but our vessels use 130 or 135mm and get additional days for that. If they use the Orkney trawl, which has a 2ft mesh in the bottom to let the cod escape (because cod, unlike other species, dive when they are caught), they get 20 or 25 days. We've also introduced CCTV cameras on 26 vessels. If anyone is seen discarding cod, they're removed from the catch quota scheme, which allows a higher quota but requires everything to be landed.

"The big innovation in Scotland has been the Conservation Credits Scheme, which rewards vessels with days at sea in return for reductions in cod mortality, so they can still make money from other species. It's a way of incentivising the industry, not punishing it"

There has been significant recovery in the cod stock, though it's not where it should be. In the North Sea, spawning biomass has continued to increase gradually and stock has doubled in six years. That is due to our investment in best practice more than anyone else's. What's hard to get across to fishermen is that they still can't land what they landed before. That's why we've set up courses in fisheries science, which ten of our skippers recently attended. What's more, a fully documented fishery with CCTV cameras can supply a huge amount of data to the system. Our hope is that, with a system like ours, there won't be a need for effort reduction, sparing us further decommissioning."

Before intervention/s – 1970s				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Catch: 120,000t	–	Removed 70-80% of cod stock each year	–	£75m (US$117m) to remove 140 vessels	Catch 15,000t (Total catch declined; individual boats increased)	–	▪ Stock has doubled in the past 6 years ▪ Aim to remove 15–17% of cod stock each year	Reduced by 140 vessels

UK

SPECIES FISHING GEAR TONNAGE

Scottish Pelagic Fishery

Interview with Ian Gatt, Director/Secretary, Scottish Pelagic Sustainability Group[13]

Species: North Sea herring, Atlanto-Scandian herring, Western mackerel (all MSC-certified) and West of Scotland herring (in assessment)

Fishing gear: Mid-water trawl

Country: UK (Scotland)

Ocean: North Sea, North-east Atlantic

Annual tonnage: 200,000 tonnes

Markets: Mainly Europe, also Russia and some domestic (for North Sea and Atlanto-Scandian herring); West Africa (west of Scotland herring); Japan, Europe and South-east Asia (Western mackerel)

"For generations, my family on my mother's side has been involved in fishing. When I left school, the industry was the biggest employer in coastal communities and it was natural for me to go to sea. In 1932, there were more than 1,000 boats; now there are 28. We had a huge problem with herring in the 1970s which led to the fishery's closure. Whether it was recruitment failure or overfishing or both, that was a big driver for change in the pelagic industry.

We were very fortunate that mackerel changed its migration pattern and ended up in western waters. In 30 or 40 years, it has gone from nothing to being the stock we rely on. That gave us breathing space for reform, and the most important element in that has been long-term management plans.

In the past, ICES (the International Council for the Exploration of the Sea) and fisheries managers would tell the industry what was going on. Now, the process is largely stakeholder-led. Through bodies like the Regional Advisory Councils, stakeholders draw up a long-term plan with scientists, then put it to the European Union. The EU then puts it to ICES to see if it is precautionary and sustainable. This co-operative approach has been the biggest single change in the pelagic fishery in the past 10 or 12 years.

The other has been adhering to agreements. Before, the advice of ICES would be disregarded on political grounds. Now, Iceland, the Faroes, Norway, Russia and the EU agree that the priority in setting TACs should be science.

It's a culture that has spread to the fishing grounds. People are thinking more responsibly about their quota and their market, prior to putting their nets in the water. That has aided stock recovery. If we look at North Sea herring, we've seen a complete turnaround in three years, from a biomass of 890,000 tonnes in 2009 to 1.7m tonnes. It's good news for us, and reassurance for the Marine Stewardship Council which certified North Sea herring in 2008. They can see that the plan is good and our product deserves to carry the MSC logo.

"Through bodies like the Regional Advisory Councils, stakeholders draw up a long-term plan with scientists, then put it to the European Union. The EU then puts it to ICES to see if it is precautionary and sustainable. This co-operative approach has been the biggest single change in the pelagic fishery in the past 10 or 12 years"

We're in a situation where we have three fisheries certified and one in assessment, so we can scientifically measure the difference the MSC label makes. Last year, there was a price premium of £100 a tonne for North Sea herring, which is certified, compared to West of Scotland herring, which is not. In terms of markets, our MSC-certified herring – North Sea and Atlanto-Scandian – is sold mainly to Europe and a little bit to Russia, whereas West of Scotland herring has found a market only in western Africa. You simply cannot sell it into Europe. It's probably going to cost us £75,000 a year to keep all our certifications going, but there are benefits. That's why we decided to put West of Scotland herring up for assessment as quickly as possible."

Before intervention/s				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
–	–	North sea herring biomass (2009): 890,000t	–	£75,000/year (US$115,400) to keep certification going	Price premium for MSC certified herring: £100/t		North sea herring biomass (current): 1.7m t	28 vessels (reduced from 1,000 in 1932)

13 The Scottish Pelagic Sustainability Group (SPSG) is one of five member groups within the Scottish Pelagic Sustainability Group (SPSG) that applied for MSC certification.


“Our sole, our wealth, our lives: this is the vision of our management plan”
Ousman Bojang, Chair of GAMFIDA
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SPECIES FISHING GEAR TONNAGE

Gambian Red and Black Sole Fishery

Interview with Ousman Bojang, Sole Fishermen and Chair of the Gambian Artisanal Fisheries Development Association (GAMFIDA)

Species: Red and Black Sole (*Cynoglossus senegalensis and Synaptura cadenati)*

Fishing method: Bottom gill nets

Country: Gambia

Fishery tonnage: Approx 200t

Markets: Europe (Netherlands, Spain)

"I started fishing when I was 19, and it was then that I built up my local knowledge on fisheries in The Gambia. After a period working for the government, I then returned as a commercial fisherman in 1978, and now fish for sole alongside 500 other fishermen spread along the coastline.

We undertook an MSC pre-assessment in 2006 and are hoping to go for full assessment next year. Sole is an ideal candidate as it is exported and not consumed in The Gambia. Our chief buyer, Atlantic Seafood, is not sure if we will get a better price but they do think it will open up new markets, as some European retailers only buy MSC product. At the Gambian Artisanal Fisheries Development Association (GAMFIDA) we feel that to be qualified as sustainable by the MSC would be a major achievement.

For the past two years, we have been working on a USAID funded project (Ba Nafaa) – supported by the University of Rhode Island, WWF, Atlantic Seafood and the Gambian Government – to meet the requirements set out in the pre-assessment. One of our main achievements has been the closure of the sole fishery from May until October within a protected area 1nm from the shore. This means we will allow the sole to breed; the young ones will be there, and when they grow we start to catch them.

Each landing site now has its own sole management committee and has written its own by-laws. This brings the management down to the community level. For example, while the government allows for nets that are 40mm,[14] we have increased the net size to 42-46mm. We are not catching small fish and the by-catch is reduced dramatically.

"We are also collaborating with research and have been out to sea with the scientists to share our local knowledge and map out the sole's migration routes, their reproduction areas and spawning grounds"

Stock levels are very much improved and I am proud of that. We have benefited from better catches after the closed season, but for now these are just my observations. For the future, we are training fishermen to use log-books so that we can collect monthly data and compare this with previous years' data held by Atlantic Seafood. We are also collaborating with research and have been out to sea with the scientists to share our local knowledge and map out the sole's migration routes, their reproduction areas and spawning grounds.

'Our sole, our wealth, our lives' is the vision of our management plan which will be signed by the Honorary Minister in 2012. The next steps for us will be a stock assessment using the new data we have collected and then MSC certification. It is no good exploiting the resource without good information. I want to have sustainable fisheries for years to come."

Before intervention/s – Current				Transition	After intervention/s – Too early to determine impacts			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ 2007: 1,293t ▪ 2008: 866t	▪ Crew: US$2,364/ year ▪ Boat Owner: US$12,582/year	Stock assessment not yet completed	475 Sole Fishers In addition approximately 34-249 people employed by processing plants (mainly women)	–	–	–	–	–

Sources for table include: Fatajo, F.S; Tobey, J & Drammeh, O (2010) Sole Fishery Value Chain Assessment, Coastal Resources Center, University of Rhode Island, pp.33

14 Only refers to artisanal catch

MADAGASCAR

SPECIES FISHING GEAR TONNAGE

Malagasy Octopus Fishery

Interviews with stakeholders of the fishery

Species: Reef octopus (*Octopus cyanea*)

Fishing method: Spear-fishing

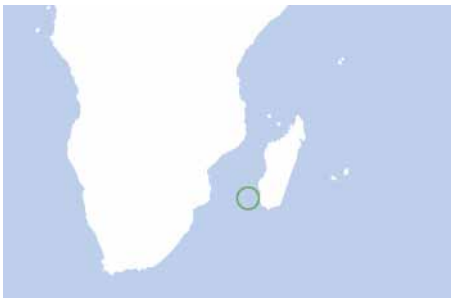
Country: Madagascar

Ocean: Indian Ocean

Fishery tonnage: 600t/year

Markets: Southern Europe: France, Spain, Italy, Greece & Portugal

© Blue Ventures



Fishing is a way of life along the remote south-west coastline of Madagascar known for some of the largest coral reef systems in the Western Indian Ocean. Over 90% of adults in the region are fishers or known locally as 'gleaners' which involves going out at low tide to collect primarily octopus but also snails and sea cucumbers from the reef flats. "The octopus is a hugely important fishery to the local communities," says Sophie Benbow, of Blue Ventures and Project Coordinator of the Regional Octopus Project, "and is now one of the largest export commodities from the south-west."

Prior to 2002, the villages exploiting octopus for commercial export were limited to those close to the regional capital of Toliara. However, in 2002 the main octopus collectors expanded their range to the whole of the southwest coast, leading to rapid exploitation of octopus and anecdotal reports of decreases in catch. Blue Ventures,[15] together with local communities decided to trial temporary closed areas to see if these could stem the decline.[16]

The first temporary closures for octopus were established in 2004, and have gradually grown in number. "We started with a temporary closure in the remote community of Andavadoaka," says Sophie, "but through local demand have now expanded to 50 other communities extending along 400km of the coastline." One of the initial problems was the success of the closures attracting fishers from outside the communities. Yet since the first pilot, the area covered by the temporary closures has increased, spreading the benefits and reducing the incentives for free riders. Felicite from Andavadoaka (who has been fishing for 35 years) sums up the benefits to villagers, "We have experienced an increase in octopus catch and an increase in the individual size of octopus".

"The temporary closures of octopus fishing grounds have been immensely successful," says Sophie. "We have found that all of the closures are profitable at the village level and analysis of seven years of landings data has shown that individual fishers are also benefitting, with each fisher catching 5.9 kg of octopus per day on average after the closures, compared to 2.3 kg before."

The latest development has been an MSC pre-assessment to determine whether the south-west Madagascar octopus fishery could be certified, and thereby gain international recognition for the significant strides in sustainability. "It would be the cherry on the top," says Sophie. "This way the fishery can illustrate how local communities are able to manage their own octopus fishery in a sustainable way." Sophie also explains how new buyers have been attracted; "Several international import companies did not know that Madagascar produced octopus before this work began."

The next steps for the fishery are to develop a fisheries improvement plan and set up a regional management committee. As Roger Samba, President of Velondriake,[17] explains, "the villages are now working together for one goal, which is managing our resources to sustain our livelihoods."

Before intervention/s – 2004				Transition	After intervention/s – 2011			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
CPUE in 2004 2.4kg/ fisher/day	Wages Less than US$2/ day	Reported declining catch (but no data to prove this)	–	Administrative costs of a single round of closures is approximately: US$500	CPUE in 2010 3.5kg/ fisher/day	Wages: US$2/day	▪ Current level of exploitation is not negatively affecting octopus stocks. ▪ Recent stock assessment modelling for the Velondriake region between 2008-2010 indicates fishing effort, given current management model, is sustainable	Increased (population increase and migration from inland tribes)

15 Blue Ventures is a British marine conservation NGO: http://blueventures.org/

16 Collaboration also with the Madagascar Institute of Marine Sciences (Institut Halieurtique des Sciences Marines – IHSM) and the Wildlife Conservation Society

17 The largest locally managed marine area in south-west Madagascar and the site of the pilot octopus closures (www.velondriake.org)

MADAGASCAR

Malagasy Shrimp Fishery

SPECIES FISHING GEAR TONNAGE

Interview with Mathias Ismail, Group Managing Director, OSO (R&O, Seafood Gastronomy)

Species: Shrimp (*Penaeus monodon)*

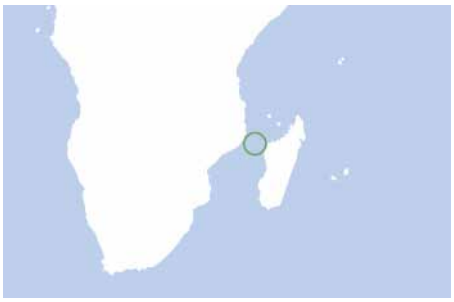
Fishing method/gear: Trawl

Country: Madagascar

Ocean: Indian Ocean

Fishery tonnage: 8,000 tonnes

Main markets: EU, Asia, Africa and USA



"Industrial fishing started in Madagascar in the early 1970s, but fishing effort was minimal. Few investors were interested in basing their businesses in the country, due to the political situation during the 1980s and early 1990s, and we were not popular with distant water fishing nations. The resultant lack of fishing effort meant that, at a time when many of the world's oceans were being overfished, the Malagasy wild prawn resources were preserved.

Change came in the 1990s with a new vision from the private sector to further develop and invest in our shrimp fishing business. However, we knew that we needed reassurance from our government that they shared our view of being committed to supporting responsible fishing and preserving the sustainability of the resource.

We got this reassurance, and the result is a shrimp fishing sector that is co-managed by private sector operators through the shrimp farmers' and fishermen's group of Madagascar (GAPCM) and the central government. This established a system of institutions and incentives to ensure sustainable management of shrimp resources. Among the institutions are: the Malagasy Fisheries and Aquaculture Agency, which is responsible for overall co-management of the sector; the Fisheries Monitoring Centre, for control and licensing; and the Economic Observatory of Shrimp Fisheries, a joint public-private organisation responsible for producing analysis on the sector and regulating closed seasons.

In 2000, when fishing effort was frozen in both the industrial and artisanal sectors, a range of management measures were introduced to improve sustainability of the stocks. These included the use of satellite tracking and government observers on vessels for improved monitoring as well as the introduction of dolphin safe nets and turtle excluding devices to reduce incidental catches.

Further regulations aimed at controlling fishing effort and improving efficiency of fishing equipment were introduced in 2009, in response to a pre-assessment for possible certification of the fishery. These included reducing fishing effort from 66 to 32 vessels. We also increased net mesh sizes and reduced the width of the trawls in an effort to reduce the use of fuel and thus the cost to achieve the same level of catch.

We have also developed shrimp aquaculture in Madagascar as we could see that the demand for Malagasy shrimp outstripped the levels that could be sustainably met by our wild catch. The production of EU-certified organic shrimp, of the same species type and quality as are caught wild, has enabled us to meet the demands of the market without increasing pressure on the wild stocks.

Despite the current difficulties, stemming from the poor international economic climate and political instability in Madagascar, the reputation of the Madagascar shrimp has protected us from declining sales. In the last 30 years the sector has become the country's leading source of foreign exchange and a major source of tax revenue and jobs. As a company we also bring the financial benefits of packaging and processing to the community, as all our product is processed in Madagascar before being dispatched directly to our customers."

Before intervention/s - 2000				Transition	After intervention/s – current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
9,000 tonnes (2003) (Wild & Farmed Prawns)	Less income but more fishers involved	Under exploited	66 vessels (2000)	Management of fishery by government and fishing sector	8,000 tonnes (estimate for 2011) (Wild & Farmed Prawns)	▪ Better income for less fishers but wider sector, with aquaculture and processing ▪ Overall better income to country and community	Healthy stock levels	32 vessels (2011)

Mozambican Fisheries Surveillance

SPECIES FISHING GEAR TONNAGE

Interview with Manuel Castiano, Mozambique's Director of fisheries surveillance

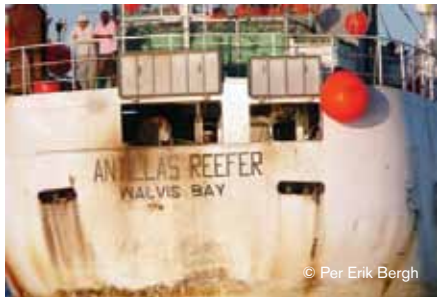
Species: All species in Mozambique (e.g. Tuna & demersal species)

Fishing gear: All methods

Country: Mozambique

Ocean: Indian

Fishery tonnage: +100,000 tonnes (domestic and all landings)



© Per Erik Bergh

"It was a proud day for us all, when the *Antillas Reefer* sailed into Maputo harbour painted red and white and bearing the name "Fiscalizaçao Da Pesca" - Fisheries Patrol Vessel. Although the vessel, originally an illegal long-line vessel, had been arrested in 2008, the journey to this day began in 1990 when our new fisheries law came into force, followed by the formation of a dedicated Ministry for fisheries.

As a country, fish are important to us. We record catches of over 100,000 tonnes each year, but we know these are underestimates, as much of the catch in the small scale and subsistence sectors is not reported. The main catch, from our national industrial and semi-industrial fleet, includes shrimp, demersal fish and small pelagic fish. These fisheries are managed by licences, closed areas, and gear restrictions. The system is not perfect, but it is starting to work well. We also have an important foreign fishery that brings in much needed hard currency from access payments for about 150 vessels that come annually to fish yellow-fin, big-eye and albacore tuna.

Before the 1990s our most important commercially exploited stocks – shrimp and demersal fish – were highly or fully exploited and only the pelagic and tuna resources were lightly exploited. So we knew action was necessary. We have made changes in the last two decades, in order to strengthen our management system to one where access is controlled and monitored and action is taken when laws are broken.

In my main areas of work - monitoring, control and surveillance - we still have a long way to go, but the story of the *Antillas Reefer* demonstrates that we are succeeding. When the vessel company applied for a tuna licence we received intelligence from the legal fleet that the vessel was already fishing in our waters. So we requested the Namibian operators to order the vessel to port in Maputo for a pre-licence inspection. Following the inspection it became evident that the master, a Spanish national, had been fishing illegally in Mozambique waters for some 50 days, targeting kitefin shark, which is also an illegal activity. Over the next days, and through working closely with our partner agencies of foreign affairs, the judiciary, defence and immigration and also the vessel operators and international partners, we were able to evacuate 37 crew members, over 80 tonnes of shark product, 65 tonnes of bait, and illegal fishing gear including long lines of over two kilometres in length.

It took two years from the arrest to the successful confiscation of the vessel, its cargo and the imposition of a fine of four million US dollars on the master and ships' owners. So, although we still have a way to go, we demonstrated that our policies, institutions and processes are in place and that they can work to ensure that our fisheries can be managed sustainably. Now we have the benefit of the Antillas Reefer operating as a patrol vessel providing support to legal operators and acting as a deterrent to those who don't follow the regulations."

© Ministério das Pescas

MOZAMBIQUE

SPECIES FISHING GEAR TONNAGE

Mozambican Shallow Water Shrimp Fishery

Interview with João Marcos Mangave, Mozambique Fisheries Association

Species: Indian White prawn (*Penaeus indicus*) and Speckled shrimp (*Metapenaeus monoceros*)

Fishing gear: Trawl

Country: Mozambique

Ocean: Indian Ocean

Fishery tonnage: 5,500t (2010)

Markets: Europe, Japan, South Africa

"Our association represents 60% of total fishing capacity in Mozambique, although through my role in the Confederation of Business Associations I represent the entire fishing industry.

Our most important fishing ground for shallow-water shrimp is the Sofala bank. This is an area in southern Mozambique 40km from the coast, covering an area of 50,000km^2, and supporting 12 industrial freezer trawlers and 5 semi-industrial vessels. Prior to independence the shrimp resources were almost open access, but as the fleet developed the government realised how important the fishery was as a source of foreign currency and started to put management measures in place.

"We see the importance of protecting the environment and allowing recovery of shrimp biomass"

We now have a system of total allowable catches (9,000t/year in the 1980s and around 6,500t today), marine protected areas closed to trawling and a closed season. The closed season was initially brought in for less than a month but has been gradually increased to five months. This year it started on 5th October and we will go back to the fishery at the end of February. The scientists believe this is important to protect the biomass, and as businesses it had become less economic to fish during this period as daily catch rates decline over the summer months. There has also been a mind-shift in the industry over the past four years. We see the importance of protecting the environment and allowing recovery of shrimp biomass. Part of this shift has been the industry's employment of fisheries biologists on their staff as well as increasing demand from our European market for shrimp that is caught in a responsible and sustainable way.

Stocks are not as healthy as we would like them to be and part of this is due to reduced river run-off which limits the amount of nutrients flowing into the sea. The building of dams for electricity generation hasn't helped, but we have also noticed that the onset of the rainy season is much later than previously. We find that when we return to the fishing grounds after the closed season that the shrimp are not as large as before.

The government is taking further action by reducing the capacity of the fleet by up to 40% between 2011 and 2013. After this period there will be an evaluation and if there has been a recovery of the stock and the government increases the TAC the operators that had previously had their capacity reduced will have priority over increased quotas.

The most positive change we see coming is a move towards rights-based fisheries management. This has been written into the new Fisheries law which is going through Parliament. Currently the industry has annual licenses that expire every year, and companies have no security that the government will allow them to go back to the fishing grounds the following year. A rights-based system would significantly increase our willingness to invest and participate in initiatives to protect the fishing ground. We would know that even though we may not be able to fish this year, we would be able to fish in future years and reap the benefits."

Before intervention/s				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ CPUE: 25.8kg/hour (1999) ▪ Catches: 8,111t (1999) ▪ Have fluctuated from 9,300t in 1981 to lows of 5,668t in 1990. Back to 9,000t in 2002.	–	Stock biomass: 2,310t (1999)	–	–	▪ Catches: 5,500t (2010) ▪ Low catches also due to a smaller number of vessels involved.	–	–	12 Industrial 5 semi-industrial

Namibian Fisheries

SPECIES FISHING GEAR TONNAGE

Interview with Donovan Hawes, Hake fisherman

Species: Hake (*Merlucius paradoxus* and *M. capensis*)

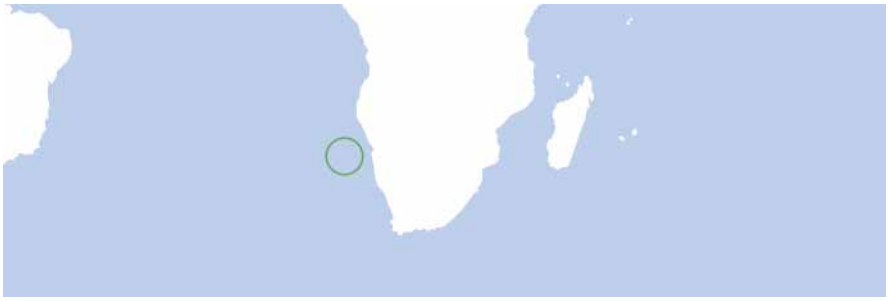
Fishing gear: Bottom trawl method

Country: Namibia

Ocean: Atlantic

Fishery tonnage: 134,976 tonnes (2009)

Main markets: EU, mostly Spain



"Prior to independence, in 1990, Namibia's fisheries were largely foreign-operated and most were vastly overexploited with more than 300 mid-water and bottom trawl vessels operating off the coast. Following independence, the government quickly turned this situation around by declaring a 200 nautical mile exclusive economic zone and dramatically enforcing it through the arrest of thirteen illegal trawlers. This sent out a strong message that unlicensed foreign vessels would not be tolerated and resulted in a 90% drop in the number of vessels fishing in the area.

In 1992 a new policy and legal framework was introduced. These stated a clear and transparent process for allocating fishing rights based on criteria that ensured Namibians had a fair chance to enter the industry, and facilitated the empowerment of groups that had previously been disadvantaged due to the apartheid regime. This policy provided an economic incentive, to encourage Namibian participation in fisheries in terms of both ownership and employment, in the form of tax reductions on quotas fees.

I became a fisherman back in 1988, when I was 17, in order to support my family when my father passed away. I started in the monkfish fishery and later joined the small pelagic fishery. Back then, it was difficult for us 'non-white' people to get any promotion or opportunity in the fishery, but I benefitted from the new laws and now I am a skipper in the hake fishery, Namibia's most valuable fishery which contributes almost 10% to Namibia's Gross Domestic Product.

The new policies that followed Namibia's independence gave me the opportunity to have a successful career in the industry. Policy change, together with the high levels of management within Namibia's fisheries, has resulted in sustainable benefits for the Namibian people. Apart from the fact that most Namibians now have an opportunity to apply for fishing quotas and can also attend maritime schools, our government implements strict rules to protect our fish stocks. The amount of fish that can be caught has been reduced considerably, and this means that our resources are not overexploited. Our government also has a firm control over harvesting and processing: it limits access to the different fisheries; provides Total Allowable Catches by fishery as well as demands all fishing vessels to be flagged in Namibia, the only exception being those that are involved in the horse mackerel fishery.

"We are better equipped to ensure good education for our children and we have a sense of pride and respect. It is important for us to protect and take care of our resources for the generations to come"

I can truly say that the Namibian Government has gone to great lengths to include the Namibian people, by allowing us the opportunity to take further studies and become captains, chief engineers and crew members. This has improved our overall living standards; we are better equipped to ensure good education for our children and we have a sense of pride and respect. It is important for us to protect and take care of our resources for the generations to come."

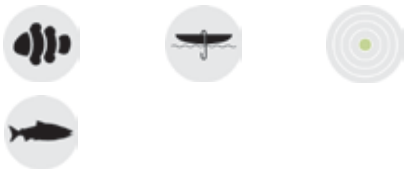
Before intervention/s – 1980's				Transition	After intervention/s – 2011			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ Hake landings: 382,000 tonnes ▪ (Estimated from foreign landings)	–	Over exploited	Open access	The cost of MCS in the "newly" defined EEZ and the management system.	▪ Hake landings 134,976 tonnes (2009) ▪ Decreased aiming at sustainable levels in an access controlled fishery	▪ Average wages: about US$15,000 per year depending on position on vessel ▪ Increase in on-shore processing	Sustainable	38 companies hold rights of exploitation for hake

SEYCHELLES

Seychelles Hook and Line Fishery

Interview with Beatty Hoarau, Seychelles Fishing Boat Owners Association

SPECIES FISHING GEAR TONNAGE



Species: Emperor red snapper (*Lutjanus sebae*), Green jobfish (*Aprion virescens)*, Humphead snapper (*Lutjanus sanguineus*), Yellowfin tuna (*Thunnus albacores*), Sword fish (*Xiphias gladius*), Bigeye tuna (*Thunnus obesus*), line fish label covers: - captain blanc, job jaune, etelis, grouper

Fishing gear: Hook and Line

Country: Seychelles

Ocean: Indian Ocean

Fishery tonnage: 9 tonnes (2011)

Main markets: EU, local high-end consumers

"When the Seychelles Fishing Boat Owners Association was formed in 2003, discussions began on how we could add value to our fish and fish products. We wanted our fishery to be sustainable to ensure that future generations would benefit from the same quality and abundance of fish that we enjoy today.

In 2008, with the assistance of The Seychelles Fishing Authority, and in collaboration with the French Sea Bass Association (Association de Ligneurs de La Pointe de Bretagne) we began work on what was to become a flagship programme of fisher self-monitoring known as the 'Seychelles Hook and Line programme'. Through the creation of our own certification and labelling process we are able to guarantee that our fish meet the criteria demanded by ever-more aware consumers that fish are selectively caught and in a manner that respects the environment.

Certification is overseen by the Seychelles Bureau of Standards who assess all fishing units to ensure they satisfy requirements relating to the vessel, crew and fishing methods as well as to hygiene and sanitary regulations regarding the handling, processing and storage of the fish. Inspections are carried out on a random and ongoing basis to ensure that standards are met by all vessels.

The hook and line fishing technique is a traditional fishing method in the Seychelles and is internationally recognized to be one of the most selective means of harvesting wild fish. For this reason our fishery has a very low level of by-catch, discarding of fish does not occur, and there is no damage inflicted on marine habitats. Our circle hooks ensure that we catch mostly larger fish which have already reproduced.

Our approach, from inception, was one of ownership by the fishermen. They are the ones that are involved and their buy-in to the programme was considered to be of utmost importance. The fishermen and fishing boat owners on the two main islands, Mahe and Praslin, were consulted at all stages.

We also worked closely with the Fish Veterinary Division to develop a set of standards which the fishermen could adhere to in order to improve their on-board handling practices. When vessels and boat owners meet the minimum criteria for food safety and hygiene standards, a certificate is issued by the Fish Inspection Unit.

This has been very good for our fishery as it has raised the quality of fish being brought to the market, and as a result has increased the revenue that fishermen get. This has resulted in other fishers voluntarily joining the programme after seeing the benefits.

The branded fish are more expensive, and are targeted towards export markets and the high-end hotels and restaurants within the Seychelles. In the long run we would like to see all exported fish from the Seychelles being branded in this way. However, we are careful to also maintain our local markets as the Seychelles has one of the highest per capita consumption rates of seafood worldwide, and all Seychellois families depend on fish as a principal source of protein.

In addition to improving the branding of Seychelles fish, we have also improved the image of artisanal fishing in the Seychelles as a noble profession, one which provides food security for our nation, thus encouraging young people to join the industry."

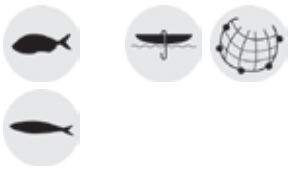
Before intervention – 2003				Transition	After intervention – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
Varies from US$3–6 per Kg	US$770 per month	–	No hook and line members	US$150,000	Up to US$7.5 per kg	US$900–US$1,000 per month	–	15 licensed as Seychelles Hook and Line

SIERRA LEONE

Sierra Leone Community Fisheries

Interview with Thomas Siddiqui, Bonthe Master Fisherman

SPECIES FISHING GEAR



Species: All species in the Inshore Exclusion Zone

Fishing method/gear: Canoes with nets

Country: Sierra Leone

Ocean: Atlantic

Fishery tonnage: Artisanal catch: 112,653 t (2010)

Main markets: Local: Bonthe, Yargoi and Bo

"As fishermen in the Sherbro River Estuary, our livelihoods come from the fish we are able to catch using our dugout canoes. We target species such as grouper and catfish. Until recently our catches have been declining in the Estuary and we were afraid to take our boats into the open sea, as trawlers from other countries were fishing illegally and unsustainably in the Inshore Exclusion Zone (IEZ) of Sierra Leone. They were ruining our fishing gear, taking away fish from fishing grounds reserved for us and preventing fish from entering the Estuary. We lacked the resources to effectively control and monitor fishing activities in our waters and the decline in the fish catches was resulting in a direct loss to local fishermen.

In order to combat this problem, we collaborated with the Ministry of Fisheries and Marine Resources, the NGO Environmental Justice Foundation (EJF), and local authorities to develop a community surveillance programme. Two years ago a new EJF-funded surveillance vessel was launched to patrol the IEZ along Sierra Leone's coastline. We alert the vessel to any irregular activity and they record that activity and collect evidence that is used towards the arrest and hopefully prosecution of illegal fishers. They have now purchased a bigger, faster boat.

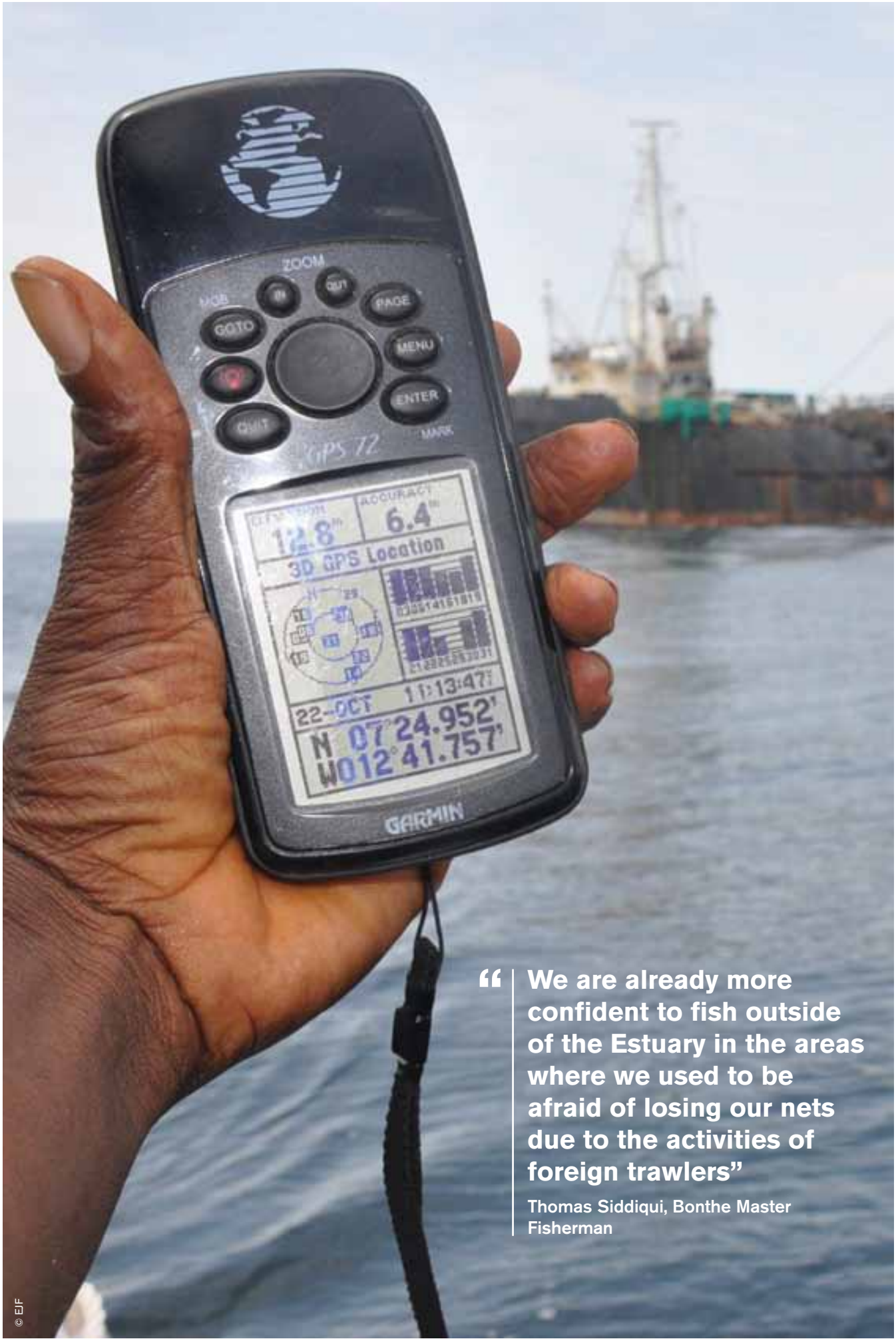
In March 2011 information from us and the patrol boat led to the seizure of $6 million worth of fish in Las Palmas, Spain; I'm told this is the largest seizure of suspected illegally caught fish since new EU regulations came into effect two years ago. It is still early days, but we have already seen a real drop in foreign illegal trawlers since the patrol boat started to operate. Community reports show a significant decline: between April and June 2011 there were only 4 reports of illegal trawler activity, compared to 32 during the same period in 2010.

Not only are our interests and livelihoods being protected but the initiative has also recently generated government revenue in excess of US$150,000 as a result of a fine issued after the observation of illegal activity in the Sierra Leonean IEZ.

Although we lack detailed catch data, we are already noticing an improvement in catches in the Estuary. A catch reporting scheme has recently started which will provide us with better data in future years. We are already more confident to fish outside of the Estuary in the areas where we used to be afraid of losing our nets due to the activities of foreign trawlers."

Before intervention/s – pre 2008				Transition	After intervention/s – current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
▪ Artisanal catch: 65, 758t (2003) ▪ Fish smoked and dried for consumption and some local trade	Costs to fishers due to damaged gear	Assumed threatened	Around 8,000 vessels in small scale sector	▪ US$180,000 This covers the initial buying of the boat and other equipment ▪ Running costs: US$15,000 year	Artisanal catch: 112, 653t (2010)	▪ Better fishing conditions, less danger and less fear ▪ Improved safety of fishers and gear	Reduced pressure on stocks	Open access so assumed to be still around 8,000 vessels

AFRICA



“We are already more confident to fish outside of the Estuary in the areas where we used to be afraid of losing our nets due to the activities of foreign trawlers”

Thomas Siddiqui, Bonthe Master Fisherman

SPECIES FISHING GEAR TONNAGE

South African Hake Fishery

Interview with Roy Bross, Secretary of the South African Deep Sea Trawling Industry Association (SADSTIA)

Species: Hake (*Merluccius paradoxus* and *Merluccius capensis*)

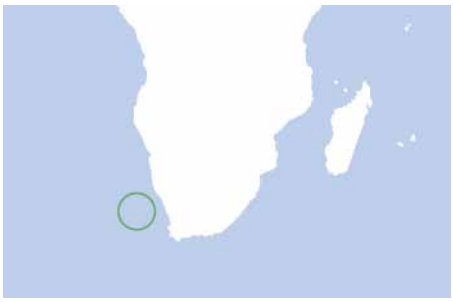
Fishing gear: Bottom trawl

Country: South Africa

Ocean: Atlantic

Fishery tonnage: 128,500t

Markets: EU, USA and Australia



"Commercial bottom trawling, largely for hake, has been important in South Africa for over one hundred years and today it accounts for half of South Africa's fisheries catches. Historically, the fishery was heavily fished by a large foreign fleet that had severely depleted the fishery stocks. In the late 1970s South Africa set about expelling the foreign fleets and putting in place a regulatory and conservation system for the main fishery resources, including hake. In the beginning this system focused on controlling access and setting precautionary catch limits, tasks that the government and the industry cooperated on. Slowly, and with great relief we started to see an improvement in the hake stocks and a move to more prosperous times.

In more recent years our association – South African Deep Sea Trawling Industry Association (SADSTIA) – has played a key role in building on this early cooperation between industry and government to support the move to gain Marine Stewardship Council (MSC) accreditation for the deep-sea trawl fishery. We achieved this goal in 2004 making us the first African fishery to gain MSC certification as well as being the first bottom trawl fishery to be certified.

It took several years and hard work from both the industry and government sides to gain this certification, but today's more prosperous and stable situation for the industry has made it worthwhile. In the last five years, MSC certification has provided many benefits: we have moved away from our traditional lower-value markets for unprocessed whole fish, towards new markets where we deliver processed, packaged and branded high-value goods. These are sold largely in the markets of Europe – where we were relatively inactive in the past. Our MSC labelled goods do not attract a price premium in these new markets, but they do get us access.

There have also been other benefits emerging from the certification process, such as the improved relations and co-operation with the conservation NGOs; improved co-management especially in association with the resource management authorities; and a better attitude in the trawling community where there is now a readiness to fish sustainably for its own sake.

Since the initial certification in 2004 we have continued to improve on the sustainability of our fishery. There have been improvements in by-catch management as well as better understanding of our fish stocks. Tori lines are now part of permit conditions and this measure is estimated to have reduced seabird mortalities by about 90% since 2006.

Assessment for MSC certification meant that we had to research and identify habitats susceptible to impacts from bottom trawling. We have charted our modern trawling grounds and introduced a monitoring system to ensure that trawlers never go outside the demarcated area. Non-fishing zones were created in the vulnerable areas and the fishery has initiated an independent assessment of their potential as offshore Marine Protected Areas.

Personally, the most gratifying benefit is the way in which certification motivates participants. Certification raises awareness of all fishing stakeholders about the need to adopt best practices with a view to the long term future of the hake resource and benefits for us all."

Before intervention/s – before 2004				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
166,000 tonnes (2002)	Data not available	Previously assessed as a single species	106 vessels (2004)	US$70,000 for MSC certification process	▪ Catch: 128,500 tonnes ▪ Decrease in hake harvested, aimed at maintaining sustainable levels in fishery	Data not available	▪ M.capensis stock is above sustainable levels, and catches below maximum sustainable levels. ▪ M.paradoxus stock is below precautionary levels, and a rebuilding plan is in place.	▪ 46 vessels ▪ A decrease in the number of vessels, to maintain sustainable levels

SPECIES FISHING GEAR TONNAGE

South African Rock Lobster Fishery

Interview with Richard Ball, Chair of the South Coast Rock Lobster Association

Species: South Coast Rock Lobster (*Palinurus gilchristi*)

Fishing gear: Longline trap fishery

Country: South Africa

Ocean: Atlantic, Southern Indian Ocean

Fishery tonnage: 330 tonnes (2011)

Main markets: US

"I have been involved in the South Coast Rock Lobster fishery for over 35 years and today I am the Chair of the South Coast Rock Lobster Association. This is a deep-water longline trap fishery that began around 1974 when the lobsters were first detected in the search trawls of fishing vessels, and then they were targeted using the standard lobster traps that are common for the west coast of South Africa.

In the early 1970s the open access fishery had a large number of vessels exploiting the resource, and this led to high and unsustainable levels of effort in the lobster fishery. This inevitably led to the lobsters being overexploited, and fishers were at one point harvesting 1,200 tonnes of lobster tails annually and this culminated in a sharp downturn in the lobster population in the late 1970s. It was this downturn that excluded a number of fishers from the fishery, as it became less economically viable for some of them to carry on catching the rock lobster.

"The most impactful management intervention has been the introduction of a quota system, which eliminated a number of participants from the fishery in the early 1980s and reduced the pressure on the lobster population"

In late 1976, a licensing system was introduced in the fishery, which further reduced the number of vessels, and in general the lobster fishery became a reasonably sustainable and stable fishery for the next two decades. However in the late 1990s there was once again a decline in the fish stocks, and it was discovered that some members of the fishery were in fact poaching. A stop was put to this through pursuing prosecutions including fines and imprisonment with the assistance of third countries. After the poachers' exclusion the fishery once again became stable, with very little change in fishing effort or in the number of participants.

The most impactful management intervention has been the introduction of a quota system, which eliminated a number of participants from the fishery in the early 1980s and reduced the pressure on the lobster population. After the introduction of the quota system the number of vessels in the fishery went down from about 40 fishing vessels to 8 registered vessels, a level that has now been maintained for 15 years. Had quotas not been introduced, the business would undoubtedly have been flattened within ten years.

The South Coast Rock Lobster Fishery is one of the few global crustacean fisheries that have not experienced an increase or decline in output greater than 10% over the last ten years. This is due to a good Operational Management Plan, which includes a computerized and objective total allowable catch calculation system. This fishery provides a constant supply of high quality lobster resulting in a good market price. The limited number of operational groups in the industry coupled with the long term (fifteen year) rights to the fishery has ensured that fishers have a sense of ownership over the resource, and do not fall prey to the 'tragedy of the commons'. It is a fishery responsibly operated by the state and stakeholders."

Before intervention/s – the 1980s				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
1200 tonnes	Initial economic return	Exploited	40 vessels	Fewer people are now employed in the fishery otherwise management costs	330 tonnes (tail mass) @ US$50 per kg	Increase in economic return	Stable	8 registered vessels

SPECIES FISHING GEAR

Zanzibar's Village Fishermen Committees

Interview with Mohammed Sulieman Mohammed, Chairman of the Fumba Village Fishermen Committee

Species: Mixed small pelagics

Fishing gear: Small scale and artisanal. Primarily canoes

Country: Zanzibar, United Republic of Tanzania

Ocean: Indian Ocean

Fishery tonnage: Data deficient

Main markets: Local sale and consumption

"Fishing is important to the people of Zanzibar with many in our communities reliant on fish for food as well as for their livelihoods. For many years the fishers around Zanzibar used destructive and unsustainable fishing methods, such as drag nets and dynamite blasting, and these had a really bad effect on the fish and the seas around Zanzibar. The government found it difficult to stop these damaging practices or to enforce conservation policies in this area because of under-staffing and poor financial resources.

In the 1990s the fishers around Zanzibar began to suffer from extremely low catches. Fishers were spending much more time at sea, but their catches were small, almost nil on some days. By 1994 the situation had become so bad that the villagers were motivated to ask government authorities for greater control and responsibility for the marine resources. The government, with support from WWF, assisted communities in setting up Village Fishermen Committees.

I was fully involved in the setting up of the Fumba Village Fishermen Committee. Fumba is one of the villages along the Menai Bay Conservation Area. My major role was to mobilize fishers to work together and to give them training on the importance of management of marine resources. I was also involved in mobilizing fishers in my village to turn up to election meetings; it was important that everyone had a say and chose who represented them.

Before the Village Fishermen Committees were formed we used to think that the marine resources belonged to the government. No one took any care and they were not worried if they saw somebody using destructive fishing methods. After the formation of the Village Fishermen Committees and after attending a series of classes on environmental education every fisher believed that the marine resources were his and had to be used sustainably. Over the last ten years we have seen a regeneration of our marine resources so fishers catch more fish and sell them at good prices. These increased fish catches have led to the increased well being of fishers.

"As a result of effective surveillance made jointly by government and Village Fishermen Committees, the marine resources have thrived, coral reefs are now in good condition and rare marine mammals like dolphin and whales are now common"

As a result of effective surveillance made jointly by government and Village Fishermen Committees, the marine resources have thrived, coral reefs are now in good condition and rare marine mammals like dolphin and whales are now common. This has resulted in booming tourist activities within the area which helps our local economy."

Before intervention/s – 1994				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
–	Very reliant on fisheries	Exploited	18,619 small canoes and vessels	Estimated project cost for establishing committees in Zanzibar US$150,000	▪ Stable but increase in revenue from tourism ▪ Mixed systems of livelihood generation	▪ Improved for fishery and indirectly for tourism ▪ Fishery communities have improved social conditions	Unable to say – but indications are stable	34,570 vessels

SPECIES FISHING GEAR TONNAGE

Patagonian and Antarctic Toothfish Fisheries

Interview with Martin Exel, Chair of the Coalition of Legal Toothfish Operators (COLTO)

Species: Antarctic toothfish (*Dissostichus mawsoni*) and Patagonian toothfish (*Dissostichus eleginoides*)

Fishing gear: Trawl and longline

Countries: Australia, New Zealand, Chile, Argentina, Uruguay, Peru, Falklands, Spain, France, Japan, CCAMLR waters

Ocean: Antarctic and sub-Antarctic – specifically South Georgia, Ross Sea (both MSC-certified), Heard Island, Macquarie Island and Kerguelen/Crozet (all under assessment), Prince Edward and Marion Islands, and the EEZs of Chile, Argentina, Uruguay and Peru (all outside CCAMLR waters).

Fishery tonnage: 20,000 tonnes

Markets: Europe, the United States and Japan; China a growing market.

"I work for Austral Fisheries, which harvests Patagonian and Antarctic toothfish. We fish all around the Antarctic, but the Heard Island stock is particularly important for us and within Australia's exclusive economic zone.

One of my main tasks has been protecting those species from illegal, unreported and unregulated (IUU) fishing. In the late 1990s, it was at a level no single government could keep pace with. That's when we started COLTO[18] (the Coalition of Legal Toothfish Operators) to provide information about what we were seeing and to help governments control IUU fishing. Illegal fishing was like a military operation then, and its impact on the legal industry was huge.

This threat to the long-term sustainability of the fishery was one issue, bird by-catch another. IUU fleets were killing tens of thousands of seabirds a year as they used no mitigation measures. That issue helped us collaborate with NGOs, as one common goal we shared was the reduction of bird by-catch.

We addressed the first problem by sharing information between members in all relevant countries, within and outside the jurisdiction of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). We helped CCAMLR devise a catch documentation scheme using VMS, observers, verified product containers and verified unloading, to ensure the legal catch was traceable.

On the by-catch side, gear manufacturers, scientists and the legal industry developed integrated weighted lines, which reduce the availability of bait to seabirds. Other measures included using bird scarers (tori lines) to prevent birds diving on baited hooks, and not throwing offal overboard. Through collaboration and sharing a common goal with the NGOs, we reduced seabird by-catch by 99%. Last year, only 36 birds were caught in gear across the entire CCAMLR zone of the southern ocean. Because birds are no longer stealing bait from hooks, catch rates per set have gone up, reducing costs.

"With less illegal toothfish on the market, prices have improved. Catch values are as high today as they have ever been"

Such significant reductions in by-catch could only be achieved by getting rid of the illegal operators. Since 1996, we have reduced IUU fishing by 97%, with illegal catches down from 32,000 tonnes a year to about 1,000 tonnes. That's a huge achievement.

Toothfish stocks are recovering too. In the early years, the TAC for Heard Island was 3,800 tonnes, but dropped to 2,500 tonnes because of IUU catches, and to ensure sustainability of the stock. However, as we have addressed the IUU issue TACs are again increasing and went up by 200 tonnes this year.

With less illegal toothfish on the market, prices have improved. Catch values are as high today as they have ever been. At the peak of illegal fishing, you could expect as little as A$ 3 per kilogram, whereas toothfish sold to the United States now fetches up to A$ 23 per kilogram. It's a win-win."

Before intervention/s – (1996/7)				Transition	After intervention/s – Current			
Economic indicators	**Social indicators**	**Environmental indicators**	**Fleet indicator**	**Cost of interventions**	**Economic indicators**	**Social indicators**	**Environmental indicators**	**Fleet indicator**
US $3/kg	–	Catches: 60,000t	–	▪ Industry: US $10-50m ▪ Governments: US $100-500m	Price US $21-24/kg	Increased	▪ Allowable catches: 20,000t ▪ Reduced IUU of Patagonian toothfish: 97% ▪ Reduced by-catch seabirds: 99%	Small reductions

18 www.colto.org

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