Asia-Pacific
Economic Cooperation

Seminar on Sharing Experiences in Managing Fishing Capacity

APEC Fisheries Working Group

September 2006

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This document is the final report of the project APEC FWG 01/2006 “APEC Seminar on Sharing Experiences in Managing Fishing Capacity”. It was proposed to APEC by Chinese Taipei and co-sponsored by Chile, New Zealand and the United States of America.

Introduction

The issue of managing fishing capacity has been raised in light of a growing concern on the spreading phenomenon of overcapacity, excessive fishing inputs and overcapitalization in world fisheries. In 1999 FAO adopted the International Plan of Action for the Management of Fisheries Capacity (IPOA-Capacity). The IPOA-Capacity calls upon States to achieve an efficient, equitable and transparent management of fishing capacity. Furthermore, the issue of excessive fishing capacity has been of concern within the APEC region. Notably the Bali Plan of Action adopted in the 2nd APEC Ocean-Related Ministerial Meeting also calls upon those APEC economies which have been or will be facing the problem of excessive fishing capacity to implement the IPOA-Capacity.

In response to the concern and noting the lack of opportunity among APEC FWG members to exchange views on fishing capacity, and in view of its painful experience in encountering the problem of excessive fishing capacity, Chinese Taipei has decided to implement an APEC project by hosting the "APEC Seminar on Sharing Experiences in Managing Fishing Capacity" in order to facilitate the information sharing among FWG economies on the issue. The aim of the Seminar is to enable member economies to learn lessons and share experiences in the management of fishing capacity and to provide a means of capacity-building for those members who have the issue of excessive fishing capacity but have not yet designed such a program as envisaged in IPOA-Capacity. The Seminar is also aimed to respond to the objective of the Bali Plan of Action, whereby member economies are urged to adopt feasible measures to tackle the problem of excessive fishing capacity, with the hope of mitigation of their impacts on over-fishing, degradation of marine fisheries resources, decline of food production and significant economic waste.

Summary Report of the Seminar on Sharing Experiences in Managing Fishing Capacity (FWG 01/2006)

Background

The objective of the Seminar is to create a forum for member economies of FWG to share their experiences and learn lessons in the management of fishing capacity and to provide a means of capacity building for those members who might have the problem of overcapacity but have not yet designed a program in managing their fishing capacity, in order to achieve the objectives as laid down in the Bali Plan of Action and International Plan of Action for the Management of Fishing Capacity, and to ensure sustainable fisheries development for the utilization of future generations.

The Seminar is divided into four sessions (final agenda is attached as Annex 1), focusing on the regional experience within and outside the APEC in managing fishing capacity, and cases of managing capacity of individual economies, including fleet reduction.

Opening

Attended by 56 participants from 17 APEC member economies (participant list attached as Annex 2) the Seminar on Sharing Experiences in Managing Fishing Capacity took place from 8-9 May 2006 in Kaohsiung, Chinese Taipei.

The seminar was opened by a remark (Annex 3) made by the seminar organizer, Peter Ho, the President of the Overseas Fisheries Development Council of Chinese Taipei. He later invited special guest Dah-Wen Shieh, Director-General of the Fisheries Agency of Chinese Taipei and Lead Shepherd of FWG, James Sha, to deliver their welcoming remarks.

First session

The first session of the seminar was convened by Dr. Chin-Hwa Sun, Professor and Director of Institute of Applied Economics of National Taiwan Ocean University of Chinese Taipei. She introduced the first speaker, Rebecca Lent, Director of International Affairs, National Oceanic Atmospheric Administration, U.S. Department of Commerce, to give her presentation. Her paper entitled “Capacity Reduction: Rationalizing Fisheries Management” (Annex 4) introduced different approaches of managing fishing capacity and a number of case studies of U.S. management of fishing capacity, including individual fishing quotas in the Alaska Halibut Fishery and limited entry in the Atlantic highly migratory species. The paper also acknowledged

the importance of data and analysis in the management process as well as stakeholders participation.

Questions raised by participants during the discussions included the involvement of stakeholders, the positive and negative impacts on social and economic aspects created by the management measures of fishing capacity, the funding for the U.S. vessels buyback programs and measures that varied from fishery to fishery. It was generally accepted by the participants that a broader involvement of stakeholders before, during and after the implementation of measures should be much encouraged. The delegate from Canada shared its experience of consultation framework, or stakeholder outreach, by having a professional facilitator in communicating with the industry which would create a deliberate process that ultimately gains understanding from everyone. The delegate from the United States recommended formulating a list of economical analysis serving as means of tool kit to further enhance the APEC member economies in forming management of fishing capacity or as reference tools during the decision making process.

After the discussions on the first presentation, the session convener Dr. Sun invited Lori Ridgeway, Director General of International Coordination and Policy Analysis of Department of Fisheries and Oceans of Canada, to deliver her presentation. Her presentation entitled “Managing Fishing Capacity—Some Insights from OECD and Canadian Experiences” (Annex 5), introduced the experiences of management of fishing capacity and lessons learned through those managements from OECD. She also shared the experiences of management of fishing capacity of Canada in different fisheries, such as Pacific salmon fishery and Pacific halibut fishery.

Discussions on the presentation were focused on the importance of the analysis of economic incentive for stakeholders to actively participate in the program of management of fishing capacity, the efforts of the government of Canada in assisting fishermen to adjust the transitional period when a fishery is closed, and introduction of ecolabelling to the Canadian fisheries and fishermen. The speaker responded that the decision-makers and the leaders should have the full knowledge of the risk of their decision. Assistance, such as early retirement, investment of new business, and relocation of manpower, has been implemented by the government of Canada to help fishermen to make adjustment during the transitional period of fishery closure. Canada continued to encourage its fishermen to build up their own code of conduct, which would create responsible fishing practice and lead to the ecolabelling concept. The delegate from the United States expressed that the concept of ecolabelling should

be driven by the market force. Such intervention was echoed by many of the participants. The delegate from Canada indicated that the entire government system should be involved in the implementation of measures in managing fishing capacity; such sentiment was also shared by many APEC member economies.

Second session

The 2nd session was convened by Lori Ridgeway of Canada. She invited Mr. Suriyan Vichitlekarn, Policy and Program Coordinator of Southeast Asian Fisheries Development Center (SEAFDEC) based at Bangkok, Thailand to present his paper entitling "Management of Fishing Capacity in Southeast Asia: Experience, Directions and Challenges" (Annex 6). The paper introduced the general situation of coastal small fisheries of Southeast Asian countries. He also expressed the concern on the supplemental livelihood in order for fishermen, who remain inactive during the measures, to make living.

After the presentation, the delegate from Chinese Taipei expressed that given the difference of the fisheries in Southeast countries in nature, long term reliable fisheries statistic and issues of El Niño and La Niña should be taken into account in understanding what management measures would be needed for fisheries in the region. He also urged different approaches in determining the appropriate measures to address the issues of fishing capacity by understanding who should be responsible, or when to respond and enhance the data-sharing mechanism. Mr. Vichitlekarn also shared the experiences of SEAFDEC in introducing ecolabelling. He mentioned that ecolabelling should be a market-driven mechanism and SEAFDEC was in the process of investigating ways to ensure the benefit of the very first starters in the implementation of ecolabelling, thus creating more incentives for fishermen or harvesters to follow suit.

The delegate from China queried that SEAFDEC not being mandated to implement measures that would require its members to comply such as in the case of FFA in the south Pacific, and would subsequently be difficult in convincing its members to adopt common fisheries management measures. Mr. Vichitlekarn responded that SEAFDEC acknowledged that actions of compliance would rely on individual members, however SEAFDEC could assist members to implement measures, such as building institutional capacity in ensuring the social security. He also added that all members of SEAFDEC being the members to Association of Southeast Asian Nations (ASEAN), which is an Inter-governmental organization with conformity nature, the implementation of common measures would be pushed under the framework of

ASEAN. And, it was noted that ASEAN has increased its attention on fisheries-related issues and has been acting in collaboration with SEAFDEC on such issues.

Following the discussions, a presentation entitled “Impacts of the New Zealand Quota Management System on Fleet Capacity and Fishing Effort” (Annex 7), was given by Dr. Robin Connor, Senior Policy Analyst of the Ministry of Fisheries, New Zealand. His presentation mainly illustrated New Zealand’s experience of quota management system, in particularly the individual transfer quota (ITQ). The paper also introduced effects of the introduction of transferable property rights on fleet capacity.

Participants raised various questions regarding the presentation, including how the fishermen of small fisheries adjusted themselves during transitional period after downsizing the fleet, and the political environment during the time when the government of New Zealand introduced the ITQ system. Dr. Connor responded that there was no long-standing traditional fishing village in New Zealand, which made the transition smoother. He also mentioned that the ITQ system was introduced in the economic downward cycle and also during the time of change of government in the mid 1980s. By knowing the timing background of New Zealand’s ITQ system, Canada commented that a fisheries management measure can be implemented in both ups and downs of the economic cycle, but it is important to take advantage of the timing.

Following the discussions on Dr. Connor’s presentation, the Convener, Lori Ridgeway invited Dr. Italo Campodonico, Undersecretariat for Fisheries, Department of Fisheries, Chile, to present his paper entitled “Chilean Experience in the Reduction of Excess Fishing Capacity” (Annex 8). His paper introduced actions undertaken by Chile in reducing fishing capacity from 1990 to 2004, including measures of effort control, quota control and maximum catch limit per ship owner. Dr. Campodonico also shared the outcomes produced by those measures.

Questions regarding the presentation of the Chilean experience in managing fishing capacity were the rationale of maintaining the inactive vessels and the contribution of the management of fishing capacity to the increase of the fish landing price. Rodrigo Polanco, co-author of the paper, responded that the reason of keeping inactive vessels is because the licenses of these inactive vessels have not been removed, and operators of these vessels are entitled to keep or give up the licenses.

Third session

The third session of the seminar was convened by Dr. Campodonico. He first invited Dr. Mala Supongpan, Senior Expert on Marine Fisheries, Department of Fisheries, Thailand to present her paper entitled “Reduction on Fishing Capacity in Thailand” (Annex 9). The paper introduced the background of the trend in marine capture fisheries in Thailand, focusing on coastal fisheries. The paper also highlighted the experiences of banning of push net fishery, reduction of excess fishing capacity of the trawl fishery and other fishing capacity management, such as zoning area for anchovy fishery, the establishment of crab bank and community-based or co-management approached in coastal resource management.

After the presentation, many participants raised the question on whether the tsunami rebuilding funds from the international community has created new players that lead to the increase of fishing capacity. Dr. Supongpan responded that building of new boats is not within the jurisdiction of the Department of Fisheries, Thailand. Dr. Smith Thummachua of the Thai delegation, further elaborated that the tsunami rebuilding funding was mainly to assist fishermen to acquire new fishing gears, rather than building new boats. The delegate from Japan also expressed his appreciation to Thailand for collecting and keeping the statistical data of trash fish, which Japan finds very hard to accomplish.

Followed the discussion on Dr. Supongpan’s presentation, Dr. Campodonico invited Dr. Chin-Hwa Sun, Professor and Director of Institute of Applied Economics of National Taiwan Ocean University of Chinese Taipei, also the convener of the 1st session, to deliver her presentation. The presentation entitled “Chinese Taipei’s Experience in Managing Fishing Capacity” (Annex 10), introduced various measures implemented by Chinese Taipei in managing its fishing fleets to maintain the sustainability of marine resources. She also explained the economic approach in analyzing the voluntary vessel buyback program by using economic method in examining the relationships of equilibrium market prices and harvest.

After the presentation, the delegate from Japan expressed that Japan and Chinese Taipei should cooperate more closely to effectively manage the fishing capacity, given the two economies constitute major portion of the global distant water tuna fisheries fleet. He also asked the process of determining the vessels to be bought in the vessel buyback program. Dr. Sun responded the vessel buyback program was conducted in 2 phases, with one in 2005 and another in 2006. During the first phase in 2005, the vessels owners were reluctant to join the program and the vessel selecting process has to be accomplished through numerous consultations among vessels owners, where as

in 2006, due to the skyrocketed fuel price coupling with decreasing fish landing price, more owners were willing to join the program and a lot drawing process was to be conducted in the case vessel owners were unable to come up to the list of vessels subject to reduction.

During the discussions on Chinese Taipei's experience in reducing fishing capacity, participants acknowledged that a verification process is of vital importance in ensuring the results of management of fishing capacity would lead to the improvement of the condition of fish stocks.

Fourth session

The fourth session of the seminar was an open floor for general discussions convened by seminar organizer, Peter Ho and Stetson Tinkham, Deputy Director, Office of Marine Conservation of U.S. Department of State. Before turning the floor for general discussion, Mr. Ho invited Mr. Tinkham to present a brief update on the international trend in managing fishing capacity under the FAO Capacity International Plan of Action.

In his presentation (Annex 11), Mr. Tinkham briefly introduced the history, scope and objective of the IPOA-Fishing Capacity, encouraging member economies to act responsibly and rapidly in addressing the IPOA-Fishing Capacity. He especially noted that the international community was falling behind the timeframe indicated in IPOA-Fishing Capacity, which called to achieve worldwide, preferably by 2003, but not later than 2005, an efficient, equitable and transparent management of fishing capacity.

During the general discussions, many member economies shared efforts made towards the IPOA-Fishing Capacity, such as Russia's accession to FAO with tighter coherence of FAO policy in fisheries, and Mexico's stronger MCS mechanism by having all its high sea fleet to install VMS under its new sustainable fisheries and agriculture law. The delegate of China took the opportunity to briefly introduce China's draft capacity reduction program, with a short-term goal, aiming to reduce the total number of vessel from 222,000 in 2002 to 192,000 in 2010, and a mid-term goal of further reducing the number to 160,000 in 2020. The seminar also invited the representatives from the fishing industry of Chinese Taipei to share their views toward the management of fishing capacity.

It was noted that many member economies shared the same view that the issue of

overcapacity and IUU fishing have created serious adverse impact to the sustainability of fisheries and that responsible fishermen and the international community could no longer tolerate the issue of overcapacity. Member economies also recognized resolving of the problem of overcapacity required a whole government approach and international collective actions, and encouraged capacity building under APEC framework to cope with the issue. To sum up the discussions throughout the seminar, participants produced a list of recommendations (Annex 12) as the conclusion and there was anticipation of a second APEC seminar on share experiences in managing fishing capacity, or a seminar of similar nature.

Annex 1

Asia-Pacific
Economic Cooperation

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

FWG 01/2006--D001

Final Draft Agenda

Fisheries Working Group Meeting
8 – 9 May 2006
Kaohsiung, Chinese Taipei

Final Draft Agenda

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

8 – 9 May 2006, Kaohsiung, Chinese Taipei

Sunday, May 7th

18:00 – 20:00	Registration (1F Lobby, Ambassador Hotel)

Monday, May 8th

08:30 – 09:00	Registration Continued (20F, Top of Ambassador, Ambassador Hotel)
09:00 – 09:30	Opening Ceremony (20F, Top of Ambassador, Ambassador Hotel) 1. Welcoming remarks by the Project Organizer 2. Remarks by the Guest from Chinese Taipei 3. Remarks by Lead Shepherd of FWG
09:30 – 09:50	Photo Session (To be announced)
09:50 – 10:10	Coffee Break

- First Session –

10:10 – 10:40	"Capacity Reduction: Rationalizing Fisheries Management" Presented by Dr. Rebecca Lent, Director of International Affairs, NOAA, Department of Commerce, USA
10:40 – 11:00	Discussions
11:00 – 11:30	Presentation by Ms. Lori Ridgeway, Director General of International Coordination and Policy Analysis, Department of Fisheries and Oceans Canada
11:30 – 11:50	Discussions
12:00 – 14:00	Buffet Lunch (1 F, Love River Restaurant)

- **Second Session –**	
14:00 – 14:30	"Management of Fishing Capacity in Southeast Asia: Experience, Directions and Challenges" Presented by Mr. Suriyan Vichitlekarn, Policy and Program Coordinator SEAFDEC, Thailand
14:30 – 14:50	Discussions
14:50 – 15:10	Coffee Break
15:10 – 15:40	"Impacts of the New Zealand Quota Management System on Fleet Capacity and Fishing Effort" Presented by Dr. Robin Connor, Senior Policy Analyst of the Ministry of Fisheries, New Zealand
15:40 – 16:00	Discussions
16:00 – 16:30	"Chilean Experience in the Reduction of Excess Fishing Capacity" Presented by Mr. Italo Campodonico, Undersecretariat for Fisheries, Department of Fisheries, Chile
16:30 – 16:50	Discussions
18:30	Welcome Dinner: Hosted by Dah-Wen Shieh, Direct General of the Fisheries Agency, Council of Agriculture

Tuesday, May 9th

- **Third Session –**	
09:30 – 10:00	"Reduction on Fishing Capacity in Thailand" Presented by Dr. Mala Supongpan, Senior Expert on Marine Fisheries, Department of Fisheries, Thailand
10:00 – 10:20	Discussions
10:20– 10:40	Coffee Break
10:40 – 11:10	"Chinese Taipei's Experience in Managing Fishing Capacity" Presented by Dr. Chin-Hwa Sun, Professor and Director, Institute of Applied Economics, National Taiwan Ocean University, Chinese Taipei

11:10 – 11:30	Discussions
12:00 – 14:00	Lunch (2 F, Cantonese Restaurant)

- Fourth Session –

14:00 –15:30	General Discussions Closing of the Seminar

Annex 2

Asia-Pacific
Economic Cooperation

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

FWG 01/2006--D010

Participant List

Fisheries Working Group Meeting
8 – 9 May 2006
Kaohsiung, Chinese Taipei

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Annex 3

Asia-Pacific
Economic Cooperation

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

FWG 01/2006--D011

Opening Remark

Mr. Peter Ho
Seminar Organizer

Fisheries Working Group Meeting
8 – 9 May 2006
Kaohsiung, Chinese Taipei

Opening Remarks
By Peter Ho[1]
Seminar Organizer

Good Morning everybody, welcome to Kaohsiung and welcome to this seminar. My name is Peter Ho, President of the Overseas Fisheries Development Council. I am the organizer of this seminar. It is my honor to serve as your chair.

It is encouraging to see such a great attendance. My record shows that out of the 21 APEC economies, 18 members of FWG have sent representatives to attend this seminar. I am very pleased that under funding from APEC the Seminar on Sharing of Experience in Managing Fishing Capacity can be held in this port city of Kaohsiung in the southern part of the island. I would like to thank the United States, Chile and New Zealand, for their co-sponsorship of our proposal.

Overcapacity in fisheries has been a problem for quite some time. FAO 2004 SOFIA reports that nearly 77% of the world's fish stocks which capture fishery depends on are in the state of full exploitation or even overfished. Overcapacity or excessive fishing inputs are said to be the major contributors to the deterioration of these fish stocks. FAO has been drawing the attention of States to this effect in many international instruments and papers, notably the FAO Code of Conduct for Responsible Fisheries and the 1999 FAO International Plan of Acton on Managing Fishing Capacity. Article 6.3 of the Code calls upon "states to prevent overfishing and excess fishing capacity and implement management measures to ensure that fishing effort is commensurate with the productive capacity of the fisheries resources and their sustainable utilization." The IPOA Capacity which is an instrument elaborated within the framework of the Code, addressing specifically the matter of fishing capacity. Many APEC member economies, as well as those outside the APEC family, have implemented measures in managing their fishing capacity. There are many ways of managing fishing capacity. Some have been proven to be successful and some not. Our speakers will be providing you a better picture during the course of their presentations. This seminar is meant to serve as a forum for exchanging and sharing experiences among APEC member economies in their management of fishing capacity and enhancing capacity building for those who might be facing such problem.

Now, I have the honor of introducing to you 7 reputable and outstanding international scholars and experts to deliver their papers on the management of fishing capacity. I have here Ms. Lori Ridgeway of Canada, Mr. Italo Campodonico of Chile, Dr. Robin Connor of New Zealand, Dr. Chin-Hwa Sun of Chinese Taipei, Dr. Mala Supongpan and Mr. Suriyan Vichitlekarn of Thailand, and Dr. Rebecca Lent of the United States, to speak to us. I am sure you will find their presentations interesting and informative.

The seminar will be conducted in four sessions, and I have asked Dr. Chin-Hwa Sun to chair the first session, Ms. Lori Ridgeway the second session, Mr. Italo Campodonico the third session and Mr. Stetson Tinkham the former Lead Shepherd of FWG and myself the session on general discussions. Before proceeding to the general discussions Mr. Tinkham will give you a brief update on the international trend in managing fishing capacity under the FAO Capacity International Plan of Action.

[1] President, Overseas Fisheries Development Council.

According to the agenda, each speaker will be given 30 minutes to complete his or her presentation. After each presentation we will have 10 minutes discussion. Please don't overrun your time too much. Otherwise we will be late for lunch or dinner.

Once again welcome to Kaohsiung and I wish you a pleasant stay here. Don't forget to find time looking around the city. If you need any help please ask anyone of the secretariat staff. In closing I would like to thank the secretariat staff led by David Chang, who has been working long hours preparing the logistic arrangements.
Now, I would like to ask Mr. Dah-Wen Shieh, the Director-General of the Fisheries Agency to say a few words to us.

Annex 4

Asia-Pacific
Economic Cooperation

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

FWG 01/2006--D002

Capacity Reduction:

Rationalizing Fisheries Management

Dr. Rebecca Lent
Director of International Affairs, NOAA
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Fisheries Working Group Meeting
8 – 9 May 2006
Kaohsiung, Chinese Taipei

Capacity Reduction:
Rationalizing Fisheries Management

Dr. Rebecca Lent
Director of International Affairs, NOAA, Department of Commerce, USA

Abstract

While considerable progress has been made in managing fisheries both within EEZs and, to a lesser extent, on the high seas, excess capacity continues to plague global fisheries. Largely a result of open-access regulations, or in some cases no regulations, excess capacity is associated with overfishing, bycatch, and habitat impacts. Management measures that address capacity, including limited entry and market-based measures, are likely to result in more productive fishing fleets and reduced impacts on the marine ecosystem. Despite these potential benefits, design and implementation of capacity reduction measures is challenging. Based on case studies, it is clear that the management process must be informed by data and analyses, and must include considerable public participation. While such processes are time-consuming as well as costly, they are critical to implementing capacity reduction measures that are acceptable to stakeholders.

In most parts of the world, free and unfettered access to coastal seas and the resources therein is pretty much history. Numerous legislative and regulatory measures are in place to address living marine resource management within EEZs. Multilateral fisheries management bodies cover most tunas and tuna-like species of the world, as well as a growing number of other species. Despite these efforts at the national and international level, and the nearly universal acceptance of excess capacity as a key problem in managing living marine resources, excess capacity continues to plague global fisheries.

For example, excess capacity remains a considerable problem in the global tuna purse seine fishery: across regions, average excess capacity (defined in this case as capacity output minus observed output), was estimated at 26 to 35% (Reid et al, in press). Open access regulations and resulting excess capacity is the root cause of overfishing, habitat damage, and critical levels of bycatch of non-target species, some of which are close to extinction. Excess capacity has been shown to be a major cause of illegal, unregulated and unreported (IUU) fishing. Most importantly, excess capacity leads to poor economic conditions in the fishery and related sectors such as processing and marketing - - and this is true in both developed and developing countries. Christy (1997) estimates that $2.9 billion in potential revenue is lost due to excess excess-capitalization in the United States. Even with a healthy target stock, overcapitalization will lead to profit dissipation as too many fishers chase too few fish.

The purpose of this paper is to echo the call from many fora, including the United Nations, the Food and Agriculture Organization, the Organization for Economic Cooperation and Development, the Yokohama Declaration, and APEC itself to reduce fishing capacity. After addressing some of the basic facts about fishery management and fishing capacity, two case studies of rationalization will be provided: limited entry in the U.S. Atlantic highly migratory species (HMS) fishery, and individual fishing quotas in the Alaska halibut fishery. The paper wraps up with a discussion of the particular challenges of rationalization in the international context.

Theoretical and empirical discussions continue regarding how best to measure and define

fishing capacity and how to determine the "optimal" total level of fishing capacity. Indeed, there is an FAO conference underway at the same time as this APEC workshop focused on measurement of capacity for the tuna fisheries worldwide. The measurement of capacity and its optimal level in a given fishery is not addressed in this paper; the objective is rather to emphasize the need to reduce capacity – however it is measured – for long term economic (and ecological) sustainability of the fishery.

General Background

The Problem

Fisheries have traditionally been managed in an open access fashion, where entry into an open-access fishery is limited only by the equipment and skill to catch fish. Traditional, biologist-designed regulations were designed to be limits on catch, via either direct limits on catch, such as total allowable catch (TAC), or indirectly via effort limits, such as restrictions on fishing gear, establishing fishing seasons, and other such tools. Such an open access approach leads to dissipation of profits because fishers will continue entering and investing capital in the fishery until it becomes unprofitable to fish - - rather than fishing to maximize profits. This type of management, referred to as regulated open access, seeks only to restrict the total harvest or fishing effort without attempting to control fleet size or capacity.

Under such management measures, fishers have every incentive to compete for the largest possible share of a limited harvest, therefore leading to the "race for the fish" and "capital stuffing" where fishers continue to invest in the fishery to catch an ever decreasing share of the harvest. As a result, fishing seasons must become increasingly short to avoid exceeding the TAC. The result is levels of fleet capacity exceeding what is needed to capture the TAC, a situation referred to as excess capitalization. Excessive capitalization results in economic waste as each fisher catches fewer fish but continues to invest in boats to catch these fish (dissipation of profits).

In addition to economic losses, excess capacity has an impact on fishing safety. Fishing remains one of the world's most dangerous professions, and the race for the fish only exacerbates this danger. Shortened fishing seasons lead to a rush to reach the fishing grounds (and to make round trips to offload), incentives to fish long hours, taking shortcuts that lead to injury or death. Furthermore, fishermen are simply maximizing their catch, rather than waiting until prices of fish (as well as fuel, labor, etc.) are propitious for a more profitable fishery. The sudden glut of product on the market leads to poor quality, as vessel crews are too busy getting their bigger share of the pie to pay attention to ice, handling, and cleaning the fish. Also, processors must over-invest in refrigeration and other facilities in order to handle an entire season's TAC in just days.

Regulating Capacity

Many options exist to regulate capacity. Some options (limited entry) simply limit the number of fishers or vessels but do not eliminate the incentive to increase capacity. As long as incentives remain to increase capacity to harvest more fish, fishers will find inventive methods to increase capacity within existing regulations. For example, after a limited entry program was implemented in the Hawaii longline fishery, the number of vessels and trips remained constant, while the number of hooks nearly doubled. Market based options, such as individual fishing quotas (IFQs) while more costly to implement, can alter incentive structures and lead to more rational, economically efficient fisheries.

1) Limited entry regulation is most commonly used to curb the build up of excess capacity because it is relatively easy and cheap to implement. Some fishery management programs begin with a "moratorium" on new entry - - i.e. no new vessels can enter the fishery, and then follow with a limited entry scheme wherein vessels must have a fishing history to qualify for fishing, usually resulting in a reduction of fleet size. For a moratorium as well as limited entry, monitoring, control, and surveillance are applied to vessel capacity, usually in conjunction with limits on TAC. Limited entry programs involve issuing licenses to fish to a limited number of fishers (often based on historical use). However, those remaining in the fishery still have an incentive to catch as many fish as quickly as possible. This incentive results in capital stuffing, as remaining fishers invest in better/bigger boats. To achieve TAC, managers often have to implement gear or seasonal restrictions. In some extreme cases, the fishery may only be open for a few days or hours. Success of limited entry is dependent on the design and restrictiveness of program and the complexity of the particular fishery to be managed; however, more restrictive programs are generally very costly. Transferability of the licenses adds to the complexity, and creates a market for access to the fleet.

2) Market-based tools- Unlike regulated open access and limited entry programs, market-based regulation attempts to shift both the costs of resource depletion and the benefits of conservation to the fishing industry

    a) Taxes can be applied to harvests to increase the cost of fishing to a level that better represents the true costs of resource extraction. Increasing costs should, in turn, decrease fishing effort and encourage innovative methods to reduce fishing costs. In addition, tax revenues can be used to fund fishery management. However, it is difficult to achieve specific harvest levels with taxes and taxes are often politically difficult to implement. Finally, taxes do not necessarily reduce the race for the fish and all the problems associated therewith.
    b) Quotas- Individual transferable quotas (ITQs) give fishers exclusive, transferable, and enforceable harvesting privileges, which provide fishers a long-term interest in managing fish efficiently and to maintain the health of fish stocks. By giving fishers such harvesting privileges, they make their own, economically rational decisions on the appropriate level of fishing capacity (vs. capital stuffing) and timing of fishing activities (vs. the race to fish). As a result, ITQ programs result in controlled exploitation, higher profits, safer fishing practices, improved product condition, and increased seasonal availability of the product – with benefits for consumers. ITQs are generally allocated by historical use or by auction. Allocation by auction should result in an allocation to those who place the highest value on the quota (presumably the most efficient fishers) and generates revenue that can cover management costs. Allocations based on historical use, however, are more politically feasible and thus most commonly used. IFQ programs can be designed to ensure that quotas remain allocated in a manner that preserves fishing communities.

Variations on IFQs include transferable days at sea (DAS), which are currently in use in the New England groundfish fishery. A fixed number of DAS were assigned to each fishing vessel based on its fishing history, and these may be leased by owners who choose not to fish or to fish fewer days.

3) Buyback programs- Buyback programs (for fishing vessels and/or permits) offer an additional means to reduce fishing capacity, and can be used in conjunction with limited entry or a market-based approach for capacity reduction. Buyback programs provide financial assistance to fishers who chose to leave the fishery, and increase profitability of remaining fishers. However, buyback programs require purchase of vessels (or permits) and therefore can be very costly. The question of who pays (government vs. industry) may affect the acceptance/feasibility of the program. In addition, incentives remain for remaining fishers to circumvent regulations and increase capacity through capital stuffing. Buyback programs must also ensure that retired vessels do not simply shift to different fisheries. In some programs, vessels have been transferred to enforcement or research organizations while other programs require destruction of boats. However, without the proper monitoring, many programs have simply shifted fishing pressure to other fisheries. Obviously, some form of limited entry must be in place before buybacks are initiated or buybacks will be entirely ineffective as new boats move in to replace decommissioned vessels.

4) Effects on fishermen
Reducing capacity affects livelihoods of fishers and fishery dependent communities. Those who remain in the fishery tend to be more profitable and more productive, producing a more stable source of employment and income in both the fishing and processing sectors. While buyouts and retraining programs can be implemented for affected fishers, many fishers and communities have few other industries and opportunities. In addition, limited entry programs or consolidation occurring under ITQ programs reduce the number of vessels and can have dramatic effects on shore-based industries. As a result, reducing capacity, while necessary, is a contentious and politically difficult progress. Because policies to reduce capacity are generally adopted once a fishery is already depleted, the challenge of implementing capacity reduction is even greater.

Probably the most difficult aspect of implementing limited entry is determining “who is in and who is out” (for limited entry) and “who gets how much quota or days at sea” for IFQ-type programs. These challenges cannot be overstated. An open, public, participatory process, as well as ample analysis of various management alternatives, can lead to more public awareness and informed debate - - and hopefully acceptability of the program.

Two Examples from the United States

IFQs in the Alaska Halibut Fishery

Although originally unpopular and difficult to implement, the Alaska halibut fisheries is a classic success story of capacity regulation. Halibut is a bottom-dwelling flat fish found off the coast from Northern Alaska to Southern California. The Alaska halibut fishery primarily uses fixed longline gear and is comprised of large freezer processor ships and smaller catch vessels. Its landings (in 1996) were valued at over $3.5 billion with landings of approximately 60 million pounds.

In the 1980’s, rumors of a moratorium on new entrants prompted a rush to enter the fishery. Excess-capitalization and a race for the fish situation ensued, as new and old fishers invested in new boats and gear. In response, effort limitation regulations were implemented

including vessels/trip limits, gear restrictions, and fishing season limitations/closure. By the early 1990's, the fishing season was reduced to only a few 24-hour fishing "seasons." These season openings were characterized by thousands of boats, setting excessive amounts of gear, often under inclement weather conditions. These conditions resulted in gear loss, highly inefficient harvests, dangerous fishing conditions, high levels of bycatch, poor quality of fish, and short market seasons for the fish product.

To address this situation, in 1995 an IFQ program was implemented. The program was designed to improve efficiency and preserve the traditional character of the fishery. Percent share quotas were assigned, based on historical catches, to persons in four vessel classes (based on vessel size). Quotas are transferable, but subject to restrictions designed to prevent excessive quota consolidation or otherwise change the character of the fishery. Quota share holders are issued landing cards which must be presented a register location when catch is off-loaded. The catch is electronically debited from the holder's yearly IFQ. Compliance is monitored by the National Marine Fisheries Service with shore and vessel based observers.

The IFQ program has been a success for both fishers and consumers. Fresh, high quality halibut is available year round and fishers have benefited from moderate increases in price. In addition, efficiency has improved, and the cost of fishing has greatly decreased from reduced competition, gear loss, and crew size. In addition, some fishers have increased their quota through purchases of IFQs from other owners, and IFQ holders can fish exclusively for halibut any time they want during the long halibut fishing seasons. Mortality due to overharvesting has been eliminated and bycatch has declined, particularly for seabirds, as has gear loss (as associated mortality). Challenges of the program include the costs of implementation of the program and enforcement and monitoring. To fund these costs, a fee of 3% of IFQ fishers' ex-vessel earnings has been implemented.

The decision to implement limited entry was finalized after 14 difficult years of deliberations, litigation, and public hearings. Even once finally completed, the IFQ program was initially received with such controversy that the U.S. Congress imposed a moratorium on IFQ programs from 1996 to 2002 and mandated a National Research Council review of IFQ programs.

Limited Entry in the Atlantic Highly Migratory Species

In the 1990s, NMFS had shark and swordfish permits that were essentially species-based but also allowed fishermen to catch tunas other than bluefin tuna. NMFS also had bluefin tuna permits that were established by gear-type. In July 1995, the Atlantic HMS fishery participants were notified of the plans to implement a limited access program for the commercial Atlantic swordfish and Atlantic shark fisheries. A background paper outlining the issues and the options for implementing limited access was developed and disseminated, and workshops were held with stakeholders to gain public input on the design and objectives of such a system.

About a year and a half later, proposed rules to implement limited access in these fisheries were published. Due to public requests, the comment period was extended even further. Twenty-three public hearings were conducted from Maine to Texas, including the Caribbean. Through this lengthy but important public process, a number of concerns were raised by the public and the HMS Advisory Panel (AP) regarding the implementation of limited access in

the Atlantic swordfish and shark fisheries. Federal managers had additional concerns including the magnitude of changes from the proposed rule being considered, and other changes in the swordfish and shark fishery.

For these reasons, the proposed rule was revised and again published for public comment. Additional public hearings were held. The final rule was published in early 1999, with limited access finally implemented mid-year. It took nearly five years for limited entry to be implemented, but the public, participatory process was key to garnering stakeholder support – or at least understanding – of the importance of limiting the number of participants in these fisheries. The HMS Fishery Management Plan of 1999 put the final touches on this limited access system.

Eligibility criteria for participation in the commercial fisheries were based on historical participation, and aimed to create a management system to make fleet capacity commensurate with resource status so as to achieve the dual goals of economic efficiency and biological conservation. The program was designed to prevent further capitalization of the fishery and reduce latent effort, without significantly affecting the livelihoods of those who truly were dependent on the fisheries. Because this program did not directly reduce the capacity in these fisheries, this program was merely meant to be the first step towards reducing capacity in the Atlantic swordfish, shark, and tuna longline fisheries.

Upgrading restrictions were included in the limited access regulations, which limit vessels from any increase over 10 percent length overall, 10 percent gross or net tonnage, and 20 percent horsepower. NMFS continues to receive comments that these vessel upgrading restrictions are not appropriate for primarily longline fisheries, are not the preferred vessel characteristics to limit capacity, and have caused safety at sea concerns. In developing the current upgrading restrictions, hold capacity was identified by constituents as a vessel characteristic that would not impact safety at sea and would meet the objective of addressing capacity in HMS commercial fisheries. NMFS did not implement hold capacity as a measure to limit vessel upgrading in 1999 due to the lack of standard measurements of vessel hold capacity, as well as the lack data.

There was one legal challenge to the HMS limited entry program, which was successfully defended. Future regulatory measures may consider modifications to the limited access program, including the upgrading restrictions. Managing migratory, shared stocks in a mixed species fishery through market-based mechanisms is far more complex than the case of halibut - - therefore, future capacity reduction programs will be all the more challenging in HMS fisheries.

The Particular Challenge of High Seas Fisheries

The high seas may be the last frontier of “true open access fisheries”, but there are increasing levels of coverage with international, regional, and national management structures with varying degrees of regulatory authority. Even when multilateral bodies exist to address resource stewardship, the focus may be more on determining TAC and allocating this limited catch among countries - - as opposed to rationalizing the fleet size. To some extent, guidance is provided by overarching measures and products from the United Nations (some still under development) including the international plans of action, the Code of Conduct, the High Seas Compliance measures, and measures for high seas driftnets, among others.

Nevertheless, fewer national incentives exist for establishing market-based, rational measures for multilateral fishery management - - other than the increased pressure on all countries to address sustainable stewardship.

Capacity has been addressed in some regional fishery management organizations (RFMOs), although to varying degrees. In 1999, the Inter-American Tropical Tuna Commission (IATTC) placed limits on carrying capacity of the purse seine fleet in the eastern Pacific, including limits for each country. In 2002, IATTC implemented a regional vessel register resolution. The International Commission for the Conservation of Atlantic Tunas has set limits on overall catch and allocated catch to fishing countries, providing each nation the option to limit its numbers of vessels as it sees fit, but few countries have implemented such limits. The new Western and Central Pacific Fisheries Commission (WCPFC) includes in its Convention the authority to address fishing capacity, and measures from the initial meeting called for a rollback of the number of purse seine vessels to 1999 levels, as well as limits on the level of fishing effort by purse seiners (number of vessels) and catches by longliners in order to conserve bigeye and yellowfin tuna.

The OECD has identified investment restrictions and services liberalizations in the harvesting sector as a final frontier on liberalization of the fisheries sector generally. This would involve free trading of rights not just among domestic interests but also globally. While the notion of internationally traded fishing rights may appear to be rather far-fetched, there has been initial discussion of this approach both theoretically (Trondsen et al, 2006) and for particular fisheries .

A first-ever summit of all tuna RFMOs in January 2007, hosted by Japan, will address capacity and hopefully be an important first step in harmonizing these measures for global tuna fisheries. Perhaps this is a first step in considering options for globally traded fishing rights.

Conclusions

Reducing fishing capacity is a huge challenge for any organization, whether a domestic agency or a multilateral fishery management body. A critical element in successfully addressing capacity is conducting appropriate analyses of the current level of fishing capacity relative to the optimal levels given stock conditions. This is not only difficult to define and determine, it is also a moving target. Data must be collected as a first step, including in some cases just the basic numbers of vessels, fishing effort, and catches. In that vein, countries participating in regional fora, including the new WCPFC, should assist in ongoing data compilation on relevant fleets and fishing effort, in order to have in hand the basic fleet size information that is critical to taking steps to address fishing capacity. This information may be combined with other ecosystem data – stock status of target and incidental catches as well as protected species bycatch, habitat implications, etc. to outline a number of alternative approaches to reducing fishing capacity. Analyses must address both the costs and the benefits of capacity reduction, with an emphasis on the long term benefits to the fishing community. While data will always be lacking, there is enough information available to conclude that capacity reduction is both necessary and desirable.

The next critical step is getting this information to the stakeholders, as a first step in the regulatory process, in order to have a more informed and focused public debate on the alternatives available for addressing capacity. As tough as it can be to implement capacity

reduction, it will only be more difficult if the public does not feel they are a part of the process. With the facts available to all, including the clear indications that capacity must be reduced, stakeholders will be more apt to at least understand that some measures must be endured, and that such impacts are far more bearable than a depleted stock. Furthermore, participation by stakeholders will help bring to light additional issues or impacts that might not otherwise have been considered, such as the ability for vessel owners to devise methods to circumvent the regulations.

Perhaps most importantly, market-based fishery management mechanisms provide a sense of ownership and/or interest in the health of the resource. As such, the participants are more apt to be informed and engaged in the stewardship of their fishery, with an increased appreciation for the need to address problems swiftly and effectively. Fishery stakeholders may also be more apt to recognize and work toward the implementation of capacity measures in the last – and most challenging – arena, notably multilateral fisheries.

Annex 5

Asia-Pacific
Economic Cooperation

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

FWG 01/2006--P003

MANAGING FISHING CAPACITY -

SOME INSIGHTS FROM OECD AND CANADIAN EXPERIENCES

Ms. Lori Ridgeway
Director General of International Coordination and Policy Analysis,
Department of Fisheries and Ocean Canada

Fisheries Working Group Meeting
8 – 9 May 2006
Kaohsiung, Chinese Taipei

MANAGING FISHING CAPACITY

SOME INSIGHTS FROM OECD AND CANADIAN EXPERIENCES

LORI RIDGEWAY
Fisheries and Oceans Canada

Fisheries and Oceans Canada | Pêches et Océans Canada

Canada

GLOBAL CONTEXT

- Overcapacity is a serious threat to fisheries worldwide
  - Undermines conservation (overfishing, IUU fishing, ecosystems)
  - Results in poor economic conditions and returns on investment
  - Exacerbates conflicts over access and allocations (domestic overcapacity spills over into international overcapacity problems)
  - Distracts from and prevents fisheries management reforms
- Problem is fundamentally driven by perverse incentives for industry to over-invest in capacity
  - Some solutions address these incentives while others do not
- Global community is determined to eliminate overcapacity
  - International debate is focusing on systematic capacity reduction
  - Failure by countries to take action now will lead to stronger measures (trade bans, port state and RFMO measures, fishing and gear bans, escalating regional conflicts, control of resources taken out of hands of fishing countries)

2

TWO MAIN WAYS TO MANAGE CAPACITY

- Regulatory/Management approaches (passive adjustment)
  - Approaches based on input controls and other measures to restrain investment in and use of capacity
  - Approaches that encourage automatic capacity adjustment
- Active adjustment
  - Use vessel buy-back and other schemes to remove capacity

3

REGULATORY/MANAGEMENT APPROACHES

- Measures that restrain (but do not eliminate) incentives for creation of overcapacity include
  - Restricting participation in the fishery (e.g. limited entry)
  - Using various other input controls (e.g. vessels, gear, openings)
  - Removing subsidies that encourage capacity investment (e.g. vessel construction and modernization, fuel costs)
- Problems with approaches based on input controls/restraints
  - Generally difficult to control all aspects of effort
  - Industry will find other ways to increase capacity
- Other approaches (market-based) encourage automatic adjustment of capacity by industry by changing incentives
  - Requires well-defined individual rights of access (transferability, quality of title, duration, flexibility and exclusivity)

4

APPROACHES THAT ENCOURAGE AUTOMATIC ADJUSTMENT

- These management systems have varying degrees of aspects of market-based mechanisms
  - Individual catch quota systems
  - Individual effort quota systems
  - Territorial Use Rights (TURFs)
  - Community-based management
- OECD experience shows a wide variety of instruments in use which, to a greater or lesser degree, encourage automatic adjustment
  - Transferability of rights is key to encouraging long-term capacity adjustment by industry

5

ACTIVE ADJUSTMENT MEASURES

- Primarily vessel buy-back schemes
  - Also licence retirement when linked to vessel ownership
  - Widely used and viewed as a solution to overcapacity
- Lessons from OECD experience
  - Schemes should be one-off otherwise they become embedded in expectations
  - Focus on removing actual/active capacity rather than latent/dormant capacity
  - Best as part of a package of reforms to change management towards automatic adjustment mechanisms
  - Stakeholder consultation and buy-in throughout the development and implementation of the scheme is necessary

6

OECD GOVERNMENT FINANCIAL TRANSFERS (GFTs) IN 2003

- USD 432 million was spent on vessel buy-back schemes (7% of all OECD GFTs)
- All OECD GFTs combined represented 20% of the total value of OECD fisheries

GFT Category	USD millions
Direct Payments (including vessel buy-backs)	1,082
Cost Reducing Transfers	626
General Services	4,791
Total	6,499

7

CAPACITY MANAGEMENT IN CANADA

- Traditional approach to capacity management was to regulate use of inputs
- Ingenuity inevitably defeated input controls
  - Industry adapted to vessel length limits with wider and deeper vessels
  - Then adapted to volume ("cubic number") limits for replacement vessels by building faster and more powerful vessels, and so on
  - System became increasingly complex and inefficient
- Overcapacity led to poor economic viability, overfishing, and unsustainable quotas
  - Created pressure to challenge responsible conservation and management decisions
  - Eventually contributed to severe declines of Atlantic groundfish and Pacific salmon fisheries in the 1990s

8

EXPERIENCE WITH ACTIVE CAPACITY REDUCTION IN CANADA

- Canadian government has had to intervene on a massive scale to reduce overcapacity
  - licence retirement and other adjustment programs
  - changes to fishing licence policies and access rules

Number of Vessels	1990	2002
Atlantic	29,205	19,684
Pacific	5,937	3,263
Total	35,142	22,947

9

MOVING FROM ACTIVE TO SELF-ADJUSTMENT OF CAPACITY IN CANADA

- Experience with licence retirement programs reveals:
  - very expensive and creates expectations of future assistance
  - must be carefully designed if it is to achieve meaningful capacity reduction
  - must be developed and implemented in consultation with stakeholders to ensure acceptance and buy-in
  - reduces incentives for industry to self-adjust capacity
  - works better in the long run when accompanied by
    - Licence and access policy changes
    - Introduction of rights-based management tools
    - Measures to prevent capacity from affecting sustainability
- Future emphasis will be on self-adjustment through adoption of rights-based management regimes, which are gaining acceptance
  - 19% of all fishing licences and 56% of the total landed value of the fishery is now under some form of rights-based management
- Emphasis will also be on capacity assessment as a part of ongoing fisheries management

10

PACIFIC SALMON FISHERY

- Between 1970s and early 1990s capacity grew significantly (hulls, motors, electronics, refrigeration)
- Vessel (length, gear, etc) and seasonal restrictions became ever more restrictive to ensure conservation
- By mid 1990s conservation concerns and depressed prices due to aquaculture required significant capacity reduction
- Salmon licence retirement program and licence policy changes were introduced
  - Licences became limited to certain areas and gear types
  - Policies encouraged “licence stacking” (combining separate gear/area licences)
  - Most of the licences retired were from single-licence vessel owners
- Since 1995 the overall number of salmon licences cut in half
- Capacity better balanced with resource now but by no means resolved
  - Large segments of salmon fleet still dependent on this fishery alone
  - Fishing seasons still very short (few days or no openings at all)
  - Low prices and precautionary management to protect weak stocks makes capacity problems extremely difficult to resolve
- Further progress will require use of complementary licensing and management policies that promote diversification out of salmon fishery

11

PACIFIC HALIBUT FISHERY

- Overcapacity and a competitive fishery led to harvest taken in six days in 1990
- Individual vessel quota (IVQ) system introduced in 1991 led to a more efficient and safer fishery that lasts a full eight months every season
- Input/output controls now used only for biological objectives (not capacity control)
  - area restrictions to protect inshore rockfish
  - requirement to have on-board cameras introduced this year
- While the number of licenced vessels unchanged at 435, number of active licenced vessels is now half as a result of transferability of IVQs
- Profitability also improved as harvest is better quality and for fresh fish market (previously frozen) as can now manage to market needs
- New fishing technology adopted now still improves efficiency but no impact on sustainability
- IVQ system extended to the Pacific groundfish trawl fishery in 1997

12

CANADA AND GLOBAL CAPACITY MANAGEMENT

- Committed to FAO International Plan of Action for the Management of Fishing Capacity
  - Recognized value of and lessons from our own domestic active capacity management programs in 1990s and move to passive rights-based capacity management in the future
  - Reporting periodically to FAO on our efforts on capacity assessment and annually on vessels operating on the high seas
- Supporting WTO negotiations aimed at eliminating subsidies that contribute directly to overcapacity and overfishing
- Urgent need for Regional Fisheries Management Organizations to launch their own plans of action for capacity management
  - Canada will be working within its RFMOs to implement St. John's Conference Ministerial Declaration commitment
    - Cap fishing capacity at its current level
    - Reduce fishing effort to a level matching available resources
  - RFMOs will need to develop mechanisms (such as internationally transferable fishing quotas) to ensure fair access and allocations

13

Annex 6

Asia-Pacific
Economic Cooperation

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

FWG 01/2006--D004

Management of Fishing Capacity in Southeast Asia: Experience, Directions and Challenges

Mr. Suriyan Vichitlekarn
Policy and Program Coordinator of SEAFDEC, Thailand

Fisheries Working Group Meeting
8 – 9 May 2006
Kaohsiung, Chinese Taipei

Management of Fishing Capacity in Southeast Asia: Experience, Directions and Challenges[1]

Mr. Suriyan Vichitlekarn
Policy and Program Coordinator of SEAFDEC, Thailand

I. Fisheries in Southeast Asia

1.1 Overview

The Southeast Asian region covers a large expanse of marine coastal water areas, which is located in the tropical area between latitude 10^{o} S and 25^{o} N and longitude 94.5^{o} E and 140^{o} E. Covering the countries of Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam, the region is geographically advantaged by the richness and productivity of the various waters resources, of which consists of sea waters area such as the South China Sea Area, Malacca Straits, the Java, Flores, Banda, Ceram, Molluca, Celebas and Sulu seas including some parts of India Ocean, and inland waters area including some of the Mekong river area and other big water river bodies that can be found through the Countries.

In Southeast Asia, fisheries contribution is clearly recognized across the countries, as it does not only provides a source of fish consumption but also provide employment and income opportunities as well as generating trade the region. In terms of employment and income opportunities, more than 4 million people in the region are engaged in their primary economic activity, for example those who work at capture or culture fisheries either on a full-time or a part-time basis, both in small-scale and commercial capture fisheries and in fish farming. Meanwhile the estimated number of persons employed in fisheries related industries such as processing, distribution and trade amounts to some 20 million.

Besides its contribution to employment and income earnings, fisheries also provide benefits to the economic wealth of countries in the region. According to the status and potential of fisheries and aquaculture in Asia and Pacific in 2004, the production of fish in the region has well known contributed significantly to the world fisheries production both marine and inland waters. Furthermore, FAO reported that the capture fisheries production growth in Southeast Asia has been very strong for the past four decades with marine capture production increasing linearly through this period with the production level of 14 million tones in 2002 after China sub-region. The trade of fisheries commodities has developed rapidly during the past years and has become one of the most important commodities in international trade. Indonesia, Malaysia, Philippines, Thailand, and Vietnam have earned substantial foreign exchange through the export of their fish and fishery products.

Fish as like rice has constituted the staple diet as “ways of life” of the Southeast Asian people, as fish is acceptable to all ethnic and religious groups. The utilization rate of fish in this region itself, including freshwater fish, is high and almost all kind of fishes are eaten and practically any state of preservation, thus, fisheries has an important role to play in ensuring food security for the steadily expanding populations in the region, especially the low-income rural communities and urban poor.

[1] A paper presented at APEC Seminar on Sharing Experiences in Managing Fishing Capacity, 8 – 9 May 2006, Kaoshiung, Chinese Taipei.

1.2 Characteristics of Fisheries in Southeast Asia and the Need for Management

Most countries in the region are in the top 20 capture fishery producing countries in the world, with some experience annual increases in production of up to 5 percent. Pelagic fishes dominate landings by volume and value, as demersal fisheries have been largely over-exploited. The majority of fisheries in Southeast Asia is small-scale in nature and operated in coastal areas. Fish landed is in a large number of small decentralized landing places for distribution through complex marketing networks at the community level. Estimates of the value of capture fisheries production are largely underestimated and do not adequately value the small-scale fishing sector.

As being one of the most abundant tropical marine areas, fisheries resources in Southeast Asia are typically multi-species. Most fishers rely on the harvest of different species for their livelihood and only rarely on one particular target species. As a consequence, there are no clear definitions and understandings of the by-catch issue. In addition, ecological factors in the tropics, such as fecundity, replenishment, migration or productivity, are very different from those in temperate waters. The monsoon and topographical conditions such as coral reefs, mangrove areas, sea grass base and other critical habitats are unique to the tropics and provide the basis of the ecological specificity.

In terms of socio-economic and cultural aspects, most countries in the region, have traditionally developed their own culture on fish as food, as can be seen in the tremendous diversity of local fisheries products. Another specificity that needs to be considered is the socio-economic integration of fisheries into local communities, especially for small-scale and coastal fisheries.

Declining fish availability, coupled with over-capacity and the dependence of the small-scale sector on coastal fisheries for income generation has led to the adoption of destructive fishing practices to maintain short-term incomes and food production. Similarly, based on present consumption patterns and population growth rates, pressure on coastal fisheries is steadily increasing. Despite nutritional requirements and current population growth rates, regional countries are generally net exporters of fishery products. This trade pattern is continuing since the need to generate foreign exchange to buy capital inputs for industrialization generally continues to be a higher priority than food security.

Fisheries trends suggest that production from capture fisheries will wane in coming years unless fishing effort (and related over-capacity) is reduced. The obvious problem in the reduction of fishing capacity is that regional fisheries are mostly small-scale in nature with the majority of participants (and their families) highly dependent on fish catches for income, food and well-being.

The above characteristics underline a need for different approaches and methodologies for assessing aquatic resources and ways to manage fisheries in the region. It is therefore imperative to take into consideration the above characteristics and uniqueness of fisheries when developing an appropriate management system for fisheries. It is important to note that by replicating approaches and systems developed for industrial fisheries and/or in temperate areas may lead to further confusion and deterioration of the fisheries sector.

1.3 Issues in the Fisheries Sectors and Related Actions

The same as many regions in the world, fisheries in Southeast Asia is generally conducted in an open-access regime. Participation in a fishery managed under an open access regime is restricted only by required skills and investment. Early entrants in an open access fishery generally reap substantial profits, which in turn attract additional fishermen. Eventually, the fishery reaches a level where no additional fishing pressure is needed to capture available fishery resources. Yet, the fishermen often continue to invest capital in the fishery beyond that level, creating an excess of fishing capacity through what is known as 'capital stuffing' in order to catch the fish before any competitor does, a phenomenon also called 'race for the fish'.

Once total catch exceeds the maximum biological productivity of the stocks, the fishermen have to invest even more capital in the fishery just to maintain the same level of catch. This cycle of increasing investments and decreasing returns ultimately reduce profits to a level where fishing become unprofitable, causing the fisheries to collapse. Where subsidies are carelessly provided, fishing activities may even continue beyond that point, possibly leading to a near-complete exhaustion of resources.

Excessive fishing capacity coupled with over exploitation of limited fisheries resources, use of destructive fishing gears and practices, conflicts of various users' interests and lack of appropriate regulatory system for fisheries are key contributors to drastic deterioration of fisheries resources. These situations have also provided impacts on the aggravation of poverty for the small-scale fisheries both in inland and inshore waters. Government officers including policy makers have, over the years, been concerned on manners and extent of the current utilization of fisheries resources and have called for urgent actions to rectify fisheries practices toward sustainable development goals and the improvement of management practices. In line with the concept and principle set forth in the 1995 Code of Conduct for Responsible Fisheries (CCRF), SEAFDEC[2] in consultation with countries in Southeast Asia in 1998 initiated regionalization as a process to internalize the CCRF into actions focusing on the regional fisheries context. As a result of this process from 1998 to 2005, four sets of regional guidelines for responsible fisheries in Southeast Asia were developed through a series of consultation at national and regional levels. The four sets of guidelines deal with fishing operations, aquaculture, fisheries management and post-harvest practices and trade.

As a follow up to the above regionalization of the CCRF, the ASEAN[3]- SEAFDEC Member Countries organized a Conference on Sustainable Fisheries for Food Security in the New Millennium: "Fish for the People" in 2001. The Conference identified important fisheries issues and formulated a regional fisheries policy framework and priority actions to achieve sustainable fisheries, which was adopted as "the Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region". With regards to aspects related to fisheries management, the Resolution and Plan of Action stress the need to develop an innovative fisheries management by incorporating decentralization of appropriate fisheries management functions to the local level, introduction of rights-based fisheries management through licensing and community fishing rights, and development of supporting legal and institutional frameworks under the co-management system.

II. Understanding Fishing Capacity and its Management

[2] An inter-governmental organization established in 1967 working towards the promotion of sustainable development of fisheries in Southeast Asia, whose current members are ASEAN countries and Japan.
[3] Association of Southeast Asian Nations

The issues of excess fishing capacity in world fisheries are of increasing concern as they contributes considerably to over-fishing, the degradation of marine fisheries resources and habitats, and are a significant economic misuse. Without action, fishing pressure and fishing conflicts are likely to increase, and will lead to resource depletion through over-fishing. These issues call for strong collaborative efforts to curb the escalation.

What is fishing capacity? In the simplest of terms, fishing capacity is the ability of a vessel or fleet of vessels to catch fish. This ability is based on four components which contribute to the overall catching power of the fleet:

1. The number of fishing vessels in the fleet;
2. The size of each vessel;
3. The technical efficiency of each vessel, determined by factors such as on-board gear and equipment, fishermen's knowledge and techniques, and the size of the crew/fishers; and
4. The time spent fishing.

The term "overcapacity" indicates a level of catching power that exceeds what is needed to catch available fishery resources. When a fishery is described as “overcapitalized”, it means that the industry has invested more in fishing capacity than what is needed to catch fish at the least cost.

The FAO Code of Conduct for Responsible Fisheries specifies that States should take measures to prevent or eliminate excess fishing capacity and ensure that levels of fishing effort are commensurate with sustainable use of fishery resources. In order to address the issue of excess fishing capacity though fisheries management, FAO prepared the International Plan of Action on Management of Fishing Capacity (IPOA-Capacity), endorsed in June 1999. Subsequently, the Johannesburg Plan of Implementation adopted by the World Summit on Sustainable Development in 2002, specified implementation of the IPOA-Capacity as a time-bound goal, calling for developing and implementing national and, where appropriate, regional plans of action by 2005.

The IPOA calls for States and Regional Fisheries Organizations to monitor and assess fishing capacity. It also calls for States to establish compatible national records of fishing vessels and to support the establishment by FAO of an international record of vessels operating on the high seas. However, the measurement and monitoring of fishing capacity are more difficult to be implemented in the Southeast Asian region. This is due to its specific nature of tropical fisheries with multi-species in various eco-systems while the most fisheries players are the small-scale fisheries that mostly dominated by the poor and vulnerable communities.

In the past, fishery managers have attempted to control fishing capacity through regulations on inputs (such as numbers of vessels, time spent fishing, or gear restrictions) or outputs (total allowable catch possibly divided into individual quotas). More recently, managers began to implement limited access regimes to fisheries and resources, relying on rights-based management schemes. Yet, none of these measures does effectively remove the incentive in capital stuffing to race for the fish.

In 2004 FAO review of the progress on the implementation of the IPOA-Capacity shown that most countries deals with the management of fishing capacity through the limitation of new

boats entries to fishing fleets, at least for commercial fisheries, together with measures aimed at limiting the use of existing capacity. Practically, they directly incorporate capacity considerations into their fisheries management regimes. Generally, countries worldwide seem to have been rather successful in stabilizing the size of their commercial fishing fleet, although new technologies and improvements to vessels' ability to catch fish may counterbalance these trends. More importantly, smaller-scale fisheries - still largely unchecked - continue to expand.

Controlling capacity in the less developed regions of the world does not consist in removing the poor from fishing and make way for the richer commercial vessels. While the poor are competing for a resource for their basic survival and livelihoods; the "commercials" can make good profits with it. Yet, any attempt to control capacity by focusing only on the larger fishing operations is doomed to failure in these developing countries since mounting overcapacity in these areas is often simply caused by a growing number of fishermen rather than occurring because of new technologies or capital stuffing.

It is also recognized that the poverty is the root cause of food insecurity while the majority of fisher folk and their communities are still under privileged and live a very poor life, thus the eradication of poverty and the maintenance of food security to ensure food for all are, therefore, given high priority by all the governments of the region.

Thus any reduction of fishing capacity must be accompanied with alternative or supplementary livelihoods, as often these people depend on fishing for their very survival. In many ways, fisheries is seen by the poorest as the last alternative for employment. The dominance of small-scale fisheries also renders the management of capacity very difficult to implement as it requires well developed and effective monitoring, control and surveillance (MCS) schemes. Yet, in these countries, there is usually a lack of institutional and technical capacity for research and policy development as well as for implementation.

III. Experience and Directions for Management of Fishing Capacity in Southeast Asia

It is well-recognized that the nature of fisheries is so diversified in the various regions of the world that more should be expected from regional fisheries bodies (RFBs) and States. The global initiatives promoted mainly by the more developed nations, although useful to raise awareness on the issues, might not be valid for less privileged countries. The international framework as promoted by FAO through the IPOA-Capacity might be appropriate for high seas fisheries if addressed, but when working with issues related to resources and fisheries in exclusive economic zones (EEZs) or for transboundary fish stock, practical approaches should be left to more local authorities such as RFBs or individual states.

In Southeast Asia, overcapacity is seen as the largest fisheries management problem threatening sustainability. Based on the Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region, Regional Guidelines for Responsible Fisheries in Southeast Asia: Fisheries Management, and years of implementation of ASEAN-SEAFDEC regional fisheries collaborative programs, management of fishing capacity in Southeast Asia could be achieved through the following approaches:

- Better understanding of status and trends of tropical fisheries – fishery statistics, information and indicators
- Integrating fisheries into habitat conservation and management
- Promotion of co-management and rights-based fisheries
- Freezing and control number of fishing vessels.
- Development of supplementary/alternative livelihoods for coastal communities

3.1 Better Understanding of Status and Trends of Tropical Fisheries – Fishery Statistics, Information and Indicators

3.1.1 Linkages among Fishery Statistics, Information and Indicators

Knowledge of the status and trends of fisheries, not only in terms of fishery resources but socio-economic aspects, is a key to sound policy-making and responsible fisheries management. Information on the status and trends of fisheries, obtained through routine data collection (fishery statistics) and non-routine data collection (research), is therefore essential for assessing the validity of fisheries policy and for tracking the performance of fisheries management.

Classical single species fisheries resource assessment models developed in temperate areas, such as the Maximum Sustainable Yield (MSY), have been widely used in the region to evaluate resource levels, but have met with limited success. In contrast, fisheries in tropical areas target many species in relatively small quantities, a specificity of tropical ecosystems. Experiences in the region show that the multi-species and multi-gear composition of most fisheries makes assessment of the resources difficult and setting of catch limits (output control) problematic.

Best scientific evidence available should be used in the evaluation of the status and trend of fisheries, which should not be limited to fishery statistics, but also should comprise other available data, information and potential indicators. Fishery statistics can provide basic data to support indicators. This linkage should be made explicit to maximize the use of fishery statistics and their support to management of fisheries.

Fishery statistics should not be developed in an isolated manner but rather be part of a broader fishery data and information system, which is supported by fishery statistics through registration, records, reporting, census and surveys on one hand, and ad-hoc/specific data and information collection including the use of indicators on the other. The fishery data and information system should be developed through consultation with wider stakeholders including policy makers and researchers in order to meet the requirements of national planning and sound management, as well as the need to strengthen linkage and coordination of the stakeholders in the collection of routine and non-routine data.

By using the fishery data and information as a basis, simple fisheries indicators can be considered to be used as a ready tool for describing the state of fishery resource and fishery activities and for assessing trends regarding sustainable development objectives. Furthermore, the fisheries indicators open the possibility to enhance accountability as well as to assure the communication, transparency and effectiveness in fisheries management.

3.1.2 Use of Indicators in Fisheries Management

Under a broad co-management concept, adaptive management is an approach where fishery managers react on suit of indicators to undertake assessment of fisheries, resources and eco-system instead of classical stock assessment (e.g. MSY and MEY), incorporating views and knowledge of interested parties in decision-making process using best available information. Adaptive management is by itself a process to achieve management objectives and also a learning process among interested stakeholders about fisheries or system being managed in order to adapt policies and management framework to be more responsive to future conditions. The backbone of a good adaptive fisheries management system lies on a good data and information system.

While noting that definitions can be varied, 'fisheries indicators' is generally referred as a practical tool to support management of fisheries. 'Indicators' provides information on status and trend of fisheries and resources, which can support the decision making process. There is a close link between policy objectives and the selected indicators in achieving sustainable development goals. Thus indicators used may include resource/ecological, social and economic indicators to support the management decisions.

The indicators should be simple, easily understood and scientifically valid to act as a communication tool among stakeholders. For effective implementation of fisheries management, indicators could be used in all the management process – planning, communication, monitoring and evaluation in fisheries management. In planning stage, indicators should be used in setting directions for developing management plan and action. Efforts should be made to interpret indicators in such a way to create understanding among concerned stakeholders particularly policy makers, managers and resource users. Indicators could also be used as a tool in monitoring the effectiveness of management action and policies.

Based on on-going regional collaborative studies, several potential indicators for management of fisheries including fishing capacity are:

- Fleet or fishing capacity indicators, including the number of fishing boats, fishing power in terms of horse power or gross tonnage, fishing time, and type and number of fishing gear;
- Harvesting or resource indicators, including landing volume, CPUE, biomass, catch composition, number of species caught, fishing ground, average fish size, and size of mature fish; and
- Economic and social indicators, including landing value, Revenue per Unit Effort (RPUE), export and import (in quantity and value), per capita fish consumption, investment in fisheries, number of fishers, number of employees in the fishery sectors, and fishers' profits.

3.2 Integrating Fisheries into Habitat Conservation and Management

Most common approaches to fisheries management in the ASEAN region have not effectively integrated spatial considerations into fisheries management frameworks. The success or failure of fisheries management has largely been determined by the ability of the management system to control fishing effort so as not to exceed resources capacity and, to a lesser extent, economic attributes of fisheries.

Integrating fisheries into habitat conservation and management, under the concept of fisheries

refugia, is promoted based upon the emerging body of evidence that the existence of natural refugia is a basic element explaining the resilience of commercial fish stocks to exploitation. Commercial fisheries in the ASEAN region are subject to high levels of fishing effort, such that stocks of most commercially important species are considered fully fished or overexploited. Maintenance of natural refugia, or creation of refugia in cases were natural refugia no longer exist, should be important priorities for the management of fisheries in the ASEAN region, and may act as effective buffers against uncertainty and recruitment failure, of which the latter is especially important in terms of food security.

Fisheries Refugia in Southeast Asia are commonly understood as: "Spatially and geographically defined, marine or coastal areas in which specific management measures are applied to sustain important species [fisheries resources] during critical stages of their lifecycle, for their sustainable use."

Fisheries refugia can complement conventional fisheries management measures, such as effort or gear restrictions, and should be a priority consideration in the ASEAN region in situations where fisheries are subject to intense and/or unmanageable fishing pressure. They may also be used to separate potentially conflicting uses of coastal and marine habitats and their limited resources. However, the effectiveness of fisheries refugia will largely depend on the selection and appropriate use of fisheries management measures within the refugia area, and at the most general level, the process of establishing fisheries refugia must consider the:

- Life-cycle of the species for which refugia are being developed;
- Type(s) of refugia scenarios(s) that relate to the species for which refugia are being developed;
- Location of natural refugia and appropriate sites for the establishment of [artificial] refugia; and
- National and regional level competencies in the use of fisheries management measures and spatial approaches to resource management and planning.

Unlike a number of protected areas or aquatic reserves, important characteristics of fisheries refugia are:

- NOT "no take zones",
- Have the objective of sustainable use for the benefit of present and future generations,
- Provide for some areas within refugia to be permanently closed due to their critical importance [essential contribution] to the life cycle of a species or group of species,
- Focus on areas of critical importance in the life cycle of fished species, including spawning, and nursery grounds, or areas of habitat required for the maintenance of broodstock,
- Have different characteristics according to their purposes and the species or species groups for which they are established and within which different management measures will apply,
- Be sub-dividable to reflect the differing importance of sub-areas to the species or species groups for which they are established. Management plans for the refugia should reflect different fisheries management measures for the sub-divisions.

Management measures that may be applied within fisheries refugia may be drawn from the following [non-exhaustive] list:

- Exclusion of a fishing method (e.g. light luring purse seine fishing),
- Restricted gears (e.g. mesh size),
- Prohibited gears (e.g. push nets, demersal trawls),
- Vessel size/engine capacity,
- Seasonal closures during critical periods,
- Seasonal restrictions (e.g. use of specific gear that may trap larvae),
- Limited access and use of rights-based approaches in small-scale fisheries.

3.3 Promotion of Co-management and Rights-based Fisheries

Small-scale fisheries either involved as full-time or part-time, both in inland and inshore waters constitute the major part of the sector. Considering its contributions to local food security, sustainable livelihoods and poverty alleviation, and the fact that small-scale fisheries are generally a weak sub-sector in terms of financial and technical capabilities, the comprehensive supports from the government are perceived as inevitable and required factors to maintain social and economic securities in the rural areas.

It is understood that any innovative fisheries management methodology will not be effectively implemented, as far as the fishing operation is conducted under the current unregulated and “open access” manner. The introduction of rights-based fisheries has therefore been considered as a crucial factor for the effective implementation of the innovative management. Larger fishing vessels are managed under a rights-based fisheries system, through each national licensing scheme, which usually encourages the freezing of their number to their current level. This should be supported by improved registration of fishing vessels together with the reduction of their number and level of fishing effort. Most of commercial vessels are excluded from fishing into coastal waters.

In view of developing and improving the management of small-scale fisheries, “group user rights” are considered as appropriate right-based fisheries to be promoted under co-management system. By adopting “group user rights”, ownership and partnership of small-scale fisheries in management of resource utilization could be enhanced. If the management needs are fully shared among resource users, the compliance level of the regulations in achieving the sustainable fisheries will be greatly improved. To achieve this, keys to success would then lie on clear national policy and supporting legal frameworks for co-management using group user rights, the need for designated areas for fishing and aquaculture activities in coastal areas, and empowering fishing communities through strengthening local institutions.

Rights-based fisheries and co-management could be considered as proactive approach for the reduction of fishing capacity. Under fisheries co-management, by law, management roles, functions including responsibilities are shared between two partners: government agencies and resource users (fishers) organizations. Co-management mechanism should be set up for providing floor for interaction and dialogue between the partners. The degree of co-management has to be in this level, not just the level of participation which the resource users does not have any clear functions, responsibilities and authorities in managing fisheries. Rights-based fisheries focus on granted resource use rights to the local fishers’ organizations (group user rights). This will provide clear picture of what to be managed under the co-management. The boundary of the resource area will be demarcated and the member of the organization will be identified. To avoid the conflict, the organization might

accommodate the existing number of the local fishers as the initial members.

Rights-based fisheries and co-management approaches will contribute to the fishing capacity reduction on the following issues:

1. To control the increasing number of small-scale fishers and commercial fishing operation at the coastal area.
2. To reduce the number of small-scale fishers and commercial fishers as a long term objective of promoting “regulated entry” fisheries management measure.
3. To provide better management measure and practice at the coastal areas which will result to the increasing and enhancement of the fisheries resources.
4. Better compliance of the fishers as well as better enforcement system which will reduce the number of non-registered fishing operation.

3.4 Freezing and Control Number of Fishing Vessels.

Controlling the numbers of fishing boats, especially for small-scale fisheries is a far more sensitive issue. If one consults with fishing communities in each Member Country, he could likely realize that most of the fishermen may immediately agree with the concept of not allowing any additional fishing boat to enter the local fisheries. In other words, the concept of freezing the number of fishing boats is relatively well accepted; as fishermen feel this will somewhat guarantee the stability of their income in the future. It also provides them with a basic sense of ownership and responsibility toward the resources. Most are extremely concerned that the ever increasing numbers of fishermen and boats will eventually reduce their portion of catch.

The need for freezing the number of fishing boats and fishermen with the right to fish to its current number are a reality that all must recognize. Although registration and freezing of the larger-scale commercial fishermen has been initiated, this must be extended to all users, to include all fishermen, counting in small-scale operations that altogether catch far more fish in the region than their commercial counterparts. Control of fishing rights for these dominantly impoverished subsistence fishermen can be only achieved through collaboration and consultation with the local communities, and possibly the devolution of some management authority later on. Local communities and fishermen must be at the heart of the registration, freezing, management and reporting measures for proper compliance and enforcement.

The urgent need for freezing fishing capacity is critical to avoid further acceleration in the depletion of resources, although it is little but a first step toward the serious management of fishing capacity that must be accomplished later on. Provided that both the relevant governmental agency and local communities get proper assistance, and that the use of indicators to understand the status of each fishery on a case by case basis is promoted, these future management action will definitely help to match fishing capacity with sustainable yields. It may mean further reducing fishing capacity in some cases, while allowing new entrants in others. This must be judged on a case-by-case basis, on the base of sounds scientific evidence.

3.5 Development of Supplementary/Alternative Livelihoods for Coastal Communities

In many places, catches by coastal fisheries are perceived to be in excess of sustainable levels, but with little alternative source of employment, reducing fishing capacity is a difficult

challenge. The relevant fisheries management agency in each country in the region is considered as responsible to address such a task.

In addressing fishing capacity management particularly reduction, it is unavoidable that certain portions of the fisheries sector have to be less active or most probably out of the sector. A number of countries in Southeast Asia have developed exit programs as part of fishing capacity reduction. One major experience indicates that these programs should not be simply developed to take away certain percentage of fishers from the sector as this would enter into a new set of problems. Rather than "shifting problems of livelihoods", a comprehensive livelihoods plan for coastal communities should be considered and developed. Those who could continue to retain in the sector may require supplementary livelihoods. While those who would exit from the fisheries sector should be secured for their new livelihoods not only in terms of technical but also entrepreneur aspects.

IV. Future Challenges - Regional Strategies to Facilitate Required Actions in Managing Fishing Capacity in Southeast Asia

It is important now to recognize that the fisheries situation in the region is in the state of overcapacity. Some may argue that a particular fishery has not (yet) reached that status, and they might be correct in some cases, but nonetheless it is imperative that each country first recognizes that fisheries resources which are not fully regulated are likely to be overexploited as a basis for future actions.

National efforts have been exerted in addressing the issue of management of fishing capacity. And based on several years of regional cooperative programs to address the issue, directions and lessons have also been drawn. But these have been in a little success. As the issue is a regional priority concern, this has called for regional collective strategies to managing fishing capacity in Southeast Asia. These are:

- Implementing regional collaborative programs
- Promoting policy coordination and dialogues with high-level authorities
- Promoting partnership and collaboration at regional and international levels

4.1 Implementing Regional Collaborative Programs

International fisheries societies have elaborated various global instruments to regulate the fisheries such as the Code of Conduct for Responsible Fisheries and International Plans of Action in addition to the international fisheries related laws in order to promote a concerted and coherent approach concerning the sustainable use of aquatic resources.

The developing countries that may have, in general, less technical and financial capabilities including general poverty situation prevailing especially in their rural areas, which make these countries difficult to take appropriate action, even though they wish to do so on the issues requested by these global instruments including CCRF.

In this connection, ASEAN and SEAFDEC, under the Fisheries Consultative Group (FCG) mechanism, have been implementing regional collaborative programs to clarify regional policy and priorities as well as to support national efforts in addressing management of fishing capacity. Current ASEAN-SEAFDEC regional collaborative programs in addressing management of fishing capacity are:

- SEAFDEC Regional Fisheries Policy Network
- Regionalization of the Code of Conduct for Responsible Fisheries
- Capacity Development for Fisheries Management in Southeast Asia
    - Capacity Improvement of Fisheries Community for Fisheries Management and Alleviation of Poverty
- Strengthening Small-scale Fisheries Management through the Promotion of Rights-based and Co-management Concepts
- Improvement of Statistics and Information for Planning and Management of Fisheries in the ASEAN Region
- Responsible Fishing Technologies and Practices (Fishing in Harmony with Nature)
- Rehabilitation of Fisheries Resources and Habitats/Fishing Grounds through Resource Enhancement
- Sustainable Utilization of Potential Fisheries Resources and Reduction of Post-harvest Losses
- The Use of Indicators for Sustainable Development and Management of Capture Fisheries in the ASEAN Region

Through the implementation of such programs, ASEAN and SEAFDEC could systematically assist their Member Countries in promoting the issues identified. Although the most of the technical cooperation programs implemented by SEAFDEC and other organizations are aimed to assist the beneficiary countries on their long- term national actions in line with achieving sustainable fisheries, it has been recognized that gaps exist between these technical initiatives and national follow-up actions in the respective Member Countries.

As various technical initiatives by external organizations have normally been carried-out under the project kind of activities, it was understood that some streamlining exercises between these project type of activities and related national actions would be required. Enhancing the ownership of these projects by the beneficiary countries is the point for the effective implementation of these projects. In addition to the needs that the objectives and technical activities to be conducted by the projects are along line with national priorities and needs, it is understood that the policy dialogues with policy makers and their involvement in the various stages including the designing, implementation and evaluation of the projects through the mechanisms mentioned above can be the key issue.

4.2 Promoting Policy Coordination and Dialogues with High-level Authorities

If above regional programs are operated in stand alone manner, the impacts of these technical initiatives may only remain within the technical levels in the respective beneficiary countries. In this connection, ASEAN-SEAFDEC Strategic Partnership (ASSP) is being developed by the two organizations. The ASSP does not only aim at promoting regional collaborative programs but also regional policy dialogues with high-level authorities (ASEAN Sectoral Working Group on Fisheries – ASWGFi) and Senior Officials Meeting of the ASEAN Ministers on Agriculture and Forestry – SOM-AMAF and AMAF) on fisheries issues as well as coordination with other sectors.

4.3 Promoting Partnership and Collaboration at Regional and International Levels

In order to exchange experience with other tropical regions and tap on existing expertise and knowledge of a wide range of organizations at regional and international levels, ASEAN and

SEAFDEC are promoting partnership and collaboration with organizations including FAO, WorldFish Center, Asia-Pacific Fishery Commission (APFIC), Network of Regional Fishery Bodies (RFBs), etc. In addition, it is also expected that by taking active participation into international fora, the Southeast Asian region would be able to contribute experience drawn from tropical fisheries, which could be consider as a basis when planning future development of international fisheries agenda.

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Annex 7

Asia-Pacific
Economic Cooperation

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

FWG 01/2006--D005

Impacts of the New Zealand Quota Management System on Fleet Capacity and Fishing Effort

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Fisheries Working Group Meeting
8 – 9 May 2006
Kaohsiung, Chinese Taipei

Impacts of the New Zealand Quota Management System on Fleet Capacity and Fishing Effort[1]

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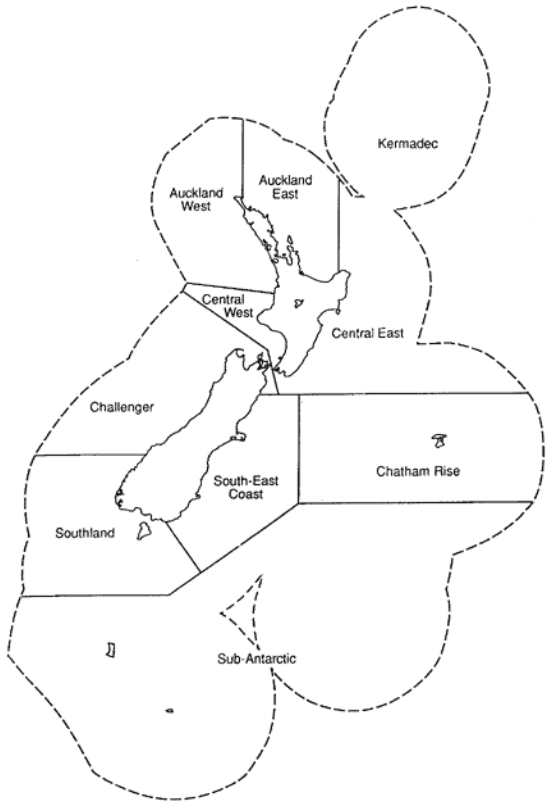
The New Zealand Context

Map: New Zealand Exclusive Economic Zone, showing the 10 Fisheries Management Areas



New Zealand is an island nation of the South-west Pacific, settled relatively recently by Polynesians (Maori) from about 800 AD, and Europeans from the late 18th Century. The majority European population represents a relatively fresh settler culture of the frontier, with some imported traditions of family-based fishing, but is strongly entrepreneurial and without strong attachments to place, fishing method, or fishery species. The indigenous Maori population has a much stronger common culture of relations with the marine resources of the country, and one that was severely underestimated by the dominant culture before the advent of the current fisheries management system.

Fishery resources have always been significant as a food source and as trade goods but are only moderately abundant in international terms. The estimated maximum sustainable yield for the 4.1m km^2 Exclusive Economic Zone (EEZ), declared in 1978, is something over half a million tonnes, with about one third of the zone fishable by modern demersal methods.

As in other coastal states, the declaration of the EEZ was in part a response to fishing of the zone by distant water fleets of other nations, in particular by Japan, Korea and the USSR. This foreign exploitation of New Zealand fish-stocks had begun in the 1950s when the

[1] This paper is based on a study previously published as Connor 2001.

domestic industry was highly regulated. The government response was to completely deregulate fishing in 1963 and to provide subsidies and other encouragement for the domestic industry to compete for a larger share of the catch. The industry responded with a vessel building boom and a rapid increase in catches from the inshore fisheries. However, the foreign fleets also increased their efforts, and by 1977 were taking nearly 90% of the 476,000 tonne known fin-fish catch from the area (Sharp 1997).

Responsibility for the management of New Zealand's fisheries lay with the Ministry of Agriculture and Fisheries (MAF).[2] Initially, following the declaration of the EEZ, the fisheries outside the twelve-mile Territorial Sea were managed separately. Total allowable catches (TACs) were struck for the offshore species, and these were allocated preferentially to the domestic industry, and secondly to the foreign fleets under licence and government bilateral agreements. These policies offered the foreign fleets less of the prime species and areas than they had been fishing before 1978. This changed the economic balance and resulted in a much reduced total catch for the next few years (OECD 1997).

Government policies at this time also provided incentives for domestic companies to invest in onshore processing plants and vessels for offshore fishing, but the main initial domestic involvement was developed through joint ventures with foreign companies and foreign vessel charter. Joint ventures brought local crew onto the big vessels and direct involvement of domestic companies in the management of fishing operations and marketing, paving the way for further domestic expansion. Foreign vessels began delivering large catches to onshore processing. By about 1982 local companies had learnt what they needed to know from joint ventures, and arrangements with foreign vessels moved to simpler contracts to charter fishing capacity to catch against domestic company quotas. Foreign vessel charter has remained an important part of offshore fishing in New Zealand since that time, gradually diminishing as domestic companies have invested in large freezer trawlers. Both arrangements brought greatly increased cash flow to the domestic industry, foreign exchange from exports, and employment in processing.

At the same time that the offshore fisheries were being domesticated, New Zealand's inshore fisheries began showing signs of stress, and management gradually moved into crisis mode. New powers to declare controlled fisheries were introduced in 1977 and a moratorium on scallop and rock lobster permits followed in 1978. Alarming fluctuations in catches of the most economically important inshore species, snapper (*Pagrus auratus*), and rapidly increasing catches of vulnerable species of sharks and gropers, brought a total fishing permit moratorium in 1982. Both management and industry had recognised that there were economic as well as stock problems in the inshore fisheries (Riley 1982). Five per cent of the fleet was taking two thirds of the catch, and there were large numbers of part time operators.

During 1983 a consultative policy review process was initiated by the Ministry for the inshore fisheries, and a trial "enterprise allocation" (EA) quota scheme was introduced in the offshore fisheries. After several rounds of consultation and a change of government, a decision was made in 1985 to adopt a near-comprehensive ITQ based management system for both inshore and offshore sectors. For the offshore, existing EA quotas were converted to ITQ directly. For the inshore, a complex process of assessment and allocation was

[2] The Fisheries Division of the Ministry of Agriculture and Fisheries was reformed in 1994 as the Ministry of Fisheries. In this document the agency – before and after reform – is referred to as MAF or the Ministry.

undertaken.[3] Initial allocations of entitlement were based on catch histories from the best two of three qualifying years, and a tendering process was undertaken for reduction of total allocations through a government funded quota buy-back. Where reduction targets were not met for critical species, administrative reductions were made to establish the required TACs.[4]

New Zealand ITQs came into effect in October 1986 applying to 153 management stocks of 26 species – the nine off-shore species under EAs, plus 17 inshore species. Catches from these species at the time comprised some 83% by weight of the total commercial fin-fish catch. Allocations were subject to appeal to a quasi-judicial Quota Appeal Authority, but this did not affect the full operation of the management system or quota trading.

ITQs were created as a perpetual right to a part of the fish harvest, designated in absolute weights of whole fish (in metric tonnes) for a particular species or species group to be taken annually from a specified quota management area. These rights were allocated free of charge to existing participants in the fisheries, and were to be fully compensable in the event of TAC reductions. Free transferability and lease was subject to reporting of all transactions with prices to the Ministry, and to aggregation limits of 20% for inshore and 35% for deep-water stocks. The ITQ allocated rights to utilise the resources, but the fishing permit remained as the right of access. Under the QMS legislation, a fishing permit was to be granted to anyone who fulfilled the minimum quota holdings requirement of 5 tonnes for finfish.

Responsibilities attached to quota ownership included legal obligations to land all catch of quota species, unless under minimum legal size; to submit monthly quota monitoring reports in addition to completing catch and landing returns and catch-effort logs for each fishing trip; and to pay resource rentals on all quota held whether caught or not. Some flexibility was built into the system by allowing the carry-over of up to ten percent of uncaught quota to the following year, or for up to 10% over-catch of holdings to be counted against the following year's entitlements.

These characteristics established the character of the ITQ as private property in the right to harvest fish from a given stock – not in the fish stocks themselves – and a clear understanding of this character has become generalised in New Zealand since 1986. There was no legal impediment to the use of ITQ as security for bank loans, but the Ministry did not make provision for the registration of liens or caveats against the title to ownership, and this in many cases prevented such use.

The nature of the ITQ right underwent a major change in 1990. The original specification of ITQ in tonnes of fish required the government to enter the quota market to buy or sell quota when it wished to alter the total allowable catch. When faced with potential for stock collapse in orange roughy (*Hoplostethus atlanticus*) and the need to reduce this valuable quota by large percentages, the system was changed so that ITQ were denominated as a percentage of the TAC, rather than as a specific tonnage. Adjustment then implied merely the automatic *pro rata* adjustment of all ITQ holdings at the beginning of each season to match the TAC.

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[3] The basis of the QMS is described in Clark, I.N. and Duncan 1986, and Clark, I.N., *et al.* 1988.

[4] Under the New Zealand quota management system, TACs are set for overall take of a fish stock, including recreational and indigenous customary fishing. The commercial catch limit is a subset of the TAC and is known as the total allowable commercial catch or TACC.

Assessment of Fleet Capacity

Characterising Fleet Capacity

The New Zealand fisheries to which quota management has been applied cover a full range of species, habitats and methods. The fleet subject to quota restrictions thus covers every possible size and configuration from three metre dinghies to 100+ metre freezer trawlers. Methods include single and pair trawling, seining, drop line, pelagic and bottom long-line, pole and line, trolling, set net, potting, and trap. More than 100 finfish species caught range from estuary flounders to deep-sea oreos, and shellfish include scallops, clams, dredge oysters, abalone (paua) and rock lobster. Few vessels within the fleet pursue a single species. In such high value specialist fisheries as rock lobster and abalone, fishers may be content with one target, but most will fish for other species out of season, and/or take some by-catch. Some 32 species were managed under ITQ in 1996 when new fisheries legislation was passed mandating the gradual inclusion of all commercial species in the system. By 1998 there were 42 species under ITQ and by 2005 more than 90 species, managed as over 500 stocks.

Detailed study of capacity utilisation under these conditions would require specific data collection and would need to be confined to a small sample of the fleet. This study takes a broad descriptive approach. Data available from the agency vessel registry is used to examine trends in a vessel capacity proxy (gross registered tonnage) by vessel size class, and to assess the age structure of the fleet. Separation by method or target species was not possible with the data used, but would be possible using vessel logbook data. Three metre size classes in length over-all (LOA) are used to stratify the fleet, which matches data summaries of earlier years (for example, see King 1985).

The analysis of capacity is focused firstly on the inshore fleet, which was viewed as overcapitalised at the time that the QMS was introduced. An assumption is made in the analysis of GRT by length class that vessels over 33m are not primarily part of the inshore fleet. This is somewhat arbitrary and, in part, is an artefact of the pre-QMS data that groups together all vessels greater than this size. However, it is considered reasonable that most vessels greater than 33 metres in length would be primarily deployed fishing in deeper waters. In fact, many vessels smaller than 33m are likely to be deployed in fishing for offshore species, at least part of the time.

Results of Capacity Assessment

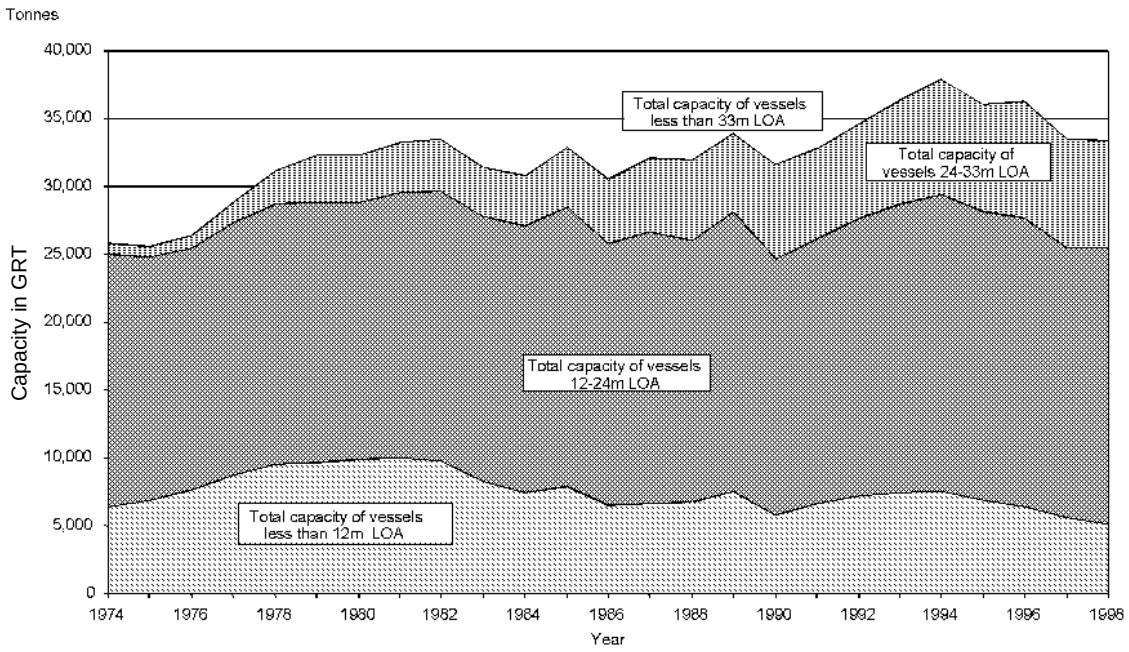
Inshore Fleet

Changes were expected in the fleet across the boundary where the QMS was introduced in 1986, particularly for the inshore where total allowable catches were reduced considerably through a quota buy-back scheme. In addition, the *Fisheries Act 1983* introduced a new definition of commercial fisherman that effectively excluded many smaller vessels prior to the implementation of quota, on the grounds that they were only fishing on a part-time basis.

The results of the analysis of GRT trends for the inshore domestic fleet (less than 33m LOA) produce a natural stratification into three blocks: under 12m; 12-24m; 24-33m. The general pattern has been for the small boat sector to decline in both numbers and capacity; the mid-size fleet has remained fairly constant; and the larger vessels have increased in number. The result has been no net change in capacity from the pre-QMS peak in 1982 to 1998, although a higher peak was reached in 1994. Figure 1 illustrates the trends. The mean

total GRT for under 33m vessels for the years 1976-85 was 31,301 tonnes, and for 1987-1998 it was 34,219: an increase of 9%. The 1998 figure was 33,352 tonnes.

Figure 1: New Zealand Domestic Fleet (under 33m LOA) total GRT for three vessel length classes – 1974 to 1998



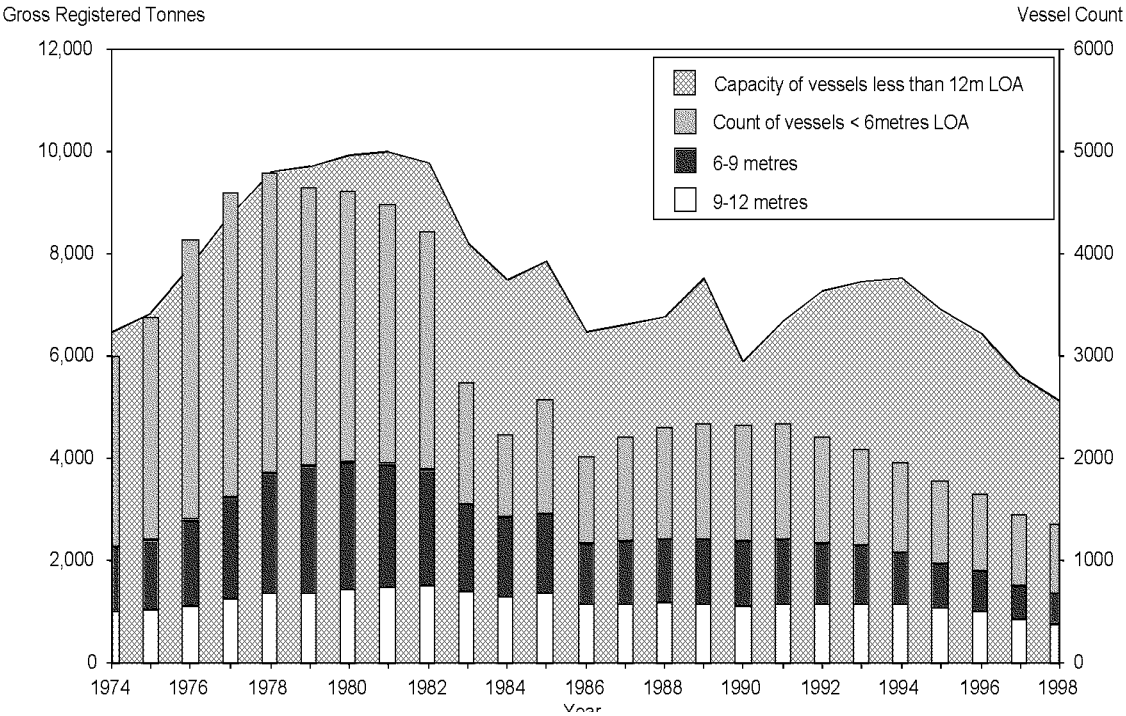
Data sources: King 1985; FSU data; QMS data.

A number of other features are evident in this data. Some of the variation in the period 1982 to 1989 is likely due to data problems, but the impacts of policy change can be clearly seen. The enactment of the *Exclusive Economic Zone Act 1977* stimulated expansion in the number of both small (<12m) and large (24-33m) vessels. From 1976 to 1982 small vessel capacity increased by some 27% while the large vessels increased by 400%, each of these groups contributing about the same amount of additional tonnage over the period. The 1983 exclusion of part-timers hit small vessels harder than the other classes as expected. Numbers of vessels less than 12 m LOA have dropped substantially from 4800 at their peak in 1978, to just over 2000 following implementation of the exclusion policy and ITQs. This represents a 54% drop in numbers and a 34% reduction in capacity, indicating a greater number of smallest boats from the group exiting (see figure 2). A brief resurgence in numbers of small boats in the late 1980s was followed by further declines to around 1300 in 1998 – representing 28% of the peak number and 54% of peak capacity for this sector. This reduction represents 14% of the 1978 total inshore (<33m) fleet capacity.

Once the data settles down following the transition to ITQs in 1986 the whole fleet experienced steady growth until 1994. From this point, the year that full cost recovery was implemented in New Zealand, over the next four years capacity in the small boat sector declined by a third, and by about seven percent in the other two classes. Further detail is provided in figures 3 and 4. Notable are the large numbers involved and the volatility in the smallest size classes, the static nature of capacity and numbers in the 12-24m classes (this might be regarded as the core inshore fleet), and the high growth rate in the large vessel classes. The 24-33m classes increased in number and capacity by a full order of magnitude

over two decades before growth was halted in the mid 1990s. As will be seen below, this indicates greater affiliation with the offshore sector than the inshore for these 24-33m vessels.

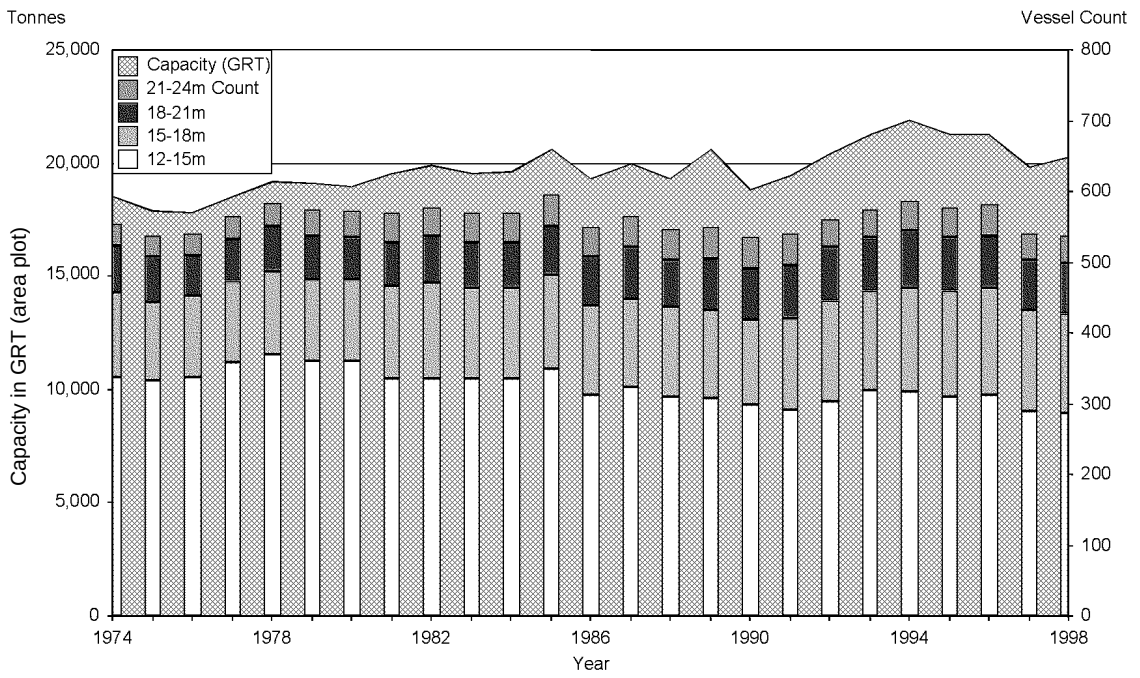
Figure 2: New Zealand Small Boat Sector – Total capacity (GRT) and count of registered vessels less than 12m length



Data sources: King 1985; FSU data; QMS data.

Overall, although the total capacity of this under-33 metre fleet has not been reduced over time, policy changes have certainly had some impact in halting expansionary phases. Further, close examination of the activities of the larger vessels included in the analysis (24-33m) may significantly change the picture, as a significant proportion of the capacity in these classes is undoubtedly applied to offshore fisheries such as hoki and the pelagic species. This would imply that capacity being applied in the inshore fisheries has effectively declined from its pre-QMS peak in 1982. If the 24m+ vessels are excluded as not part of the inshore fleet, then capacity in 1998 is back down to pre-EEZ (1974) levels. Aggregate catch for the main inshore species has not changed between peak years before and after the QMS, although the catch composition has changed through quota effectively constraining the catch of particular species, while others have increased. Catch trends are considered in more detail below.

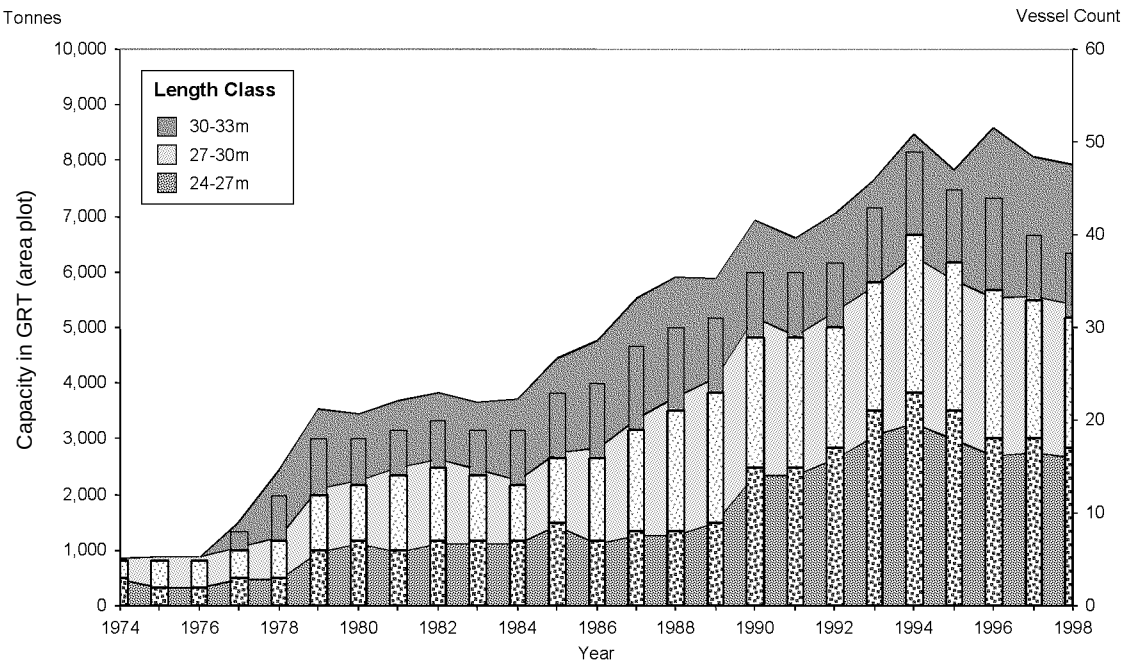
Figure 3: Total capacity (GRT) and count by length class of registered fishing vessels of 12 to 24 metres length – 1974 to 1998



Data sources: King 1985; FSU data; QMS data.

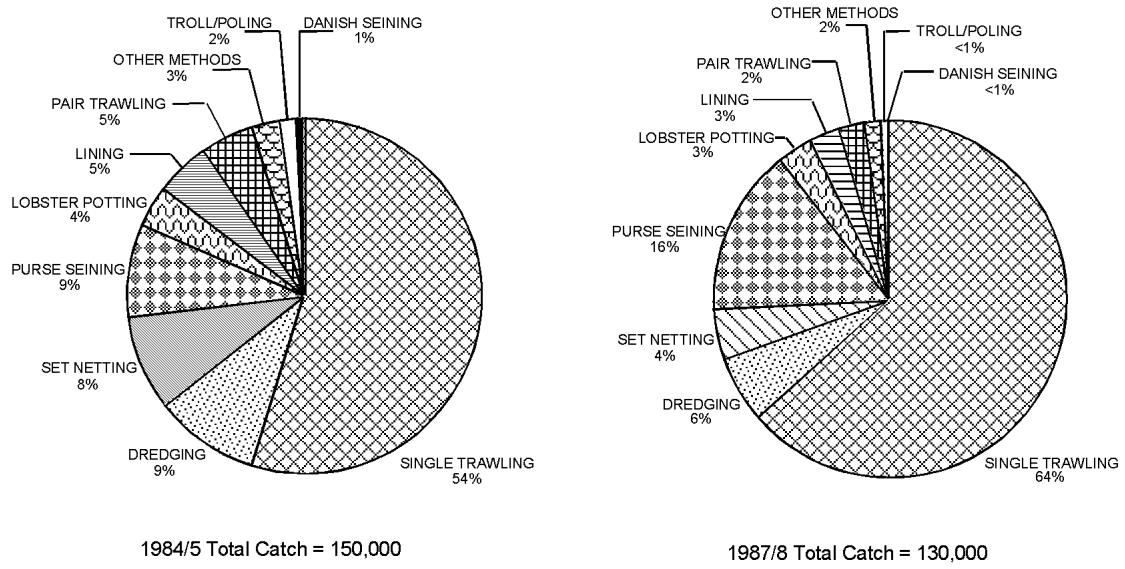
Data sources used here have meant that detailed analysis of the distribution of capacity by species and method has not been possible. However, figures five and six show data published by the Fishing Industry Board (FIB 1987, 1989, 1990, 1994, 1996) covering the whole domestic fleet. Figure 5 indicates the proportion of catch taken by method for the 1984-5 and 1987-8 fishing years. The total catch taken by the domestic fleet declined from 150,000 tonnes to 130,000 tonnes between these years with the implementation of ITQs. Single trawl catch is constant for the two years and so increases as a proportion of the total. The other bulk method, purse seining, expanded its catch of jack mackerels (*Trachurus* species) and kahawai (*Arripis trutta*) rapidly in this period. Catch from all other methods declined. Set netting was particularly hard hit due to targeted reduction in catches of shark species, snapper and groper under quota, and most of the vessel exits from this sector were from the under 12 metre classes. Figure 6 shows the change in numbers of vessels by method, and indicates that set netting is making something of a comeback by the mid-1990s. Of note also is the similar recovery of lining methods, and a gradual but steady decline in numbers of rock lobster boats.

Figure 4: Total capacity (GRT) and count by length class of registered fishing vessels of 24 to 33 metres length – 1974 to 1998



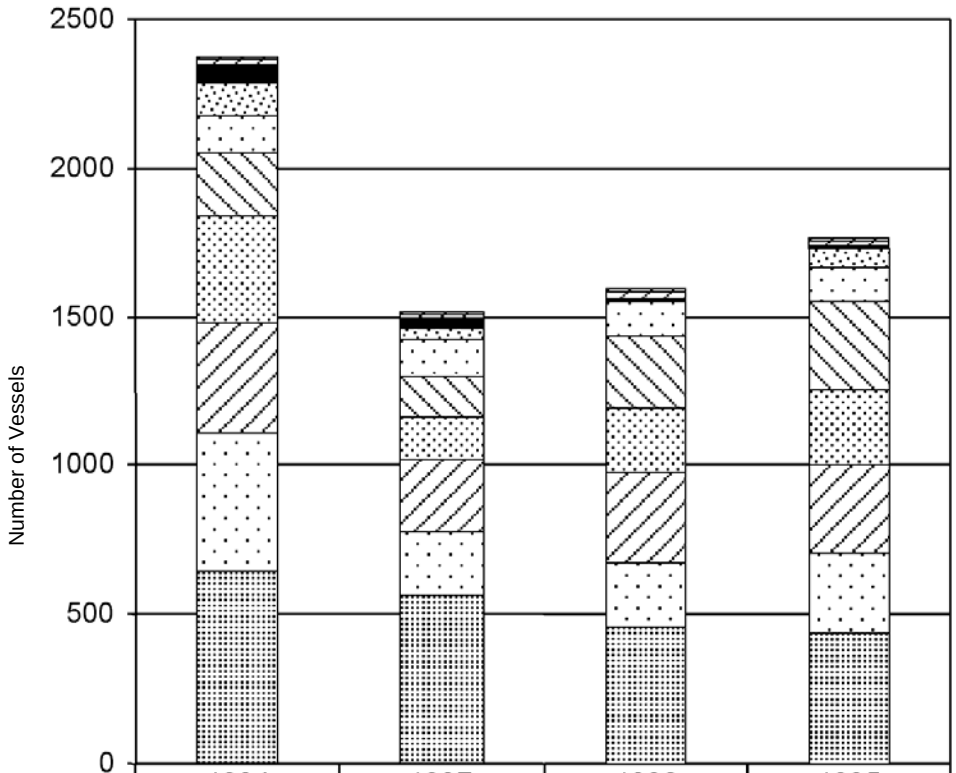
Data sources: King 1985; FSU data; QMS data.

Figure 5: Proportions of total New Zealand domestic catch by method: 1984/5; 1987/8



Data source: FIB 1987, 1989.

Figure 6: Numbers of full-time* domestic vessels by method for selected years



	1984	1987	1993	1995
Purse Seining	6	6	8	9
Danish Seining	23	10	26	21
Pair Trawling	61	35	7	5
Troll/Poling	106	37	7	60
Dredging	125	124	110	120
Other Methods	218	134	247	299
Lining	358	146	215	249
Single Trawling	368	244	303	299
Set Netting	465	212	212	268
Lobster Potting	645	566	459	436

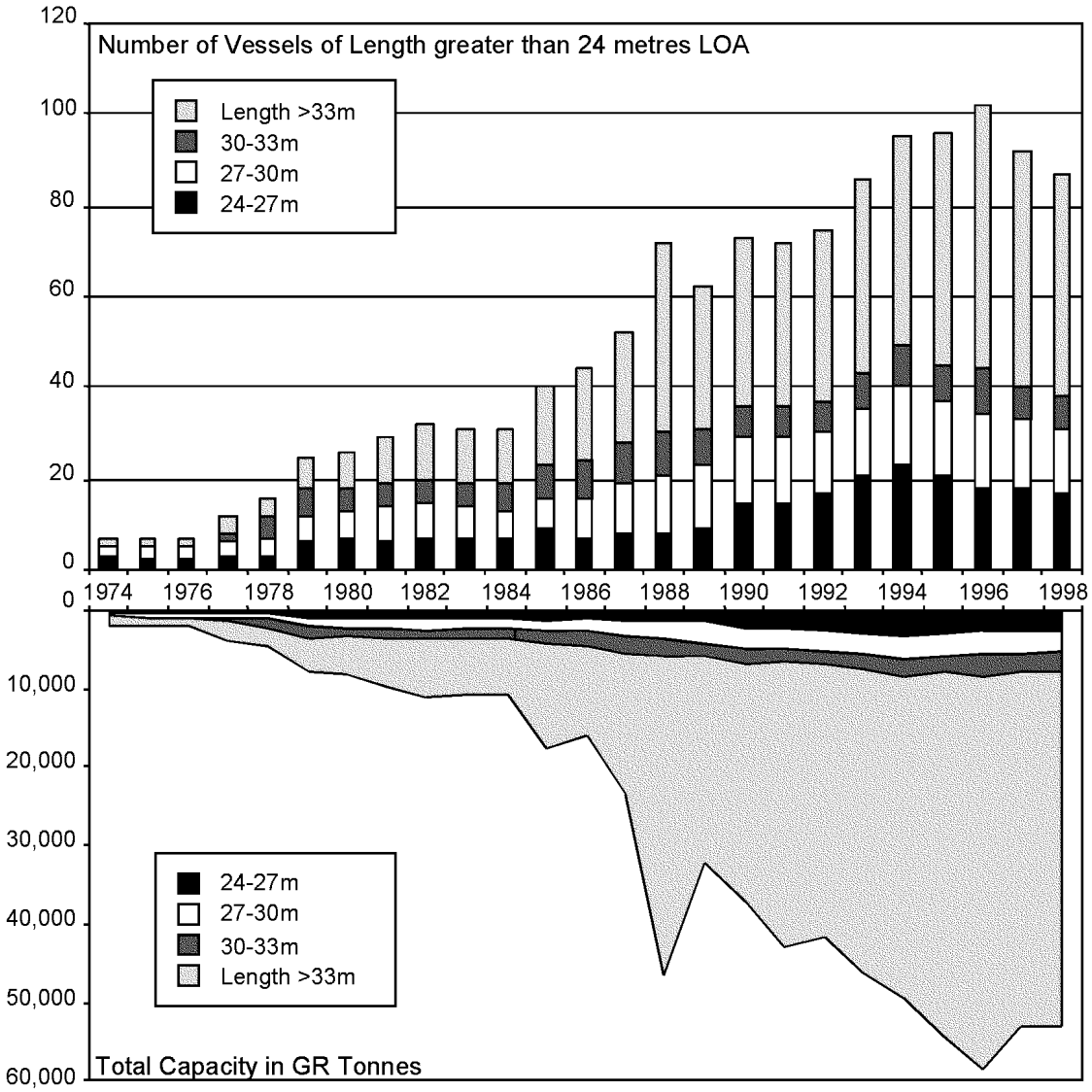
* Full-time vessels are defined as those landing more than 7 tonnes of fin-fish or molluscs, or 2 tonnes of rock lobster.
Data sources: FIB 1987, 1989, 1994, & 1996.

Offshore Fleet

In the vessel length classes suited to fishing the offshore species, more dramatic trends are apparent. Figure 7 shows growth in capacity and numbers for the over-33 metre fleet compared with that of the large inshore classes already discussed. While the 24-33m class has expanded to some 8000 tonnes of the 33,000 tonne inshore fleet, numbers of over-33m domestic vessels have increased from two in the late 1970s to 49 vessels in 1998, totalling some 45,000 registered tonnes. This large fleet of offshore vessels has been gradually replacing capacity provided in the past by foreign vessels chartered by New Zealand fishing companies. After some earlier use of very large vessels, the dominant length classes are now the 60-70 metre vessels and 40-45 metre vessels (see figure 8).

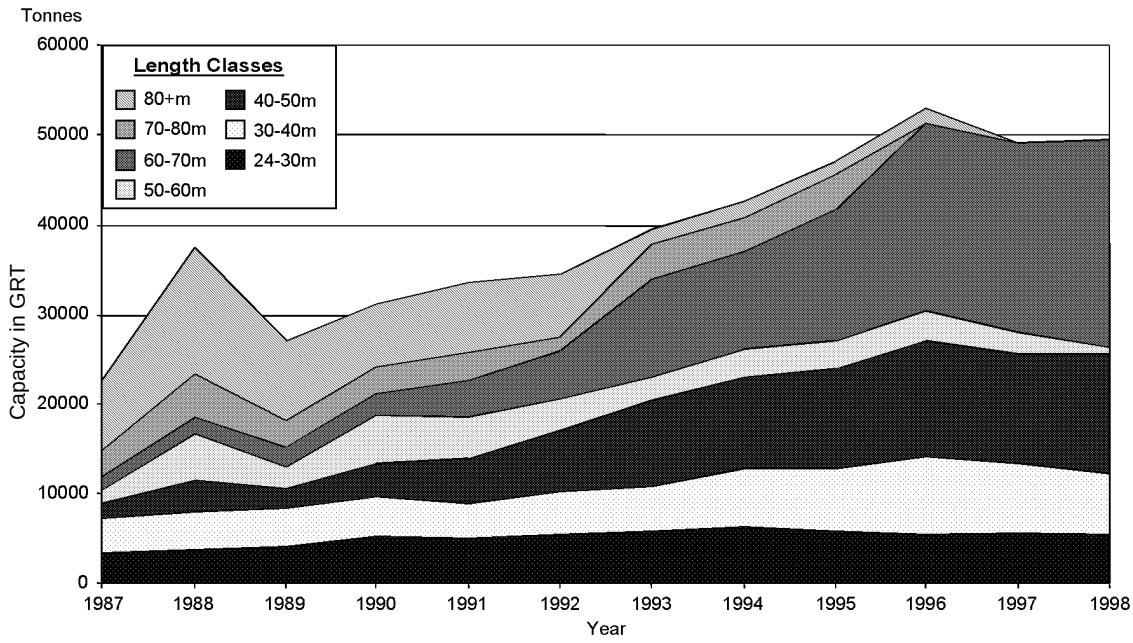
This bimodal configuration is due in no small measure to a regulation (the 43 metre rule) that limits the use of vessels over 43 metres long in the inshore and in designated areas important for the huge hoki fishery. Vessels have been custom built for this fishery to conform to the regulation, and these "fat boats" have increased the average tonnage for this length class dramatically. In the 40-45 metre range, there were 4 vessels in 1987 and 18 in 1998. Average tonnage of these vessels has increased by 50%, so total GRT has climbed from 1600 to over 11,000 tonnes. The 60-70 metre class are now the largest vessels in the domestic fleet: there was 1 vessel in 1987, and 12 in 1998. Again, average tonnage has increased by 50% and total GRT has increased from about 1400 to 23,000 tonnes. The data shows up to ten vessels in length classes greater than 70 metres in the years since the implementation of the QMS, but all have now gone. This capacity has been more than accounted for by the expansion in the two classes described.

Figure 7: Domestic Fleet – Numbers and capacity of large length classes 1974 to 1998



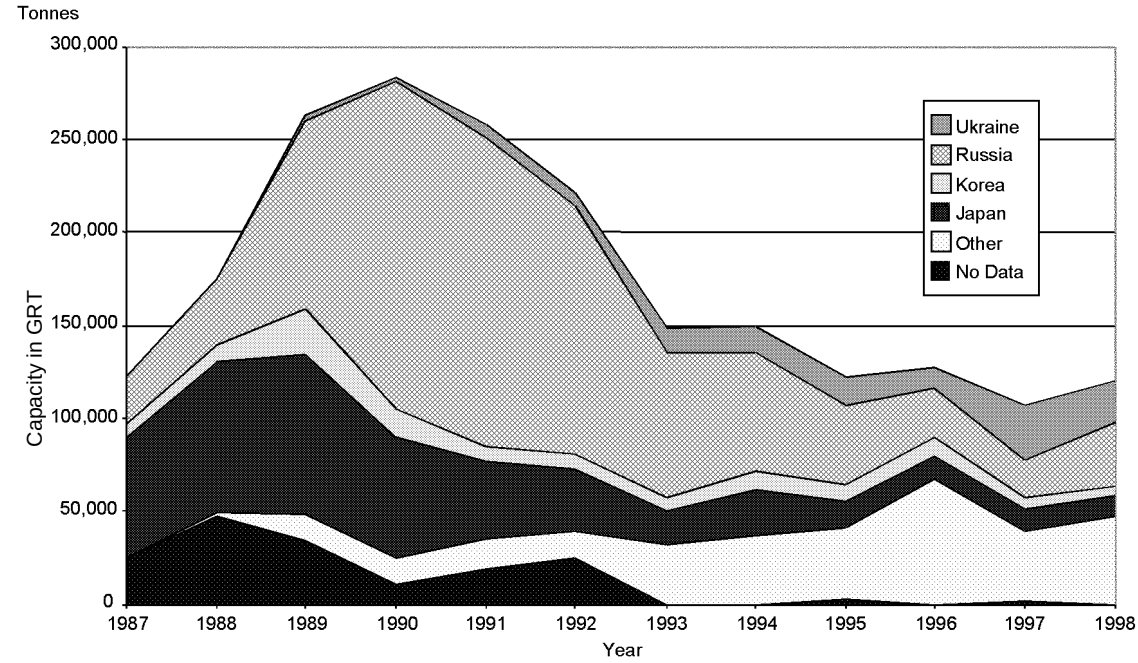
Data sources: King 1985; FSU data; QMS data.

Figure 8: New Zealand domestic fleet capacity trends (GRT) - large vessels by length class 1987 to 1998



Data source: QMS data.

Figure 9: New Zealand foreign charter fleet capacity (GRT) by major flag state



Data source: QMS data.

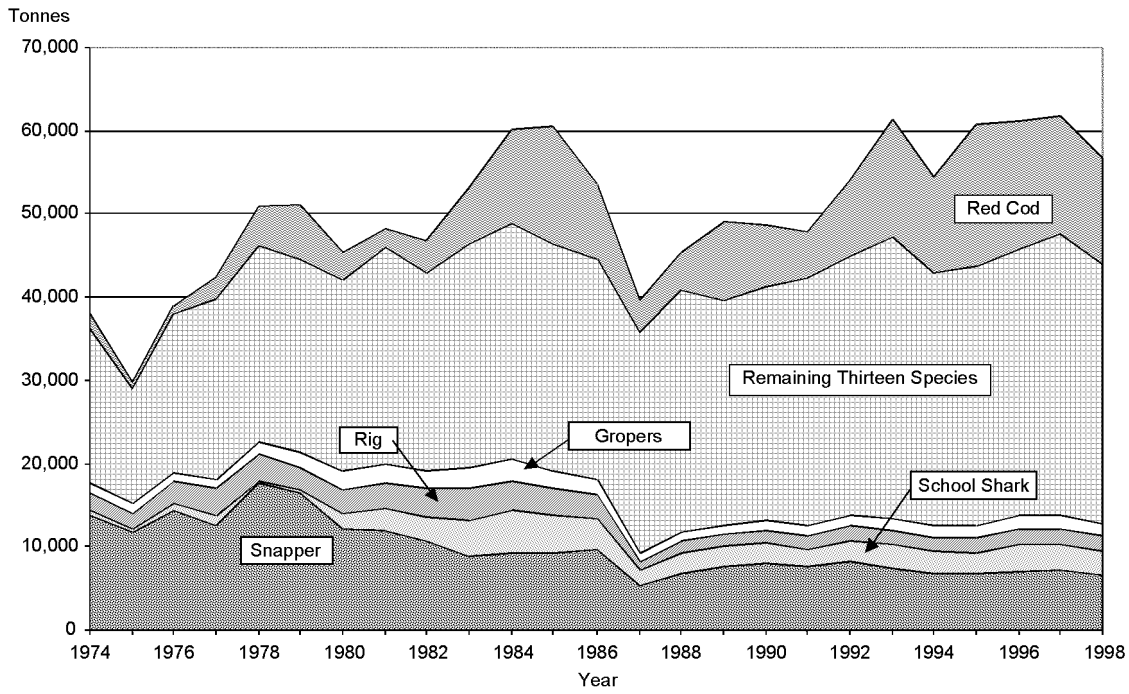
Trends for registered charter capacity are shown in figure 9. The charter fleet is still very important to the New Zealand fishing industry, with 125,000 tonnes active during 1998. This

compares with less than 80,000 for the total domestic fleet, but charter vessels do not generally spend all year fishing in New Zealand waters. The 1998 charter tonnage is within 4% of the total in 1987, with 1997 being the lowest total since the start of the QMS. In the interim, a huge peak of 288,000 tonnes was registered in 1990. The majority of these vessels (176,000 tonnes) were Russian, possibly reflecting difficulties in the administration of the fleet following the collapse of the Soviet Union. The Japanese charter fleet was already declining off its peak the previous year. From a traditional base in the Russian, Korean, and Japanese distant water fleets that have fished New Zealand waters since the 1950s and 60s, the flag status of the charter capacity has diversified substantially since 1992, with some 20 nations now represented. Russian and Ukrainian flagged vessels still provide some 45% of charter tonnage.

Catch

Catch figures over the period have been reviewed to put fleet changes in context. Figure 10 shows the catches of the main inshore species from 1974 to 1998, and figure 11 compares catches immediately before ITQs with the 1998 result. As mentioned above, the aggregate catch for these species has not changed dramatically, although the catch mix has changed. Red cod catches are volatile due to variable recruitment, but within the other 17 species shown, catches of four were sharply reduced on the introduction of the quota system and have been kept down. These were the specific targets of the quota buy-back program implemented in 1986.

Figure 10: Total catch for New Zealand inshore finfish species: 1974-1998

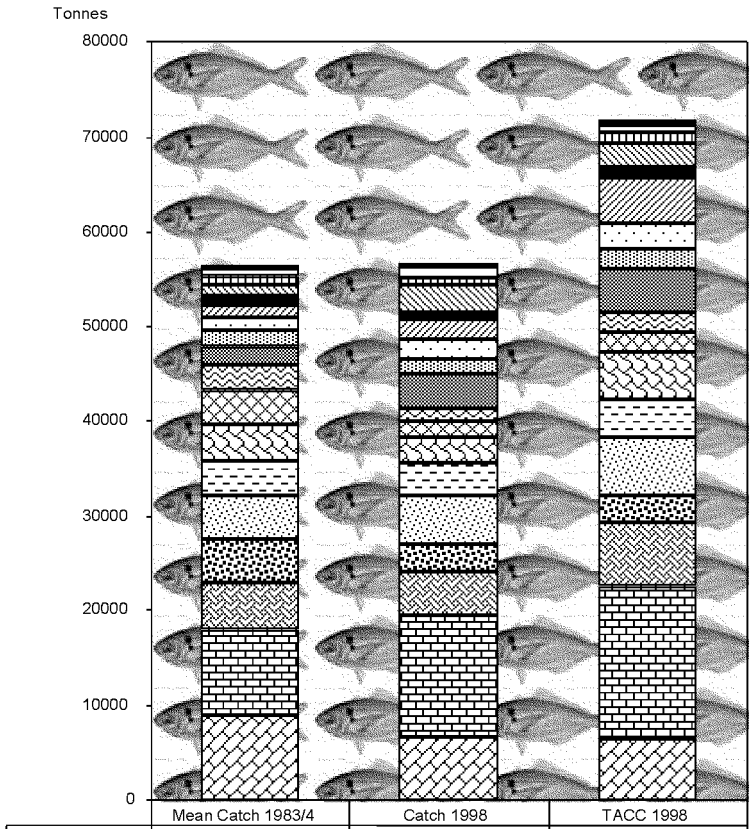


Data sources: King 1985; FSU data; QMS data.

Effort seems to have shifted to other species for which TACCs were under-caught, but as mentioned above, there are interactions between vessel size, method and species. Those fishing the four key buy-back species included small boats using set nets and long lines, and production by these methods was reduced sharply by the reforms. Groper is the only one of

the four not currently constrained by aggregate quota, but this is an artefact of the distribution of quota across areas. The areas of highest catch historically are fully fished against quota, while more remote areas are not. Another feature is the dip in total catches in the first year of the quota system. Reported catch for many species was well under the TACCs in 1987 but rose again the following season as fishers adjusted to the new system.

Figure 11: Long-term impacts of institutional change on catch of inshore species



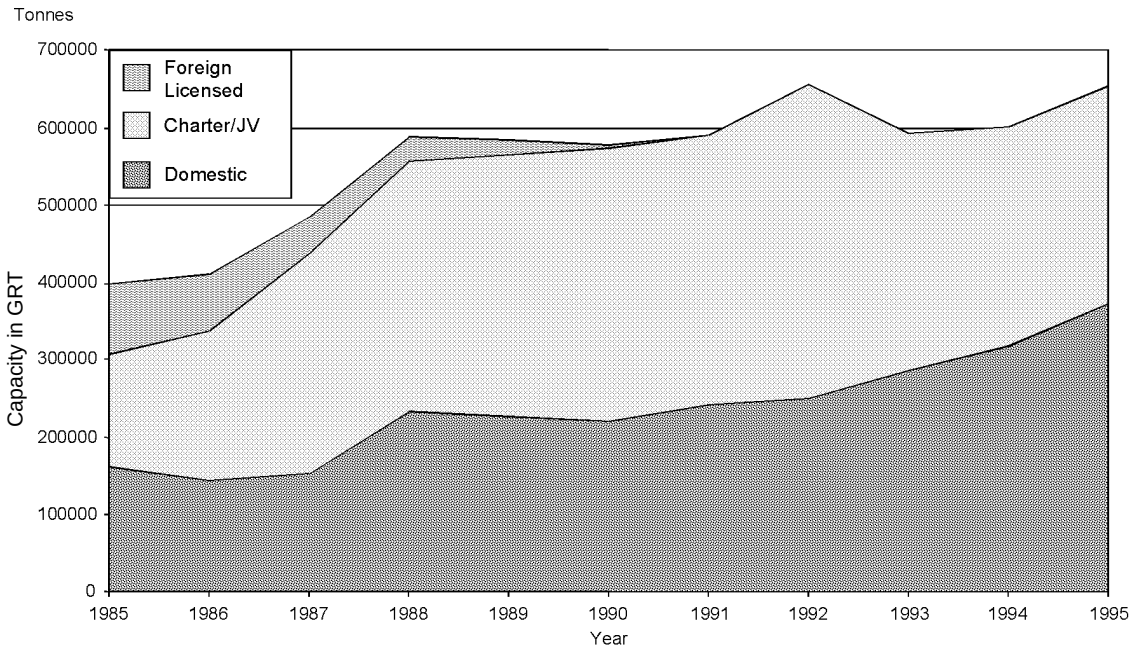
	Mean Catch 1983/4	Catch 1998	TACC 1998
Blue Moki	625	498	604
Elephantfish	754	1087	715
John Dory	782	812	1107
Bluenose	1056	2837	2490
Grey Mullet	1082	733	1086
Stargazer	1339	2131	4972
Blue Cod	1365	2187	2665
Gemfish	1762	1370	2211
Blue Warehou	1966	3722	4512
Gropers	2605	1402	2181
Rig	3694	1757	1888
Red Gurnard	3743	2541	5143
Trevally	3816	3358	3932
Tarakihi	4402	5287	5992
School Shark	4747	2915	3106
Flatfish	4895	4653	6670
Red Cod	8992	12872	16066
Snapper	9009	6585	6495

Data source: QMS data.

The relevance of catch data from offshore species to the issues of domestic capacity is perhaps to point out the blue-sky opportunity for capacity development in this sector. From the declaration of the EEZ in 1978, the New Zealand fishing industry worked to develop and domesticate the offshore fisheries. In 1977, foreign fleets took almost 90% of the 500,000 tonne catch from the zone. This foreign catch was cut right back in 1978 and the fisheries

were gradually redeveloped under joint venture and charter arrangements with foreign vessels. Some foreign licensed fishing also continued. Figure 12 shows the split of total production from the zone between foreign license, charter/joint-ventures, and domestic vessels for the period 1985-95. This indicates the domestic fleet's increasing share of an expanding total catch. The gradual switch from foreign to domestic catching accelerated in the 1990s due to the development of the large vessel capacity described above.

Figure 12: Proportion of total catch from New Zealand EEZ caught by foreign-licensed, charter and domestic vessels – 1985 to 1995



Data sources: FIB 1987, 1989, 1990, 1994, & 1996.

Total catches of offshore quota species are shown in figure 13.[5] The plot shows the cuts in catch in 1978 with the implementation of the EEZ, particularly for the rapidly expanding foreign catches of hoki, hake and ling. Orange roughy then came to dominate this sector in value terms until the major expansion of hoki catches from 1986.[6] Reference to figure 12 shows the use of charter vessels to take this catch and the response of the domestic fleet, and figures 8 and 9 reflect the massive investment in domestic capacity taking place in the offshore sector from 1987.

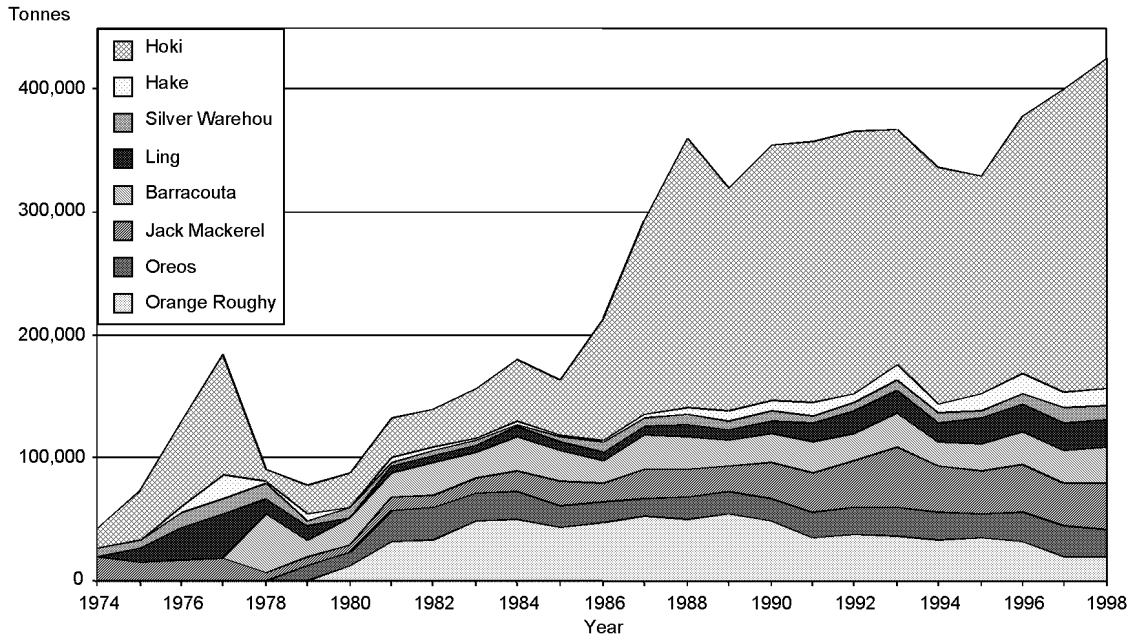
Orange roughy catches have declined markedly from the mid-1980s, with 1998 landings being only 39% of 1987 totals, at just over 20,000 tonnes. The several roughy fisheries had TACCs initially set high on biological assumptions that proved overly optimistic. Since 1990 the TACCs have been progressively reduced to what are thought to be more sustainable levels, and these changes have brought catches down. This has been a highly charged process and there have been overt political and economic trade-offs made against scientific

[5] These figures include foreign licensed and charter catches. Squid has been omitted, as data prior to the QMS was not available.

[6] Orange roughy is a very high value species for a bulk fishery, with an indicative port price of NZ$2,000 per tonne in 1988 compared with NZ$350 per tonne for hoki. By 1995 these port prices were $3,500 and $500 per tonne respectively.

recommendations for large TACC cuts. To some extent TACC reductions may have been tracking falling catches, and explicit deals with the industry have delayed overall reductions by creating new divisions of quota management areas, with industry investing in exploration of new areas to make up their catch. This 'serial discovery' of new sea-mounts and other aggregation sites has protected the industry from what otherwise would have been major economic impacts, but the impacts on stocks and their ecology are largely unknown.

Figure 13: Total New Zealand catch for selected deep-water species - 1974 to 1998



Data sources: Annala and Sullivan (1997); QMS data.

Age Profile of the Domestic Fleet

An analysis was made of the age structure of the domestic fleet from vessel registry records. The most complete data set was for vessels registered in 1996 and this is used for the main assessment. A further limited analysis was conducted of 1987 and 1984 data, which were less complete but allow some comparisons to be made. Histograms were plotted by length class showing vessel numbers and total GRT by year built (see Appendix I).

Regular cycles of vessel building activity are clear from this analysis. In general, peaks in numbers of vessels built occur at approximately decade frequency, but these cycles are also strongly correlated with the major regulatory changes. A decade long boom in vessel building occurred in New Zealand following the deregulation of fisheries in 1963, and another occurred with the declaration of the EEZ. The bulk of the capacity in the offshore fleet was built between 1986 and 1992, following the implementation of the QMS, but the established fleet did not experience another boom at this time.

These vessel cohorts are evident in the 1996 registry data for the 12-24m vessels, where vessels built in the 1960s remain the dominant cohort in numbers and capacity (Table 1). Earlier cohorts are also still evident with peaks immediately post-WWII and again in 1956. In this range about 25% of vessel numbers and total capacity fishing in 1996 was built before 1960, with the oldest vessel built in 1906.

The general picture for this core inshore fleet is that it is aging, with 80% of capacity more than 15 years old. Replacement since the implementation of the QMS has been at a low rate, with 80 vessels totalling 2400 tonnes built between 1987 and 1996. This has maintained the aggregate capacity of the fleet, but this pattern does not reflect any great incentive provided by ITQs to increase productive efficiency by investing in new vessels. This sector of the fleet warrants closer study to determine the impacts of the quota system on exit and entry incentives, and could provide a good opportunity to examine strategic decision making of vessel owners under uncertainty.

There were few vessels in the New Zealand fleet larger than 24m before the 1970s. The 1996 records show 7 vessels in the 24-33m range built between 1967 and 1975, but the bulk of the capacity in this class was built between 1977 and 1981 (the EEZ cohort). Twenty-seven vessels totalling 4,350 tonnes from these 5 years were still fishing in 1996 – around 60% of the total tonnage in this range. The origin of these vessels is not known, but it is certain that a good number of them were imported second hand, as 1984 records show fewer than 20 registrations for the class at that time (refer figure 4).

Table 1: Cohorts of 12-24 metre vessels

Year Vessel Built	Number still registered in 1996	Total GRT 1996
Pre-1963	152	4,970
1963-1974	201	7,780
1975-1985	134	5,050
1986-1996	89	2,700
All Vessels	576	20,500

For very large vessels (greater than 33m) a similar strong cohort is present from the 1970s with 27 of 58 vessels registered in 1996 built between 1971 and 1981. However, another 25 vessels were built between 1986 and 1992, and these have an average tonnage of more than twice the earlier group. Again many of these vessels have been imported into New Zealand from service in other fisheries. In 1984 there were only 12 vessels of over 33m registered, but records show that of vessels in this range registered in 1996, 30 were built before 1984. Similarly for the second cohort, there were 20 additional registrations in this class between 1992 and 1996, but only 2 of these vessels were built in that period. Hence the majority of the capacity added to the New Zealand fleet as a consequence of the domestication of the offshore fisheries seems to have been sourced from existing foreign fleets, although some vessels have been purpose built.

In the smaller vessel classes (less than 12m LOA), the 9-12m vessels show the two earlier cohorts as dominant – the first peaking in 1969 and the second in 1978, with no sign of a resurgence of building after the QMS implementation. The replacement rate has been low – an average of 8.6 vessels (60 tonnes) per year since 1987 for a 500 vessel fleet, and the average tonnage of these replacements is significantly down (28%). Total capacity was maintained from 1987 to 1996, but has fallen nearly 20% through to 1998.

In the 6-9m range there are fewer older vessels as expected, with only a handful built before 1976 still operating. The EEZ build up is the dominant feature here with 35% of 1996 capacity built between 1976 and 1980. Since 1980 the replacement rate has been fairly

constant at about 30 tonnes per year, or 2.7% of the 1996 fleet size. This low rate has no doubt contributed to the decline of the class in recent years as boats built in the late 1970s are retired. One possible explanation for the decline in this class is the replacement of older permanently moored vessels with smaller (5-6m) aluminium hulls on trailers to improve productive efficiency and reduce maintenance costs.

Most under-6m boats in the fleet in 1996 had been built since 1984 (70%) at an average of 37.5 boats (5% of the 1996 total) per year. This seems a high enough rate to maintain the fleet but numbers have still fallen about 25% since 1987. Within this period the building rate and total number was higher from 1989 to 1994 and has since tapered off. This sector is flexible due to the low cost and relatively short life of boats. There will always be a place for these small boats, but it is unlikely under quota that they will ever again reach the numbers of the late 1970s when almost 3000 under-6m boats were registered for commercial fishing.

Summary of Fleet Capacity Trends

In summary, the total capacity of the New Zealand domestic fishing fleet grew by a net 43% from 1987 to 1998. This is accounted for by growth in the offshore (>33m) fleet to replace charter vessels and increase specialisation. The key expanding large vessel classes are the 43 metre vessels and 60-70 metre freezer trawlers. The inshore fleet has changed little in aggregate capacity although it has undergone significant restructuring. This restructuring has important dimensions not covered in the current analysis, such as vessel replacement, changed ownership patterns, gear configurations and changed targeting. A core inshore fleet of 20,000 tonnes in the range 12-24m LOA has been maintained as a constant capacity component since the mid-1970s. This section of the fleet is aging and there is a suggestion in the data that the replacement rate may be picking up through the 1990s.

The capacity shed by a more than 70% drop in numbers of small (<12m) boats has brought capacity for this sector down below that of the early 1970s and seen a shift to larger average vessel size. The 24-33m class has developed rapidly from a few boats in the mid-1970s to become a significant sector of the domestic fleet. Many of these vessels will be deployed in fishing for other than inshore species, indicating an overall decline in the capacity dedicated to the inshore since the introduction of quota. At the same time, the overall catch of inshore species has been maintained, although the proportional species mix has changed significantly, as catch levels for some over-fished stocks have been brought down while others have increased.

Insufficient data was available to describe in detail the impact of charter capacity. Charter vessels are not in New Zealand all year round, and a fuller assessment of the relationships and trends in capacity and catch will require data on how long vessels are in New Zealand waters. However it is clear that the domestic fleet is taking an increasing proportion of the catch, and the early 1990s were a time of significant expansion in domestic capacity. Some of the large vessels added to the fleet had previously operated as charters and have been purchased by New Zealand companies. Others have been purpose built or imported from overseas. Numbers of foreign licensed vessels fishing New Zealand waters and their catches declined steeply as New Zealand companies increased charter operations following the QMS implementation. In 1984, for example, foreign licensed vessels took a total of 120,000 tonnes of a range of species from New Zealand waters. By 1994 this had been

reduced to about 30 tonnes of one species – blue-fin tuna.

Effects of the Introduction of Transferable Property Rights on Fleet Capacity

Without more detailed study including interviews with vessel owners, it is not possible to fully separate the effects of the introduction of ITQs from those of other regulatory measures, changes in export markets, and other factors. However, some observations are possible.

Firstly, the introduction of quota did not provoke a new vessel building boom for the inshore fleet as other major regulatory changes have done in the past. The historical context is important in that the bulk of the core inshore fleet constructed in the late 1960s was still serviceable at this time. Estimates made by the Fishing Industry Board in 1983 suggested the inshore fleet was overcapitalised by about 20% (NAFMAC 1983). This was highlighted at the time as a signal that the regulatory framework required reform, but the key issues for the inshore were the overexploitation of a few valuable and vulnerable species. Through ITQ, and lower overall catch limits enabled by the quota buy-back, these catches were brought down effectively while permitted catch levels for other species were increased over historical levels. This allowed the fleet to adjust target species without an urgent need to shed capacity. However, because of the implications of the targeted cuts for particular methods used by the small boats, particularly lining and set netting, a substantial number of smaller vessels exited at implementation. Pressure has continued on this sector and a significant run down in numbers of small boats has occurred through the 1990s. The 6-9 metre class in particular seems to be disappearing, and this may be a product of both efficiency considerations for the size class and the age of many of these vessels.

Some vessels built elsewhere in the universal boom of the late seventies were imported into New Zealand after 1986 both for the core inshore fleet and the offshore sectors, and some new vessels have been built. Whether the new construction constitutes any more than an efficient replacement rate for the fleet or not, given that the offshore catches were being domesticated from foreign charters, is an unanswered question at this stage. In general, it seems that replacement of vessels in most classes has become more regularised than it has been in the past, with a similar number of new vessels brought in each year rather than all at once in response to a policy change.

The increased security offered to businesses by quota ownership, as part of a credible commitment from government over access to resources, undoubtedly promoted the massive investments required in vessels and shore processing operations required to domesticate the catch from the EEZ. ITQ provided the means for repatriation of the flow of resource rents, previously captured by the distant water fishing nations, through charter and joint venture operations. Local companies used these cash flows to back investment to expand their own capacity, turning the fishing industry into a major contributor to GDP and export earnings for New Zealand.

The significant negative impact on capacity growth trends for the inshore fleet from 1994 suggests that the new cost recovery regime may be driving out marginal operators. Although “cost recovery” may be easier to justify in political terms than taxes or “resource rentals”, any increases in charges under transferable quota will hit less well-capitalised businesses harder. Higher charges will flow through into lower quota prices eventually, but for those who have paid top prices to get into the fishery or have borrowed against high quota

values, new charges could spell trouble. If operations have high debt-equity ratios and are not high-liners, they may be driven out by increases, where they could have survived had the charges been in place before they bought their quota.

Conclusion

In conclusion, although ITQ systems are often advocated where over-capacity is a problem, they do not act directly to regulate fleet capacity. By limiting catches of individual species independently, quota systems can establish conditions for structural change within the fleet, and they provide the mechanism of transferability of catching rights to allow autonomous adjustment. Whether a net decrease in capacity occurs in a particular fishery or sector of a fleet depends on a range of factors, including the degree of over-capacity present, opportunity costs of holding vessels, labour and quota, and perceptions about the future of fishing and quota prices. In the case of New Zealand, the almost complete coverage of the quota system precludes movement of small vessels to other non-quota fisheries, and some may have been locked in while their vessels still had useful life in them. As the fleet ages some small-boat capacity seems to be dropping out without being replaced, and this trend is likely to continue. At the other end of the scale, the QMS has provided the conditions for large-scale development of the offshore industry, and the use of charter vessels has allowed the domestication of capacity to occur in ways most advantageous to New Zealand companies. It is unclear whether the future fleet will ever be totally domestically owned.

The patterns of vessel registrations tend to support the view that boats will tend to remain in use as long as possible. With no alternative application, vessels may need to reach a use value equivalent to salvage before being withdrawn from fishing. The fleet appears to be adjusting and reducing by attrition of old vessels rather than exit of working boats. This is seen in reduced numbers of the smallest vessels in the fleet during the 1990s, but significant reduction in total capacity of the inshore fleet may not come until the largest cohort of 12 to 24 metre vessels reach the end of their life span. In addition, the overcapitalisation argument may have been somewhat oversold in relation to the pre-QMS fleet. Modelling at the time suggested the fleet was about 20% larger than it needed to be (NAFMAC 1983). This is not a great deal of surplus capacity, and given the shifts in target species and increases in TACCs and catches for many stocks under the QMS, the inshore fleet may not require significant reduction.

One avenue for expansion of catch not closed off by the initial implementation of the QMS was into pelagic species. Existing purse seine capacity rapidly expanded its catches of jack mackerels (*Trachurus* species) and kahawai (*Arripis trutta*) following the introduction of quota for other species. Rather than displacement of capacity from quota fisheries, this activity is likely to represent a "race for quota" – attempting to quickly establish a catch history for species that are likely to be brought under ITQ in the future. This illustrates a significant issue in any staged or partial implementation of quota management.

There is little doubt that the QMS successfully checked and contained expansion of the inshore fleet in areas that were over-capitalised, and provided the means to redirect effort and existing capacity away from overfished and vulnerable stocks toward those capable of higher production levels. Given the levels of capacity existing in the mid-1980s, the use of ITQs undoubtedly produced a more efficient economic outcome than could the alternatives of input regulation or competitive TAC management, and took pressure off vulnerable stocks.

The factors discussed here make New Zealand something of a special case in fisheries management. The country is small enough to make a unified management system and administration of fisheries possible, meaning that all economically significant commercial fisheries are under quota leaving nowhere for vessels to go to exit the system. A small domestic market relative to production levels has led to export orientation driving both vertical integration and concentration of quota and catch into firms large enough to compete in world markets.

However, for other jurisdictions implementing or considering quota management, these types of factors are becoming increasingly significant. Many fisheries are managed under some form of limited entry reducing the potential for vessel displacement. The concentration of ownership in domestic marketing channels in supermarket chains makes security of supply issues more important and will have implications for transferable catching rights. Vessel lock-in may have implications for levels of discarding and high-grading in some fisheries.
The New Zealand QMS did not solve all management problems in 1986, and continues to evolve and face difficult management issues. However, excessive fishing capacity or over-capitalisation of the fleet is not a feature of the New Zealand fisheries. This can be attributed to the implementation of quota management. The lack of excess capacity makes many other aspects of fisheries management more tractable, and makes the fishing industry a generally profitable and buoyant sector of the New Zealand economy.

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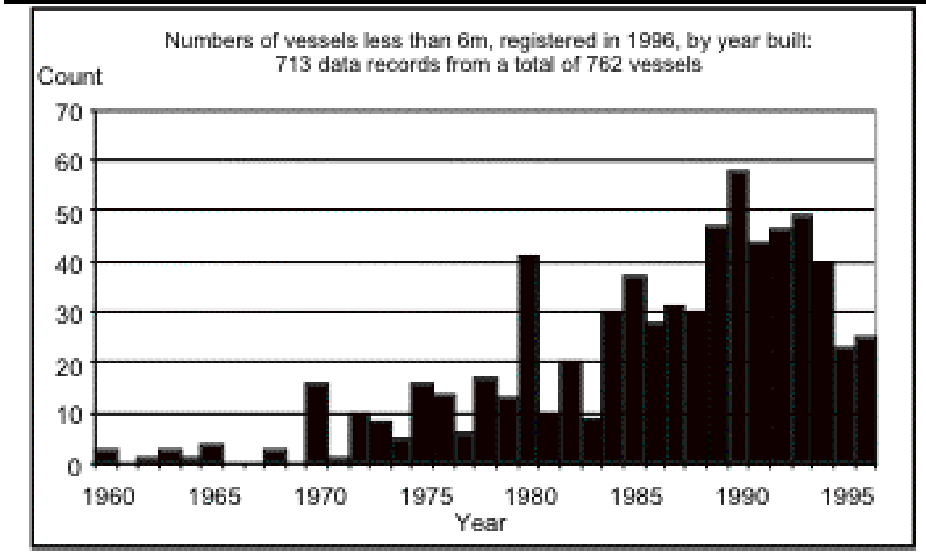
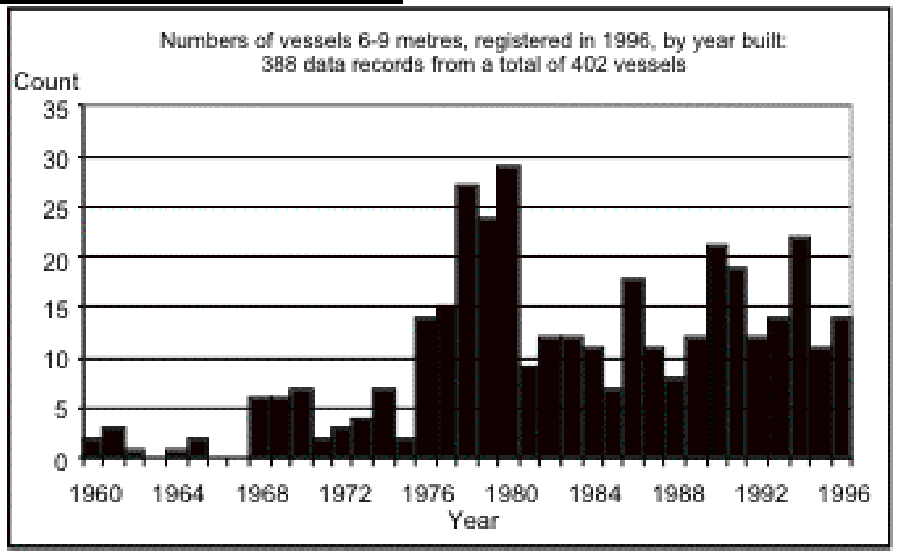
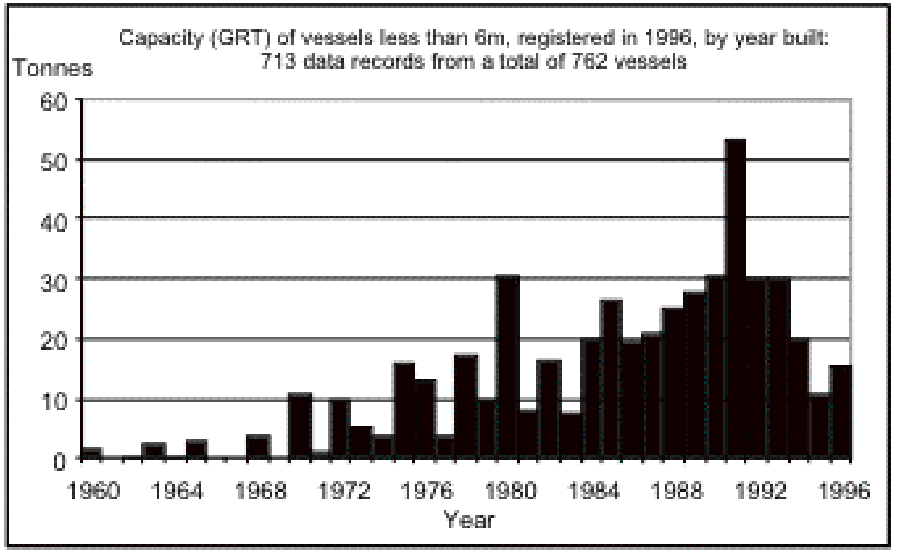
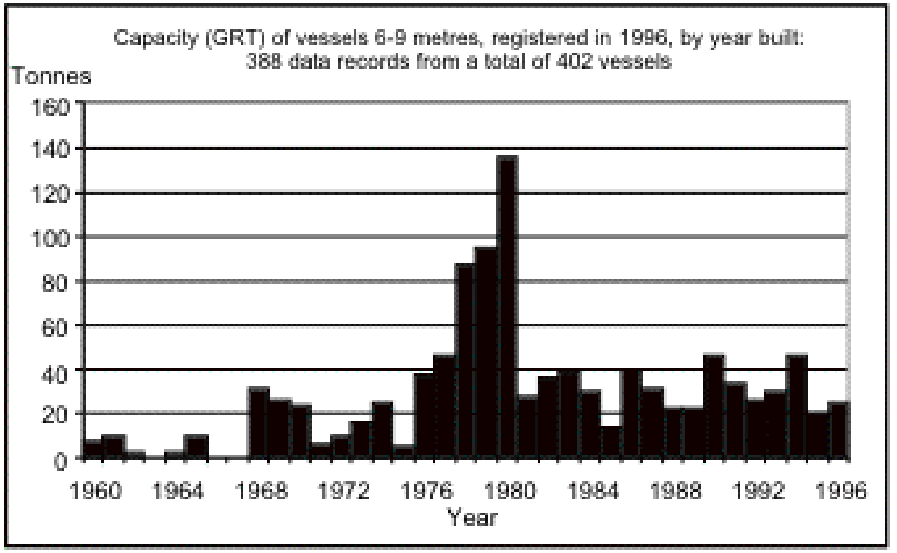
Appendix I: New Zealand Domestic Fishing Fleet – Histograms of Age Structure by Length Class









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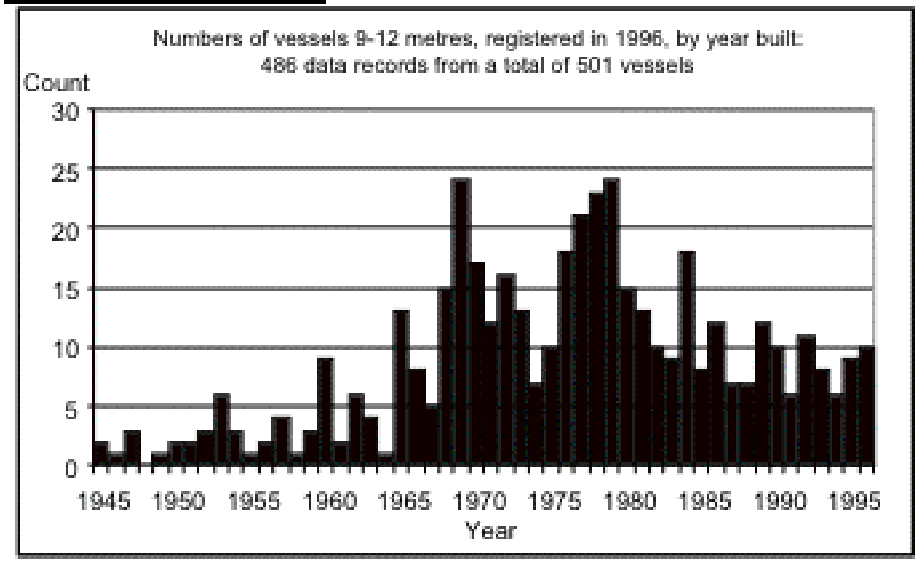

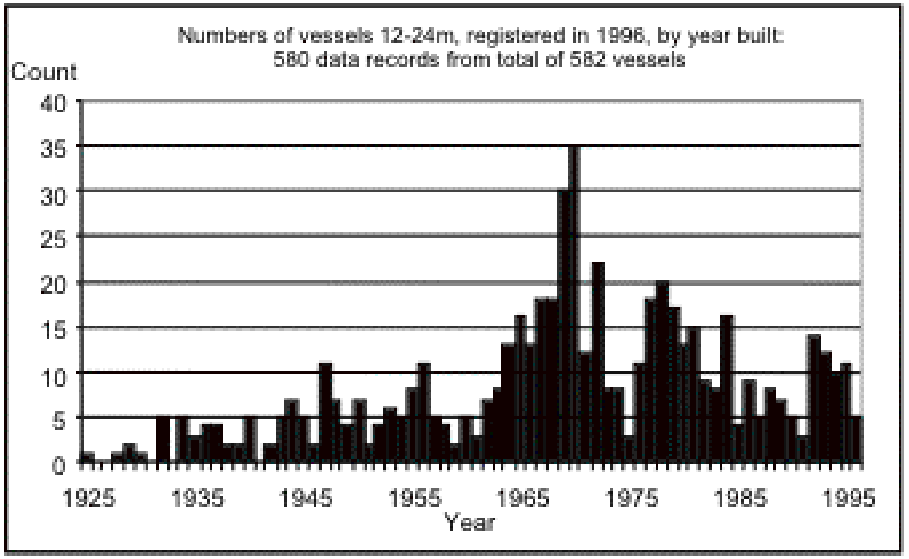

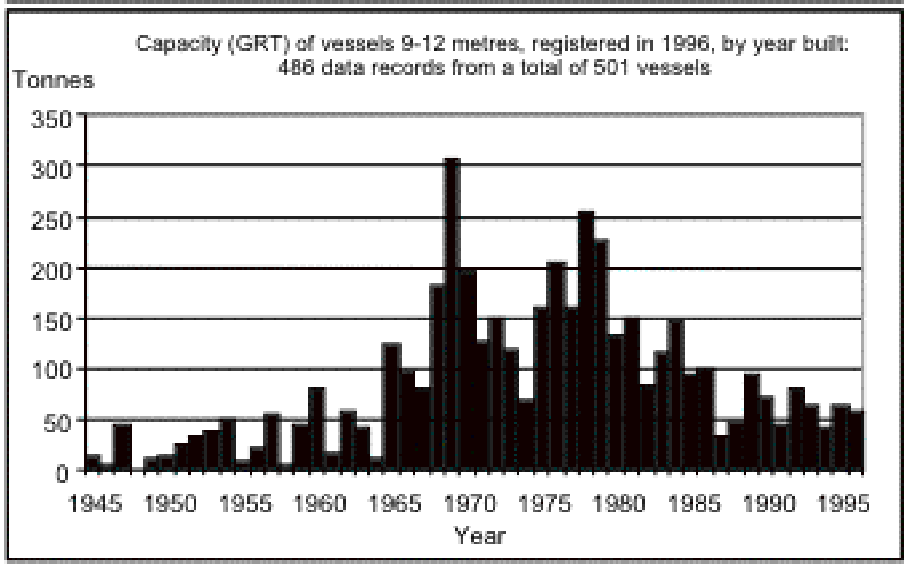

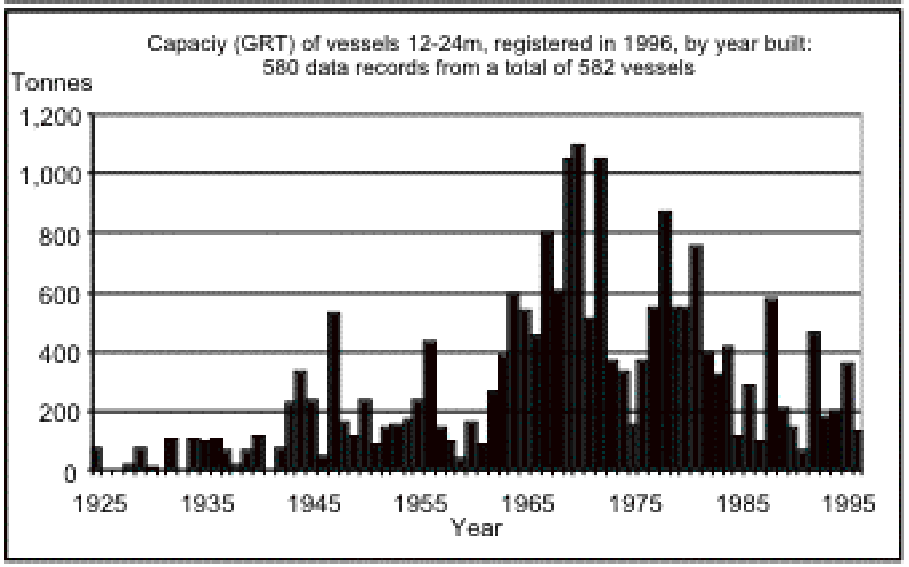

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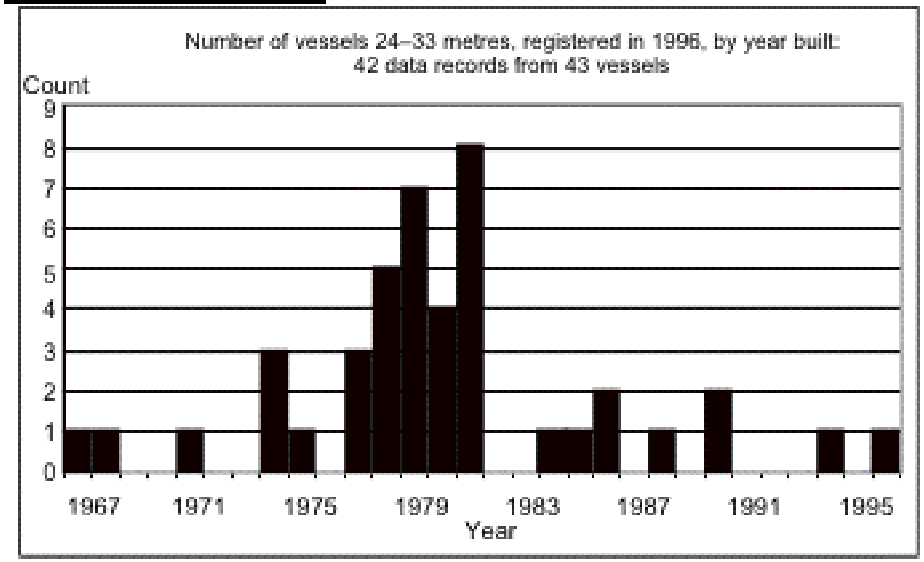

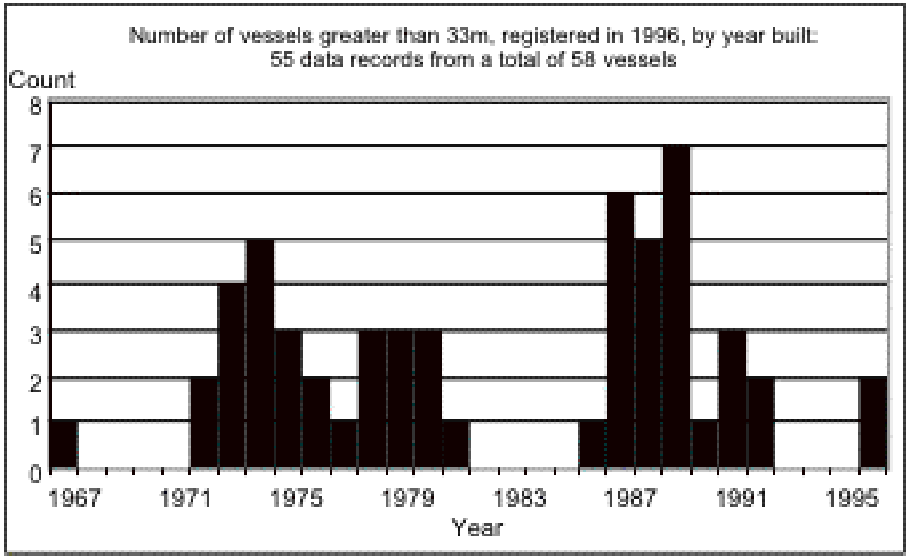

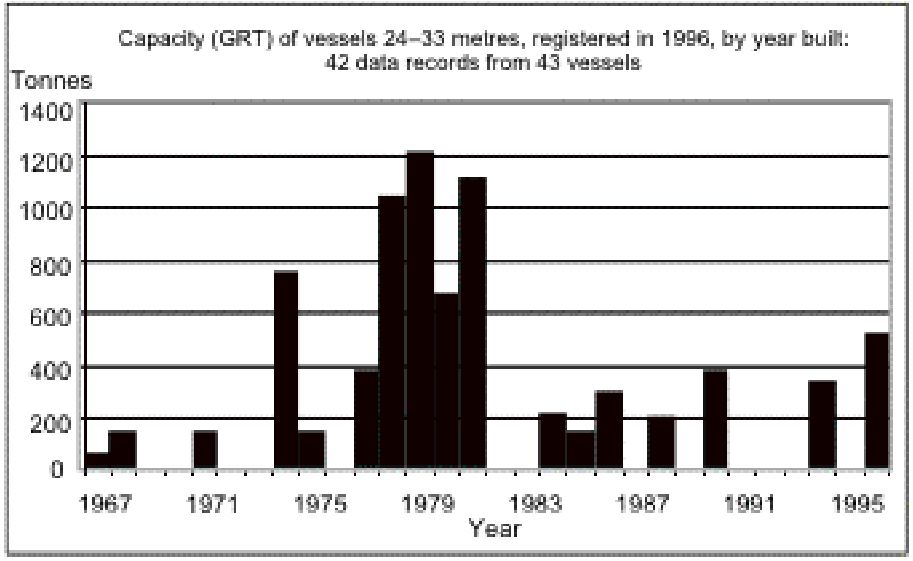

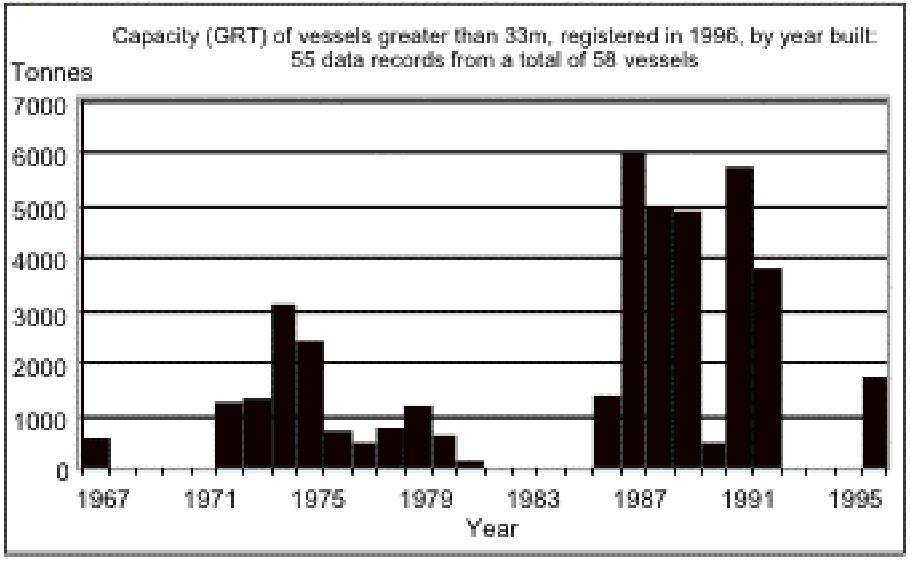

Annex 8

Asia-Pacific
Economic Cooperation

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

FWG 01/2006--D006

Chilean Experience in the Reduction of Excess Fishing Capacity

Mr. Italo Campodonico G. and Mr. Rodrigo Polanco Z.
Undersecretariat for Fisheries, Department of Fisheries, Chile

Fisheries Working Group Meeting
8 – 9 May 2006
Kaohsiung, Chinese Taipei

Chilean Experience in the Reduction of Excess Fishing Capacity

Mr. Italo Campodonico G. and Mr. Rodrigo Polanco Z.
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1.- Introduction

Regulating the fishing capacity of the Chilean fleet has been an on-going concern for the Fisheries Authority, in light of the growing tendency towards increases in fleet size and fishing capacity.

In 1986 Chile set out to control fishing effort by adjusting this to the productive surplus of the various fisheries under exploitation.

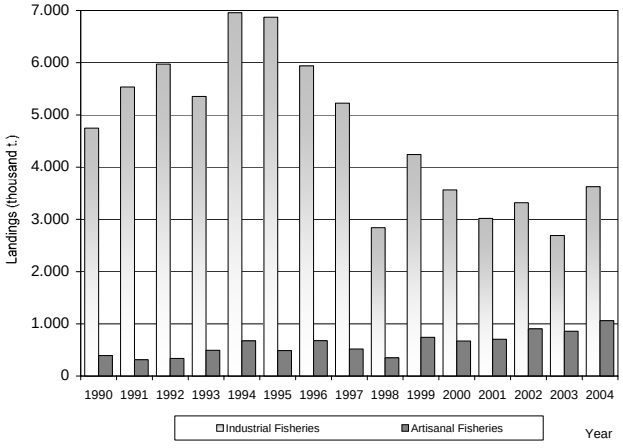
This paper summarizes the actions undertaken by Chile in order to reduce fishing capacity. Furthermore, the information contained in this paper will provide the basis for the formulation of a National Action Plan, in accordance with the general guidelines recommended by FAO.

2.- General Background on Chilean Fisheries

As a result of a joint effort between the private and public sectors, Chile is ranked among the top ten countries with the largest fishery production in the world. Factors such as the high levels of productivity and quality of Chilean waters contribute to explaining this situation. In 2004 Chile was ranked 6th in the world for total landings, including aquaculture harvests.

On average, during the period 1990- 2004, the total Chilean fisheries production was around 5.9 millions tons. Out of this figure, 5.2 millions tons correspond to capture fisheries. During this period industrial landings represented 87 percent of the overall landings, but their relative importance has diminished over the last 5 years (Figure 1). In terms of volume, pelagic fish fisheries are the most relevant (over 3 million tons in the last years); next in importance are demersal fish fisheries and crustacean fisheries.

Figure 1. Historical landings - Capture Fisheries



3.- Actions Implemented to Reduce Fishing Capacity

Early Stages

During the latter half of the 1980's, Chile passed the first national regulations aimed at controlling fishing effort. The access of new vessels and any increase in hold capacity were restricted in 1986 for the anchovy, sardine and jack mackerel fishery units in the north of Chile and the jack mackerel fishery in the south-central zone of Chile. Similarly, in 1989, fishing effort in the demersal fisheries in the southernmost zone was regulated by restricting the access of new vessels and regulating the gross register tons (GRT) and the total fishing power of authorized vessels. These regulations were directed mainly at the exploitation of southern hake and kingclip.

General Law of Fisheries and Aquaculture

The General Law of Fisheries and Aquaculture was passed in 1991 and its regulations incorporated a concept of fisheries administration based on two systems:

a) Effort Control; this system aims to administrate fisheries by awarding fishing licenses to vessels with determined characteristics, and for resources and specific areas (fishery units). Access to the fisheries can be closed when the fleet has the capacity to catch the productive surplus of the resource. This system was implemented through the General Access Regime and the Full Exploitation Regime.

b) Quota Control; this system aims to administrate fisheries by allocating individual transferable catch quotas, valid for a 10 year period (allocated by public auctions). This system was implemented through the Recovering and Incipient Development Regimes.

a) Effort Control

As indicated above, the effort control regulations have been implemented through two regimes. As a result of the first regime, the General Access Regime, a registry of vessels entering the activity was created, specifying resources, fishing gear and areas where activities may be carried out. This regime established the grounds for turning down fishing license applications.

The second regime is the Full Exploitation Regime, which was applied to industrial fishing fleets that already had authorization and that were capable of catching the entire productive surplus of the target species. The application of this regime made it possible to halt and reduce the number of vessels through the following mechanisms:

1. Restricting the access of new vessels to the fisheries.
2. Regulating the replacement of vessels so that:
    a. There was no increase in the number of vessels. That is, vessels could be replaced as long as the total number of vessels did not increase.
    b. There was no increase in the specific parameters for total length, beam, hold capacity, power and Gross Register Tons (GRT).
    The renovation and modernization of the fleet was made possible through this second mechanism, whilst maintaining a restriction on certain characteristics

of the vessels which relate to fishing effort.

3. Reducing the number of vessels by canceling the fishing licenses for vessels that did not start extractive activities within the established time periods, or that suspended activities for more than 12 months.
4. Creating a registry of industrial vessels operating in Chilean fisheries. This registry was created using information compiled from when the vessels were part of the General Access Regime.
5. Semi-annual publication of a list of vessels authorized to operate in each of the fisheries. This allowed for a stricter control over vessels that were liable for license expiry.
6. Industrial fishing vessels were required to implement a satellite geographic positioning system. This was enforced in August 2000 and since then it has been possible to control the operation areas of vessels and prevent illegal fishing in unauthorized areas.

The full exploitation regime has been applied to the 15 most important industrial fisheries, which include: anchovy, jack mackerel, sardine, common sardine, kingclip, Chilean hake, southern blue whiting, hoki, southern hake, skate, red squat lobster, yellow squat lobster, deepwater shrimp, cardinal fish, and splendid alfonsino.

The application of the effort control system has reduced the number of vessels and restricted the geometric and functional characteristics of vessels related to their fishing capacity. However, there were also some negative effects, such as the incentive to fish the established quotas as early as possible, an over-investment in new vessels (under the replacement mechanism) and a focus on short term objectives as opposed to maximizing added value in the processing of the raw materials.

All of this resulted in an inadequate exploitation of the fishery resources, a reduction in the length of fishing seasons, an inappropriate use of catches, unstable working conditions in some fisheries and pressure on the Fisheries Authority to increase quotas above the levels recommended by experts.

b) Quota control

As previously mentioned, this allocation system was created in 1991 as part of the General Law of Fisheries and Aquaculture. The Chilean fisheries administration established, for the first time, a system of access by awarding aliquots of the global catch quota through public auctions. This was implemented through two regimes:

Incipient Development Fisheries Regime, applicable to demersal or benthic fisheries that were previously subject to the free access regime.

The Patagonian toothfish fishery in the area south of the 47th L.S. parallel and the Orange roughy fishery throughout the EEZ come under this regime.

Recovering Fisheries Regime, applicable to fisheries that had been over-exploited and subject to an extractive ban for at least three years.
This regime operates using a system of individual transferable quotas (obtained through annual public auctions) that are valid for a period of 10 years, but decreasing by 10% every

year. In the first bidding, 100% of the annual catch quota is awarded. In subsequent biddings, only 10% of the annual quota is awarded.

This regime has been applied to the yellow squat lobster and red squat lobster fisheries in the central zone of Chile.
The principal characteristics of the quota control regimes are as follows:

1. The Undersecretariat for Fisheries adjudicates, through an annual public auction, the right to catch the equivalent in tons of a percentage of the annual global catch quota.
2. A special fishing license is awarded which represents an individual transferable quota. The holder of this license is allowed to catch annually, for a period of 10 years, a percentage of the requested quota. These licenses can be divided, transferred, transmitted, rented or loaned.
3. Special fishing licenses, unlike regular fishing licenses, are not associated with a specific vessel, so the shipowner can use any vessel that he chooses, as long as the vessel is registered in a special registry.

Maximum Catch Limit per Shipowner (MCL)

In 2001, it was decided that a system similar to "quota control" would be applied to all fisheries that had been managed in the previous decade under the "effort control" system and that were declared in the full exploitation regime.
The new measure was named "Maximum Catch Limit per Shipowner" (MCL) and consisted in allocating the industrial fraction of the global catch quota of a resource among the industrial shipowners with valid fishing licenses.
The relevant aspects of this new measure, aimed at reducing the number of vessels in operation, thereby reducing the fishing capacity, are as follows:

1. Immobilization of vessels: a shipowner who has more than one vessel is able to decide which of these vessels he wants to use for fishing the quota. In this case, the rest of the vessels will not incur in the cancellation of the fishing licenses.
2. Associations: the shipowner has the opportunity to associate with another owner, to jointly catch the quota using any of the vessels belonging to the associated shipowners.
3. Exclusion of vessels: the shipowner has the opportunity to exclude definitively a vessel from the fishing activity. In such cases the shipowner receives a certificate in which the catch history and the vessel characteristics are recorded.
4. The control and enforcement systems were strengthened, with a certification system for landings and a clear system of penalties.

The Maximum Catch Limit per Shipowner measure was applied to the majority of fishery units which had previously come under the full exploitation regime.

The main advantages observed during the application of this regime were as follows:

1. The race to fish ended ("Olympic race") and fishing seasons became longer.
2. The shipowners were no longer interested in increasing the fishing capacity of their fishing fleets, which put an end to the over-investment that this entailed.
3. There was a reduction in the number of vessels operating on each fishery unit.
4. Better use was made of resources (added value products were elaborated).
5. Investments were made in new processing plants.

6. There was job stability for workers on vessels that remained operating.
7. There was an increase in the number of jobs in processing plants.
8. There was better control of the quotas allocated to the industrial sector.

It is important to point out that the Chilean government did not incur any expense as a result of the application of the MCL to reduce the fishing capacity of the Chilean fishing fleet. On the contrary, since this measure has been in force, the value of fishing licenses has increased 110%. This increase in fiscal revenue has made it possible to strengthen enforcement and fishery research, among other areas.

It must also be noted that while the immobilization of part of the fleet (as a result of the application of the MCL) has meant a reduction in the number of jobs available, this problem has been tackled by employment retraining schemes and social support for the affected workers.

4.- Results of the Application of the Regulations Aimed at Reducing Fishing Capacity

Indicators and Action Areas of the Evaluation

The evaluation of the application of mechanisms aimed at reducing fishing capacity was carried out by means of a quantitative analysis of the behavior of the fleet, in relation to the number of vessels and their dimensions, which included both authorized and operating vessels (annually and monthly). The following indicators were defined for this purpose:

- Number of authorized vessels and number of vessels operating annually
- Gross Register Tons (GRT), total authorized and operating annually
- Number of vessels operating monthly

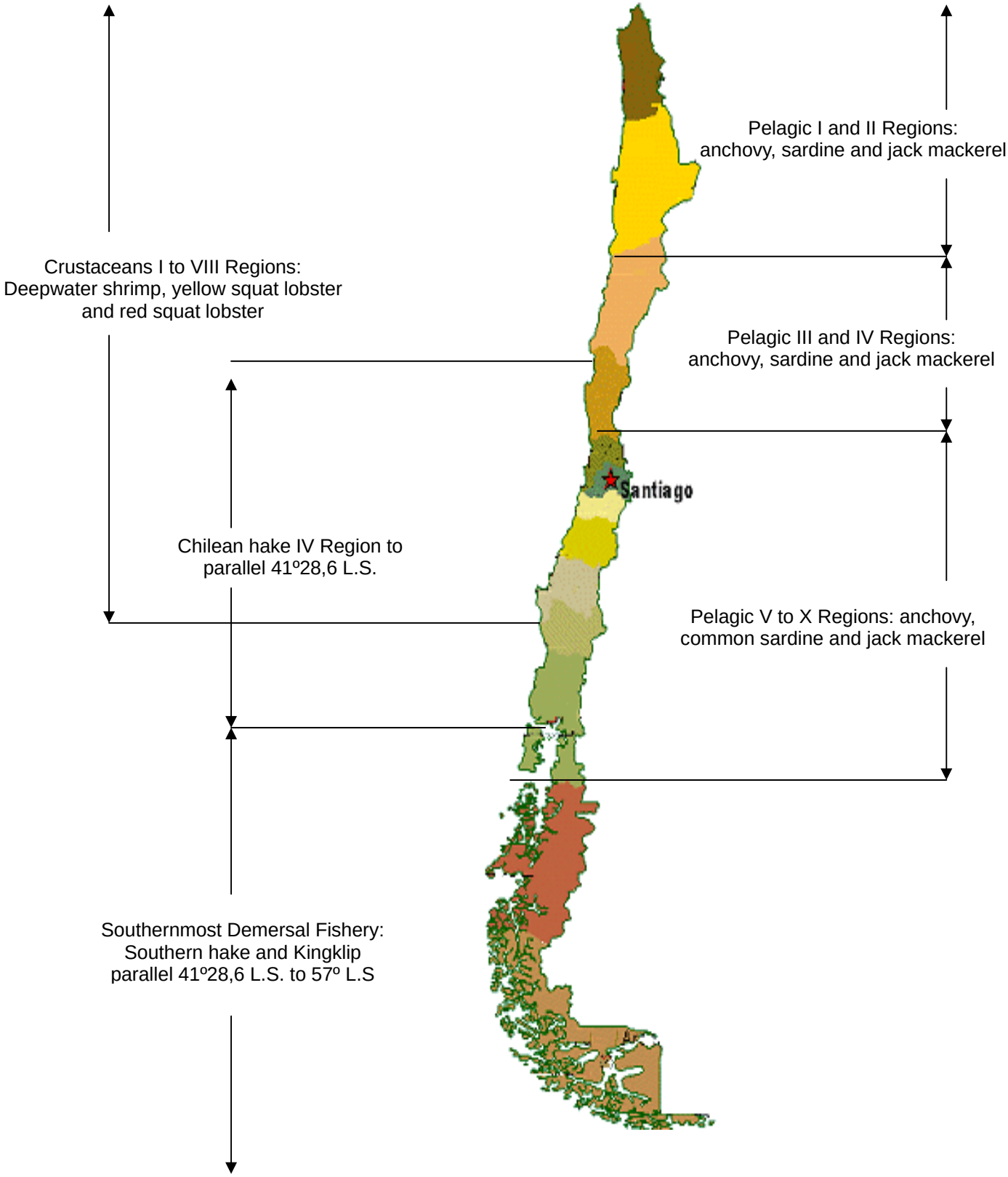
The evaluation of the reduction in fishing capacity was only carried out on the industrial sector fleet due to its importance both in terms of landings and its contribution to the national economy.

Similarly, the evaluation focused on the fisheries that were considered most relevant, which are: (Figure 2)

1. Pelagic fish fisheries in the northern zone (I and II Regions): includes the sardine (*Sardinops sagax*), anchovy (*Engraulis ringens*) and jack mackerel *(Trachurus murphy*) fishery units.
2. Pelagic fish fisheries in the central-southern zone (V to X Regions): includes the jack mackerel, common sardine (*Strangomera bentinki*) and anchovy fishery units .
3. Chilean hake fishery *(Merluccius gayi)* in the central-southern zone (IV Region to parallel 41º28,6' L.S.)
4. Demersal fish fisheries in the southernmost zone, which includes the southern hake fishery *(Merluccius australis*) and kingclip (*Genypterus blacodes*) between parallels 41º28,6' L.S. and 57º L.S.

The red squat lobster fishery *(Pleuroncodes monodon*) in the central-southern zone (V to VIII Region), which was managed under individual transferable quotas, will be mentioned apart.

Figure 2. Geographical coverage of the fishery units considered in the evaluation of the plan to reduce fishing capacity



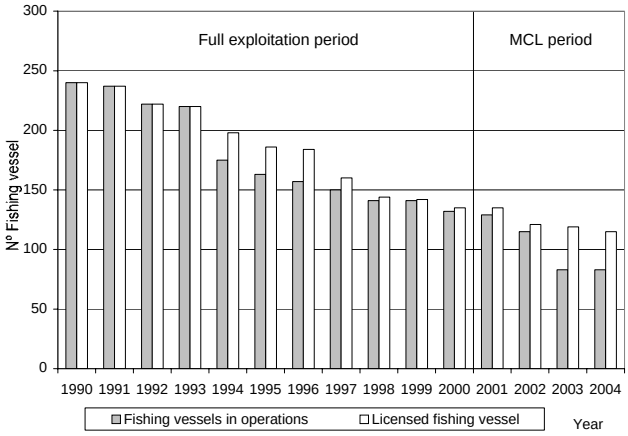
Results

Notwithstanding the particularities of each of the fishery units, in general, the actions to reduce fishing capacity were successful in terms of reducing the authorized and operating fleet and also the dimensions of the vessels.

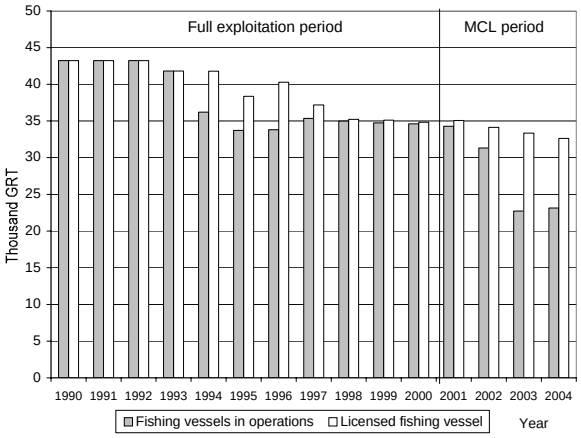
Pelagic fish in the northern zone: this fishery had average landings of 1.5 million tons during the 1990's and 1 million tons from the year 2000 to the present. There are significant inter-annual variations in catches due to environmental phenomena. This industry is primarily dedicated to the production of fishmeal.

There has been a tendency over the years towards a reduction in the fleet, both in terms of authorized vessels and operating vessels. Between 1990 and 2004 the number of vessels dropped by 57% and 49% respectively.

Number of vessels in operation and authorized yearly in the pelagic fish fisheries of the I and II Regions (1990 – 2004)



Annual GRT in operation and authorized in the pelagic fish fisheries of the I and II Regions (1990 – 2004)



Number of vessels in operation monthly in the pelagic fish fisheries
of the I and II Regions (1990 – 2004)

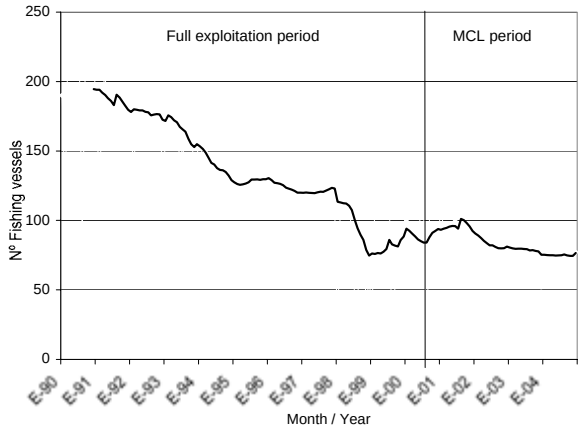


Table I. Indicators of fishing capacity per period for the pelagic fisheries
of the I and II Regions

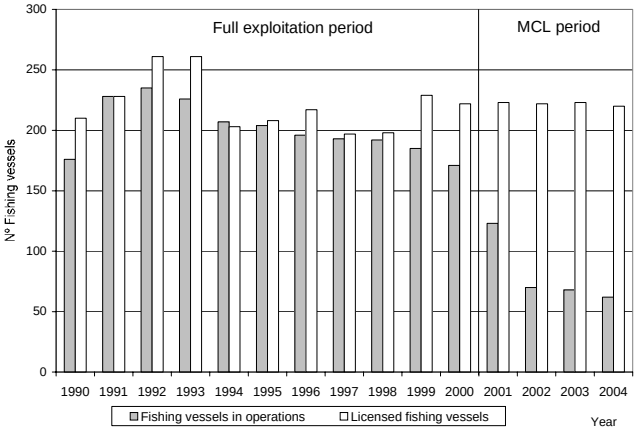
	Vessels			GRT		
	Authorized	Operation yearly	Operation monthly *	Authorized	Operation yearly	Operation monthly
Year 1990	240	240	195	43,232	43,232	32,617
Full exploitation 1991-2000 *	182	173	126	39,105	37,173	27,639
Maximum Catch Limit 2001-2004 *	122	103	81	33,799	27,866	22,230

* Average figures

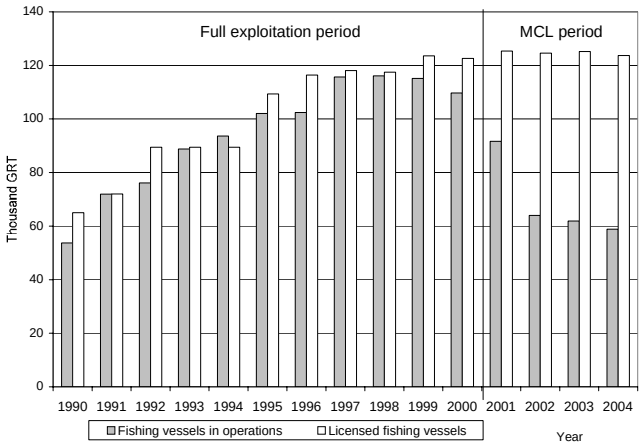
Pelagic fish in the central-southern zone: this fishery in the central-southern zone had average landings of over 3 million tons per year in the 1990's. After a crisis in 1998, landings stabilized at around 1.5 million tons. Originally, this industry was dedicated to the production of fishmeal; however, in recent years it has diversified into the production of greater added value products.

The regulatory plan reduced the extractive capacity, particularly among the operating vessels, as is shown by the annual and monthly reduction in the number of vessels. The reduction in authorized extractive capacity is not as evident due to modifications to the law which allowed new vessels to access the fishery after the access was closed.
The annual GRT in operation shows an initial phase of growth up till 1997; then there is a decrease as a result of the application of the MCL which stabilizes at around 61,500 GRT from the year 2002 onwards. Between 1998 and 2004, this indicator reduced by 47.3%.

Number of vessels in operation and authorized yearly in the pelagic fish fisheries of the V to X Regions (1990 – 2004)



Annual GRT in operation and authorized in the pelagic fish fisheries of the V to X Regions (1990 – 2004)



Number of vessels in operation monthly in the pelagic fish fisheries of the V to X Regions (1990 – 2004)

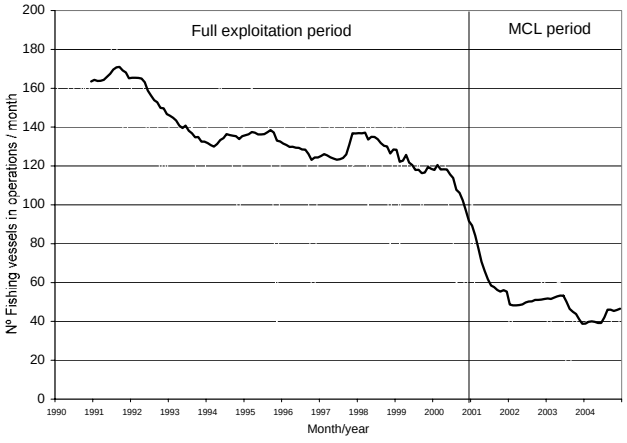


Table II. Indicators of fishing capacity per period for the pelagic fisheries of the V to X Regions (1990 – 2004)

	Vessels			GRT		
	Authorized	Operation yearly	Operation monthly *	Authorized	Operation yearly	Operation monthly
Year 1990	210	176	163	65,000	53,721	43,460
Full exploitation 1998[1]	198	192	129	117,429	116,071	87,819
Full exploitation 2000[2]	222	171	92	122,582	109,703	69,818
Maximum Catch Limit 2001-2004 *	223	67	48	124,461	61,869	45,240

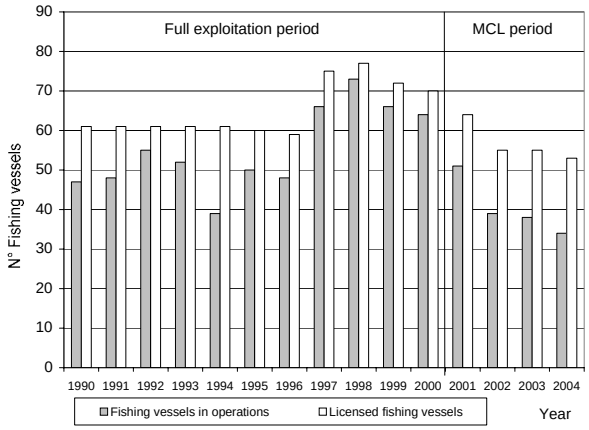
* Average figures

Demersal fishery of Chilean hake in the central-southern zone: this is a bottom trawling and longline fishery that has an important artisanal component. However, landings from the industrial fleet represent 70% of the total. The industry is mainly based on the elaboration of frozen products.

The number of authorized vessels was reduced from 77 in 1998, to 53 (-31%) in 2004. Similarly, there was a reduction in the number of operating vessels from 73 in 1998 to 34 in 2004 (-53%), and only 31 vessels registered constant monthly operations throughout this year.

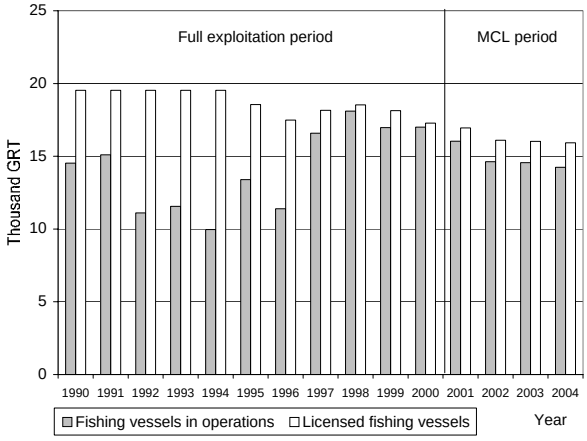
The total authorized GRT was reduced from around 18.5 thousand GRT in 1998, to 15.9 thousand in 2004, which implies a reduction of 14%. This tendency of reduction can also be observed in terms of GRT in operation. In 2004 there was a total of 11.6 thousand GRT operating constantly in the fishery.

Number of vessels in operation and authorized yearly in the Chilean hake fishery of the IV to X Regions (1990 – 2004)



[1] Full exploitation declaration of jack mackerel fishery in the X Region.
[2] Full exploitation declaration of the common sardine, anchovy and hoki fishery units.

Annual GRT in operation and authorized in the Chilean hake fishery
of the IV to X Regions (1990 – 2004)



Number of vessels in operation monthly in the Chilean hake fishery
of the IV to X Regions (1990 – 2004)

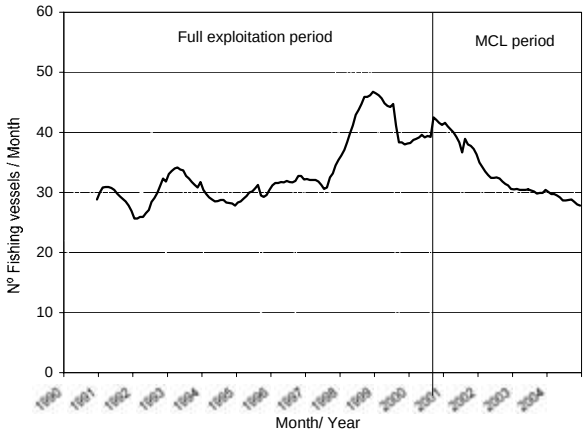


Table III. Indicators of fishing capacity per period for the Chilean hake fishery of the IV to X Regions

	Vessels			GRT		
	Authorized	Operation yearly	Operation monthly *	Authorized	Operation yearly	Operation monthly
Year 1998	77	73	47	18,537	18,108	13,647
Full exploitation 1998-2000 *	73	68	42	17,983	17,362	13,249
Maximum Catch Limit 2001-2004 *	57	40	31	16,251	14,869	11,602

***** Average figures

Demersal fisheries of Southern Hake and Kingclip in the southernmost zone: these bottom trawling and longline fisheries involve factory vessels and freezer vessels that carry out operations in the southernmost zone of Chile. After reaching a maximum catch level of 42 thousand tons in 1990, industrial landings have now stabilized at around 20 thousand tons per year. The industry is mainly dedicated to the production of frozen products.

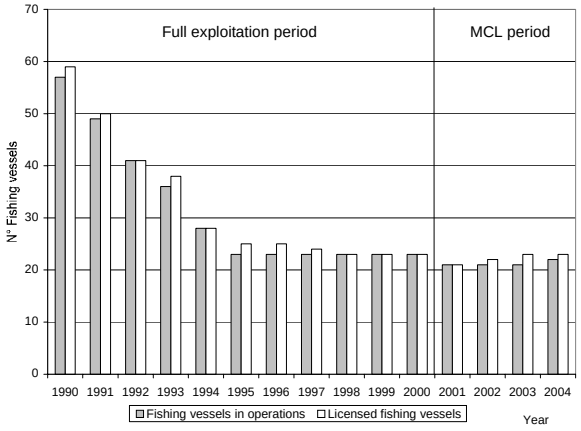
The actions applied to these fisheries have reduced the fleet from 59 authorized vessels in 1990, to 23 in the year 2004, which is a reduction of 61%.

The same reduction can be observed in the number of vessels operating annually.

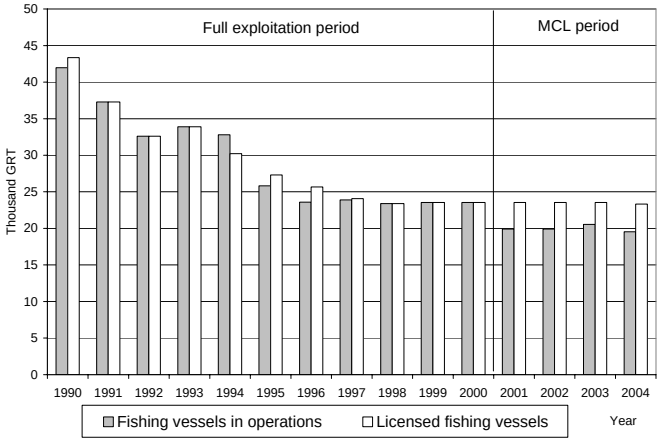
In 1990, there were on average 39 vessels operating per month. This number dropped to 12 in 2004.

It is important to highlight that in the case of these fisheries, the adjustment of fishing capacity occurred as a result of initiatives taken by the users themselves, prior to the Maximum Catch Limit per Shipowner measure coming into force.

Number of vessels in operation and authorized yearly in the southern hake and kingclip fisheries of the southernmost zone (1990 - 2004)



Annual GRT in operation and authorized in the southern hake and kingclip fisheries of the southernmost zone (1990 - 2004)



Number of vessels in operation monthly in the southern hake and kingclip fisheries of the southernmost zone (1990 - 2004)

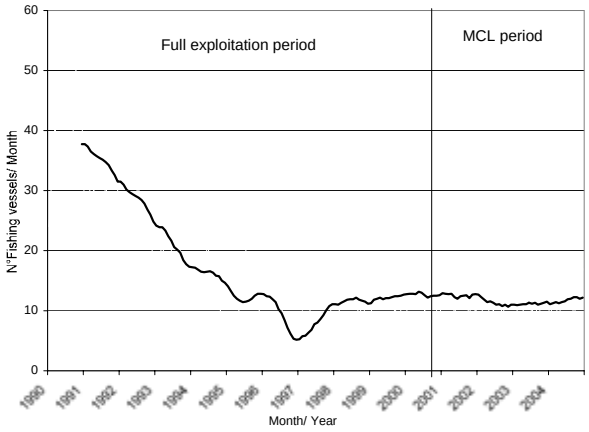


Table IV. Indicators of fishing capacity per period for the demersal fisheries of the southernmost zone

	Vessels			GRT		
	Authorized	Operation yearly	Operation monthly *	Authorized	Operation yearly	Operation monthly
Year 1990	59	57	39	43,353	41,975	27,128
Full exploitation 1991-2000 *	25	24	12	26,700	26,048	11,000
Maximum Catch Limit 2001-2004 *	23	22	12	20,075	19,981	11,000

***** Average figures

Recovering Fisheries Regime (= Individual Transferable Quotas System)

Case: The red squat lobster fishery (*Pleuroncodes monodon*)

From 1983 until the end of 1989, the squat lobsters fishery in Chile was subject to a free access scheme with annual global catch quotas. As a result of this management system there was excessive fishing effort, over-exploitation of the resources, total disorganization of the activity and a dissipation of revenue. At the end of 1989, the fisheries authority had to impose a ban which remained in force until the beginning of 1992.

In 1992, the ban was lifted on the red squat lobster fishery in the central-southern zone of Chile and this time the fishery was managed under the Recovering Fisheries Regime which was established in the General Law of Fisheries and Aquaculture, enacted in 1991.

What were the results in the red squat lobster fishery?

The fishery was subject to a monitoring program for each year that the regime was applied. In addition, direct stock assessments were conducted periodically.

Although during the first years of the regime there were positive results (the number of vessels operating reduced significantly in comparison with 1989 and the fishing seasons were

considerably longer), after 9 years of a system of individual transferable quotas (1992 a 2000) the resource reached a negligible biomass level and the fishery collapsed. In 2001, the Undersecretariat for Fisheries had to impose a total moratorium which remains in force up to the present day (2006).

The causes of this failure are not attributable to the individual quota system, but are principally due to the following factors:

1. The Undersecretariat for Fisheries received poor technical advisory services (over-estimation of the biomass of the resource), which resulted in catch quotas being set at excessively high levels which were unsustainable over time.
2. Erroneous evaluation by the Undersecretariat for Fisheries of the actual stock condition (too little attention was paid to the opposite trend observed between the biomass and the catch per unit effort).
3. Actual catches were much higher (2 or 3 times higher) than the reported landings and the quotas established by the fisheries authority. This was due to insufficient enforcement of the fishery, which at that time was enforced on the basis of a documental control only. In our view, the high prices paid in the public auctions for the quotas induced the users to capture more than the permitted quota, in order to increase the profitability of the activity.

5.- Concluding Remarks

The actions adopted by Chile to reduce the fishing capacity of the industrial fleet have been consistent over time, based on mechanisms that are recommended internationally and these actions have involved modifying the national fisheries law.

The following conclusions are based on the evaluation of the results of these actions:

1. The application of a common or standard regulatory measure to different fleets or fisheries generates different responses.
2. In the pelagic fish fisheries of the northern zone, the mechanisms of the effort control system and the quota control system (MCL) gave positive results in terms of reducing the number of vessels and the fishing capacity.
3. In the pelagic fish fisheries of the central-southern zone, the effort control system during the Full Exploitation period did not give the expected results. This was due to constant pressure from the users to increase the fishing effort, even though access to the fishery was closed. In this fishery it was the application of the MCL that gave immediate results in terms of reducing the operating fleet.
4. The Chilean hake fishery in the central-southern zone responded to the process of reducing fishing capacity after 1998, when the last vessels entered the activity. The fishery showed an important drop in the number of vessels operating, mainly during the period when the MCL was applied.
5. The demersal fish fisheries in the southernmost zone responded positively to the effort control system, adjusting the size of the fleet in 1996. The application of the MCL merely recognized and legalized a practice that had already been implemented by the users themselves.
6. Finally, it is necessary to point out that an adequate process for reducing fishing capacity requires an ongoing system to improve and evaluate the actions.

Annex 9

Asia-Pacific
Economic Cooperation

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

FWG 01/2006--D007

Reduction on Fishing Capacity in Thailand

Dr. Mala Supongpan
Senior Expert on Marine Fisheries, Department of Fisheries, Thailand

Fisheries Working Group Meeting
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Reduction on Fishing Capacity in Thailand (Practical Experiences)

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Abstract

The paper shortly presents the background of marine capture fisheries trend in Thailand. Coastal fisheries in focus, decreasing in catch rate from research vessel surveys, economics of coastal capture fisheries, the development of small scale fisheries, the fishery resource rehabilitation and some major goals of the WSSD (2002) relevant to fisheries were reviewed.

In Thailand, some practical works have been implemented on the reduction of the fishing capacity. From the year 1997 to 2003, the Department of Fisheries has provided Baht 19,310,388 for the total number of 1,292 fishers quitted from the push net fishery. Push net fishers volunteered to change their destructive fishing gear to non destructive fishing gear and other alternative jobs. The reduction of push net fishing boats in Ranong province is raised as an example.

Other options for fishing capacity management are also shown. Trawl and push net fishers in the Gulf of Thailand will be consulted for capacity reduction by cost sharing project between The Department of Fisheries and FAO/GCP/RAS/199SWE. The project is now dividing the coastal areas in the Gulf of Thailand into four zones. The Stakeholder Consultation Meetings will be held 4 times correlated to the zones to consult the stakeholders for their alternative job and willing to quit from trawl and push net fisheries. All results will be considered by the policy makers and high senior officials in formulating action plan to be implemented. Other fishing capacity management issues are also briefly mentioned, e.g. Zoning area for anchovy fishery in Songkhla Province; strong enforcement for illegal fishing; enlarge mesh size for crab trap; crab bank establishment; and community-based or co-management approached in coastal resource management.

I. Background on Marine Fisheries in Thailand

1.1 Coastal Fisheries in Focus

During the period 1985 to 1995, the structure of the marine capture sector has been changed, the total number of all fishing boats decreased by 2%. The small scale fishing boats decreased by 3.4% while the commercial fishing boats increased by 7.0%. The creation of a boat-tenure system within the commercial sector and the strengthening of the small scale sector according to the 8th National Economic and Social Development Plan (1997-2001) resulted in the total number of all fishing boats increasing by 4.5%; the small scale fishing boats increasing by 6.5% and the commercial boats decreasing by 7.5%. Registered fishing boats then numbered 18 182, comprising 49% trawlers, 26% gillnetters, 8% purse seiners, 5% push netters and 12% small scale fishing boats. About 75% of registered boats operated within the EEZ and 25% operated outside Thai waters.

Otter-board trawlers dominated (6 000 to 7 500) from 1992 to 1996 pair trawlers were fewer, and the other gear numbered less than 1 000. Squid cast-net, shrimp gillnet and crab gillnet numbered more than other gear in the small scale fisheries sector.

In 2001, the Gulf of Thailand contributed approx. 73.7% of the total marine catch (3,159,686 t) in the country while the Andaman Sea coast accounted for the remainder. In the Gulf of Thailand; 1,699,978 t from large scale fisheries (73%) and 630,000 t came from small scale fisheries (27%). The total landings were dominated by pelagic fish (25.5%) and trashfish (23.4%). The remainders were demersal fish (13.7%), squid and cuttlefish (5.2%), shrimp (11.7%), crab (1.6%) and miscellaneous (9.4%).

Demersal fish are caught mainly by otter-board trawls, pair trawls, beam trawls and push nets. The demersal fish resources in coastal waters of the Gulf of Thailand have been severely depleted. The changes in catch composition were towards small-sized fish and low value species. Trash fish from research vessels currently constitute about 60%, between 18% and 32% of trash fish are juveniles of commercially important fish species. While the trash fish caught by commercial trawls contribute 94% of the trash production from all gears.

The marine capture in Thailand can be divided into commercial and small- scale fisheries. The small scale fisheries are defined as those with small boats of less than 12 m LOA (overall length), with or without engine and mostly operated in shallow water. The commercial sector is defined as that with boats of LOA more than 12 m, or more than 10 gross tons (GT), modern fishing gear and operating offshore for several days. They typically land at large fishing ports; commercial fishing boats operating outside Thai waters usually have their own freezers on board.

The small scale fishers conduct fishing about 5 km from the shoreline in one-night operation. The fish are landed at the village and sold directly by the owner’s wife. The gear employed are gillnet (fish, shrimp, crab, etc), lift net, trap, falling net, entangling net, set net, set bag net, hook-and-line etc. Some use light to lure the fish, e.g. falling-net and lift net to catch anchovy and squid.

The commercial sector boats include trawler, purse seiner, push netter and short-necked clam dredger. The catch is landed at fishing pier and sold by fish agent.

Trash fish catch is landed at fish-meal plant separately. The boats are usually well equipped, with echo-sounder or sonar for purse-seine, several crew member and voyage last several days. Lure such as light or coconut leave may be used to lure the fish. Trawler almost all use otter-board to stretch the net. Pair trawls are also used. Some trawlers use both otter-board and boom to catch shrimp; they catch fish in day time and catch shrimp at night by changing their nets. The mesh size used is 2.5 cm for cod-end mesh and for shrimp net the mesh size is 1.5 cm. The fishing grounds of purse seiner are usually in deeper zones, near the middle and southern part of the gulf (Janetkitkosol *et al*., 2003).

1.2 Decreasing in Catch Rate from Research Vessel Surveys

From 1966 to 1996, Monthly surveys by research vessels to measure catch rate of demersal resources were conducted by the Marine Fisheries Division, Department of Fisheries. More than 700 fixed grid stations in the Gulf of Thailand were monitored. In 1966, the catch rate was 172.9 kg.hr-1. A catch rate of over 300 kg.hr-1 had been reported in 1961 (Figure1). The cod-end mesh size used to be 4 cm but in 1971, an additional net with 2.5 cm mesh was applied to the cod-end so that the cod-end mesh size used for surveying was the same as that used by fishermen. This modified method has been carried out up to now, although the number of station has been reduced due to budget limit. The results showed the catch rate in the period 1966 to 1976 declined from 172.9 kg.hr-1 to 75.14 kg.hr-1. During this period there was a petrol crisis, in 1973 and 1975, resulting in a temporary suspension of fishing by some trawlers. The catch rate at this time fluctuated between 60 and 80 kg.hr-1, indicated that when fishing stopped for a while, the resources may have recovered slightly. The catch rate has continuously decreased since the trawl was introduced into Thailand, from 172.94 kg.hr-1 in 1966 to 17.9 kg.hr-1 in 1998 (National Seminar, 1999). It is likely that the catch rate may drop to near zero if there is no proper management. The Department of Fisheries has issued many management measures to mange the marine fisheries; enforcement of the illegal fishing was sometimes intervened by politic and some impacts to socio-economy.

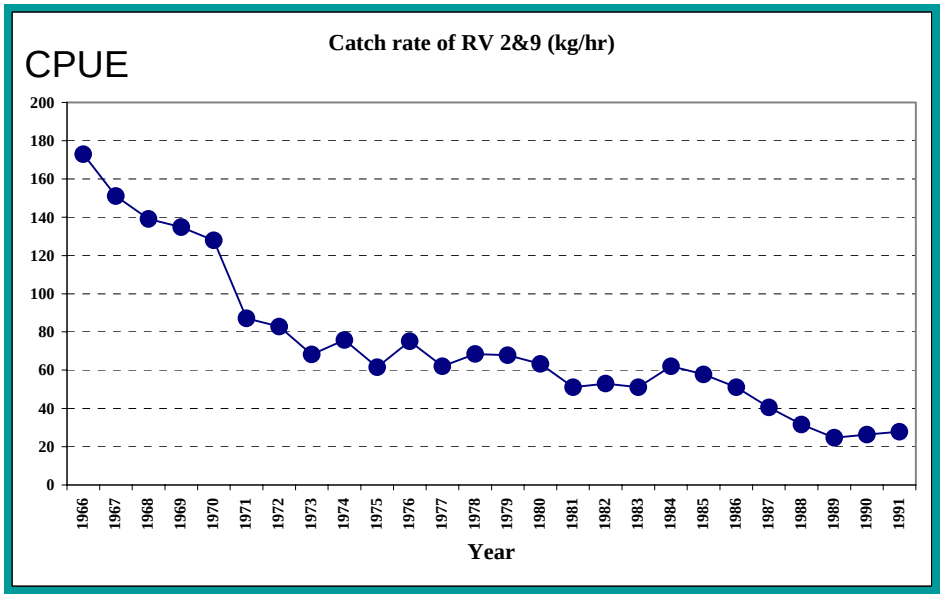


Figure 1. The catch rates (CPUEs) of total catches (including trash fish) in the Gulf of Thailand from 1966 to 1991 surveyed by the Research Vessels, Pramong 2 and 9. (National Seminar, 1999).

1.3 Economics of Coastal Capture Fisheries

The study examined the small scale and commercial fishing fleets, costs-earnings and profitability, discards and by-catch. They found that there was considerable room for maintaining the small scale fishing fleets due to their contributions to employment and fish production. It was also evidence that the profit was greater from larger boats. The larger boats have the ability to adjust to both economic and fishing ground changes. Among trawlers, medium and large boats could best adjust and maintain continuous profits, while push netters of all sizes were declining in net profit. In the case of pelagic fisheries, purse seiners make higher profits and yield higher returns than trawlers and gillnetters. Pelagic fisheries give higher returns to crew-labor and daily wages higher than the national minimum wage (Janekitkosol *et al*., 2003).

1.4 The Development of Small Scale Fisheries Project

Thailand has faced problems with the development of marine capture fisheries since 1982. Marine demersal fishery resources are overexploited and some pelagic fishery resources are fully exploited. Fishery conflicts between small scale fishers and commercial fishers are increased, and disputes with neighboring countries have risen.

The Department of Fisheries found that there is considerable room for developing the small scale fisheries due to their contributions to employment and fish production for domestic consumption. The small scale fishers are also a majority number in fisheries sector but their fishery production is quite low when compared to commercial sector as well as low advance in fishing techniques. It is evidence that the profit is lesser from smaller boats due to the smaller boats have less ability to adjust to both economic and fishing ground changes. In Thailand the small scale fishing boats comprising 38% of the total registered fishing boats with 18,182 numbers. The fisheries frequently have conflicts between small scale fisheries and large scale fisheries that they fished at the same fishing grounds and the resources are considerable scarce. Our tropical fisheries are also characterized as opened access to any fishers and they can move to fish in any areas. The fisheries resources are continuously decline especially the demersal resources and enforcement is also weak in some cases. Anyhow, the natural resources are substantial renewable resources; it can also recover by itself. Therefore resource enhancing and resource rehabilitation are possible to increase the natural resources to be fruitful for sustainable utilization under proper management scheme.

For several reasons, the Department of Fisheries has launched two projects on the Small Scale Fisheries Development and the Artificial Reef Projects during 1987 to 1991 and these projects have proceeded until 1996.

1.5 The Fishery Resource Rehabilitation Project

During the 8th Plan for the National Social and Economic Development (1997-2001), the Fishery Resource Rehabilitation Project has been launched. This project has combined all activities from the Small Scale Fisheries Development and Artificial Reef Projects together.

The Fishery Resource Rehabilitation Project has objectives to sustainable utilized the fishery resources and to maintain the level of fishery production, reducing conflicts

among fishers with different sectors, to have better quality of life for small scale fishers as well as to conserve coastal resources including extension the small scale business. Several activities were assigned and provided as the following:

a. Artificial reef installation
b. Fishing gear modification and development for non destructive gear
c. Basic infra structure provision (fishing pier and breakwater construction, rain water tank supply)
d. Fishing gear repairing house and winch provided
e. Fish processing house provision
f. Extension for aquaculture
g. Fish enhancing by seed releasing
h. Training for fishers and students about conservation and coastal resource management
i. Revolving fund group establishing

1.6. Some Major Goals Relevant to Fisheries

A guide to the Fish-Related Paragraphs of the Plan of Action of the World Summit on Sustainable Development-WSSD in Johannesburg, South Africa, 2002, is shown as the following:

Year	Goals	Reference
2004	Deter and eliminate illegal, unreported and unregulated fishing by 2004. Establish effective monitoring, reporting and enforcement, and control of fishing vessels, including by flag States, to further the international plan of action to prevent, deter and eliminate illegal, unreported and unregulated fishing. Establish by 2004 a regular process under the United Nations for global reporting and assessment of the state of marine environment, including socio-economic aspects, both current and foreseeable, building on existing regional assessments.	Para 30 (d) Para 34 (b)
2005	*Urgently develop and implement national and, where appropriate, regional plans of action, to put into effect the FAO international plan of action for the management of fishing capacity by 2005.*	*Para 30 (d)*
2010	A more efficient and coherent implementation of the three objectives of the Convention on Biodiversity and the achievement by 2010 of a significant reduction in the current rate of loss of biological diversity will require the provision of new and additional financial and technical resources to developing countries.	Para 42
2012	Develop and facilitate the use of diverse approaches and tools, including the ecosystem approach, the elimination of destructive fishing practices, the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012 and time/area closures for the protection of nursery grounds and periods, proper coastal land use; and watershed planning and integration of marine and coastal areas management into key	Para 31 (c)

	sectors.	
Not later than 2015 if possible	Maintain or restore (fisheries) stocks to levels that can produce the maximum sustainable yield with the aim of achieving these goals for depleted stocks on an urgent basis and where possible not later than 2015	30 (a)

The fishery management strategies should be in accordance with the 1995 Convention on Biodiversity, the 1995 FAO Code of Conduct for Responsible Fisheries and the 1999 International Plan of Action for the Management of Fishing Capacity.

For the management of the fishing capacity, the country should develop urgently and implement as the national plans of action within the year 2005 as indicated from the above paragraph.

II. Push net Reduction and Alternative Jobs

Under the fishing gear modification and development activity of the Fishery Resource Rehabilitation Project, the reduction of push net has implemented since 1997 until the present year. From the year 1997 to 2003, the Department of Fisheries has provided Baht 19,310,388 for the total number of 1,292 fishers quitted from the push net fishery (Table 1). The fishers gave the net rods to the government officials to sell by auction and kept that money back to the fisher groups to manage for their own groups. Some of the fishers changed their fishing activities to be aqua-culturists. Some of them culture grouper, white snapper, and red snapper as cage culture; some culture for cockle, oyster and mussel by natural feeds. Some changed their push nets to used other types of non destructive fishing gear, e.g. trammel net to catch shrimp, fish gillnet to catch pelagic fish, swimming crab gill net, crab trap, bottom long line to catch bigger demersal and pelagic fish, set net with standing type to catch small shrimp species in Songkhla lake. Some of them changed their small mesh size to be bigger meshes for crab trap e.g. crab bank project in Patiew Intregated Coastal Resource Community-based Management Project.

These fishers collected some amounts of money in terms of fishing gear, net and fishing accessories from the Department of Fisheries to apply for their new fishing activities and they have to pay back the same amount of money to their fisher groups in every month with fixed amount as agreed. The interest for their loan from the fisher groups is very small percent if they delayed to pay back in each month. The fishers who quitted from push net fishery have to sign for their agreements not to come back for push net fishery in front of their leaders of fisher groups, local fishery provincial officials and local NGOs. The fishers in the project have to be members of the groups as well. The fisher groups are managed by an elected committee (usually one chair person and eight representatives of the groups).

Table 1. Results on the Reduction of Pushnetters During 1997 - 2003.

Year	Province	Number of pushnetter quitted	Budget provision (Baht)	Gear modification and Alternative jobs
1997	Songkhla	45	391,200	Trammel net, shrimp trap
	Phuket	60	1,627,350	Fish GN, cockle culture, trammel net
1998	Phuket	10	879,680	Fish cage culture
	Phang-Nga	65	1,109,000	Cockle and oyster culture
	Satun	59	240,000	Trammel net, snapper GN, sand whiting GN
	Krabi	20	80,000	Trammel net
	Pattani	62	1,260,000	Trammel net, swimming crab GN
1999	Satun	53	276,620	Trammel net
	Ranong	107	2,280,000	Trammel net, fish cage culture
2000	Trang	157	1,620,000	ND
2001	Krabi	76	815,000	Weighted fish net, Indo-Pacific GN, trammel net, bamboo stake trap
2002	Satun	22	493,974	Trammel net, grouper culture
	Ranong	58	759,010	mussel culture (hanging type), mud crab trap, solf shell mud crab, white snapper culture
	Phuket	40	920,337	Bottom long line, weighted fish net, sardine fish net, red snapper culture
				White snapper culture, crab GN, grouper culture
	Trang	140	2,513,517	White snapper culture, crab GN, grouper culture
2003	Chumphon	30	96,400	Increase mesh size of crab trap
	Ranong	15	360,600	Fish cage culture, red snapper cage culture
	Phang-Nga	91	300,000	Increase mesh size of crab trap
	Satun	151	2,832,700	set net, red snapper cage culture, crab trap
	Trad	11	35,000	Increase mesh size of crab trap
	Nakorn Sri-Thammarat	40	420,000	Gill net
	Total	1,312	19,310,388	

2.1 Push net Reduction in Ranong Province as an Example

In the year 1999, the number of fishers had quitted from the push net fishery was 107 and the budget provision from the Department of Fisheries accounted for Baht 2.280 million. Most of them have changed their fishing gear to be trammel net to catch bigger size shrimps (e.g. banana shrimp, pink shrimp, tiger shrimp), and developed cage culture for grouper, red snapper.

In the year 2002, the number of fishers had quitted from the push net fishery was 58 and the budget provision from the Department of Fisheries accounted for Baht 759,010. Most of them have changed their fishing gear to be mud crab trap, and

developed for soft shell mud crab rearing, mussel culture and cage culture for white snapper. These fishers were from three fishing villages as following:

1. **Baan Kao Fa Chee.** This group had 20 members. There were two types of fishing activities: aqua-culture sub group with 12 members that culture white snapper and soft shell mud crab and the fishing gear sub group with 8 members that changed for crab trap, trammel net, and fish gill net.
2. **Baan Tachang**. This group had 18 members. All members had changed for mussel culture with hanging type.
3. **Baan Rajchagrood.** This group had 15 members. There were two types of fishing activities: aqua-culture sub group with 13 members that culture mussel, fish and soft shell mud crab and the fishing gear sub group with 2 members that changed for crab trap and fish gill net.

An Agreement.

Fishers under the Pushnet Reduction Program have to sign their names in an agreement document in front of their fisher group leaders, the provincial fishery officials and NGOs for:

a. Not coming back for push net fishery
b. Giving the net rods and nets to the government officials
c. Return back the fishery license of the last year (2001) to the government officials

In the year 2003, the number of fishers had quitted from the push net fishery was 15 and the budget provision from the Department of Fisheries accounted for Baht 360,600. Most of them have developed cage culture for grouper and red snapper.

In the year 2005, after the Tsunami disaster in the Andaman Sea Coast of Thailand (26 December 2004), a total of 80 push net fishers in Ranong province had requested the Department of Fisheries to provide some budgets for them to change their fishing activities. The Network of Fisher Group in Ranong Province, the leader named Mr. Narongthorn Ratanakaew has developed the project by consulted the Department of Fisheries to request CHARM project (CHARM = Coastal Habitats and Resource Management of DOF and EU cost sharing project implementing in Thailand) and the Rotary Association for budget funding. A total of Baht 1.3 million has been approved (CHARM provided Baht 300,000 and the Rotary Association provided Baht 1,000,000). The budget was used to prepare fish cages for cage culture and buying fish fry. Only forty four fishers can follow the terms and arrangement from the project. These fishers have to register as members of the Network of Fisher Group. The Group will be managed by a committee comprising nine representatives from fishers by election. They have agree as following:

a. No fishing by push net and not come back again for push net fishery
b. Giving net rods and accessories at the assigned date. That will be sold by auction and the money will return to the owners to spend during transitional period for changing their activities.

In the year 2006, the fishery provincial official and the researcher from the Marine Research and Development Station in Ranong province have proposed a project for push

net reduction to the provincial governor with the total budget Baht 6 million for 314 push net fishers to change their activities for other alternative fishing activities. At present the governor has approved this project and the validity of the data based of number of push net fishing boats is in the process. It is planned to giving Baht 20,000 for each fisher to change his activity.

III. The Reduction of the Excess Fishing Capacity of the Trawl Fishery of the Gulf of Thailand Project.

Although the push net fishers have volunteer and some are willing to quit from push net fishery since 1977, almost of the fishers are located in the Andaman Sea coast and some in the Gulf coast that not included all coastal provinces. There is a consequently need to reduce more fishing capacity of trawl gear as a whole.

Kongprom *et al*.; 2003 reported that the excess demersal fishing effort was estimated to be about 50% of the number of registered boats in 1995. The excess number of fishing boats totals 2 506 units, which could be broken down into 1 024 medium otter board trawlers, 1 309 large otter board trawlers, 1 081 pair trawlers, and 167 push nets. The excess fishing effort should be eliminated from the fishery and new entrants effectively banned. A ban on push nets would lower excess fishing effort by about 3%. A ban on both push nets and pair trawlers would result in the lowering of excess fishing effort by about 22%. The reduction of pair trawls and push nets should receive first priority as they operated near shore and catch valuable small sized fish that only went into fish meal factories. They also sometime operate within 3 km from the coast which was illegal.

The Department of Fisheries has implemented the tenure system (or freezing number of fishing gear) since 1 November 1996. Owners of trawl gear (otter board trawl, otter boom trawl, pair trawl) have to continue their licenses every fishing year (1 April to 31 March of the following year). If there is no license fee payment and license continuation, that fishing gear is automatically quitted from trawl fishery. The license can be hereditable to the son only, no selling to other person. Only one type of gear on a motorized boat can be registered, (pair trawl can have two boats with one trawling gear). At the same time, the Minister of Agriculture and Cooperatives has issued a notification to limit entry of new trawl and push net boats.

To put more effort for fishing capacity reduction, the Reduction of the Capacity of the Trawl Fishery project was proposed and modified to implement initially in the Gulf of Thailand under the Strengthening the Capacity in Fisheries Information Gathering for Management Project funding by the FAO under the GCP/RAS/199/SWE project.

The Department of Fisheries has signed a Letter of Agreement to implement the Reduction of the Capacity of the Trawl Fishery of the Gulf of Thailand Project to the FAO under the GCP/RAS/199/SWE "Strengthening the Capacity in Fisheries Information Gathering for Management Project" for three years. The project was started in 2004 and will be finished in December 2006.

It is estimated that in the Gulf of Thailand there are about 28,796 small-scale vessels. Commercial scale vessels operating in the Gulf of Thailand number approximately 7,199. The Department of Fisheries has concluded that there is obvious over fishing capacity in the

Gulf of Thailand and this can be best addressed by reducing excess capacity in the trawl and push net fisheries. The focus on this part of the fisheries is for the following reasons:

- Trawl gears are non-selective fishing gear
- Push nets are destructive fishing gear
- Source of conflicts with the small scale fishery
- Benefits to the small-scale fishery which represents about 80% of total number of vessels)

Excess fishing capacity reduction will have some impacts on those who are excluded from the fisheries. In this respect it is required to get more information on the socio-economic dynamics of fishing communities and information is needed on alternative employment opportunities.

To be able to formulate clear policy advice additional consultations are required to assess the willingness of fishermen to leave fisheries and allow them to respond to the proposals for excess fishing capacity reduction. In addition the discussions may assist to formulate proposals to ensure that once capacity is reduced, the number of vessels is controlled so that return for trawl fishery and new vessels will not re-enter. This may be coupled to some form of rights being given to the remaining fishers and the nature of these rights and who may be given under what circumstances needs to be discussed with all stakeholders. At the same time more information is required on available alternative employment opportunities, to assess the options available for people leaving fisheries.

The GCP/RAS/199/SWE Strengthening the Capacity in Fisheries Information Gathering for Management Project offers the chance to contribute to the consultative process that has already been started in Thailand. The focus for the project is the reduction of the capacity of the trawl fishery of the Gulf of Thailand.

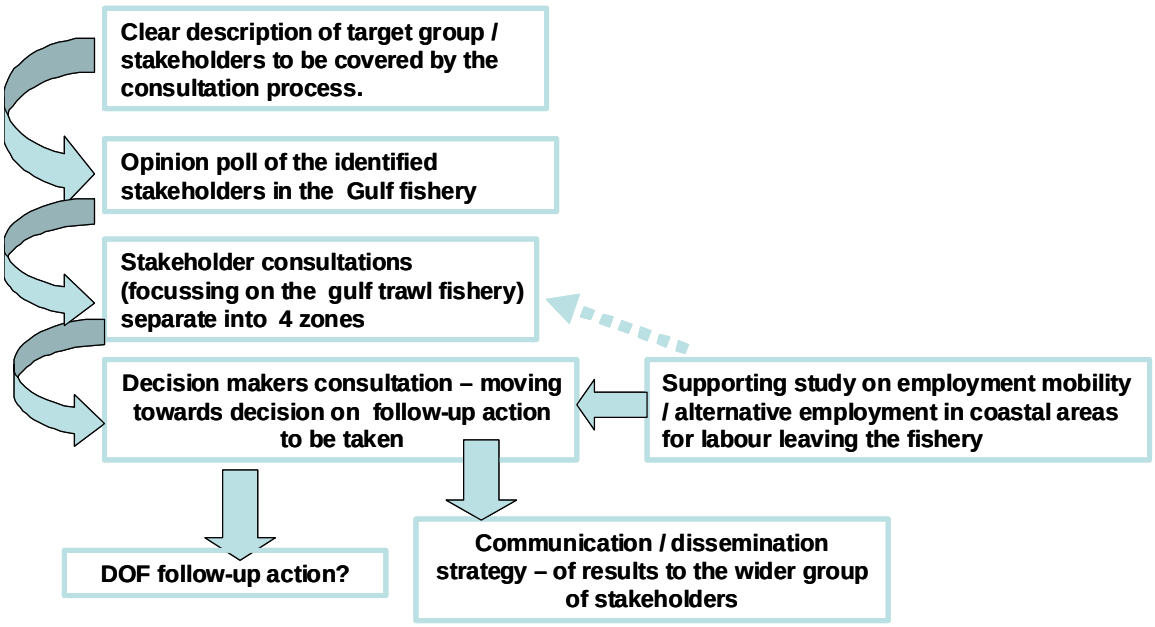
The long-tern policy objective for the Department of Fisheries is to reduce excess fishing capacity in the Gulf of Thailand. The project activities will contribute to enhance dialogue between policy makers, the policy-implementing agencies and fishermen to formulate proper, clear and feasible policies and management interventions in relation to the reduction of excess fishing capacity:

The project is implemented in the Gulf of Thailand that divided into four zones, upper gulf, eastern gulf, upper south and southern zones. The upper gulf zone covered Cholburi, Samuth Prakarn, Samuth Sakorn, Samuth Song Kram, Petchaburi Provinces. The eastern gulf zone covered Trad, Chantaburi and Rayong Provinces. The upper south zone covered Prachub Kiri Khan, Chumporn and Surat Thani Provinces. The southern zone covered Nakorn Sri Thammarat, Songkhla and Pattani Provinces. Each zone may has different opinion and culture of his daily life style, and the area of each zone is a bit large that the project need more variety and good representatives of the whole gulf for their needs and willings to leave trawl fishery and alternative opportunities for other jobs. The Stakeholder Consultation Meeting (SCM) will be held for each zone for four times. At present the three SCM have already been held and the last SCM will be held in late April 2006 at Songkhla Province for southern zone.

The implementation steps of each zone of the project are

a. The KU interview for socioeconomic of the trawl fishery
b. The ABAC Opinion Poll for willing to leave the trawl fishery
c. The Stakeholder Consultation Meeting
d. The High Senior Level Meeting for policy and Action Plan

Overall consultation process is shown below:



Each SCM has the same format of the meeting; that is the first day of the meeting dealing with the opening ceremony by the governor of the province and high senior officials, further presentation of the results by KU, ABAC and DOF. The presentation reviewed the fishery situation, fisher willing and socio-economic of the zone to make fishers know their fishery situation within their zones. The first day afternoon, the participants are separated into two groups of trawl and push net fisheries for discussion and consultation. Results of the discussion and consultation are concluded and presented by the chairmen of the groups in the second day afternoon. After presentation of the results at the plenary session, some issues may have to be clarified to the meeting. Finally, after clarification, the meeting has adopted the report. The summary result of the first SCM (upper gulf zone) is an example that appeared in Annex 1.

IV. Other Fishing Capacity Management

4.1 Zoning Area for Anchovy Fishery in Songkhla Province.

There has a long history for anchovy fishery that makes conflict to other types of fishing gear and the fishers frequently request DOF to except some fishery regulations for anchovy fishery. At present there are several Notifications of the Ministry of Agriculture and Cooperatives that directly regulate the anchovy fishery, e.g. a Notification issued on 1 February 2000, setting the program for the fishers who used anchovy nets to register and apply for fishing licenses and control mesh size (0.6 cm); a Notification issued on 23 March 2001, banning the anchovy lift net and falling net used with electric generator to catch anchovy. Until now the fishers are frequently request

DOF to allow them to use smaller mesh size (0.5 cm).

Previously, the anchovy fishers operate their fishing activities more concentrate in the eastern and central Gulf of Thailand until 1996, the resources were scarce. They extended their fishing activities to southward. Conflicts occurred between the one who move in and that the local fishers. Usually, the fishery resources are considered as opened access that anyone can move to anywhere. In this case the local fishers in Songkhla province did not allow outsiders to move in their areas. The seriousness conflicts continually increased. Consequently, the Board of National Policy agreed to set up Songkhla as an example area for case study of anchovy fishery using a zoning system with the following details:

i. Area within 5 nm would be used for local fishery
ii. Areas within 5 – 12 nm would be used for anchovy falling and lift nets
iii. Areas within 12 – 15 nm would be used as a buffer zone
iv. Areas more than 15 nm would be used for bigger size boat for anchovy falling and lift nets

Note: There is no setting for suitable number of fishing boats in each zone that led to less catch in zone 5-12 nm in recent year.

4.2 Strong Enforcement for Illegal Fishing

As stipulated in the Fisheries Laws, Section 32, the illegal fishing in fresh water basin, set net, push net are arrested. During October 2005 to February 2006, the number of arrested set net is 71 and arrested push net is 40 from fresh water basin around the country. These illegal types of fishing gear are operated in fresh water reservoirs, rivers, lakes and river's mouth. The implementation steps are firstly announcement to the public and then take action in collaborated with the local policemen.

This is just an example for enforcement activities. Usually in the marine fishery sector there has the same activities to enforce the illegal fishing.

4.3 Enlarge mesh size for crab trap

Under the fishing gear modification and development for non destructive gear activity of the Fishery Resources Rehabilitation Project, the DOF has provided some budgets for the small scale fishers to enlarge their bottom part of crab trap. It is shown that when the fishers enlarge their mesh size, the production of swimming crab increase obviously in the following year. At present, there are 16 members of the crab trap fishery in Patiew District, Chumporn Province are all implemented by replace mesh size 2.5 cm to former mesh 1.5 cm.

4.4 Crab Bank Establishment in Kao Tieb, Patiew, Chumporn Province as an Example

The crab trap fisher group has realized that the swimming crab production in his area decline year by year. After they have enlarged their mesh sizes, they also aware for the sustainability utilization of the swimming crab. The leader of the fisher group ever visit to Phang Nga Bay Fisheries Co-management that has an activity on the establishment of Crab Bank and that is originated his idea to establish crab bank for his

own group. He has ideas to release small crab to the sea as resource enhancement and rearing gravid female crab in the big cage setting in the sea (Crab Bank) for few days until the female crabs release their larvae. Then he will take that female for sale and that amount of money will come to deposit for the group to use for repairing the trap and buying new traps as a loan. Gravid female crabs are volunteer giving by the members in every day. Lung Jang or Uncle Jang, the name of the leader of crab trap fishery, he also records the number of female gravid crabs in each day and sets an experiment on the rearing of gravid female to find out how many days for the yellow, grey and black colored eggs be laid. Nowadays, each member can earn at least Baht 1,000 per day. The member can also loan some amount of money for trap repairing or making new trap and he must return back his loan to the revolving fund of the group. Several guests from inside and outside of the country often come to visit this success fisher group. The number of member of the group should be further considered to a limiting number that is the next step for management of the fishing capacity by the fisher committee. This practical experience is already extended to other fisher groups in every province.

4.5 Community-based or Co-management Approached in Coastal Resource Management

Bang Saphan Bay, Prachuab Kiri Khan province is an example for community-based fishery management in Thailand. There are about 400 fisher households live in the Bay, with about 70% are small-scale fishers. These small scale fishers have average income less than 20,000 Baht per head per year. Fishing activities in Bang Saphan bay has been developed, as other coastal area, with supporting from the Department of Fisheries. Adequate infrastructure to improve livelihood of fisher communities started to construct including artificial reef for the improvement of the fisheries resources of the bay. Since 1992, fishers were organized into small groups and seed fund was provided for borrowing to buy fishing gears. At present there are six fisher groups still actively implementing, and expanding their members and activities more benefit to the members e.g. money saving, convenient shop, and support for fisheries co-management and resources enhancement activities as well as preventing trawl fishery enter into the demarcated zone.

Since 1999, Thai DOF has implemented a pilot fisheries co-management project in Bang Saphan Bay. This is the first project handed over to the local administration (provincial and district level) to manage the fishing activities in the demarcated coastal waters. The demarcated coastal sea area comprises about 150,000 rai[1] or 240 square km. The project has developed its' own fisheries regulations, which have been enacted at provincial level to prohibit some destructive fishing gears/operations in the project area. The local fishers through participation in fisher groups have been actively participating in this project since the project started. They contribute not only ideas, and man power but also money in implementation of some project activities. They are also involved in the monitoring illegal fishing operations and enforcement on the project regulations together with DOF staff.

There are three pilot projects for fishery co-management or community based fishery management in Thailand: Bang Saphan Bay in Prachuab Kiri Khan, Phang Nga Bay in Png-Nga, and Patiew in Chumphorn Provinces. These projects have different

[1] one rai equal 1,600 square m.

funding sources and implementation.

Nowadays, The Department of Fisheries has implemented several fisher groups along the coasts of Gulf of Thailand and Andaman Sea as a bit to co-manage the fishery resources. These fisher groups will be gathering to be community-based fishery management or co-management in the near future that is implemented in collaborated to the present constitution for decentralized policy. The next steps these groups will be responsible to local authorities and be consulted by the fishery officials and other concerned agencies both at central and local levels.

V. Acknowledgement

The author is grateful to Messrs. Amorn Summa, Director of Freshwater Fisheries Management Institute, Tanin Singhakraiwan, Chief of Marine Fishing Ground Improvement Section and Wudtichai Wungkahart, Chief of the Ranong Marine Fishery Research and Development Station for some data provision.

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Annex 10

Asia-Pacific
Economic Cooperation

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

FWG 01/2006--D008

Chinese Taipei's Experience in Managing Fishing Capacity

Dr. Chin-Hwa Sun
Professor and Director, Institute of Applied Economics
National Taiwan Ocean University

Fisheries Working Group Meeting
8 – 9 May 2006
Kaohsiung, Chinese Taipei

Chinese Taipei's Experience in Managing Fishing Capacity

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Professor and Director, Institute of Applied Economics
National Taiwan Ocean University

Abstract

Since 1978, the offshore harvest has exhibited a downward trend, but the number of fishing vessels and the total vessel tonnage have been steadily increasing until Dec. 24, 1991 when the overall restriction on the construction of fishing vessels, except for fish transport vessels over 2,000 tons, was imposed. In order to maintain the sustainability of fisheries stocks and to avoid overfishing, Fisheries Agency in Chinese Taipei has implemented various fisheries management policy to regulate harvests by suspending fishing licenses, restricting construction of fishing vessels, buying back used vessels, and limiting the number of fishing days. In addition to the overall restriction on the construction of fishing vessels, voluntary vessel buyback programs were introduced by the government to reduce the fleet size in two phases: 1991-1995 and 2000-present.

Most of the vessels scrapped voluntarily are vessels smaller than 100 GTR operating mainly in costal/offshore region. By using annual offshore fisheries harvest and the total tonnage and horse power of fishing vessels for the period 1953 to 2002, this paper utilizes the bioeconomic model in Sun (1998) to simulate the backward bending supply curve of the offshore fishery so as to evaluate the impact of voluntary vessel buyback program on the fishing capacity of offshore fishery.

In meeting the spirit of the International Plan of Action for the Management of Fishing Capacity (FAO, 1999) to reduce the global large-scale tuna longline fishing vessels, which are vessels mostly over 200 GRT, by 20% to 30%, the Fisheries Agency in Chinese Taipei has launched a mandatory vessel reduction program to eliminate 160 out of the 614 large-scale distant water tuna longline vessels in 2005 and 2006. The aim of the mandatory buyback program is to further reduce pressure on fishery resources in order to achieve the objectives of resources conservation. This study reviews Chinese Taipei's experiences with the vessel buy-back program and discusses the features of the buyback program design to achieve the goals of resource conservation and economic viability of the fishing industry. A suggestion is provided to show how the fishing effort may be reduced to meet these goals.

1. Introduction

Since 1989, world capture fishery production, after reaching a peak, have been declining and there have been increasing evidence that a large share of the traditional and highly priced marine capture species were over fished or at least fully harvested beyond the sustainable level (FAO, 2004). In particular, some traditional species suffered major stock declines; signs of excess capacity in the harvesting sector were everywhere. All these issues and concerns were the focus of papers released by FAO in preparation for the Conference on Responsible Fishing at Cancun, Mexico in May 1992.

On Dec. 24, 1991, one year before the Conference in Cancun, the fisheries authority in Chinese Taipei announced an overall restriction on the construction of fishing vessels, except for fish transporting vessels over 2,000 tons. In addition, a voluntary fleet size reduction program was launched for the first time to buy back vessels with an age of over 15 years in 1991-1995 to minimize the pressure on fishery resources due to overfishing. Fishermen would be encouraged to change their original operation to recreational fishery, in order to relieve the pressure on fishery resources and to ensure their sustainable utilization.

In order to accommodate with the fishery management regulations as being set forth in FAO Code of Conduct for Responsible Fishery, Vessel Monitoring System has been developed to obtain real time activities of distant water fishing vessels in operation, for reinforcement of fleet management since 1996. Researches on automatic location communication system for offshore and coastal vessels have been initiated for monitoring the activities of vessels at sea (Chiang and Sun, 1999; Chiang and Sun, 1999).

In 2000, in response to the action on the reduction of fishing capacity of tuna longline fishery adopted by international fishery organizations, effective management of fishing capacity had be implemented to control the fleet size, and plans have been developed to assist those flag-of-convenience tuna longliners newly built in Chinese Taipei, registering in Chinese Taipei under the required conditions so that they can be properly controlled (Fisheries Agency, 2000).

Due to a growing world demand for fish and a harvesting capacity that is increasing more rapidly than the catch of fish, there was a consistent increasing trend in the proportion of overexploited and depleted stocks in the world, from about 10 percent in the mid-1970s to close to 25 percent in the early 2000s (FAO, 2005). About half of the stocks (52 percent) were fully exploited and therefore producing catches that were close to their maximum sustainable limits, while approximately one-quarter were overexploited, depleted or recovering from depletion (16 percent, 7 percent and 1 percent respectively) and needed rebuilding. The Joint Ministerial Statement of 2005 APEC Ocean-Related Ministerial Meeting (AOMM-2), Bali Plan of Action, also expressed a serious concern to increase the number of APEC economies that implement the International Plan of Action for the Management of Fisheries Capacity[1](IPOA-Capacity), FAO in 1999.

Chinese Taipei, as the host of the "APEC Seminar on Sharing Experience in Managing Fishing Capacity" in 2006, tries to facilitate the information sharing mechanism among FWG economies on this particular issue to encourage members to adopt a suitable and feasible

[1] The IPOA-Capacity was adopted by the twenty-third Session of the FAO Committee on Fisheries in February 1999 and endorsed by the FAO Council at the session it held in November 2000.

guidance addressing the problem of excess fishing capacity, with the hope of mitigating the impacts on over-fishing, degradation of marine fisheries resources, decline of food production and significant economic waste.

The intention of this paper is to provide the fishing industry in Chinese Taipei an alternative perspective for the future and to help APEC policymakers evaluating the impact of alternative vessel reduction policies. We begin with a brief description of the situation of the fishery sector in Chinese Taipei. An overview of the voluntary vessel buyback program and an evaluation and simulation of fishing capacity and backward-bending supply of the offshore fishery by utilized the estimates presented in Sun (1998) is provided next. The mandatory tuna longline vessels buyback program and fishing capacity management of tuna longliner are presented next. Finally, the implications of the research regarding the Chinese Taipei's experience and the alternative management schemes of both offshore and distant water fishery are discussed.

2. The Status and Outlook of the Fishery Sector

In 2004, the fishery landing in Chinese Taipei is 1.26 million metric tons with distant water fishery, offshore/coastal fisheries, and aquaculture accounting for 53.81%, 20.17% and 26.02% of total production, respectively, is ranked the 20th in the world in fishery production (Fisheries Bureau, 1977–1984; Fisheries Agency, 1978-2004). Even though the total fishery production value reaches a record high of NT$ 98,949 million (US$ 2.961 billion)[2] in 2004, the distant water fishery experiences a significant 23% reduction in landings from 877.663 thousand MT to 677.703, as shown in Figure 1.

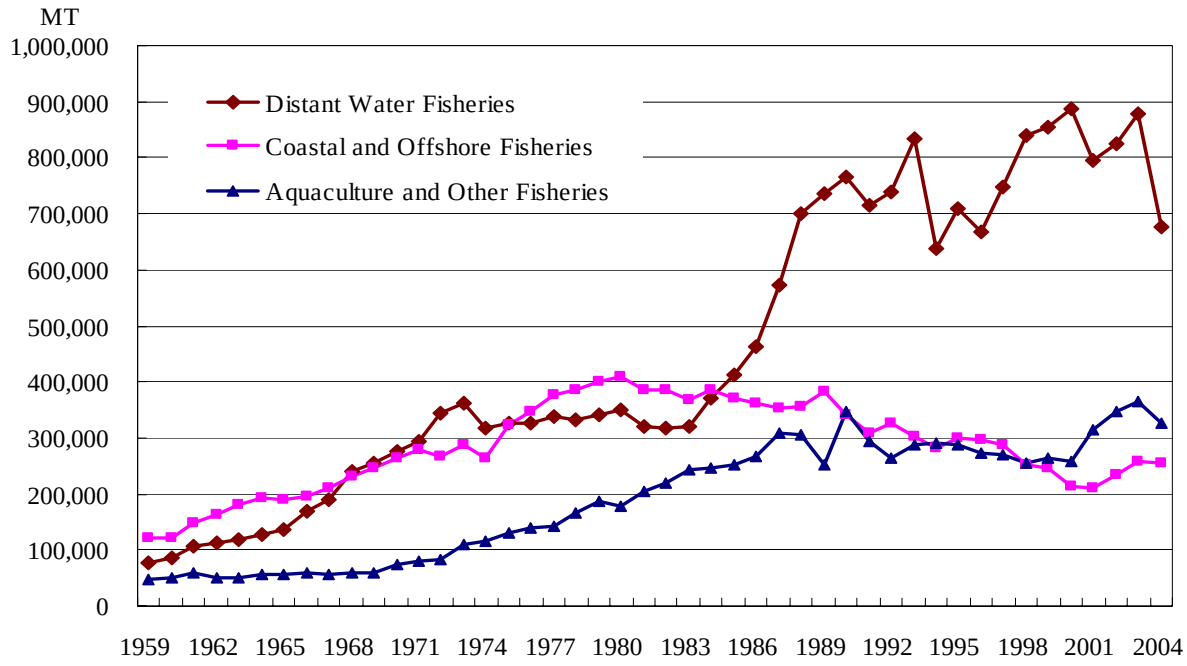

Figure1 Fisheries Production by Years (1959~2004)

In 2004, there are 136,224 households working in the fisheries, of which 4.09% are engaged in distant water fishing, 23.48% in offshore fishing, 39.83% in coastal fishing, 5.09% in marine culture, 2.96% in inland capture fisheries and 24.55% in inland aquaculture.

[2] The exchange rate of NT$/US$ is equal 33.4220 in 2004

In terms of the number of workers, a total of 346,343, consisting of 232,400 full-time and 113,943 part-time, workers are employed in fishery production. There are 153,444 of full-time and 58,154 part-time workers, which represent 69.12% and 51.04% of full-time and part-time workers, are work in Coastal and Offshore Fisheries. Fisheries have always played a significant role in contributing to the development of the peripheral industries, the stability of employment of coastal rural society and the food supply in Chinese Taipei.

The fishing vessels operating in the offshore/coastal fisheries offer employment to approximately 220 thousand workers. The number of total fishing crafts in 2004 was 26,750, of which the major types of vessels used in the coastal region are 12,984 fishing rafts and 6,769 sampans[3] and other vessels less than 5 GRT. In total, there are 25,459 vessels less than 100 GRT. They have been competing for more than a hundred fish species resources in the sub-tropical coastal and offshore area and the pressure on fish stocks has been intense.

Excluding the fishing rafts and sampans, we show in Figure 2 the number of vessels in 1990, 1996, 2000, and 2004 grouped by tonnage class. There are 6,997 vessels greater than 5 GRT in 2004, which is lower than the number in 1990 by 4,031, representing a 36.55% reduction in number of vessels, due to the two voluntary vessel buyback programs initiated in 1991-1995 and 2000-2004, respectively. Meanwhile, the vessel tonnage is reduced from 968,472.93 GRT in 1990 to 827,188.03 GRT in 2004, a 14.59% reduction in total tonnage. However, the total horse power (HP) has increased by 19.30% from 3,493,504 HP in 1990 to 4,167,887 HP in 2004. Most common fishing methods employed by these vessels are tuna long line, trawl, and torch light nets in offshore and distant water fishery. An overview of the offshore and that of the distant water fisheries are given separately below.

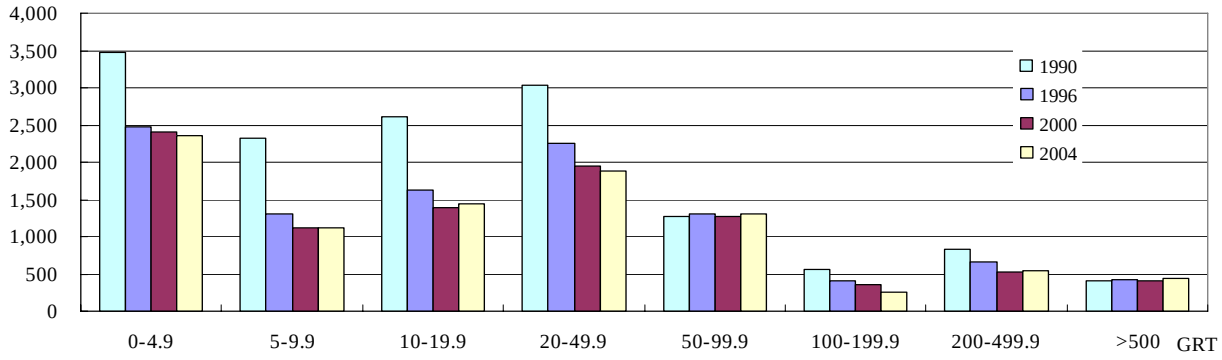

Figure 2 Fishing Vessels by Tonnage Class in Chinese Taipei (1990-2004)

2.1 The Offshore Fishery

Fishing vessels smaller than 100 tons, which are owned by individual families or small-scale fishing companies, are engaged primarily in offshore fishery. Some of these small-scale, individual vessels switch back and forth between two or more types of fishing gear, according to season and target species.

As shown in Figure 3, the offshore harvests have followed a downward trend since 1980, but the number of fishing vessels, total vessel tonnage, and the total horsepower of all vessels

[3] Raft is built from plastic pipes with/without a built-in engine and equipped with gill net, set-net, beach seine fishing, and other hook gear. Sampan is a small boat-shape raft with/without a built-in engine.

have been steadily increasing until 1992 when the overall restriction on the construction of fishing vessels were imposed.

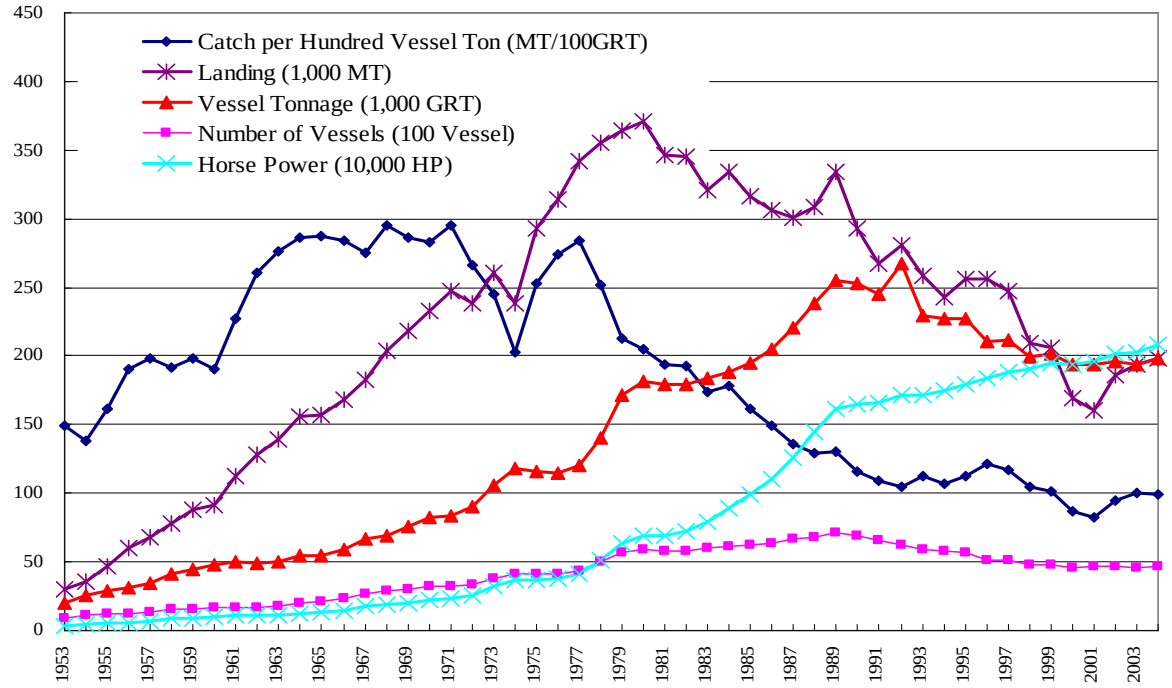

Figure 3 Structure of Powered Fishing Vessels of Offshore Fisheries in Chinese Taipei

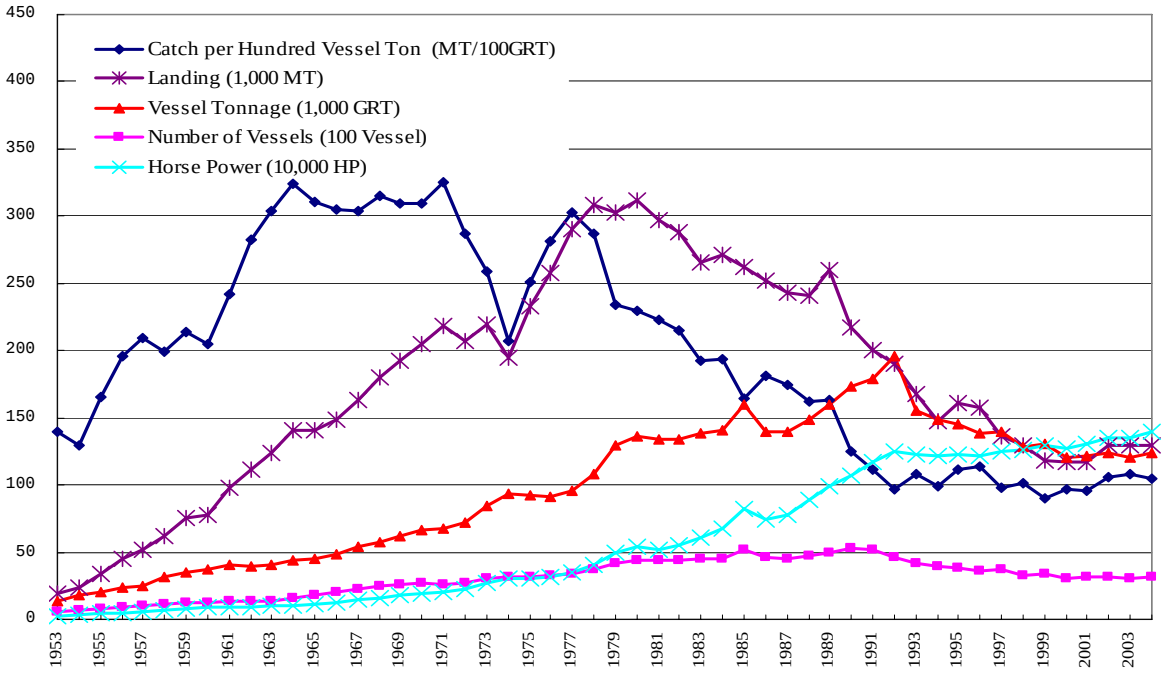

Figure 3-1 Structure of Powered Fishing Vessels of Offshore Fisheries in Chinese Taipei (Excluding Landings and Effort of 10~100 GRT Tuna Longline and Purse Seine for Mackerel)

Sun (1998) notes that the offshore harvest in 1993 were 5.5 times of the 1953 level, when the number of fishing vessels was 3.2 times greater, but the total vessel tonnage had grown by 7.8 times and total horsepower was 35.2 times larger.

As offshore longline tuna and mackerel purse seine fishery[4] were developed after 1977, the historical catch and fishing effort of offshore shown in Figure 3-1 exclude these two types of fishing fleets and landings in order that proper comparison can be made.

It is significant that the average harvest per vessel ton has shown a decreasing trend since 1971-76, i.e., the first oil crisis period, indicating that overcapitalization exists since then. To maintain the sustainability of Chinese Taipei's offshore fisheries stocks and to avoid overfishing, the government has implemented a fisheries management policy to reduce fishing effort by suspending fishing licenses, restricting construction of fishing vessels, and buying back used vessels in order to reduce the offshore fleet size.

2.2 The Distant Water Tuna Fishery

The distant water fishery refers to the fishery in which fishing activities are conducted outside the 200-mile exclusive economic zone of Chinese Taipei. The main fishing methods used include tuna longline, tuna purse seine, trawling, squid jigging and torch light saury fishing. Tuna longline fishing by super freezer longliners and the traditional albacore longliners take place in the high seas areas of the three oceans. After 1989, the distant water fishery production exceeded 700 thousand tons per annum, accounting for over half of the total fishery productions, such as shown in Figure 1. The production value of Tuna purse seiner and tuna longliner account for 91.12% of the distant water fisheries.

The first tuna purse seine vessel was launched in 1982. The number of purse seiners reaches a record high of 45 in 1992. The tuna purse seine fishery in Chinese Taipei has had 42 vessels operating in the southwest Pacific Ocean and the waters of Papua New Guinea and Micronesia in 1984. In 1994, the United States, Chinese Taipei, S. Korea, and Japan, the four major countries involved in the South Pacific tuna purse seine fishery, had a total catch of 194, 181, 173, and 171 thousand metric tonnes (MT), respectively (Wright, 1995). Sun and Hsieh (2000) notes that the main target species is skipjack tuna, which comprises about 82% of the total catch, and yellowfin tuna, which makes up the remainder. Of the total catch during 1991-1996, about 70% of the catch was exported to Thailand. Due to the adjustment of business model, the Taiwanese fleet was reduced to 34 in 2004, after the export of purse seine vessels to Pacific Island nations in the western, central Pacific Ocean, or other countries.

The landing and value of distant water tuna purse seine and tuna longline fisheries are shown in Figure 4. Since 1998, the tuna purse seine fishery has nearly matched the yearly production levels of the tuna long-line fishery. Together, the tuna purse seine and long-line fisheries are two of the most important distant water fisheries in Chinese Taipei. As shown in Figure 4, despite high production levels of the tuna purse seine fisheries, the yearly production value is only about NT$8.2 billion, one-fifth of the production value of the tuna long-line fishery in 1998.

[4] The mackerel purse seine fishery started in 1977 with one single set of fleet and grew rapidly to eight sets in 1989. Each set of the fleet is comprised of two light vessels, two shipment vessels, and one purse seine vessel.

The landings and other information on vessels over 100 GRT in the tuna longline fishery in Chinese Taipei are shown in Figure 5. The present distant water tuna longline fishery in Chinese Taipei consists mainly of vessels over 400 GRT with super freezer. In 1970s, the conventional tuna longline vessels were not equipped with super freezer, and they targeted albacore, which went mainly to the U.S. tuna canneries as raw material. The conventional tuna longline fishery reached a peak of its development during the 1970s when landings of albacore fishery was about 60,000 MT, accounting for 60-70% of the total landings of the entire distant water longine fishery.

Major operators began to build supper freezer tuna longline fishing vessels with the technique introduced from Japan in the early 1970s and switched their target species to bigeye and yellowfin tuna. The number of conventional longline fishing vessels decline significantly from 746 in 1974 to 441 in 1984. However, due to the expanding demand of sashimi grade tuna in the Japanese market, the number of super freezer tuna longliners, ranging from 400 to 800 GRT, continues to increase dramatically after 1980s. The vessel number and aggregate tonnage reach a record high of 841 in 1990, as there were no restriction on license application for building vessels greater than 700 GRT and importation of the retired Japanese tuna longline vessels. Since 1991, the overall restriction on the construction of fishing vessels were applied and only the original license owner has the right to built a new vessel to replace the retired one with the same tonnage size. This is why some Taiwanese brought in retired Japanese tuna longline vessels and settled as a flag of convenience (FOC) after 1991.

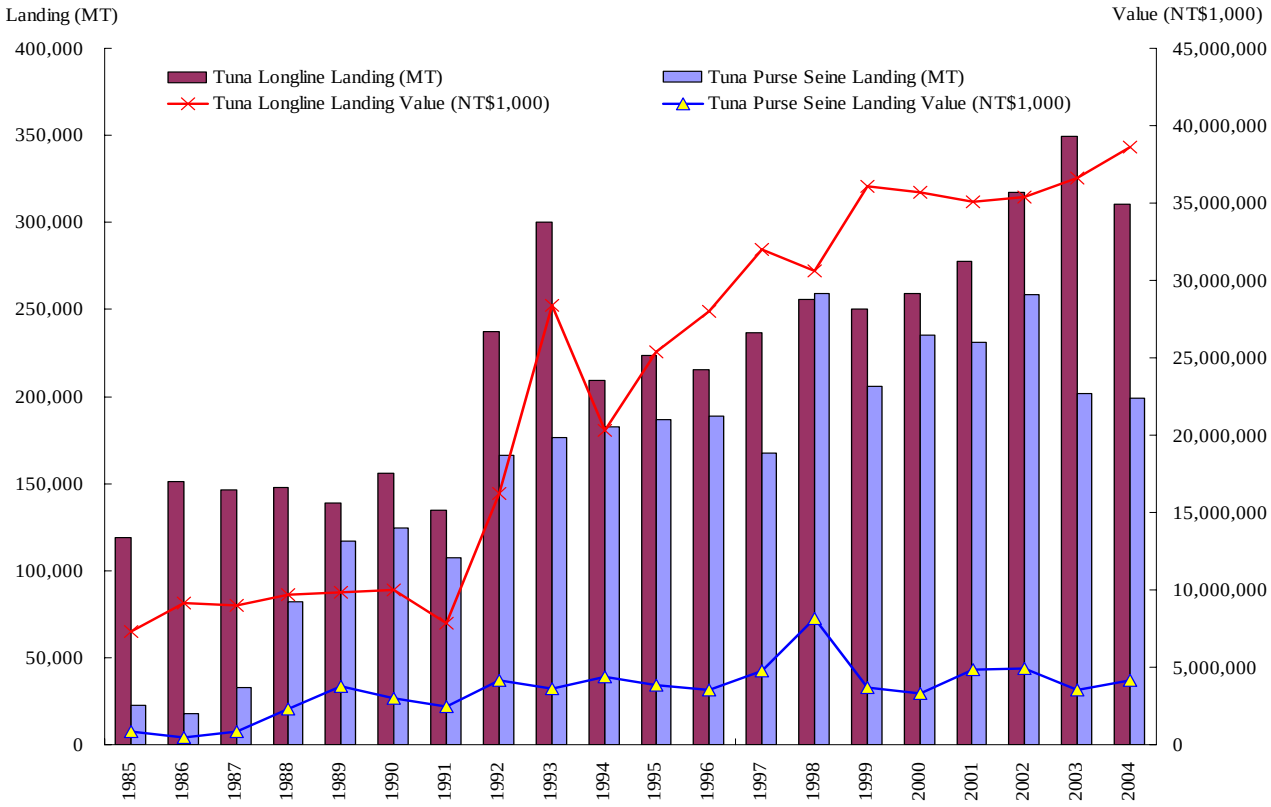

Figure 4 Landing and Value of Distant Water Tuna Purse Seine and Longline Fisheries

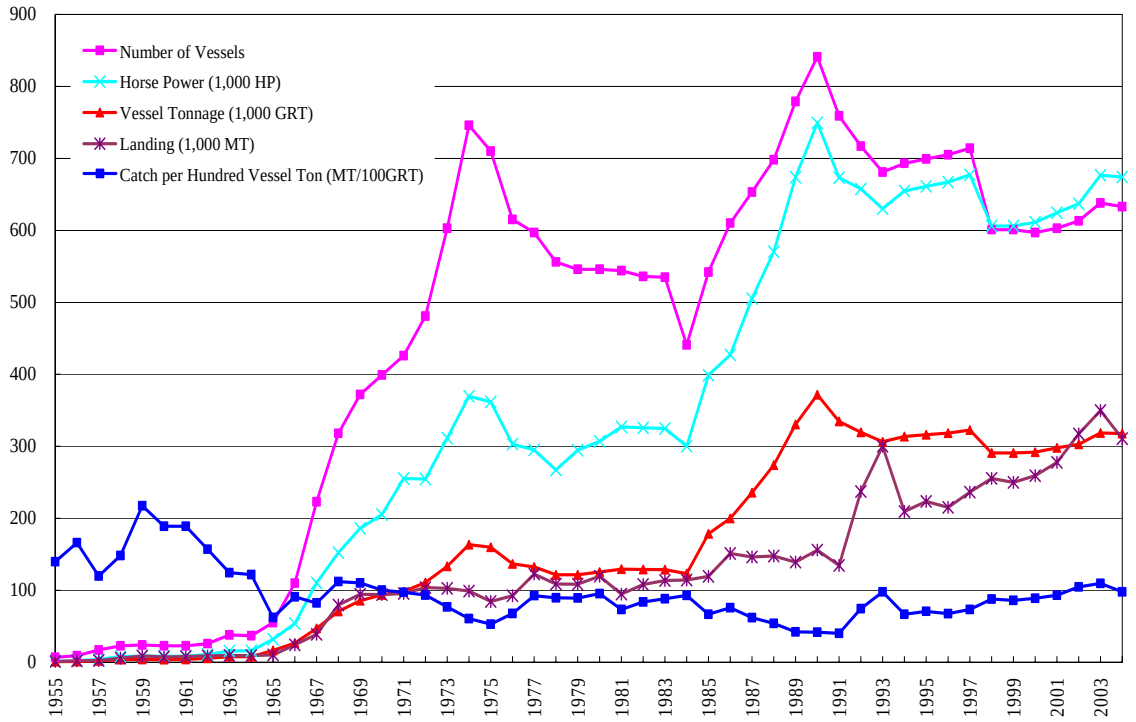

Figure 5 Landing and Vessels over 100 GRT of Tuna Longline Fishery

Since 1990, the catch of albacore has been on a declining trend. The overall restriction on the construction of fishing vessels and the voluntary vessel buyback program, while targeted to reduce the number of vessels and to shut down the driftnet fisheries in the high sea, further reduced the number of vessels to 663 vessels in 2004. In total, there are 614 large scale distant water tuna longline vessels in Chinese Taipei, of which 153 vessels in the albacore conventional tuna longline fishery, with tonnage ranging between 150 and 400 GRT.

3. Overview of the Voluntary Vessel Buyback Program and its Effectiveness

3.1 The Voluntary Vessel Buyback Program

A major revision of the Fisheries Act in 1991 gave the government in Chinese Taipei the explicit right to adjust the fishing effort according to resource abundance. The government can limit the number of vessels, total vessel tonnage, fishing area, fishing period, and design all other aspects of fishing vessel management policy for the following reasons: (1) fisheries conservation; (2) fisheries structural adjustment; and (3) restrictions resulting from international agreements or cooperation.

Four amendments that regulate the number of offshore fishing vessels in Chinese Taipei were enacted in 1967, 1980, 1989, and 1991. For example, in 1967, in order to prevent any further increase in the existing number of pair trawlers under 120 tons and otter trawlers under 200 tons, the Council of Agriculture applied measures to restrict the construction of both types of trawlers (Department of Agriculture and Forestry 1993). In 1989, the Council of Agriculture further amended the existing fishing boat building restrictions to allow for construction of only tuna purse seiners over 1,000 tons, group purse seiners for mackerel, fish transporting vessels of 2,000 tons and over, and factory vessels of 2,000 tons and over.

The most recent measure[5], announced on Dec. 24, 1991 and still in effect, restricts the construction of all fishing vessels, except for fish transporting vessels over 2,000 tons. The fishing enterpriser gaining the permission to build new fishing vessels after replacement of the retired ones may apply for fishing license

Since the offshore fishery resources have become scarce, reducing the aging fleet profile is the first step in the long-term plan for the industry. In addition to the overall restriction on the construction of fishing vessels, Chinese Taipei adopted two voluntary vessel buy back programs: one in 1991-1995 and another in 2000-2004. A mandatory large scale tuna-longline vessel buyback program was initiated in 2005 to buy back 160 vessels in 2005 and 2006. For our purpose, it is essential to examine the development of the tuna longline fishery in Chinese Taipei.

During the first buyback program, which ran from 1991 to 1995, only fishing vessels older than 12 years could qualify (Fisheries Agency, 1992-1994). The amount of government expenditure and the number of vessels bought back in each period are shown in Figure 6. Note that 2,319 vessels were bought back during 1991-1995 and the total government expenditure reaches NT$1,721 million (US$52.16 million). The purchase price of the vessel is based on price per gross tonne which was around NT$14,552 between 1991 and 1995. Based on dynamic simulations, Sun (1998) evaluates the impact of alternative vessel-reduction policies. It is shown that neither the program to restrict the building of new vessels nor a combination of this program with the vessel retirement and buy back program is sufficient to avoid the downward trend in harvests and the deteriorating state of stocks. The allowed offshore fisheries vessel tonnage under MSY is estimated as 100,800 vessel tons in 1993. As the actual vessel tons in 1993 was 164,447 vessel tons, the estimation suggests that 38.7% reduction of vessel tonnages within 10 years would be necessary to achieve the maximum sustainable yield (MSY) level, taking into accounts of both the stock abundance and economic conditions.

The second vessel buyback program aims to further reduce the pressure on the fishery resources for the purpose of sustainability. All kinds of fishing vessels, including recreational fishing vessels, can qualify, regardless of age. Sampans and rafts are not included in the buyback program because there are too many of them and there are not sufficient funds in the buyout program.

When the second phase of the buyback program was initiated in 2000, only 5 vessels accepted the offer of NT$18,000/GRT. Hence, in the 2001 the buyback price was raised to NT$50,000/GRT for vessels smaller than 5 GRT. The price for vessels larger than 100 GRT remained the same. However, the buyback program was still not very successful as fishermen, having rational expectations, were holding out for even higher payment schemes to be introduced in the near future. Only 28 vessels were bought back in 2001.

This prompted the government to change its strategy in 2002 by announcing a new payment scheme designed to speed up the buy back process. Higher buy-back payments were offered for 2002 but in decreasing amounts in the subsequent years. The payment per GRT would be

[5] Regulations for Fishing Vessel Building Permit and Fishery License Issue, 2006, Fisheries Agency, Chinese Taipei.

(1) NT$70,000 if purchased in 2002, NT$60,000 in 2003, and NT$50,000 in 2004 for vessels less than 5 tons;
(2) NT$60,000 if purchased in 2002, NT$50,000 in 2003, and NT$40,000 in 2004 for vessels between 6 to 10 vessel tons;
(3) NT$50,000 if purchased in 2002, NT$40,000 in 2003, and NT$30,000 in 2004 for vessels between 11 to 20 vessel tons,
(4) NT$40,000 if purchased in 2002, NT$30,000 in 2003, and NT$25,000 in 2004 for vessels between 21 to 50 vessel tons,
(5) NT$35,000 if purchased in 2002, NT$25,000 in 2003, and NT$20,000 in 2004 for vessels between 51 to 100 vessel tons,
(6) NT$18,000 if purchased in 2002, NT$18,000 in 2003, and NT$18,000 in 2004 for vessels over 100 vessel tons.

The total payment per vessel would not exceed NT$9.5 million for any vessel purchased in 2002, NT$8.5 million in 2003, NT$ 7.9 million in 2004.

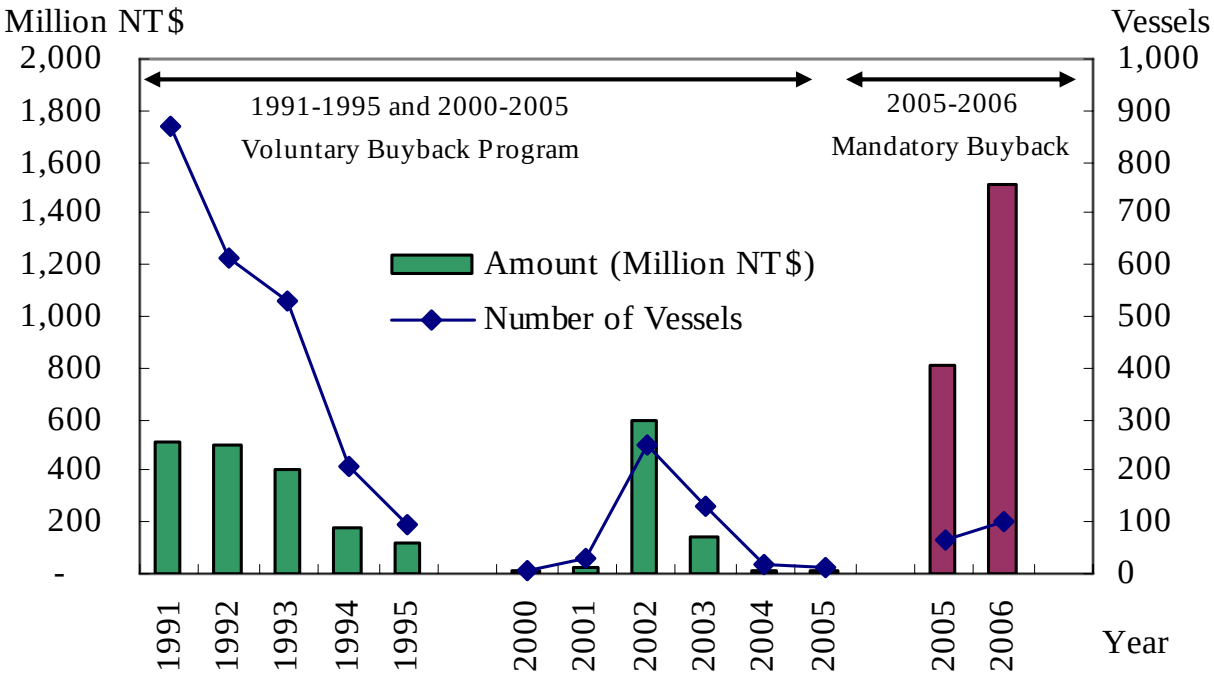

Figure 6 Expenditure and Number of Vessels in 1991-1995 and 2000-2005 Voluntary Vessel Buyback Programs and 2005-2006 Mandatory Vessel Buyback Program

The approach was intended to remove the price expectations and uncertainty in the future by offering an incentive to sell early. In 2002, 251 vessels were bought back at a total value of NT$615 million, as shown in Figure 6. In 2003 only 131 vessels were bought back and in 2004 and 2005 the number was even smaller at 18 and 12 vessels, respectively.

The voluntary vessel buyback program in 1995-2005 has not been successful in attracting large scale distant tuna longline vessels to decommission voluntarily. Hence, the mandatory 160 tuna longline vessels decommission program was initiated in 2005 and 2006 and the total expenditure of vessel buyback was raised to more than NT$2,330 million (US$70.6 million).

Figure 7 shows the number of vessels bought back by tonnage class during 2000-2006. The 2002 buyback program was successful in attracting vessels for tonnage classes less than 200. For the owners of 100-200 GRT vessels, who enjoy a greater financial incentive to sell out quickly in 2002 as compared to small vessel owners, since the voluntary buyback price for larger vessels dropped percentage wise more significantly after 2002. In relative terms, only 1% of vessel owners in the 0-10 GRT category accepted the buyback offer in 2002, while 22% of owners in the 100-200 GRT category sold out. Figure 8 and 9 show the number of vessels bought back by fishing gear and region in Chinese Taipei for the same period. Trawl and long line fishing vessels participated most in the voluntary buyback program, not only because there are more vessels to buy but also they suffered greatly from resource depletion and struggled with profitability.

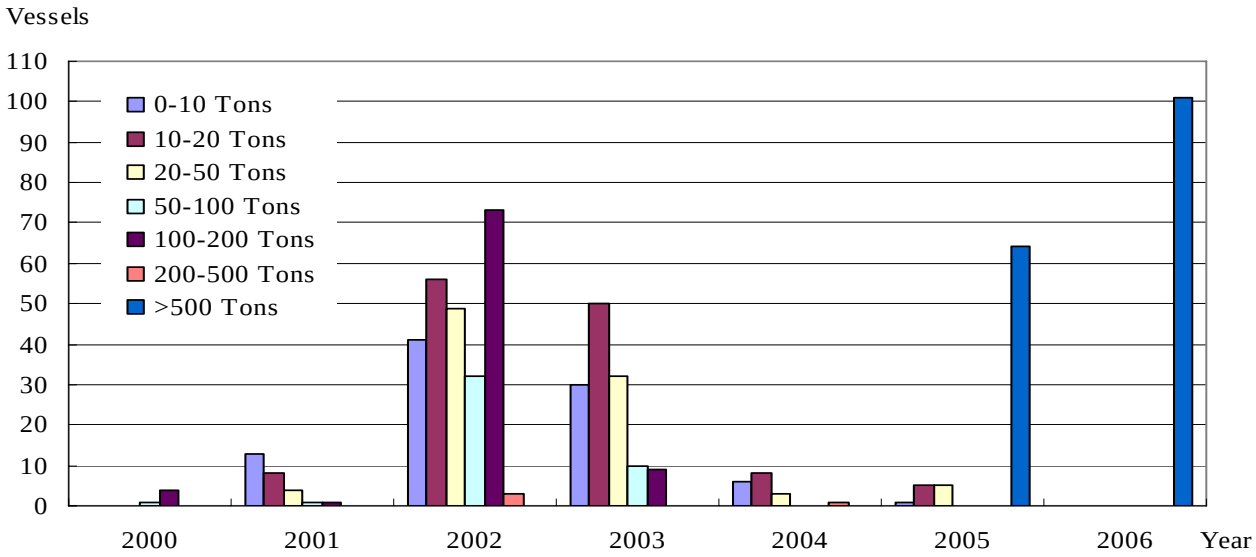

Figure 7 Number of Vessels Bought Back by Tonnage Class in Chinese Taipei (2000~2006)

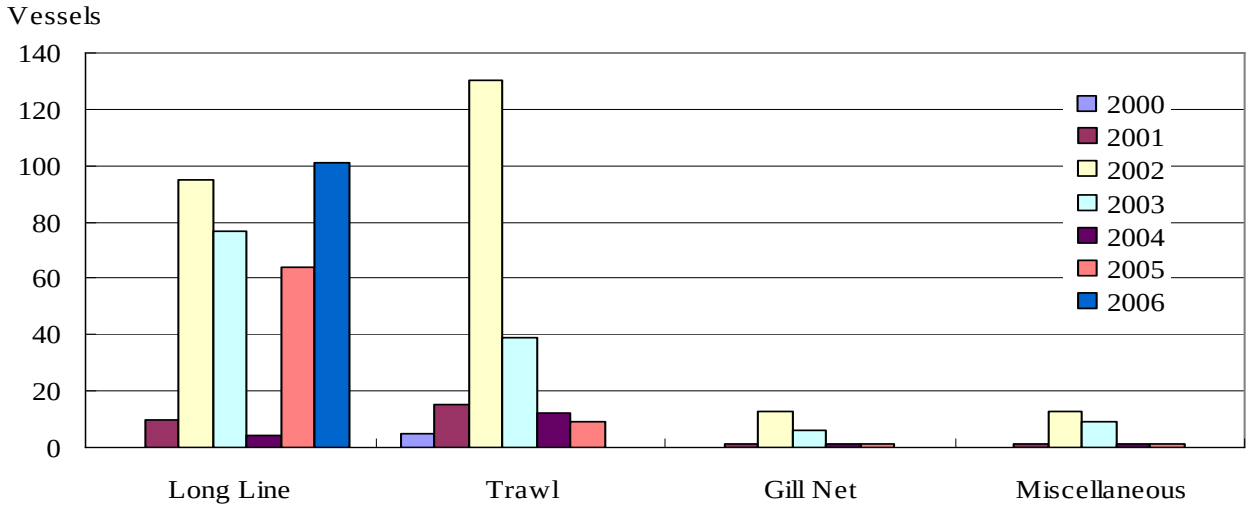

Figure 8 Number of Vessels Bought Back by Fishing Gear in Chinese Taipei (2000~2006)

In 2002, 7% of the total trawl fleet was bought out; most of them were registered in the north. In the same year, only 4% of the total long line fleet was bought, these vessels were primarily registered in the east, south, and remote islands. It is interesting to note the voluntary buyback program has attracted more vessels from the north and east region before 2002, since most of the trawl vessel are located in the north, and more vessels from the south in 2003 and 2004, since the longline vessels are mostly clustered in the south. The vessels

bough back by 2005 mandatory tuna longline vessels decommission program are all registered in the south, since the major distant water fishing ports are located in the south.

In the following section utilized the bioeconomic model, presented in Sun (1998), to simulate the backward bending supply curve of the offshore fishery to evaluate the impact of voluntary vessel buyback program on the fishing capacity of offshore fishery.

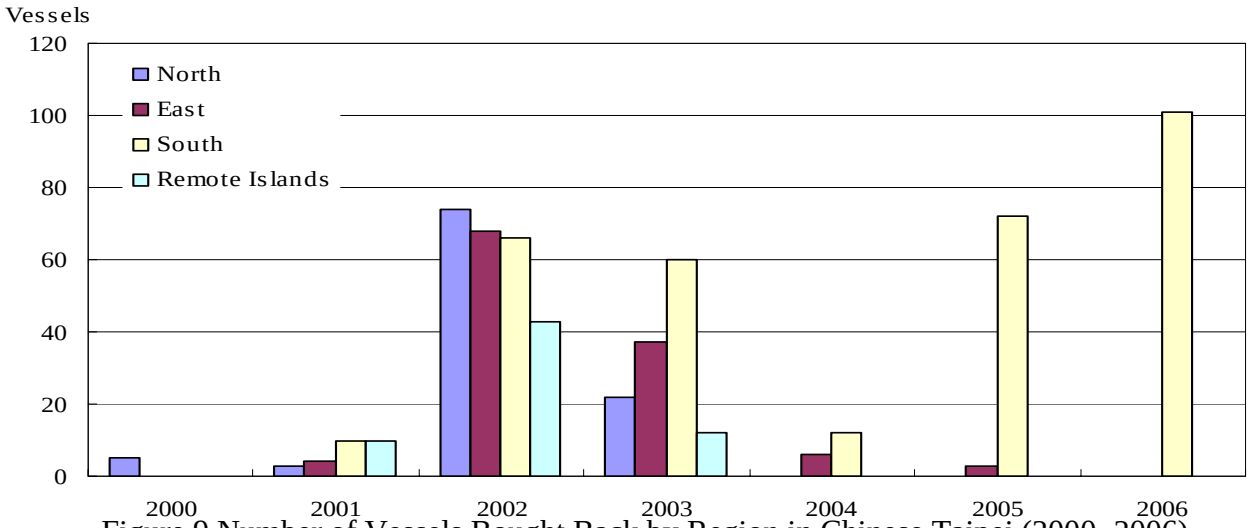

Figure 9 Number of Vessels Bought Back by Region in Chinese Taipei (2000~2006)

3.2 Evaluation of the Voluntary Vessel Buyback Program on Offshore Fishery

Sun (1998) treated the variety of species of offshore catch as one aggregate composite output and estimated that the offshore fishing industry is almost 38.7% overcapitalized by evaluating the technological efficiency in 1993 and concluded the vessel tonnage at MSY is 100,800 vessel tons, compared with the actual vessel tonnage in 1993, which was 164,447 vessel tons. Based on dynamic simulations, Sun's study shows that imposing a ban on the construction of new vessels and the vessel retirement and buyback program of 1991-1995 are not sufficient to reverse the downward trend in harvests and the deteriorating state of stocks.

Sun (2004a) examines whether or not the offshore fishing industry in Chinese Taipei in 2002 is in a Pareto inferior situation, with smaller output and higher price as characterized by the upper part of the backward bending supply curve discussed in Copes (1970). Using the bioeconomic model presented in Sun (1998) with data on annual offshore fishery harvests and the total tonnage and horse power of fishing vessels for the period 1953 to 2002, this paper simulates backward bending supply curves for various years.

To show how the simulation is conducted, we start with a generalized harvest function of the unconstrained Cobb-Douglas form (Comitini and Huang 1967; Hannesson 1983; Tomkins and Butlin 1975; Tsoa, Schrank and Roy 1984, Sun, 1998), the offshore fishery harvest in period t, fishing effort, defined as total vessel tonnage of the offshore fishery in period t, the technological efficiency of the offshore fishery in period t, defined as total horse power, which represent improvements in fishing gear, replacement of engines with larger and more efficient ones, adding better fish locating technologies, etc, are updated from 1953-2002 to obtain an assessment of aggregate offshore fishery resource stock. The growth function of the fisheries resource stock in period t is specified as a logistic growth function, which depends on the biomass of the fisheries in the previous period (Schaefer, 1954)

The parameters estimated by Sun (1998) show that the estimated intrinsic growth rate (r) equals 0.3102, the estimate of the environmental carrying capacity (K) is 3,045,995 tons, and q, α, and β are parameters which represent the scale elasticities associated with technological efficiency, fishing effort, and resource stock are estimated as0.0828, 0.5221, and 0.7937, respectively.

It is important to note that suspending fishing licenses, restricting construction of fishing vessels, and buying back used vessels may not be effective to reduce the landing directly. From a fishery management perspective it is of interest to determine whether the landing in 2002, given the current market equilibrium prices, was or was not at a sustainable level by determining the location of the harvest level on the backward-bending supply curves.

To begin with, the industry's historical price- harvest path is plotted in Figure 10. The simulated historical biomass (X_t) based on the estimation results of parameters without the biological equilibrium condition, $X_t - X_{t-1} = 0$, may be unsustainable. Substituting historical biomass (X_t) into the growth function, $G(X_t)$ and restricting $X_t - X_{t-1} = 0$, the estimated sustainable harvests (Y_t^s) is plotted in Figure 10.

The supply curve is backward-bending due to the functional property of the growth equation $G(X_t)$. It is calculated by simulating harvest levels that correspond to different price levels, while keeping costs, technology and effort constant for that year. As shown by Copes (1970), backward-bending supply curves reflect fishermen's behavior at different market prices.

The product price divided by average cost per GRT ratio has increased between 2002 and 1993, indicating greater economic incentives to catch more fish. With a 2002 average product price of NT$78.84/kg and an average cost of NT$105.991 per thousand vessel tonnes, the price-cost ratio is 0.744. In comparison, the 1993 average product price was 66.30 NT$/kg while average cost was NT$98.522 per thousand vessel tonne, resulting in a price-cost ratio of 0.673 (Fisheries Agency, 1993, 2002). The relatively higher growth of product prices as compared to fishing costs indicates that the economic incentive to exploit Chinese Taipei's fishery resources has increased.

Comparing historical to sustainable harvests, Sun (1998) shows that the fish stock has been declining since 1973, i.e. the actual harvests have exceeded natural growth, resulting in an unsustainable situation since then. Sun (2006) further show that the bio-economic equilibrium situation in 2002 is even worse than the situation in 1993 despite the two voluntary vessel buy back programs during 1991-1995 and 2000-2004. The economic overfishing phenomenon calls for a further restricted management scheme to avoid overexploiting the biomass.

Based on the average product price, the cost per unit of vessel ton are NT$66.30/kg and NT$98,522/vessel ton in 1993, respectively, the equilibrium harvest is situated in the backward-bending potion of the supply curve in Figure 10. The average product price is NT$78.84/kg and the average operation cost is NT$105,991 per vessel ton, the price-cost ratio in 2002 is higher than the price-cost ratio in 1993 and there exists even larger pressure to explore the resource, i.e., the current offshore fishing industry in Chinese Taipei is in a Pareto inferior situation with smaller output and higher price, as shown in the upper part of the backward bending supply for equilibrium in 2002.

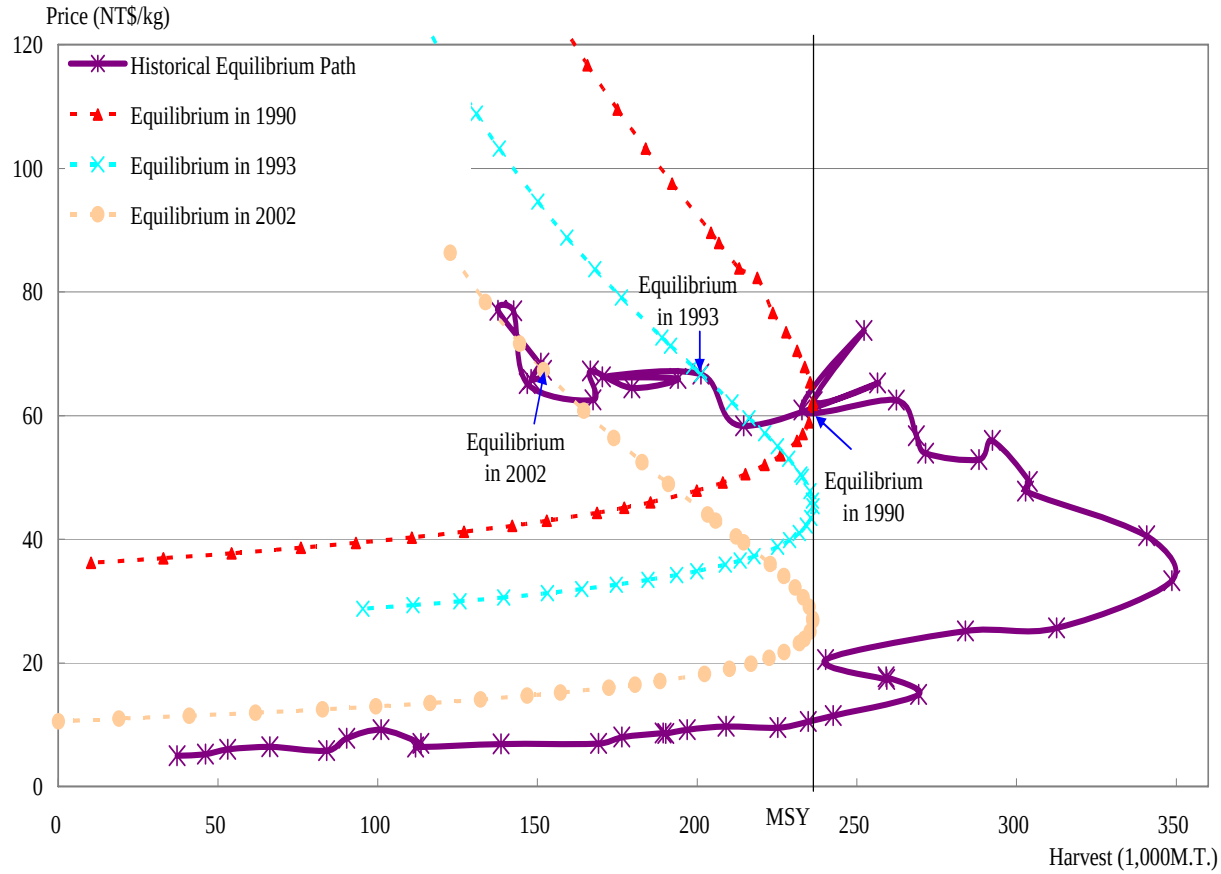

Figure 10 Simulated Backward Bending Supply Curves in 2002 and the Relationship of Equilibrium Market Prices and Harvest

Even though the government had adopted two voluntary vessels buy back programs in order to reduce the fleet size during 1991-1995 and 2000-2004, i.e., the bio-economic equilibrium situation in 2002 is even worse than the situation in 1993. The economically overfishing phenomenon would call for the need of a further restricted management scheme to avoid overexploiting the biomass.

After entering the WTO in 2002, the government in Chinese Taipei has recently instituted a comprehensive program to remunerate fishermen for voluntary reduction of fishing effort. The reward program for fishers to reduce their days at sea has been running since September of 2002. It covers all kinds of fishing vessels in all of Taiwanese fisheries with valid fishing licenses. To qualify in any given year, a vessel must have expended at least 100 fishing days and be in port for a total of 120.

To date, the reward program has not been very successful. Payments offered to fishermen for curbing fishing activities are too low to be sufficiently attractive and only 21% of the vessels fulfill the requirement voluntarily. We believe that one way to make the program work is to restrict it to a few selected fisheries with special environmental and resource considerations. By concentrating on a few species, the program could be redesigned to provide sufficient incentives to reduce the fishing effort further.

4. Management of Large-scale Tuna Longline Fishery

4.1 Fishing Capacity of Large-scale Tuna Longliner

Started in 1990s, the total allowable catch (TAC) of major tuna and tuna-like species, such as bigeye, bluefin, southern bluefin, albacore, and marlin are under the quota allocation control of all the following five international regional fishery organizations: the International Commission for the Conservation of Atlantic Tuna (ICCAT), Inter-American Tropical Tuna Commission (IATTC), Indian Ocean Tuna Commission (IOTC), Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and Western and Central Pacific Fisheries Commission (WCPFC). The quota allocation scheme is mainly based on the historical landings of Taiwanese vessels and the Fishery authority in Chinese Taipei takes the responsibility to protect and conserve resource.

For example, since 2002, Chinese Taipei's fleet of 100-plus open-water tuna-fishing vessels has been allowed to catch up to 1,140 tonnes of southern bluefin tuna as the "Fishing Entity of Chinese Taipei" is approved to be an extended commission member of CCSBT. Among all the Regional Tuna Fishery Management Organization (RFMO), CCSBT is the first RFMO, to establish a management procedure (MP) as a set of rules, agreed to in advance, to dictate how the TAC for the fishery would be adjusted as data becomes available. Its scientific basis and transparent long-run decision process guarantee the right-based quota management would be accepted by all member countries in the future (Sun, 2004b, 2005).

On November 2, 2004, in accordance with the Arrangement for the Participation of Fishing Entities in the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, Chinese Taipei had fulfilled its domestic requirements and agreed to be bound by the regime established by the Convention and to participate as a member in the WCPFC. Both the offshore and distant water tuna fishing activities within or outside the 200 nautical mile of Chinese Taipei's EEZ zone in Pacific Ocean will be managed together.

Although Chinese Taipei is not yet a member of ICCAT, IATTC and IOTC, it has a special "cooperating status" within these organizations, and is entitled to fish for tuna under the condition of maintaining the sustainability of the highly migratory tuna stocks. It is required that the fishing industry in Chinese Taipei will meet the international obligations before trying to maximize economic returns from the tuna fishery.

To accommodate with the fishery management regulations as being set forth in FAO Code of Conduct for Responsible Fishery in 1995, Vessel Monitoring System has been developed to obtain real time activities of fishing vessels in operation for reinforcement of fleet management of all distant water tuna fisheries since then. In 1999, the United Nations Food and Agriculture Organization (FAO) adopted the International Plan of Action for the Management of Fishing Capacity (IPOA-Fishing Capacity) calling for global reduction of large-scale fishing vessels by 20% to 30%. In 2001, FAO also adopted an International Plan of Action regarding IUU fishing, calling on the international community to take immediate actions for appropriate management of fisheries.

In addition to the voluntary vessel buy back programs, under a joint action plan with Japan, the fishery authority in Chinese Taipei was committed to facilitate those vessels built

domestically to be registered in Chinese Taipei by amending its regulations in 2000. From January 1, 1994 to January 28, 2000, a tuna longline fishing vessel of more than 100 GRT built in Chinese Taipei district, exported to a foreign country and operated by a Taiwanese, who has duly registered the vessel with the authority of the Central Government may apply for importation. Consequently, 48 owners of large-scale tuna longliners have completed their registration in Chinese Taipei. At the same time, Chinese Taipei has removed 48 tuna longliners in its own registry.

Even though no purse seine fleets have been identified as IUU fleets (Miyake, 2004), for those tuna purse seine vessels exported and constructed for owners in Chinese Taipei to register as FOCs, the present Regulations may, after the submission of importation plans by the fisheries association to which the Chinese Taipei's flagged tuna purse seine fishing vessels are affiliated, file an application to the authority before July 31, 2007, for the importation of two or less tuna purse seine fishing vessels[6] of more than 1000 GRT, which are operated by nationals of Chinese Taipei, and which have been built and exported before February 28, 1999.

Boat owners will be encouraged to make investment in those coastal countries which are willing to undertake their international obligations as flag States, in such a way that the operation of tuna fishery will follow the proper management requirement. For application for export of tuna purse seine fishing vessel, the fishing enterpriser shall affix with the original and a copy of a certificate issued by the competent regional fisheries management organization or the flag State certifying its replacement of a decommissioned tuna purse seine fishing vessel. Any shipyard applying to build a tuna purse seine fishing vessel or a longline fishing vessel shall, in addition to the provision of the document in the preceding paragraph, affix with the original and a copy of a certificate provided by the vessel buyer, issued by the competent regional fisheries management organization or the flag State certifying its replacement of a decommissioned tuna purse seine fishing vessel.

The most recent challenge to the distant tuna longline fisheries in Chinese Taipei is that ICCAT recently cut Chinese Taipei's quota[7] for bigeye tuna from the current 14,900 MT annually to only 4,600 MT[8] in 2006, which represents a nearly 70 percent cut due to noncompliance (ICCAT, 2005). It has called for the mandatory buyback program of 160 large scale tuna longliners in 2005 and 2006.

4.2 Mandatory Tuna Longline Vessels Buyback Program

In 2004, the number of the large-scale distant water longline vessels fishing for tuna registered in Chinese Taipei was 614, which includes 48 vessels that were recognized as FOC before and had arranged to reflag as Taiwanese vessels legally to reinforcement of fleet management, accounting for 42% of the 1,454 large-scale tuna longline vessels in the world.

[6] Where the total number of the Chinese Taipei flagged tuna purse seine fishing vessels has reached forty-two, the competent authority of the Central Government may refuse to approve any further importation of non-Chinese Taipei flagged tuna purse seine fishing vessels in accordance.

[7] In addition to the quota limit sets for the bigeye landings of Taiwanese vessels in 2006, ICCAT set Chinese Taipei's quota for Marlin is 1,030 MT, the quota for bluefin is 480MT, and the quota for northern albacore is 4,453 MT.

[8] By-catch in the albacore fishery by 60 fishing vessels up to a maximum annual catch of 1,300 MT of bigeye and 15 fishing vessels under its registry to conduct a directed fishing campaign for bigeye tuna with a maximum catch of 3,300 MT.

There are 140 albcore targeted vessels, 79 bigeye bycatch vessels, 10 yellowfin bycatch vessels and 358 vessels bigeye targeting, of which 90 in Atlantic Ocean, 86 in Pacific Ocean and 209 in Indian Ocean such as shown in Table1.

Since February 5, 2005, Fisheries Agency in Chinese Taipei has launched a mandatory vessel reduction program to reduce the large-scale bigeye longliners in two phases: the first in 2005 and the second in 2006. The program aims at scrapping a total of 160 large-scale tuna longliners. It is estimated that the total compensation paid by the government and the industry will reach NT$ 5.6 billion, equivalent to US$ 170 million.

It is reported that, in the first phase of the vessel reduction program implemented in 2005, 59 vessels with 30,396 GRT were decommissioned and their fishing licenses were cancelled. Among them, 20 vessels from Atlantic, 15 from Pacific and 24 from Indian Ocean have been returned to their homeports to be scrapped, reported sunk or lost at sea. The phase II vessel buyback compulsory program in 2006 as announced is targeting 101 vessels, of which 91 are targeted bigeye vessels from three oceans and 10 bigeye bycatch vessels from Indian Ocean, and the average vessel tonnage is 600 GRT. The 91 bigeye targeted vessels comprise of 10 from Pacific Ocean, 73 from Indian Ocean, and 8 from Altantic Ocean.

We discuss next the 2005-2006 mandatory buyback program of the large scale tuna longline fisheries and the design features of the mandatory buyback program to achieve the goals of how to reduce the fishing effort to meet these goals of resource conservation and economic viability of the fishing industry. The vessels bought back by 2005 compulsory decommission program are all tuna longline vessels greater than 500 GRT and registered in the south shown in Figure 7, 8 and 9, respectively.

Such as shown in Table 1, the number of longliners will reduce from 614 in year 2004 to 444 in year 2007, which represent 27.69% reduction and the number of bigeye target longliners will reduce from 385 to 235, which represent 38.96% reduction in line with the reduction of bigeye quota reduction in Indian and Pacific Ocean.

According to Article 38 of Fisheries Act, Chinese Taipei shall compensate the owners of those vessels scrapped under the compulsory program and the fishery association with whom the vessels are affiliated shall coordinate with all operators for the scheme of compensation. Operators whose vessels are not scrapped are also responsible to compensate the owners of the scrapped vessels under the program as well.

The compensation per GRT amounts to NT$70,000 (around US$2,121), with the ratio of cost sharing between the Government and the industry being 3 to 4. In other words, the Government will bear the cost of compensation of NT$ 30,000 (around US$909) per vessel tonnage, while the industry will provide a mutual compensation of NT$ 40,000 (around US$1,212) per vessel tonnage. Half of the mutual compensation is paid by the tuna boat owner association with whom the remaining vessels are affiliated. The other half of the mutual compensation come from the government in terms of a loan for a period of seven years with low interest rate for vessels were brought back in 2005-2006.

Table 1 Number of Large-scale Tuna Longline Vessels in Chinese Taipei

Number of Vessels in Various Years and Gears/Area	Bigeye Targeted Vessels				Bigeye Bycatch (India Ocean)	Yellowfin Bycatch (Atlantic Ocean)	Albacore Targeted	Total
	India Ocean	Pacific Ocean	Atlantic Ocean	Total				
2004 (A)	209	86	90	385	79	10	140	614
Scrapped Voluntary in 2005	1	1	0	2	0	1	7	10
Buyback in 2005 (B)	24	15	18	57	0	2	0	59
Buyback in 2006 (C)	73	10	8	91	10	0	0	101
2007 (D=A-B-C)	111	60	64	235	68	0	141	444
% Change of 2007 w.r.t 2004 ((D-A)/A)	-46.89%	-30.23%	-28.89%	-38.96%	-13.92%	-100.00%	0.71%	-27.69%

Source: Fisheries Agency, 2004, Chinese Taipei.

In November of 2005, the ICCAT cut Chinese Taipei's total allowable bigeye tuna fishing quota from 14,900 Mt in 2005 to a mere 4,600 MT in 2006 due to non-compliance. The ICCAT only allows 15 out of 64 vessels to continue their operations with an observer on each of the vessels in the Atlantic Ocean for the following one year on a trial basis. Hence, the Fisheries Agency schedules two phase mandatory tuna vessel buyback program to buy back 26 vessels in 2005 and 2006, and provide 49 vessels with compensation of NT$5.97 million (US$178,742) per vessel for vessels suspending their fishing for a year since the quota cuts in Chinese Taipei's bigeye tuna fishing in the Atlantic Ocean in 2006. By fulfilling the request from ICCAT, it is expected that the bigeye quota in 2007 will be restored to the historical level as 16,500 MT in 2003 or at least 14,900 MT in 2004 with 64 vessels which would give individual vessel a bigeye quota around 258~233 MT.

In 2006, WCPFC, IATTC and IOTC also set the quota limit for bigeye landings of Chinese Taipei vessels at 15,000 MT[9], 7,953 MT[10] and 35,000 MT, respectively. In summary, the total allowable bigeye tuna quota for large-scale tuna longliner in Indian and Pacific Oceans in 2006 is around 50,153 MT, which includes 15,153 from Pacific Ocean and 35,000 from Indian Ocean. For the 171 bigeye targeted and 68 bigeye bycatch vessels[11] in Indian and Pacific Oceans, the average bigeye targeted longliner's bigeye tuna landing is around 245 MT, if we didn't exclude the possible bycatch from albacore target vessels and various adjustment measures regulated by the fishery authority in Chinese Taipei.

[9] The 15,000 MT bigeye quota includes around 9,000 MT for Large-scale tuna longline fishery and around 6,000 small-scale longline fishery.

[10] Since there are fishing area overlapping problem between WCPFC and IATTC, the large-scale tuna lonline bigeye quota in Pacific Ocean is estimated to be 15,153 MT, which accounts for around 1,800MT overlapping in bigeye landing.

[11] The bigeye quota is allocated with the ratio that bigeye target longliner catches twice of the quota of bigeye bycatch longliner for bigeye landing.

According to the "Annual Catch Statistic of Taiwanese Distant Water Tuna Longline Fishery" (Fisheries Agency, 2004), the historical average landing for bigeye targeted longliner is about 360 MT, which include 210 MT bigeye and 150 MT of all other tuna and tuna-like species (excluding bigeye and albacore). The albacore targeted vessel would have 315 MT of albacore landing and around 150 MT of all other tuna and tuna-like species (excluding bigeye and albacore).

It is evaluated that if the total landing per bigeye targeted vessel is about 310 MT with the average price around 400 (¥/ MT) then the revenue will be about sufficient to cover the total cost with reasonable profit (Sun, 2003). According to Ono (2004), Chinese Taipei keeps its predominance in the Japanese market, since its low labor cost. While the total sales value of Japan longliner is 354,665 thousand Yen, which is higher than the one of Chinese Taipei (196,920 thousand Yen with 298 MT landing) in 1996, fisheries profit largely depends on costs saving, 375,516 MT for vessels in Japan and 130,000 for vessel in Chinese Taipei. Particularly, the labor cost, the largest cost for Japanese fisheries, is surprisingly low in Chinese Taipei and only one tenth of the one in Japan. The Japanese fishing vessels can barely make profit only before deducting depreciation cost. For Japanese tuna industry with less accumulation of internal capital and weak management base, new fishing vessel building seems to be a difficult task.

Bayliff et. al. (2004) estimated the average catch of the large-scale longliners for the average fleet in the world is about 240 MT (including albacore, bigeye, Atlantic bluefin, Pacific bluefin, southern bluefin and yellowfin) per year and conclude current economic break-even point for catch per boat is roughly 250 tonnes including (albacore, bigeye, Atlantic bluefin, Pacific bluefin, southern bluefin and yellowfin) per year.

According to the regulation announced in March 2006, the individual bigeye targeted vessel's bigeye quota is set as 200 MT in India Ocean and 220 MT in both Atlantic and Pacific Ocean. After including the 150 MT historical average of all tuna and tuna-like species (excluding bigeye and albacore), it is predictable that the bigeye target longliner was evaluated to have average landing around 350~370 MT.

The mandatory buyback in 2005 and 2006 reduction will help to resolve the problem of Chinese Taipei's insufficient fishing quotas for bigeye tuna and to ensure that all vessels fishing for bigeye tuna can be operated under a reasonable accessible quota for bigeye tuna, such that fishing operations can comply with international regulations, thereby reaching the goal of sustainable utilization of tuna resources. It is also in line with the international trend of enhancing fisheries management and conservation of marine resources for achieving the objectives of "assuming the responsibility of resources conservation" and "commensuration of the size of fishing fleet with the availability of fishing opportunities."

The Fisheries Agency hoped that, through such positive measures as implementing the program of reducing large-scale tuna longline vessels operating in the three oceans in a transparent manner, international community would understand Chinese Taipei's determination in reducing her fleet size. The Government and fishing industry in Chinese Taipei will continue to participate in the work of international fisheries management organizations to achieve the objectives of "responsible resources conservation" and "sustainable development of tuna longline fishery."

A series of revision of the domestic regulation is still under way. For example, the "Regulations for the issuing of building permits and fishery licenses to fishing vessels," promulgated on November 17, 1989, was amended 13 times. The most recently amendment was promulgated on June 29, 2005 to ensure the full control of the total vessel tonnage. In addition, the "Regulations on Permission for the Export of Fishing Vessels" promulgated on June 29, 2005 is to show that preventing FOC is also a determined government policy.

5. Conclusions and Recommendations

The fishery authority in Chinese Taipei surely tries to help promote the proper conservation and management of tuna stocks for people all over the world. There are needs to reduce the number of the offshore and distant water fishing vessels effectively through input control and to design optimal allocation scheme through output control such as the individual transferable quota (ITQ) system to ensure the resource sustainability and management scheme. We note that restricting construction of fishing vessels, offering the voluntary buyback program and rewarding suspension of fishing activities would not be effective in reducing the landing directly and resolve the overcapacity problem of both offshore fisheries and distant water tuna long-line fisheries in the short run. Based on the characteristics of these two fishing activities, the fishery authority should design distinct management procedures to achieve the reduction of fishing effort.

There are 211,598 full-time and part-time workers in the coastal and offshore fisheries, constituting the major working force in more than 231 fishing villages with various sizes of fishing harbors. Considering that there are 25,459 vessels less than 100 GRT competing for more than a hundred fish species resources in the sub-tropical coastal and offshore area in Chinese Taipei, it is difficult to establish the right-based quota system to maximize the economic rent in the short run but to ensure full-employment in the rural area. Hence, the direct payment scheme should be recommended as the major fishery management policy in the coastal and offshore fisheries. They may include compensation for the loss due to the seasonal and fishing area closure, unemployment insurance and job training program, and early retirement programs and other types of social welfare safety-net programs. Such measures are necessary to ensure the basic living standard of fishermen in the short run and to reduce the fishing capacity in the long run.

For the distant water tuna longline fishery, it is important for the industry to realize that the quota system for all tuna and tuna-like highly migratory species will all be managed under each of the international regional fishery organizations based on the historical landing record. In the context of the Code of Conduct for Responsible Fisheries and its overall objective of sustainable fisheries, the issues of excess fishing capacity in world fisheries is an increasing concern. Excessive fishing capacity is a problem that, among others, contributes substantially to overfishing, the degradation of marine fisheries resources, the decline of food production potential, and significant economic waste.

Among all the RFMO, CCSBT is the first to establish a management procedure (MP) as a set of rules, agreed to in advance, to dictate how the TAC for the fishery would be adjusted as data becomes available. It is necessary to recommend all the RFMO to establish the scientific basis and design a transparent long-run bio-economic decision process to guarantee the right-based quota management would fairly protect the welfare of all stakeholders, to maintain the fishing order, and to reduce disputes among all members in the future.

The current bigeye tuna quota allocation scheme in Chinese Taipei is to evenly split it among all longline vessels and to design seasonal area closures. The input control measure may result technology inefficiency among vessels and would not be able to keep up the competitiveness of the distant water tuna fleet. The Fisheries Agency in Chinese Taipei has launched a mandatory vessel reduction program to scrap 160 out of 614 large-scale distant water tuna longline vessels in 2005 and 2006 and ensure that all bigeye targeted longliner can be operated under a reasonable accessible quota for bigeye tuna, such that fishing operations can comply with international regulations.

However, the sky rising crude oil price, started from 2004, for example the oil prices leapt above $72 a barrel in April 2006 and settle at a record high, would increase the total cost about 20% and challenge the profitability of the tuna longline industry. In the long run, it is necessary to design an ITQ system aiming at conserving the resource and providing the incentive to reduce the capacity under the condition that the net present value of the fishery resources in the long run would be maximized. A clear and present need is to utilize the revenue-cost survey of longline fisheries to analyze their economic behavior and to evaluate the factors which influence their entry/exit behavior in the long run.

According to Bayliff et. al. (2004), the quantity sold in the Japan sashimi market was about 600,000 MT per year, of which about 390,000 MT of tunas (albacore, bigeye, Atlantic bluefin, Pacific bluefin, southern bluefin and yellowfin). Since Japan is the world's leading market for sashimi tuna, the Organization for the Promotion of Responsible Tuna Fisheries (OPRT) was initiated by Japanese tuna fishing operators, traders, distributors and consumers on December 8, 2000. OPRT has established a registered vessels white list to prevent tuna harvested under IUU/FOC fishing practices being imported into Japan.

In addition, long before the establishment of OPRT in 2000 and before Chinese Taipei[12] entering WTO in 2002, the Taiwanese Deep Sea Tuna Boat Owners and Exporters Association signed a mutual understanding with Japan Tuna Fisheries Association to accept a self-controlled export quota of a 99,000 MT ceiling of all tuna and tuna-like species to Japan aiming at stabilizing the market order, starting in 1994. This quota restriction would cause inefficiency of the longliner fishing capacity in Chinese Taipei and it has not been proven to be useful to stabilize the sashimi market price. It is recommended that the OPRT vessel registered system should be sufficient as a measure for resource conservation. The import ceiling applied to Chinese Taipei should be removed as it would distort the perfect competition situation and violate the trade liberalization of non-agriculture market access negotiations under WTO.

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Annex 11

Asia-Pacific
Economic Cooperation

APEC Seminar on Sharing Experiences in Managing Fishing Capacity

FWG 01/2006--P009

International Plan of Action
Fishing Capacity

Mr. Stetson Tinkham
Deputy Director, Office of Marine Conservation
U.S. Department of State

Fisheries Working Group Meeting
8 – 9 May 2006
Kaohsiung, Chinese Taipei

INTERNATIONAL PLAN OF ACTION

FISHING CAPACITY

HISTORY

Excessive fishing capacity contributes to:

- overfishing,
- the degradation of marine fisheries resources,
- the decline of food production potential &
- significant economic waste.

HISTORY

- Committee on Fisheries (COFI) address the issue of fishing capacity - 1997
- Technical Working Group - 15 to 18 April 1998.
- Preparatory meeting - 22 to 24 July 1998
- FAO consultation 26 to 30 October 1998.

COVERAGE

- In this document, the term “State” includes Members and non-members of FAO and applies *mutatis mutandis* also to “fishing entities” other than States.

NATURE AND SCOPE

- Voluntary.
- Elaborated within the framework of the Code of Conduct for Responsible Fisheries Article 2 (d) and Article 3.
- States and regional fisheries organizations should apply it consistently with international law and within the framework of the respective competencies of the organizations concerned.

OBJECTIVE AND PRINCIPLES

- To achieve world-wide preferably by 2003, but ***not later than 2005***, an efficient, equitable and transparent management of fishing capacity.
- ...exercise caution to avoid growth in capacity undermining long-term sustainability.

OBJECTIVE AND PRINCIPLES (actions)

- Assess capacity.
- Draft National Plans of Action.
- Strengthen RFMOs.
- Address major transboundary, straddling, highly migratory and high seas fisheries.

OBJECTIVE AND PRINCIPLES

- i. *Participation*
- ii. *Phased implementation*
- iii. *Holistic approach*
- iv. *Conservation*
- v. *Priority* – overfishing already exists
- vi. *Priority* – environmentally sound & evolving technology

OBJECTIVE AND PRINCIPLES

- vii. *Mobility*
- viii. *Transparency*

URGENT ACTIONS
Section I:

- **Assessment and monitoring of fishing capacity**
  - ***Measurement of fishing capacity***
  - ***Diagnosis and identification of fisheries and fleets requiring urgent measures***
  - ***Establishment of records of fishing vessels***

URGENT ACTIONS
Section II:

- **Preparation and implementation of national plans**
  - ***Development of national plans and policies***
  - ***Consider socio-economic requirements***

URGENT ACTIONS
Section II:

- ***Subsidies and economic incentives***
- ***Regional considerations***

URGENT ACTIONS Section III:

- INTERNATIONAL CONSIDERATIONS
  - Participate in international agreements
  - Cooperate in information exchange
  - Manage capacity of high seas fleets
  - Improve data on high seas catches
  - Deal with States that do not cooperate
  - Join RFMOs or apply their rules

URGENT ACTIONS Section III:

- INTERNATIONAL CONSIDERATIONS
  - Apply provisions of Article III UNFSA
  - Do not transfer capacity w/o OK of gaining State
  - Avoid redeploying fishing vessels if not consistent with Code of Conduct

URGENT ACTIONS
Section IV:

- **Immediate actions for major international fisheries requiring urgent measures**
  - **address capacity for international fisheries requiring urgent attention**
  - priority to overfished transboundary, straddling, highly migratory and high seas stocks

URGENT ACTIONS
Section IV:

- **Immediate actions for major international fisheries requiring urgent measures**
  - **restore overfished stocks to sustainable levels, considering:**
    - Economic importance of stocks
    - Transfer controls

MECHANISMS TO PROMOTE IMPLEMENTATION

- Information programs to increase awareness

MECHANISMS TO PROMOTE IMPLEMENTATION

- ***Scientific and technical cooperation***
  - ***Science and technology exchange***
  - ***Training and institutional strengthening***

MECHANISMS TO PROMOTE IMPLEMENTATION

- Reporting
  - Report to FAO and RFMOs on progress

MECHANISMS TO PROMOTE IMPLEMENTATION

- ***Role of FAO***
  - ***Collect, analyze and share information***
  - ***Support implementation of NPOAs***
  - ***Report every 2 years to COFI***

Annex 12

List of Recommendations from the Seminar

1. It is recognized that the international community takes the issue of fishing overcapacity seriously.
2. It is noted that most APEC member economies are facing issues of fishing overcapacity.
3. Member economies need to share experiences in developing their NPOA-Fishing Capacity (and related NPOAs).
4. It is recognized there is a need for appropriate and effective penalties/sanctions to support the management of fishing capacity.
5. It is recognized that trash fish issue and its uses as aquaculture feed need to be considered when considering capacity management.
6. It is recognized that overcapacity in capture fisheries has and continues to cause social, economic and environmental problems.
7. Capacity should be linked to available fishing opportunity.
8. Member economies understand the action of management of fishing capacity starts at home.
9. There is a need to eliminate fishing overcapacity, rather than to shift it to create stress in other fisheries.
10. There is a need to have a whole government approach to solve the problem of overcapacity successfully.
11. There is a need to have political and bureaucratic leadership to solve the problem of overcapacity.
12. There is a need to have effective management tools, based on data/analysis of situation and stronger MCS implementation, to ensure the success of the management of fishing capacity.
13. There is a need to incorporate all stakeholders in the decision making process.
14. Different approaches toward the management of fishing capacity can be used depending on the specific situation (no one size fits all).
15. Buyback programs can help transition, but this tool needs to be used with care and include fisheries management reforms to prevent reoccurrence of overcapacity.
16. Member economies understand the theory of management of fishing capacity, but need to work on managing the process.