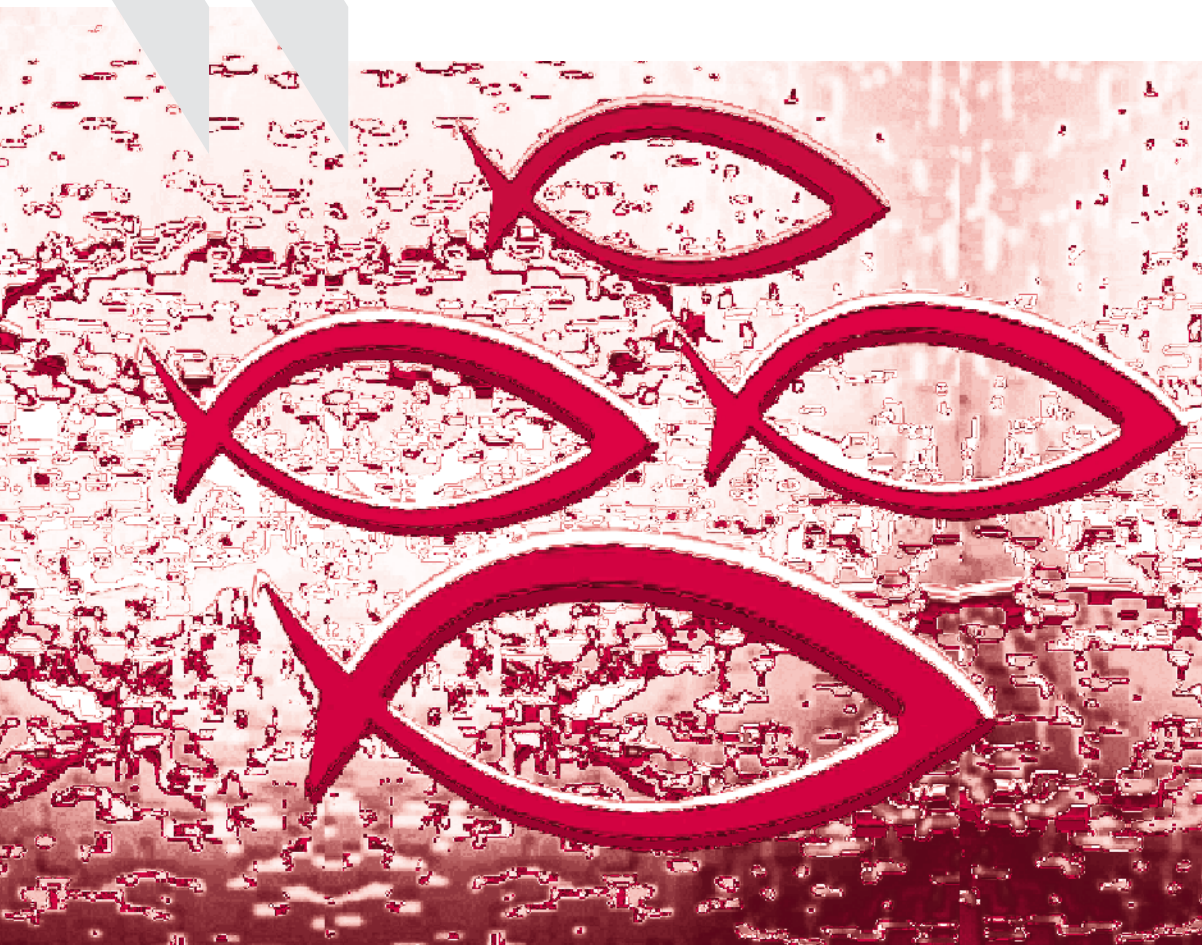
An Appraisal of the Chilean Fisheries Sector



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ISBN 978-92-64-07394-4 (print)
ISBN 978-92-64-07395-1 (PDF)

Also available in Spanish: *Políticas de pesca y acuicultura de Chile: Informe de base*

Corrigenda to OECD publications may be found on line at: *www.oecd.org/publishing/corrigenda*.

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Foreword

Chile has emerged as one of the major players in the world fisheries and aquaculture sector over the past decade. It is ranked fifth in the world in terms of production from capture fisheries and seventh in terms of aquaculture production. It is also the seventh largest exporter of fisheries products. Chile's evolution as a fishing nation has followed an interesting trajectory, and many Chilean fishing and aquaculture companies are now leaders on the world stage.

However, the evolution has not been without its problems. Resource crises in the pelagic fisheries in the 1990s presented major challenges to companies and communities engaged in marine capture fisheries. As in many other countries, the artisanal fisheries remain a difficult problem and current policies have not as yet successfully dealt with overexploitation of coastal fisheries resources or provided stable livelihoods to coastal populations. Most recently, there has been a major disease crisis in the salmon aquaculture industry and there are ongoing concerns related to diversification, zoning and environmental sustainability in the industry.

It is clear that lessons from Chile's experience provides useful insights that can be usefully applied to both OECD and non-OECD countries. Chile has been through an intense, challenging and complex learning process which is reflected in the evolution of its fisheries and aquaculture policies. The strong institutional foundations underpinning the sector have helped Chile to weather crises and move forward. In many areas, Chile's policies reflect sound policy principles and strong institutional foundations including, for example, the relative absence of subsidies in the sector, the use of market-based fisheries management approaches, and a sound scientific basis for decision making.

This report is intended to highlight the key insights and lessons from Chile's experiences. The report has been prepared as background material in support of the process for Chile's accession to the OECD. It provides an overview of the Chilean fisheries and aquaculture sector and was discussed at the 103rd Session of the Committee for Fisheries in April 2009. With the agreement of the Under-Secretariat of Fisheries in Chile, the Committee for Fisheries decided to make the report publicly available. The report is the first major English-language review of the Chilean fisheries and aquaculture sector that has been made publicly available in the past decade.

The report is released under the responsibility of the Secretary-General of the OECD.

ACKNOWLEDGEMENTS

This report was prepared by the Fisheries Policies Division under the direction of Anthony Cox. It is based on a background study prepared by Carlos Wurmann and Guillermo Moreno (Chile), information provided by the Chilean Under-Secretariat for Fisheries, and analysis by the OECD Secretariat. The report benefited from discussions with staff from the Under-Secretariat for Fisheries and other government officials during a fact-finding mission to Chile by the OECD Secretariat in December 2008. The report was prepared for publication by Louise Schets. Editorial comments provided by Saba Khwaja.

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Acronyms

English acronym as used in text	Chilean acronym used locally	Definition
AAA	AAA	Aquaculture Authorized Areas
ACAP	ACAP	Agreement for the Conservation of Albatrosses and Petrels
ADUANA	ADUANA	National Customs Service
AES	RAE	Artisanal Extraction System
CCAMLR	CCRVMA	Convention on the Conservation of Antarctic Marine Living Resources
CCRF	CCPR	Code of Conduct for Responsible Fisheries
CCSD	CCDS	Chilean Council for Sustainable Development
CIMAR	CIMAR	Research Cruises for Scientific Marine Research Program
CITES	CITES	Convention for International Trade in Endangered Species Wild Fauna and Flora
CMS	CMS	Convention on the Conservation of Migratory Species of Wild Animals
CONAMA	CONAMA	National Commission for the Environment
CONAPACH	CONAPACH	National Confederation for Chilean Artisanal Fishermen
CONFEPACH	CONFEPACH	National Confederation of Chilean Artisanal Fishermen's Federations
CONICYT	CONICYT	National Commission for Science and Technology
CORFO	CORFO	Corporation for the Promotion of Production
CPPS	CPPS	Permanent Commission of the South Pacific
CSR	RSE	Corporate social responsibility
DEI	DIA	Declaration of Environmental Impact
DIFROL	DIFROL	Directorate of Frontiers and Boundaries
DIRECTEMAR	DIRECTEMAR	Directorate General of the Maritime Territory and Merchant Marine
EIES	SEIA	Environmental Impact Evaluation System
EIS	EIA	Environmental Impact Study
ERA	RAMA	Environmental Regulations for Aquaculture
EU	UE	European Union
FAO	FAO	Food and Agriculture Organization of the United Nations

FFM	FAP	Fund for Fisheries Management
FFR	FIP	Fund for Fisheries Research
FONDAP	FONDAP	Fund for Advanced Research in Priority Areas
FONDECYT	FONDECYT	National Fund for Scientific and Technologic Development
FONDEF	FONDEF	Fund for the Promotion of Scientific and Technological Development
FPAF	FPPA	Fund for the promotion of Artisanal Fisheries
FTA	ALC	Free Trade Agreements
GDP	PIB	Gross Domestic Product
GLE	LGMA	General Law on the Environment
GMO	OGM	Genetically Modified Organisms
GPS	GPS	Global Positioning System
IFOP	IFOP	Fisheries Development Institute
INTESAL	INTESAL	Salmon Technologic Institute
BIP	BIP	Integrated Project Bank
ISA	ISA	Infectious salmon anemia
ITQ	CIT	Individual transferable quotas
IUU	INDNR	Illegal, Unregulated and Unreported Fishing
IWC	CBI	International Whaling Commission
MAEBR	AMERB	Management Areas for the Exploitation of Benthic Resources
MCLF	CLMA	Maximum Catch Limit per Firm
MCS	MCS	Monitoring, Control and Surveillance
NAP	PNA	National Aquaculture Policy
NFC	CNP	National Fisheries Council
NFP	PPN	National Fisheries Policy
NFRD	FNDR	National Fund for Regional Development
NFRF	PIN	National Fisheries Research Framework
NGO	ONG	Non Governmental Organizations
NRACA	RNA	National Registry for Aquaculture Concessions and Authorizations
NRAF	RPA	National Registry for Artisanal Fishermen
NRIF	RPI	National Registry for Industrial Fisheries
NSPI	SIN	National System for Public Investment
OIE	OIE	World Organization of Animal Health
PSC	CPS	Preliminary Site Characterization
R&D	I+D	Research and Development
RAMSAR	RAMSAR	Convention on Wetlands
SAG	SAG	Agriculture and Livestock Service

SalmonChile	SalmonChile	Association of the Chilean Salmon Industry
SERCOTEC	SERCOTEC	Technical Co-operation Service, CORFO
SERNAPESCA	SERNAPESCA	National Fisheries Service
SIGES	SIGES	Integrated geographic information system
SONAPESCA	SONAPESCA	National Fisheries Association
SRS	SRS	Pisciriketsiosis
SPRFMO	SPRFMO	South Pacific Regional Fisheries Management Organization
SSP	SSP	Undersecretariat of Fisheries
UN	UN	United Nations
UNCLOS	CONVEMAR	United Nations Convention on the Law of the Sea
UNDP	UNDP	United Nations Development Program

Executive summary

Chile is a major player in the world fishing scene. In 2006, it ranked fifth in the world in terms of production from capture fisheries, seventh with respect to aquaculture production (dominated in Chile by salmon and trout farming), and was the seventh largest exporter of fish and seafood. In the Chilean wild fisheries, the most abundant species are the pelagic species (jack mackerel, sardine, anchovy and "caballa" mackerel) and which are fished primarily by a modern industrial fleet. There is also a large artisanal fleet that has exclusive access rights to waters five miles from the coastline, providing employment and food for many coastal communities.

In 2007, Chile's fisheries and aquaculture production totaled 5.1 million tonnes, of which 82% came from wild fisheries. Aquaculture production was 904 000 tonnes in 2007, having grown at a rate of 9% a year over the previous decade. Chile exported 1.4 million tonnes of fish products in 2007 valued at USD 3.7 billion. Aquaculture exports accounted for 38% of the volume of total exports, but 65% of the value of exports.

The policy framework governing the Chilean fisheries and aquaculture sector has evolved considerably over the last fifty years. Governance of the industrial, artisanal and aquaculture industries has followed different paths of policy development and the current management regime reflects the particular challenges and policy pressures confronting each segment of the sector. This has been a lengthy and at times traumatic process, with issues of overinvestment, sharp declines in catch levels, disputes among stakeholders, fleet downsizing, and aquaculture diseases. The process of policy evolution continues with a range of initiatives designed to meet the current policy challenges.

Institutional framework

The institutional structure governing the fisheries and aquaculture sector centers around three key organisations, with a number of other institutions providing additional research and enforcement support (such as the Navy). These three organizations have a degree of operational independence while performing a crucial and interlinked function within the broad institutional

framework. First, the Undersecretariat of Fisheries (*Subsecretariat de Pesca*, or SSP) provides the policy settings and regulatory framework for the domestic management of the sector, as well as providing policy direction and input into international fisheries issues. It is nested within the Ministry of Economy and is based in Valparaiso. The mission of the Undersecretariat is to promote the sustainable development of the fisheries and aquaculture activity, defining policies and applying regulations that increase the social and economic benefits of the sector, in order to ensure the wellbeing of the present and future generations of the country.

Second, the management and enforcement of fisheries and aquaculture laws and regulations is undertaken by SERNAPESCA (*Servicio Nacional de Pesca*, or the National Fisheries Service). SERNAPESCA is also nested within the Ministry of Economy, but reports directly to the Minister of Economy rather than to the Undersecretary of Fisheries. SERNAPESCA's mission is to contribute to the sustainable development and the competitiveness of the domestic fisheries and aquaculture sectors by enforcing the compliance of fisheries, aquaculture, health and environmental regulations that govern the activity and officially ensure the safety of exported fisheries products. It is also based in Valparaiso.

Third, the research arm of the institutional framework is the Fisheries Development Institute (*Instituto de Fomento Pesquero*, or IFOP). This is a non-profit organisation created in 1964 under a joint agreement between the Chilean government, the FAO, and the UN Development Program. It is the primary source of scientific advice to the SSP on fisheries and aquaculture management issues, including the stock assessment and setting of total allowable catch levels for the wild fisheries, and the environmental and health aspects of aquaculture production. The mission of IFOP is to be the provider of scientific and technical advice for the regulation of fisheries and aquaculture and the conservation of hydrobiological resources and their ecosystems. It draws a proportion of its funds from SSP but also has to compete for funding from a range of public funding sources. Just as for the first two organisations, IFOP is based in Valparaiso.

Industrial fisheries management policy

The management regime for Chile's industrial fisheries industry has evolved from one based on open access to one based on total allowable catches and the use of market based instruments to allocate and trade quotas in most of the industrial fisheries. Different regimes are in place for fisheries that are over-exploited, under recovery or under development. Under the Maximum Catch Limit per Firm (MCLF) system, individual quota shares are allocated to firms and the quotas are tradable with the sale of the vessel

to which the quota is attached. This has provided a flexible operating environment for the industrial fishing sector, with firms able to self-adapt capacity and catching patterns to maximize profits. Landings in the industrial fisheries have largely stabilized and the economic performance of the fishing fleet is reported to have improved (although hard data on costs and earnings of the industrial fleet are not available).

There has been a substantial decline in capacity in the sector since the introduction of the MCLF, with reductions of between 43-97% in the number of vessels used in the fisheries to which the MCLF is applied. Fishing seasons have been extended, facilitating a more efficient use of on-shore processing facilities, and employees have more stable and better quality jobs. The government is also moving towards a multi-annual, rather than annual, management regime for the fisheries, as well as exploring the options for shifting to a multi-species and ecosystem approach to fisheries management rather than the single species management at present.

There remain a number of issues confronting the government in the future management of the industrial fishing sector. First, while there is 100% VMS coverage in the industrial fleet and the number of violations that have been prosecuted by the service has declined from 150-200 a year in the late 1990s to three-four a year now, there remains a need to further improve the monitoring and surveillance of catches. This is recognized by the government and an extra 250 staff will be recruited into SERNAPESCA in 2009, accompanied by a 22% increase in the budget.

Second, the MCLF was introduced with a time limit of 2012, generating a degree of uncertainty amongst the industry over the future value of their access rights. This undermines the effectiveness of the scheme to some extent and is likely to compromise the incentives for long term conservation of the resource base.

Third, Chile is becoming an increasingly important player in international fisheries in the South Pacific, particularly for jack mackerel. Adapting current management schemes to the new realities of high seas fishing, beyond the EEZ, and continuing to actively pursue the development and implementation of cooperative international agreements to sustainably manage and exploit these fisheries, is a major challenge.

Artisanal fisheries management

The artisanal fisheries, as in many other countries, present a greater management challenge due to the sheer numbers of fishers involved, the difficulties in enforcing regulations at a local level in a country with a very long coastline and many landing sites, and the high dependence on the

artisanal fishing industry by coastal communities with limited alternatives for food and income. Until recently, these fisheries had been traditionally managed under an open access system. While progress has been made towards a more restrictive entry regime with the introduction of the National Register of Artisanal Fishermen, the artisanal sector remains a regulated open access system, with a degree of control over the numbers of fishers, but less effective control over the effort that can be deployed in the sector.

Through effective political negotiation, the artisanal fisher organisations have obtained exclusive access rights over a five mile zone adjacent to the Chilean coastline, and have negotiated important shares of different fisheries that straddle this zone through the Artisanal Extraction System (AES). The AES has provided a higher degree of stability for artisanal fishers over access to resources, although the strength of the access right is open to question as it is very short term. However, the combination of regulated open access and exclusive access for the artisanal sector to the five mile zone has resulted in the heavy exploitation of a number of coastal fisheries. Further efforts are underway to develop policies to manage and control the artisanal sector, recognizing that this is a difficult and challenging policy problem that will require a broad range of policy tools to be brought to bear in a coherent package, include policies regarding social welfare, education, regional development and infrastructure, as well as fisheries management policies. Current studies by the SSP on the feasibility of extending the VMS system to cover vessels 12-18m in length will be important in moving towards more effective monitoring and control of the larger vessels within the artisanal fleet.

The introduction of an area-based cooperative, co-management scheme in the form of the Management Areas for the Exploitation of Benthic Resources (MAEBR) system has been an innovative development in the artisanal sector. Ten years after the introduction of the MAEBRs, the artisanal sector is still coming to terms with the system and the potential advantages, with the uptake varying considerably around the country depending on the local resource base and the strength of local fishers' organizations. Only in the case of 'loco' has there been a major use of MAEBRs. The recent decision to allow aquaculture activities within MAEBRs will help to make the scheme more flexible and attractive to coastal communities. However, a long term solution to the sustainable exploitation of benthic resources along the coastline employing this system will require further investment in capacity building and education on decentralized management concepts and practice within the coastal communities, coupled with regulatory and monitoring regimes that provide the appropriate incentives, accountability and sanctions.

Aquaculture policy

The aquaculture industry is likely to continue to be a major source of growth for the Chilean fisheries and aquaculture sector in the future. The aquaculture sector is managed through a system of site concessions that are transferable and negotiable, with owners paying annual license fees for the sites. There is in place a system of environmental regulations governing operational aspects such as carrying capacities of sites, effluents, escapements, zoning, and so on. SERNAPESCA is responsible for managing and enforcing regulations governing aquaculture.

In general, aquaculture policy to date has been driven by a pro-growth agenda and the resulting policy and management framework has largely developed in a reactive rather than a proactive manner. As the aquaculture boom progressed, the demand for sites and expanded facilities was very high and it can be argued that the pace of growth outstripped ability of the regulatory systems to effectively manage, monitor and control the sanitary and environmental impacts of the dynamic aquaculture industry. The outbreak of disease (ISA, Caligus sealice and SRS) in 2008 is having a major impact on the profitability and short-term prospects of many companies in the industry, and has brought into stark focus issues regarding site concessions, zoning, oversight of fish health, egg importation, transfer of live fish around the country, among other issues. The rapid growth also outstripped the capacity of the industry itself to organize and manage its operations effectively, and a strong industry focus on environmental management has only emerged in the last five years or so with the active development and implementation of voluntary industry codes of practice.

Considerable resources are now being devoted by the government and industry to addressing the disease issue in Chilean aquaculture and a number of policy initiatives indicate that Chile is shifting to a more proactive management mode for the industry. The development of the National Aquaculture Policy (NAP) in 2003 was a useful first step in articulating a new model for aquaculture. However, the disease crisis has been the catalyst that is likely to drive deeper governance and institutional changes in the industry. The establishment of the Salmon Round Table in April 2008 signalled the beginning of a major policy response to the salmon health issue. Chaired by a former Undersecretary of Fisheries and reporting direct to the President, the Salmon Round Table is examining a wide range of ambitious initiatives to strengthen aquaculture policy framework and institutions. A broad range of policy measures is being addressed, including regulations on egg importation, zoning of aquaculture operations (proximity between farms, stocking densities, etc.), improvements to laws governing aquaculture concessions, and measures to encourage operators and agencies to work together to improve coordination of environmental health. Public

discussion on the results and proposals of the Salmon Round Table are expected to be take place in 2009-2010.

Financial support programs

One of the distinguishing features of Chile's fisheries and aquaculture policy framework is the lack of extensive government programs providing direct financial payments to the sector. Financial support to the sector consists primarily of general services transfers covering expenditures on management, research and enforcement services. Preliminary estimates of government financial transfers (GFTs) for 2007 indicate that Chilean government spent around CLP 33.5 billion (equivalent to USD 40 million) on general services in that year. These transfers are for services provided by the SERNAPESCA and IFOP. Chile provides a small amount of direct payments to support artisanal fishers (providing social aid, retraining and conversion of displaced fishers), totaling CLP 12.8 million in 2007. No cost-reducing transfers are provided to companies or individual fishers. In the case of capacity reduction, Chile relies on market mechanisms and the MCLF fisheries management regime to achieve fleet rationalization and does not employ vessel decommissioning subsidies.

International co-operation

Chile is an active member in many of the international forums and agreements governing fisheries and the oceans. Indeed, Chile was in the vanguard of the movement to extend the EEZ out to 200 nautical miles, being one of the original signatories of the 1952 Declaration of Santiago on Maritime Zone (*Declaración de Santiago sobre Zona Marítima*) in which Chile, Peru and Equador proclaimed their exclusive sovereignty and jurisdiction over the waters 200 miles from their coastlines. Chile has ratified most of the major treaties and conventions that relate to international fisheries and oceans policy and governance. The notable exception is the UN Fish Stocks Agreement (UNFSA or the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and High Migratory Fish Stocks). The UNFSA is the implementing framework for the operation of regional fisheries management organisations (RFMOs) and the management of international fisheries, and Chile is yet to sign or ratify this agreement.

Chile is also participating in an initiative with Australia and New Zealand to form a new RFMO (the South Pacific RFMO, or SPRFMO) aimed at managing unregulated fishing effort in areas adjacent to the

Chilean EEZ and in the South Pacific, where Chilean interests are mainly focused on the straddling jack mackerel fishery. Negotiations began in 2006 and there are now over 20 states, as well as IGOs and NGOs, engaged in the process. The SPRFMO has yet to come into force.

Chart 1. Map of Chile and its Regions



Region	Region's name
XV	**ARICA Y PARINACOTA**
I	**TARAPACÁ**
II	**ANTOFAGASTA**
III	**ATACAMA**
IV	**COQUIMBO**
V	**VALPARAÍSO**
RM	**METROPOLITANA DE SANTIAGO**
VI	**LIBERTADOR General BERNARDO O'HIGGINS**
VII	**MAULE**
VIII	**BIOBÍO**
IX	**ARAUCANÍA**
XIV	**LOS RÍOS**
X	**LOS LAGOS**
XI	**AYSÉN**
XII	**MAGALLANES Y DE LA ANTÁRTICA CHILENA**

Up to recently, Chile had only 13 Regions, from the first to the 12th, plus a Metropolitan Region. As from 2007, the first was split into first and 15th and the 10th was split into the 10th and 14th.

CHAPTER 1

Introduction

Chile has experienced significant changes in its fishing and aquaculture activities over the past fifty years and has become a major world player; In 2006, Chile was ranked fifth in terms of production from capture fisheries behind China, Peru, the US, and Indonesia. It is the seventh largest producer of aquaculture products behind China, India, Vietnam, Thailand, Indonesia and Bangladesh. Chile is also a major player in terms of world trade, being the seventh largest exporter behind China, Norway, Thailand, the US, Denmark and Canada.

Chile has been through an intense, challenging and complex learning process which is reflected in the evolution of its policies and management systems governing the sector. The Chilean State has been one of the main forces behind the evolution of the sector, laying the foundation for a strong and robust sector. The last 50 years has seen a number of significant resource crises and the strong institutional foundations have helped the sector weather these crises and continue to go from strength to strength.

There are, however, a number of issues that still confront the sector. For example, there are ongoing concerns over disease in the salmon aquaculture industry. There are also challenges confronting the management of the small-scale sector that need to be addressed. Issues such as these will test the robustness and adaptability of both the industry itself, as well as the institutional structures governing the sector. In aquaculture, problems related to zoning, spreading of diseases and environmental sustainability, among others, are still being addressed, while in artisanal fisheries, current policies have not as yet successfully dealt with overexploitation or provided work stability to coastal populations.

This report provides an overview of the Chilean fisheries and aquaculture sector as background to the Committee for Fisheries' consideration of the accession of Chile to the OECD. The information in the report will assist the Committee's deliberations concerning the extent to which Chile's policies in the area of fisheries and aquaculture conform to OECD principles and practices. The next chapter in the report provides background on the Chilean fisheries and aquaculture sector, focusing on the production structure, trade patterns, fleet structure and employment. Chapter 3 provides an overview of the institutional framework governing fisheries and aquaculture and describes the key institutions that govern the sector. Chapter 4 reviews the evolution of the fisheries, together with details of the government financial transfers to the sector. The scientific and research support provided for management and enforcement is described in Chapter 5, while Chile's participation in international fisheries and oceans-related agreements is discussed in Chapter 6.

CHAPTER 2

An overview of the Chilean fisheries and aquaculture sector

Chile's territories are located in continental South America, on the Antarctic, in Oceania, and in the Pacific Ocean. Its continental coastline stretches 4 337 km (measured on a straight line), while its Exclusive Economic Zone (EEZ) totals almost 2.8 million km^2. In the Chilean wild capture fisheries, the most abundant species are the pelagic species of jack mackerel, sardine, anchovy and "caballa" mackerel. Salmon and trout farming dominate in aquaculture production. In 2005-2006 a total of 156 species were recorded as having been landed, comprising 75 fish species, 35 mollusk species, 25 crustacean species, 18 species of algae, and three other species).

Commercial fisheries started their development in the early 1960s when significant investments were made to install large fish meal processing lines in the northern part of the country. These were aimed at processing the large catches of anchovy and sardine available close by, caught through a large number of purse seiners built and bought specifically for these purposes. This was followed by the exploitation of hake, cold water shrimp and prawn in successive decades. The variability of pelagic fisheries along the Chilean coastline also influenced further development of fish meal production in central and southern areas, this time mainly based on jack mackerel, together with the production of canned products.[1]

The 1980s saw the start and rapid growth of the Chilean aquaculture industry, mainly based on salmon and trout (although it has begun expanding into other species in recent years). This growth has transformed Chilean fishing activities to the point that, in 2007, aquaculture accounts for 65% of total fish export values, based on only 17.9% of the volumes landed and 38% of the volumes exported. This growth has shifted the focus of policy, investment and development in fisheries, to the point that aquaculture is increasingly becoming the center of attention.

During this decade, environmental and biological fluctuations have also meant that a significant part of local pelagic catches (jack mackerel and "caballa"mackerel) are currently obtained beyond the EEZ, where Chile competes for these resources with several foreign fishing fleets. Chile is also actively involved in the catching of several demersal fish and other species in Southern and Antarctic waters, operating several factory vessels which are the property of local companies, owned by foreigners, but already well established in Chile.

The Chilean fishing industry (including aquaculture) has been modeled for decades on the concept that, having a small local population and ample fishery (and aquaculture) resources, it should have a strong export orientation. This has meant that local factories and production facilities have been designed to produce high quality fishery products, acceptable in the most demanding markets. They generally use very big processing lines, which because of their size and technology can be very efficient, taking advantage of economies of scale, both in investments and costs. This has been supported by the fact that national policies have favored market oriented and open economic policies and have reinforced the viability and long-term stability of export oriented Chilean fishing and aquaculture activities.

Following initial rapid growth, industrial fishing activities, the most voluminous of all on the Chilean scene, have leveled off during the last decade, following a severe collapse between 1994 and 1998. For the most part, they are export oriented. In contrast, artisanal fishers primarily supply the internal market with fish and shellfish that are generally available in small quantities and sold fresh. At the same time, some parts of the small-scale sector also supply several industrial processors on a regular basis, and are responsible for delivering fresh (and live) fish and shellfish to exporters that specialize in trading quality fish products. Artisanal landings have evolved considerably during the last decade, nearly doubling their volumes since 1996.

Small-scale aquaculture is mainly centered on the production of molluscs, algae and trout, and has not been as successful. Even so, this economic activity is currently regarded as an opportunity for further growth, particularly due to its potential to attract and convert artisanal fishers, some of whom are adversely affected by the growing resource scarcity and overexploitation in several coastal fisheries. Industrial scale aquaculture, in turn, has been extremely successful during the last two decades, growing at about 40% a year between 1986-87 and 1996-97, and thereafter (1996-97–2006-07) at 10% a year . However, there is concern that the original monoculture-producer model is quickly being exhausted, and the government's Salmon Round Table initiative is intended to reinvigorate the

industry, including exploring how to expand the range of species farmed in the future.

In terms of the status of the resource stocks, most natural resources fished today in Chile are either fully exploited or overexploited. As a result, no substantial growth is expected in the future for wild caught fishery products from traditional species. There is potential to develop fishing activities for non-conventional species, both in Southern or Antarctic waters (krill; cephalopods, etc.) and beyond the EEZ, where the Chilean fishing fleet has already gained experience.

Fisheries and aquaculture production

Total fisheries and aquaculture production reached a peak of 8 million tonnes in 1994, followed by a severe decline to 3.8 million tonnes in 1998. Annual production since then has stabilized to between 4.7 and 6 million tonnes, and has been characterized by a growth in aquaculture production (Table 2.1 and Figure 2.1). Aquaculture represented around 18% of total production in 2007.

Figure 2.1. Total fisheries and aquaculture production

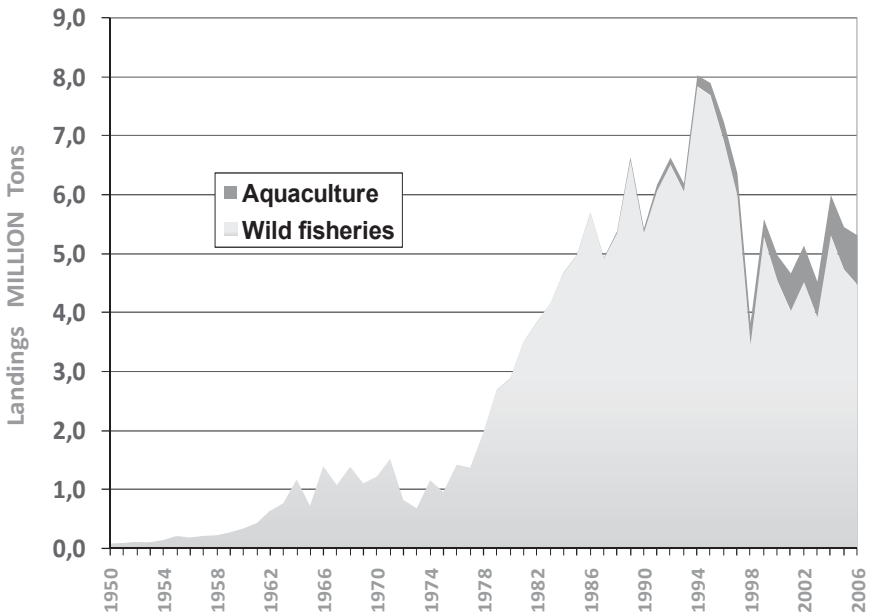


Table 2.1 Fisheries and aquaculture production, 1984-2007

Year	Total landings						Aquaculture				
	Fish	Mol-lusks	Crusta-ceans	Algae	other	total	Fish	Mol-lusks	Algae	other	total
1984	4 363	89	29	175	19	**4.674**	0	1	7	-	**9**
1985	4.660	89	21	182	34	**4.987**	1	1	5	-	**7**
1986	5.415	100	26	124	30	**5.696**	2	2	5	-	**10**
1987	4.647	108	31	117	29	**4.932**	3	2	9	-	**14**
1988	5.028	121	33	166	27	**5.375**	5	4	23	-	**32**
1989	6.291	110	24	178	29	**6.633**	12	4	36	-	**52**
1990	5.043	106	27	229	20	**5.424**	29	4	38	-	**71**
1991	5.830	122	29	160	26	**6.166**	42	5	58	-	**105**
1992	6.304	135	30	127	33	**6.628**	62	6	48	-	**116**
1993	5.864	110	26	156	35	**6.191**	77	9	49	-	**135**
1994	7.660	105	31	183	43	**8.021**	102	16	66	-	**184**
1995	7.411	91	31	299	58	**7.890**	141	16	49	-	**206**
1996	6.726	96	33	322	56	**7.233**	199	19	105	-	**323**
1997	5.905	93	37	282	49	**6.366**	248	24	103	-	**375**
1998	3.362	109	39	266	47	**3.824**	260	33	68	-	**361**
1999	5.118	110	39	261	58	**5.587**	231	44	31	0	**305**
2000	4.486	110	37	281	58	**4.972**	343	49	33	0	**425**
2001	4.151	138	26	300	48	**4.663**	505	61	66	-	**632**
2002	4.621	111	24	316	61	**5.133**	483	63	72	-	**617**
2003	3.971	145	19	349	44	**4.528**	489	79	40	0	**607**
2004	5.176	356	20	411	51	**6.014**	569	107	20	0	**696**
2005	4.531	460	23	425	39	**5.478**	614	109	15	-	**739**
2006	4.443	457	22	339	36	**5.298**	648	150	38	-	**836**
2007 P	4.232	397	22	360	36	**5.047**	664	216	23	-	**904**

Source : SERNAPESCA, *Anuarios Estadísticos*, Various volumes 2007P: Preliminary only

Table 2.1 Fisheries and aquaculture production, 1984-2007 (cont.)

	Wild Fisheries						% of Totals	
Year	Fish	Mollusks	Crusta-ceans	Algae	Other	TOTAL	Aqua-culture	Wild fisheries
1984	4 363	87	29	168	19	**4 665**	0.2	99.8
1985	4 659	88	21	177	34	**4 979**	0.2	99.8
1986	5 413	98	26	119	30	**5 686**	0.2	99.8
1987	4 644	106	31	108	29	**4 918**	0.3	99.7
1988	5 022	117	33	143	27	**5 342**	0.6	99.4
1989	6 279	107	24	142	29	**6 581**	0.8	99.2
1990	5 014	102	27	191	20	**5 354**	1.3	98.7
1991	5 787	117	29	102	26	**6 061**	1.7	98.3
1992	6 241	128	30	79	33	**6 512**	1.8	98.2
1993	5 786	101	26	107	35	**6 056**	2.2	97.8
1994	7 558	89	31	117	43	**7 837**	2.3	97.7
1995	7 270	75	31	250	58	**7 684**	2.6	91.5
1996	6 526	77	33	217	56	**6 910**	4.5	86.5
1997	5 656	69	37	179	49	**5 990**	5.9	88.0
1998	3 103	76	39	197	47	**3 463**	9.5	86.6
1999	4 887	67	39	230	58	**5 282**	5.5	88.4
2000	3 916	350	23	410	39	**4 738**	13.5	86.5
2001	3 795	307	22	301	36	**4 462**	15.8	84.2
2002	3 567	181	22	336	36	**4 143**	17.9	82.1
2003	3 482	67	19	309	44	**3 921**	13.4	86.6
2004	4 607	249	20	391	51	**5 317**	11.6	88.4
2005	3 916	350	23	410	39	**4 738**	13.5	86.5
2006	3 795	307	22	301	36	**4 462**	15.8	84.2
2007 P	3 567	181	22	336	36	**4 143**	17.9	82.1

Various volumes 2007P: Preliminary only

Source: SERNAPESCA, *Anuarios Estadísticos*,

About 84% of wild landings in 2005-2006 correspond to fish (Table 2.2). An extra 8% are algae, while 7% correspond to mollusks. 'Other species', even though meaning only 0.8% in volume terms, have a high unit value (sea urchin('erizo'), sea cucumber('pepino de mar'), while crustaceans (0.5%) are also limited in availability, but show as well high market prices (cold water shrimp; Chilean king crab ('centolla'); other crabs ('jaibas'), etc.).

Table 2.2. Wild capture fisheries production, 2005-06

Species		2005	2006	Average landing 2005-2006	% of Total 2005-2006	% Accumulated
Ranking	**TOTAL FISH**	**3 916.1**	**3795.3**	**3 855.7**	**100**	
1	JUREL	1 430.4	1.379.9	1 405.2	36.4	36.4
2	ANCHOVETA	1 548.8	995 2	1 272.0	33	69.4
3	SARDINA COMUN	289 5	440 1	364 8	9.5	78.9
4	CABALLA	280 8	368 8	324 8	8.4	87.3
5	BACALADILLO O MOTE	110 4	319 5	214 9	5.6	92.9
6	MERLUZA DE COLA	79.8	73.4	76.6	2	94.9
7	MERLUZA COMUN	47.4	48.0	47.7	1.2	96.1
8	MERLUZA DEL SUR	31.5	31.5	31.5	0.8	96.9
9	MERLUZA DE TRES ALETAS	25.4	29.1	27.3	0.7	97.6
10	SARDINA AUSTRAL	-	39.5	19.8	0.5	98.2
11	Other (65 species)	72.1	70.2	71.2	1.8	100
Ranking	**TOTAL MOLLUSCS**	**350 4**	**307 1**	**328 8**	**100**	
1	JIBIA	297,0	251.0	274,0	83.3	83.3
2	ALMEJA	14.1	13.9	14,0	4.3	87.6
3	TAQUILLA	7.0	5.3	6.1	1.9	89.5
4	JULIANA O TAWERA	2.9	6.3	4.6	1.4	90.9
5	NAVAJUELA	3.9	5.2	4.5	1.4	92.2
6	HUEPO O NAVAJA DE MAR	4.5	4.2	4.3	1.3	93.6
7	LOCO	3.3	3.9	3.6	1.1	94.7
8	CULENGUE	2.4	3.8	3.1	0.9	95.6
9	PULPO	2.6	2.8	2.7	0.8	96.4
10	CHOLGA	1.7	3.1	2.4	0.7	97.2
11	Other (25 species)	11.1	7.6	9.4	2.8	100
Ranking	**TOTAL CRUSTACEANS**	**22.9**	**22.3**	**22.6**	**100**	
1	JAIBA MARMOLA	4.6	5.1	4.8	21.4	21.4
2	CAMARON NAILON	3.9	4.5	4.2	18.5	39.9
3	CENTOLLON	5.7	2.3	4.0	17.7	57.6
4	CENTOLLA	3.2	4.1	3.7	16.2	73.9
5	LANGOSTINO AMARILLO	3.0	4.2	3.6	15.9	89.8
6	LANGOSTINO COLORADO	1.1	1.0	1.1	4.7	94.5
7	PICOROCO	0.3	0.2	0.2	1	95.5
8	GAMBA	0.3	0.2	0.2	1	96.5
9	JAIBA PELUDA O PACHONA	0.2	0.2	0.2	0.7	97.2
10	JAIBA	0.2	0.1	0.1	0.6	97.8
11	Other (15 species)	0.5	0.5	0.5	2.2	100

Table 2. Wild capture fisheries production, 2005-06 (*cont*)

Species		2005	2006	Average landing 2005-2006	% of Total 2005-2006	% Accumulated
Ranking	**TOTAL ALGAE**	**409.9**	**301.1**	**355.5**	**100**	
1	CHASCON	203.9	161.8	182.9	51.4	51.4
2	PELILLO	72.9	43.8	58.3	16.4	67.8
3	LUGA-ROJA	42.5	33.3	37.9	10.7	78.5
4	HUIRO PALO	46.9	27.6	37.2	10.5	89.0
5	LUGA NEGRA O CRESPA	24.9	17.1	21.0	5.9	94.9
6	HUIRO	8.8	9.3	9.1	2.5	97.5
7	LUGA CUCHARA O CORTA	4.9	3.7	4.3	1.2	98.7
8	COCHAYUYO	2.6	2.3	2.4	0.7	99.4
9	SPIRULINA	-	-	-	-	99.4
10	CHICOREA DE MAR	1.5	1.6	1.6	0.4	99.8
11	Other (8 species)	0.9	0.6	0.7	0.2	100.0
Ranking	**TOTAL OTHER SPECIES**	**38.9**	**36.1**	**37.5**	**100**	
1	ERIZO	37.6	34.8	36.2	96.5	96.5
2	PIURE	1.2	1.2	1.2	3.2	99.8
3	PEPINO DE MAR	0.2	0.0	0.1	0.2	100

Source: SERNAPESCA, *Anuarios Estadísticos* 2005 and 2006, and calculations/estimates of the study

Wild fish production is highly concentrated on a few pelagic species (87% on jack mackerel, anchovy, sardine and 'caballa' mackerel)[2], which supply well organized and efficient fish meal-oil and canned production, both in Northern and Central Chile. Smaller proportions of these pelagic catches are also transformed into frozen and other products.

In recent years the availability of wild mollusk has been highly dependent on jumbo squid landings ('jibia'), which arrived in unexpectedly high quantities to the Chilean coast, followed by two different clams, gastropods and mussels. Again, the top three species (among 35 available) represent about 90% of this category (2005-2006). In turn, crustaceans (25 species) are available in smaller quantities, led by various crabs ('jaibas'), cold water shrimp and the valuable Chilean king and snow crabs. The most important five species account for 90% of the total wild catches. Eighteen species of algae are also exploited, with the most important four accounting for 89% of whatever is landed throughout the country. High priced sea urchins and sea cucumbers account for most part of 'other' wild species in 2005 and 2006.

Chile's aquaculture industry is dominated by salmon and trout (primarily Atlantic salmon), although mollusk production (mussels and scallops) has been increasing rapidly in recent years (Table 2.3). From the early 1990s Chile also started to work on the farming of abalones and turbot, becoming the first nation to do so in Latin America and one of the few that

commercially farm marine species in-land in this part of the world. The aquaculture industry now produces over 16 different species.

Table 2.3. Aquaculture production, 1981-2007

Year	Salmon and trout	Other Fishes	Total Fish	Algae	Molluscs	Crustaceans	Other species	Total
1981	-	-	-	-	0.7	-	-	0.7
1985	1.1	-	1.1	4 9	1,5	0	-	7.5
1990	28.8	-	28 8	38 0	3,8	-	-	70 7
1991	42.5	-	42 5	57 7	5,1	-	-	105 3
1992	62.2	-	62 2	47 8	6,3	-	-	116 3
1993	77,4	-	77 5	48 6	9,0	-	-	135 1
1994	101 9	-	101 9	65 8	16,0	-	-	183 7
1995	141 4	-	141 4	49 2	15,7	-	-	206 3
1996	199 1	-	199 3	105 2	18,7	-	-	323 1
1997	248 0	-	248 2	102 8	24,1	-	-	375 1
1998	259 2	0.4	259 7	68 4	33,4	-	-	361 4
1999	230 2	0.3	230 5	31 3	43,7	-	0	305 5
2000	342 4	0.3	342 7	33 5	48,9	-	0	425 1
2001	504 4	0.3	504 7	65 5	61,4	-	-	631 6
2002	482 4	0.3	482 7	71 6	62,9	-	-	617 3
2003	488 2	0.4	488 7	40 0	78,6	-	0	607 2
2004	569 1	0.3	569 4	20 3	106 6	-	0	696 3
2005	614 1	0.3	614 4	15 5	109 4	-	-	739 4
2006	647 3	0.3	647 6	38 2	149 9	-	-	835 7
2007P	664 2	0.3	664 5	23 5	216 1	-	0	904

Source :SERNAPESCA, *Anuarios Estadísticos*, various volumes. Figures for 2007 are preliminary only.

In summary, the Chilean fisheries and aquaculture sector has grown substantially in recent years, and ranks among the major fishing and aquaculture nations in the world. As detailed in a subsequent chapter, the management regimes fisheries and aquaculture have evolved significantly, particularly with respect to the industrial fisheries. However, there is scope for further improvements in the management policies governing aquaculture and small-scale fisheries.

Processing

Fishery products, caught in the wild or farmed, are either processed, consumed fresh within the country or exported. The relatively small domestic market means that a high proportion of production is exported, and a significant portion of exports are processed to some degree. The number of processing facilities along the country has remained fairly stable between 2003-2007, with a slight increase in the number of facilities in both

Northern and Southern Chile (Table 2.4). Most of the processing facilities focus primarily on fresh and frozen products, while there are also a number of fish meal and canning processing lines.

Table 2.4. Number of fish processing plants by geographic area, 2003-07

Year	North	Center	South	Extreme South	Total
2003	115	50	222	54	441
2004	122	54	231	59	466
2005	138	54	240	56	488
2006	154	45	226	56	481
2007	147	49	240	48	484

Anuarios Estadísticos, various volumes. North: Regions I to IV, plus XV. Center: Regions Vth to VIIth, plus Metropolitan Region. South: Regions VIII to X plus Region XIV. Extreme South: Regions XI and XII

Source: SERNAPESCA

The production of fish meal and oil dominates the processing sector, absorbing 60% of all raw materials in 2006 and accounting for 51% of the end products (Table 2.5). This share has been declining in recent years as fresh and frozen products have become relatively more significant. In terms of end products, frozen products accounted for 27% of the volume produced in 2006, up from 22% in 2004, while the proportion for fresh products increased from 8% to 14% over the same period.

The growth in aquaculture production has been one of the driving forces behind the development of new and bigger industrial processing facilities, particularly in Regions X to XII in Southern Chile. Chile exports the majority of its salmon/trout production as value added products that are, in many cases portioned, packed and labeled and ready to be sold in supermarket chains in importing destinations. Chile is the major supplier of fresh and frozen salmon and trout fillets, steaks and portions for the US and Japanese markets. In recent years, the rapid growth in the farmed production of mussels has prompted the establishment of a number of highly mechanized and high-tech processing facilities in or near Puerto Montt and Chiloé Island (Xth Region), with the capacity to handle around 350 000-400 000 tonnes of raw mussels per year.

Table 2.5. Raw materials processed and end products, 2004-06

	Year	Fresh	Frozen	Canned	Salted dried, etc.	Algue-Algue products	Fish meal	Fish oil	other	Total
Raw materials										
Total thousand tonnes	2004	264.5	843.6	357.6	11	407.3	3 871.6	-	5.4	5 760.8
	2005	298.4	871.9	343.2	10.7	423.2	3 317	-	5.2	5 269.6
	2006	319.8	942.9	437.1	3.1	335.5	3 075	-	-	5 113.4
% of Totals	2004	4.6	14.6	6.2	0.2	7.1	67.2	-	0.1	100
	2005	5.7	16.5	6.5	0.2	8	62.9	-	0.1	100
	2006	6.3	18.4	8.5	0.1	6.6	60.1	-	-	100
End products										
Total thousand tonnes	2004	161.8	433.9	116.2	6.3	50.6	1 015.6	195.3	1.9	1 981.7
	2005	199	469.1	109.2	5.8	56.1	865.8	168.9	2.4	1 876.3
	2006	243.5	462.4	85.9	1.4	48.4	707.5	180.2	-	1 729.3
% of Totals	2004	8.2	21.9	5.9	0.3	2.6	51.2	9.9	0.1	100
	2005	10.6	25	5.8	0.3	3	46.1	9	0.1	100
	2006	14.1	26.7	5	0.1	2.8	40.9	10.4	-	100

Raw materials used for these calculations do not include re-processing nor fishery products caught by factory vessels in Chilean nor in international waters. Therefore, total raw material figures differ for those for landings presented elsewhere.
Source: SERNAPESCA, Anuarios Estadísticos, various volumes

Local fish meal plants are also among the biggest and most efficient in the world, permitting Chile to produce high quality, highly digestible fish meals, with substantial protein content. This allows Chilean producers to obtain good prices for these products in the international market. The same applies to fish oils which are extensively used in fish diets for aquaculture operations. Formerly the most important fishery exports of Chile, fishmeal and fish oil are currently mass-consumed by local salmon farmers, who demand around a million tonnes a year of balanced food for farmed fish diets. These balanced diets use a good proportion of fish meal and oil and are basically produced by five industrial facilities which are among the largest and most efficient in the world.

Between 1996 and 2006, local fish meal and fish oil production have diminished substantially, in response to severe declines in the most important pelagic fisheries, particularly that of jack mackerel. In that period, fish meal production declined from 1.4 million tonnes (1996), to 0.7 million tonnes (2006), while fish oil production reached 0.18 million tonnes in 2006, after an impressive 0.29 million tonnes in 1996.

In addition, Chile is a large producer of canned pelagic fish, particularly jack mackerel, which is consumed in Chile as well as exported. Beyond these main product lines, the country produces Chilean king crab ('centolla'), which is currently exploited in reasonable amounts in the Magellan (XIIth) Region, and exported either frozen or canned. In addition, the country produces a substantial amount of farmed scallops that are exported (primarily frozen) to the French market. Chile is also a major producer and exporter of algae, both wild and farmed, as well as different chemical derivatives, such as agar-agar and carrageenan.

International Trade

Chile's fisheries and aquaculture development has been strongly linked to foreign demand for fishery products. Limited local consumption means that the future of this industry is intrinsically linked to the international demand for fish products, in particular those produced by Chile.

In 2007, Chilean fishery exports amounted to 1.41 million tonnes and USD 3 827 million. This accounted for 5.7% of the value of all Chilean exports. These figures have varied rather widely during the last twenty years or so, as shown in Table 2.6, where all monetary values are expressed in 2006 USD to facilitate comparison. The primary export markets are Japan (USD 850 million), the United States (USD 741 million), China (USD 228 million), Spain (USD 167 million), and Germany (USD 154 million).

Over the last fifteen years (1992-2007), the volume of exports from wild capture fisheries has diminished at an average annual rate of 2.7%, and the value has also decreased at an average of 0.7% a year. In contrast, aquaculture-based export volumes have grown at an average annual rate of 16.7%, while the export value has increased by 12.4% a year[3]. As a result, aquaculture products accounted for 65.2% of total fishery exports in 2007, compared with 22.8% in 2002. Similarly, the share of aquaculture exports in the total value of exports has increased from 3.9% to 38.2% over the same period.

It is worth noting that the average annual unit values for aquaculture exports have decreased over the years, from USD 7.80 to USD 4.40 between 1990 and 2007, while those based on wild fish have shown a slightly increasing trend during the same period (Figure 2.2). While this trend is consistent with the global aquaculture sector[4], it has presented the Chilean aquaculture industry with significant challenges. Chilean fish farmers not only grew substantially in size during the last 25 years, but they did so while also improving their technology and productivity to the point that nowadays, notwithstanding some unresolved problems, Chilean salmon farms are probably among the most efficient in the world.[5]

Even though Chile is one of the most important manufacturers of fish meal in the world, over 80% of its fishery export values (and around 55% of its volumes) are comprised of products for direct human consumption (Table 2.6). Over 66% of export values of products intended for human consumption is accounted for by frozen products, and 24% by fresh products, particularly salmon sold in the US market. Average export prices for fishery products for direct human consumption practically quadruple those for fish meal, and are about 50% higher than those for algae.

Table 2.6. Chilean exports of fishery products, 1990-2007

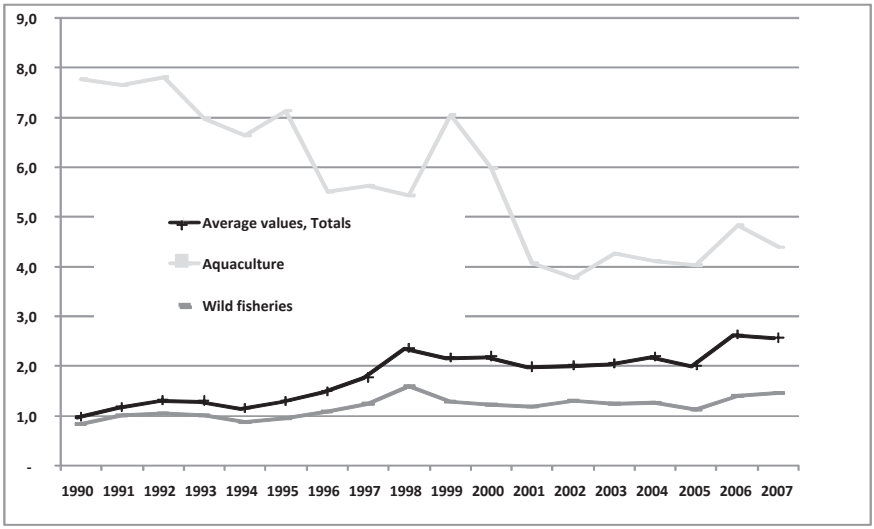
Year	Total fishery exports		Aquaculture		Wild fisheries		Avrg. values*Kilo, USD 2006			Aquaculture/ Totals(%)	
	Thousand tonnes	Million USD 2006	Thousand tonnes	Million USD 2006	Thousand tonnes	Million USD 2006	Total	Aqua culture	Wild fisheries	Volumes	Values
1990	1 299	1 298	28	219	1 271	1 080	1.0	7.8	0.8	2.2	16.8
1991	1 326	1 582	36	273	1 290	1 310	1.2	7.7	1.0	2.7	17.2
1992	1 370	1 819	53	414	1 317	1 405	1.3	7.8	1.1	3.9	22.8
1993	1 233	1 623	61	426	1 172	1 197	1.3	7.0	1.0	5.0	26.3
1994	1 602	1 869	78	522	1 524	1 347	1.2	6.7	0.9	4.9	27.9
1995	1 792	2 354	100	714	1 692	1 640	1.3	7.1	1.0	5.6	30.3
1996	1 521	2 286	140	771	1 381	1 515	1.5	5.5	1.1	9.2	33.7
1997	1 352	2 416	165	929	1 187	1 487	1.8	5.6	1.3	12.2	38.4
1998	932	2 217	189	1 030	743	1 187	2.4	5.4	1.6	20.3	46.5
1999	1 072	2 341	166	1 172	906	1 169	2.2	7.1	1.3	15.5	50.1
2000	1 053	2 326	218	1 303	835	1 023	2.2	6.0	1.2	20.7	56.0
2001	1 142	2 284	317	1 293	825	991	2.0	4.1	1.2	27.7	56.6
2002	1 212	2 462	350	1 326	863	1 136	2.0	3.8	1.3	28.8	53.9
2003	1 293	2 680	352	1 503	941	1 177	2.1	4.3	1.3	27.2	56.1
2004	1 313	2 895	431	1 775	882	1 120	2.2	4.1	1.3	32.8	61.3
2005	1 591	3 223	487	1 974	1 104	1 248	2.0	4.1	1.1	30.6	61.3
2006	1 391	3 683	500	2 427	891	1 256	2.6	4.9	1.4	36.0	65.9
2007	1 413	3 652	540	2 379	873	1 272	2.6	4.4	1.5	38.2	65.2
Average means cumulative annual rates of variations for each period (%)											
1992-2007	0.2	4.8	16.7	12.4	-2.7	-0.7					
2002-2007	3.1	8.2	9.1	12.4	0.2	2.3					
1997-2002	-2.2	0.4	16.2	7.4	-6.2	-5.3					
1992-1997	-0.3	5.8	25.5	17.5	-2.1	1.1					

Figures corresponding to wild fisheries, calculated deducting aquaculture from total values. All values are in 2006 USD, using the US PPI for all commodities as deflator.

Source: Total exports and aquaculture exports for 2003-2007: Undersecretariat of Fisheries, *Informes Sectoriales*, various volumes. Aquaculture figures for 1990-2002: Fisheries Development Institute .Corrected figures based on original Customs data for the period.

Figure 2.2. Average unit export prices, 1990-2007

(Average prices, 2006 USD per kilo)



Source: SERNAPESCA, *Anuarios Estadísticos*, various volumes

Production structure

Chile's fisheries sector consists of three broad groups: the industrial sector; small-scale or artisanal fishers, including small-scale fish farmers; and aquaculture.

In Chilean terms, artisanal activities are those carried out directly and on a habitual manner by artisanal fishers duly registered in SERNAPESCA's National Registry for Artisanal Fishermen (NRAF) (*Registro Pesquero Artesanal*). They also comprise fishing by fishers' organizations composed only by artisanal fishers. In addition, artisanal activities refer to landings from vessels under 18 meters, with a hold capacity not over 80 m^3 and with a gross registry tonnage not exceeding 50 GRT.[6]

Industrial fishing activities, in turn, are those carried out by individuals or legal persons registered in the National Registry for Industrial Fisheries (NRAF), normally owning bigger fishing vessels and generally associated with processing facilities in land. This category includes factory vessels, for which specific regulations apply. They might either work in the Chilean EEZ or in international waters.

Chilean legislation defines aquaculture as a human activity aiming at the production of living aquatic resources. All parties involved in farming activities also have to register on the National Registry for Aquaculture Concessions and Authorizations (NRACA).

Data from FAO[7] indicate that direct employment in fisheries and aquaculture for 2004 amounted to 118 500 persons, 75 900 of which are related to primary activities, while the rest are engaged in processing. In this second category, 40% of those employed were female workers.

A more recent appraisal by the Undersecretary of Fisheries[8] establishes that direct employment in the fisheries and aquaculture sector at the end of 2007 could be as high as 141 000 individuals, composed of 1 900 industrial fishers; 65 596 artisanal fishers and other small-scale operators; 43 000 laborers in processing plants, and 27 000 in fish farming activities. At least, 30 000 of these posts were assigned to female workers, representing 21% of total employment.

In their 2007 Annual Report, the National Fisheries Association (*Sociedad Nacional de Pesca* or SONAPESCA) estimated that direct and indirect employment generated by fisheries and aquaculture in Chile could well be around 375 000 jobs, of which, over 285 000 are accounted for by the industrial sector. If this is the case, and assuming that an average Chilean family is composed of 3.6 members, it can be inferred that around 1.35 million inhabitants are 'connected' with fisheries or aquaculture in Chile, or about 8% of the total population.[9]

Artisanal sector

At the end of 2007, the NRAF had over 15 000 boats registered and a total of approximately 65 600 fishers and farmers[10]. The South and Extreme South Regions are the areas where the bulk of the fleet capacity exists, reflecting the availability of coastal fishery resources (Table 2.7). Small-scale fishers tend to operate with relatively simple craft (71% of the artisanal fleet), with bigger units less abundant. Table 2.8 provides a breakdown of artisanal fishers by occupation and gender.

Table 2.7. Exports of fishery products, by type of product, 2003-2007

	2006 USD Million					Tonnes				
	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
Human consumption	**2 116.4**	**2 380.4**	**2 595.3**	**2 996.7**	**2 952.8**	**613 921**	**713 388**	**783 046**	**759 971**	**792 777**
Fresh	587.4	557.7	558.7	657.2	697.8	125 190	125.333	126 145	106.037	116.922
Frozen	1 273.2	1 542.4	1 747.1	2 049.6	1 959.4	396 673	483.689	544 425	552.239	574.203
Canned	181.8	191.5	198.9	197.8	213.4	81 014	91.739	100 156	90.135	92.694
Smoked	36.8	49.6	60.7	70.0	70.7	3 529	5 192	6 261	6.951	6.682
Dried,salted, etc.	37.2	39.2	29.9	22.2	11.6	7 515	7 434	6 059	4.609	2.276
Meals and oils	**458.0**	**406.7**	**509.1**	**558.9**	**565.1**	**628.450**	**548.044**	**753.425**	**581.635**	**560.385**
Fish meal	444.9	385.6	479.3	515.0	514.4	609.274	519.143	708.907	519.498	488.397
Fish oil	13.1	21.1	29.8	43.9	50.7	19.176	28.901	44.518	62.137	71.988
Algae products	**104.4**	**106.3**	**116.9**	**125.5**	**131.9**	**50.635**	**51.626**	**54.402**	**49.216**	**60.018**
Dried algae	31.4	33.5	36.6	32.5	38.4	44.038	44.563	46.889	41.401	51.788
Agar-agar	38.3	36.9	41.0	46.2	44.1	2.433	2.484	2.676	2.308	2.185
Carrageenin	28.6	27.8	30.8	33.8	36.7	3.438	3.597	3.772	3.986	4.528
Alginates	5.8	7.6	7.9	12.0	11.7	677	883	966	1.388	1.367
Other	0.2	0.5	0.5	1.0	1.0	50	99	99	133	149
Live products	**1.2**	**1.4**	**1.4**	**1.8**	**1.8**	**29**	**41**	**54**	**81**	**62**
Other	**0.0**	**-**	**-**	**0.0**	**-**	**5**	**-**	**-**	**32**	**-**
Totals	**2.679,9**	**2 894.8**	**3 222.7**	**3 682.9**	**3 651.6**	**1 293.040**	**1 313.098**	**1 590.928**	**1.390.936**	**1.413.242**
% Hum.cons / Total	**79**	**82.2**	**80.5**	**81.4**	**80.9**	**47.5**	**54.3**	**49.2**	**54.6**	**56.1**

Table 2.7. Exports of fishery products, by type of product, 2003-2007 (cont.)

	USD per kilogram, 2006 USD				
	2003	**2004**	**2005**	**2006**	**2007**
Human consumption	3.4	3.3	3.3	3.9	3.7
Fresh	4.7	4.4	4.4	6.2	6.0
Frozen	3.2	3.2	3.2	3.7	3.4
Canned	2.2	2.1	2.0	2.2	2.3
Smoked	10.4	9.6	9.7	10.1	10.6
Dried,salted, etc.	4.9	5.3	4.9	4.8	5.1
Meals and oils	0.7	0.7	0.7	1.0	1.0
Fish meal	0.7	0.7	0.7	1.0	1.1
Fish oil	0.7	0.7	0.7	0.7	0.7
Algae products	2.1	2.1	2.1	2.5	2.2
Dried algae	0.7	0.8	0.8	0.8	0.7
Agar-agar	15.8	14.8	15.3	20.0	20.2
Carrageenin	8.3	7.7	8.2	8.5	8.1
Alginates	8.6	8.6	8.2	8.6	8.6
Other	5.0	5.0	4.9	7.3	7.0
Live products	41.3	35.2	25.8	22.2	28.8
Other	1.4			0.8	
Totals	2.1	2.2	2.0	2.6	2.6
% Hum.cons / Total	**166**	**151**	**164**	**148**	**144**

Source: Total exports and aquaculture exports for 2003-2007: Undersecretariat of Fisheries, *Informes Sectoriales*, various volumes. Aquaculture figures for 1990-2002: Fisheries Development Institute. Corrected figures based on original Customs data for the period.

Table 2.8. Artisanal vessels, by type of unit and macro-zone

(End of 2007)

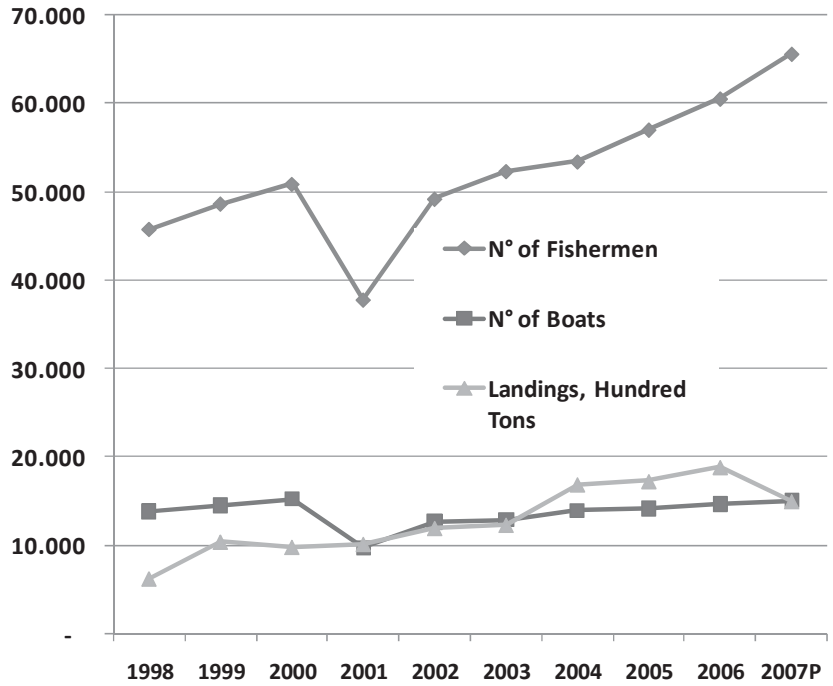
Type of vessel	North	Center	South	Extreme South	Total
Small rowing/sailing boat	323	108	828	95	**1 354**
Small boat with engine	2 385	1 165	4 256	1 498	**9 304**
Boats, LOA< 12mts	186	31	2 111	629	**2 957**
Boats, LOA 12-15mts	123	52	380	151	**706**
Boats, LOA 15-18mts	87	59	488	59	**693**
Totals	**3 104**	**1 415**	**8 063**	**2 432**	**15 014**

North: Regions I to IV, plus XV; *Center*: Regions Vth to VIIth, plus Metropolitan Region; *South*: Regions VIII to X plus Region XIV; *Extreme South*: Regions XI and XII.

Source: SERNAPESCA (2008), *Anuario Estadístico 2007*, Preliminary figures.

The numbers of boats and small-scale fishers[11] have increased between 1998-2007 (Table 2.9 and Figure 2.3). The annual landings per boat increased significantly between 1998 and 2007, while landings per fisher initially increased before eventually stabilising (Figure 2.4).[12]

Figure 2.3. Landings and number of artisanal boats and fishers, 1998-2007



Source: SERNAPESCA, *Anuarios Estadísticos*, various volumes.

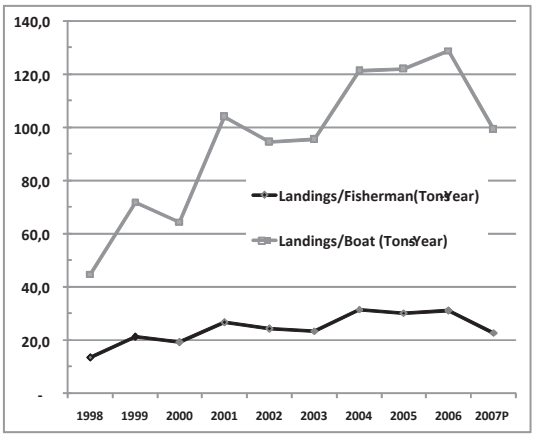
Table 2.9. Artisanal fishers by region
(End of 2007)

Region	Algae collector		Boat owner		Diver		Fishers		Totals (1)
	Female	Male	Female	Male	Female	Male	Female	Male	
XV	12	116	8	216	-	122	19	915	1 102
I	129	342	22	341	1	418	14	823	1 580
II	141	763	27	589	3	758	13	1 411	2 883
III	265	1 085	17	442	2	560	31	1 478	2 968
IV	349	1 285	25	1 064	6	1 282	45	2 756	4 821
V	132	299	16	832	3	573	66	3 667	4 329
VI	188	468	2	65	2	120	8	255	941
VII	131	277	5	323	-	225	34	1 383	1 916
VIII	1 558	901	162	2 245	2	2 047	781	10 779	14 652
IX	47	106	6	156	1	49	39	501	704
XIV	755	447	16	394	8	694	53	1 500	3 078
X	2 228	1 878	99	4 252	18	5 001	1.035	10 894	18 771
XI	7	9	49	968	7	818	318	2 301	2 867
XII	65	64	95	944	-	1 051	177	4 165	4 984
								Grand total	**65 596**

(1): Figures per Region do not add to totals. Totals indicate the actual number of persons involved in these small-scale activities. As one person might be registered under more than one category (Table 11), it could be that the sum of individual figures add up to 86 659, showing that in average, one person is registered in 1,3 activities.

Source: SERNAPESCA, 2008 *Anuario Estadístico 2007*, Preliminary figures

Figure 2.4. Landings per fishers and boat in artisanal fisheries, 1998-2007



Source: SERNAPESCA, Anuarios Estadísticos, various volumes.

Artisanal production has increased by 50% between 2000 and 2007, from 1 to 1.5 million tonnes (Table 10). This increase was primarily in fish (60% increase), mollusks (130%) and algae (35%). Due to a poorer performance of industrial fisheries, they also increased their relative importance, from 20% to 30% of total landings in that period.

Small-scale production is very asymmetric with regard to fisheries, type of boat and levels of activity and income. Bigger fishing units, although less common in this sector, are landing most of the fish captured, while receiving very high incomes, particularly in the pelagic fisheries with Chilean seabass (*bacalao de profundidad*). In contrast, individual fishers, collecting mollusks or algae, or working in small fishing craft are generally less efficient, can earn substantially less, and may even be unable to support themselves or their families in a sustainable manner in many coastal fisheries. Such fishing activities are often complemented by other work, aimed at improving the income of the fishing household. This highlights a potential issue where government support schemes, intended to help the smallest among these artisanal fishers, are complicated by the fact that current legal definitions of these small operators is very broad and also includes the more successful large boat owners.

Table 2.10. Artisanal landings, number of fishers and boats, and productivity figures, 1998-2007[P]

Year	N° Fishers	N° of Boats	Landings (million Tonnes)	Landings per fisherman-year (Tonnes)	Landings per boat-year(Tonnes)
1998	45 764	13 825	0.62	13.5	44.8
1999	48 642	14 453	1.04	21.4	72.0
2000	50 873	15 201	0.98	19.3	64.5
2001	37 777	9 753	1.01	26.9	104 0
2002	49 185	12 632	1.20	24.3	94.6
2003	52 320	12 888	1.23	23.5	95.6
2004	53 410	13 946	1.69	31.7	121 3
2005	57 013	14 179	1.73	30.3	122 0
2006	60 539	14 655	1.89	31.2	128 9
2007P	65 596	15 104	1.50	22.9	99.4

[P] Preliminary data.
Source: SERNAPESCA, *Anuarios Estadísticos*, various volumes

Small-scale operators are organised in cooperatives, syndicates and other cooperative structures. At the end of 2006, there were 492 organisations of this type, 51% of which are found in the Southern part of the country.

During the last decade, small-scale fishers associations have been given exclusive exploitation rights to several sections of the Chilean coastline. This legal scheme, entitled *Areas de Manejo y Explotación de Recursos Bentónicos,* translated as Management Areas for the Exploitation of Benthic Resources (MAEBR), was created in 1991 but is regulated only through Decree N°355 of 1995. MAEBRs are defined as well-delimited coastal areas for which exclusive use rights are granted by SERNAPESCA for four year periods (renewable). They are meant to legally establish small-scale fishers' organizations, aiming at sustainably exploiting the benthic resources available in the area through a proper management plan. In 2007, there were 752 authorized MAEBRs along Chile's coast covering an area of about 115 000 hectares. However, only 204 units were actually operational during 2007, representing 27% of the total registered fishing activities in that year. Production in MAEBRs during 2007 was around 7 000 tonnes, 67% of which relates to mollusks (essentially'loco' and 'macha'); 27% to different

types of algae, and the rest was mainly sea urchin ('erizo') (Tables 2.11 and 2.12).

Under the MAEBR system, artisanal fishers are required to produce yearly management plans, which have to be approved by the State. These plans establish the amount of each resource that will be harvested during a one year period. These production activities are thereafter followed and controlled by consulting firms, which are hired for this particular purpose, and are financed by the fishers' organizations, which in turn receive State support to cover these expenses.

Table 2.11. Catches in Chilean MAEBRs, 2001-2007, thousand tonnes

Year	Total	Algae	Mollusks	Other species
2001	2.091	524	1.530	37
2002	4.180	2.024	2.084	72
2003	6.452	1.875	4.428	149
2004	6.561	1.601	4.288	672
2005	5.510	946	4.191	373
2006	7.581	1542	5.811	228
2007	6.971	1.860	4.684	427

Source : SERNAPESCA, *Anuarios Estadísticos*, Various volumes.

Table 2.12. Artisanal, industrial and aquaculture production, 2000-2007, thousand tonnes

	Thousand tonnes						Percentages of each year's total, per sector					
Year	Algae	Fish	Mollusks	Crustaceans	Other species	Total	Algae	Fish	Mollusks	Crustaceans	Other species	Total
Artisanal sector												
2000	247	596	61	19	58	**981**	25.2	60.7	6.2	1.9	5.9	**100**
2001	234	637	77	19	48	**1 015**	23.1	62.7	7.5	1.9	4.7	**100**
2002	244	825	47	18	61	**1 195**	20.4	69	4	1.5	5.1	**100**
2003	309	800	65	13	44	**1 232**	25.1	65	5.3	1.1	3.6	**100**
2004	391	995	241	15	51	**1 692**	23.1	58.8	14.2	0.9	3	**100**
2005	410	928	336	16	39	**1 729**	23.7	53.7	19.4	1	2.2	**100**
2006	301	1 238	299	15	36	**1 889**	15.9	65.5	15.8	0.8	1.9	**100**
2007P	336	974	140	14	36	**1 501**	22.4	64.9	9.3	0.9	2.4	**100**
Industrial sector												
2000	-	3 548	0	19	-	**3 567**						
2001	-	3 010	0	7	-	**3 017**	-	99.8	0	0.2	-	**100**
2002	-	3 313	1	6	-	**3 320**	-	99.8	0	0.2	-	**100**
2003	-	2 682	1	6	-	**2 689**	-	99.7	0.1	0.2	-	**100**
2004	-	3 611	8	6	-	**3 625**	-	99.6	0.2	0.2	-	**100**
2005	-	2 988	14	6	-	**3 009**	-	99.3	0.5	0.2	-	**100**
2006	-	2 557	8	8	-	**2 572**	-	99.4	0.3	0.3	-	**100**
2007P	-	2 593	41	8	-	**2 642**	-	98.1	1.6	0.3	-	**100**
Aquaculture												
2000	33	343	49	-	0	**425**						
2001	66	505	61	-	-	**632**						
2002	72	483	63	-	-	**617**	11.6	78.2	10.2	-	-	**100**
2003	40	489	79	-	0	**607**	6.6	80.5	12.9	-	0	**100**
2004	20	569	107	-	0	**696**	2.9	81.8	15.3	-	0	**100**
2005	15	614	109	-	-	**739**	2.1	83.1	14.9	-	-	**100**
2006	38	648	150	-	-	**836**	4.6	77.5	17.9	-	-	**100**
2007P	23	664	216	-	0	**904**	2.6	73.5	23.9	-	0	**100**
Total												
2000	281	4 486	110	37	58	**4 972**	5.6	90.2	2.2	0.8	1.2	**100**
2001	300	4 151	138	26	48	**4 663**	6.4	89	3	0.6	1	**100**
2002	316	4 621	111	24	61	**5 133**	6.2	90	2.2	0.5	1.2	**100**
2003	349	3 971	145	19	44	**4 528**	7.7	87.7	3.2	0.4	1	**100**
2004	411	5 176	356	20	51	**6 014**	6.8	86.1	5.9	0.3	0.8	**100**
2005	425	4 531	460	23	39	**5 478**	7.8	82.7	8.4	0.4	0.7	**100**
2006	339	4 443	457	22	36	**5 298**	6.4	83.9	8.6	0.4	0.7	**100**
2007P	360	4 231	397	22	36	**5 046**	7.1	83.9	7.9	0.4	0.7	**100**

Table 2.11. Artisanal, industrial and aquaculture production, 2000-2007, Thousand tones (*cont*)

Percentages of each years total landing per species

Algae	Fish	Mollusks	Crustaceans	Other species	Total
			Artisanal sector		
88.1	13.3	55.5	49.7	100	**19.7**
78.1	15.3	55.3	73.8	100	**21.8**
77.3	17.9	42.5	73.6	100	**23.3**
88.6	20.2	45	69.4	100	**27.2**
95.1	19.2	67.7	72.4	100	**28.1**
96.4	20.5	73.1	71.9	100	**31.6**
88.7	27.9	65.5	65.8	100	**35.7**
93.5	23	35.2	63.8	100	**29.7**
			Industrial sector		
-	79.1	0	50.3	-	**71.7**
-	72.5	0.3	26.2	-	**64.7**
-	71.7	0.9	26.4	-	**64.7**
-	67.5	1	30.6	-	**59.4**
-	69.8	2.3	27.6	-	**60.3**
-	66	3.1	28.1	-	**54.9**
-	57.6	1.7	34.2	-	**48.6**
-	61.3	10.4	36.2	-	**52.3**
			Aquaculture		
11.9	7.6	44.5	-	0	**8.5**
21.9	12.2	44.4	-	-	**13.5**
22.7	10.4	56.6	-	-	**12**
11.4	12.3	54	-	0	**13.4**
4.9	11	30	-	0	**11.6**
3.6	13.6	23.8	-	-	**13.5**
11.3	14.6	32.8	-	-	**15.8**
6.5	15.7	54.5	-	0	**17.9**
			Total		
100	100	100	100	100	**100**
100	100	100	100	100	**100**
100	100	100	100	100	**100**
100	100	100	100	100	**100**
100	100	100	100	100	**100**
100	100	100	100	100	**100**
100	100	100	100	100	**100**
100	100	100	100	100	**100**

Source: Calculations of the study, on figures from SERNAPESCA, various years.

Industrial fisheries

In terms of volume, the main Chilean industrial fishing activities are related to pelagic resources both in the North and Central part of the country. In the Northern part, anchovy is the main species captured, followed by jack mackerel and "caballa" mackerel.[13] However, the largest quantities of mackerel and sardine are caught in Central and Southern Chile. Jack mackerel and 'caballa' mackerel are also caught in increasing volumes outside the Chilean EEZ, a relatively recent development which has required big boats with adequate autonomy and refrigeration capacities.

The rest of the industrial fishing fleet is composed of the operation of several factory vessels, which are allowed to fish only in the extreme south of Chile and in international waters. They are mainly responsible for the landing of several types of southern hakes, conger eels and a part of the very valuable Chilean seabass ('bacalao de profundidad').

These fisheries, combined with the production of common hake in Central Chile and limited amounts of shrimp and prawn constitute the core of what is called 'industrial activities'.

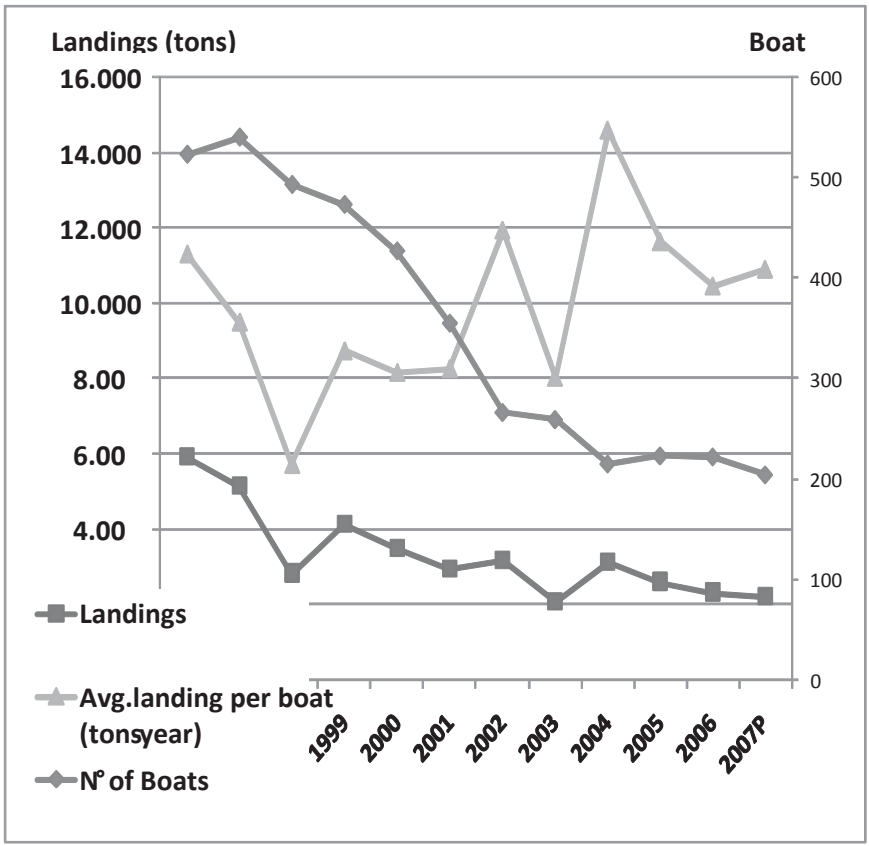
The size of the industrial fleet has declined substantially over the last decade (Table 2.13 and Figure 2.5). The volume of landings has also declined, but at a slower rate, with the result that landings per vessel have grown substantially. This trend has had a noticeable effect on the economic performance of the industrial vessels. It is worth noting that vessels that stop fishing because of the application of different management plans do not receive compensation of any sort.[14] Current government policies do not encompass the use of vessel decommissioning schemes to assist adjustment.

Table 2.13. Catches of 'Loco' and 'Macha' in Chilean MAEBRs, 2001-2007 thousand tonnes

Year	"Loco"		"Macha"	
	MAEBR's landings	% of species Total	MAEBR's landings	% of species Total
2001	806	97%	254	18%
2002	1 132	70%	676	52%
2003	2 191	74%	1 595	7%
2004	2 974	83%	727	38%
2005	3 205	98%	343	22%
2006	3 858	98%	1 229	47%
2007	2 665	78%	1 359	51%

Source : SERNAPESCA, *Anuarios Estadísticos*, various volumes.

Figure 2.5. Industrial fleet vessels and landings, 1996-2007



Does not include factory vessels nor captures made outside the EEZ.

Source : SERNAPESCA, *Anuarios Estadísticos*, Various volumes.

The structure of the industrial fishing fleet in operation during 2007 is presented in Table 2.14. In addition to these vessels, a total of 11 factory vessels registered fishing activities in national waters during 2007, while a further 12 freezer vessels operated in international waters.

Industrial vessels are normally owned by vertically integrated firms, and therefore, most of these boats supply a variety of processing lines owned by the firm, even though occasionally they might supply other processing plants and traders.

Table 2.14. Industrial fleet vessels and landings, 1996-2007

Year	N° of boats	Landings	Avg. landing per boat (tonnes-year)
1996	524	5 933	11 323
1997	541	5 151	9 521
1998	494	2 840	5 749
1999	474	4 150	8 755
2000	428	3 503	8 185
2001	356	2 952	8 292
2002	267	3 192	11 955
2003	260	2 096	8 062
2004	216	3 154	14 602
2005	224	2 609	11 647
2006	223	2 336	10 475
2007P	205	2 318	10 917

Does not include factory vessels nor captures made outside the EEZ.

Source : SERNAPESCA, *Anuarios Estadísticos*, Various volumes.

On several occasions from the 1960s onwards, several industrial fisheries collapsed after repeated growth, overfishing and overinvestment, coupled with relatively poor management and enforcement. The 1960s collapses saw the only occasion where the government intervened to provide financial assistance to 'rescue' investors facing difficulties. The government also bought vessels and processing lines, which were later sold through open biddings or other schemes. After years of trials with different management systems (Chapter 3), practically all the main pelagic and demersal fisheries where the industrial fleets operate have been stabilised, and there does not seem to exist significant excess fishing capacity.

One of the main factors affecting industrial fishing activities these days seems to be a change in distributional patterns of fish stocks, a fact that is reflected in more distant fishing grounds, longer fishing trips and further requirements for more autonomy and good refrigeration.

The volume of landings is not expected to increase in industrial fisheries during the coming years. Therefore, improvements in this sector will mostly be related to better handling of catches, more efficient fishing campaigns and strategies, and a higher portion of landings dedicated to produce fish products for direct human consumption. Indeed, since the early 2000s, at least one big processing plant per year has been built and dedicated to these ends.[15]

Future discussions on industrial fishing in Chile will need to focus on the use of more selective fishing gear, reducing discards in demersal fisheries, and a better control of incidental catches, among other matters. A project is underway in the Chilean Parliament to introduce specific regulations to deal with the issue discards. In addition, Chilean participation in fishing activities in international waters and the regulation of fishing effort in nearby zones outside the local EEZ are under discussion, both within Chile and with other countries having similar concerns in this part of the Pacific Ocean. In 2006, Australia, Chile and New Zealand initiated a process for states to cooperate in the establishment of a new RFMO for the South Pacific (entitled the South Pacific RFMO, or SPRFMO). Chile's interest in participating in the establishment of SPRFMO is driven by the growth and unregulated activity of foreign fleets in the high seas adjacent to Chile, dedicated to fishing for straddling species, particularly jack mackerel. There are now over 20 states, as well as IGOs and NGOs, engaged in the process. The SPRFMO has yet to come into force.

Aquaculture

Fish farming

Commercial fish farming activities are almost exclusively dedicated to salmon and trout farming and account for 74% of volumes harvested by the aquaculture sector in 2007. Turbot represents the only other significant fish farming activity in Chile. Most components of this industry are the property of big industrial corporations, which are usually vertically integrated. Foreign capital is fairly common in this industry as well. The technology applied is competitive on a global level and local production facilities are among the largest in the world.

Marine sites are concentrated in the Xth Region of Chile. However, increasing amounts of farmed fish are being produced further south in the XIth and XIIth Regions. Marine salmon farms were initially established in protected bays and areas, 20-45 meters deep. As the level of production per site grew and annual harvest surpassed the 1 000-3 000 tonnes, farmers started moving to deeper, more exposed and more distant sites, including a

number of areas that were originally neglected because of poor infrastructure.

Average farming capacities per site and total production per firm have grown throughout the years, and today overall output is concentrated on a smaller number of enterprises. Average production per marine site grew about 81% between 2001 and 2007, increasing from 1 013 to 1 835 tonnes. Industry sources indicate that no single producer with an annual production less than 7 000-10 000 can be considered as having a significant chance of being competitive in the coming years.[16]

The number of salmon and trout producers has declined from 47 in 2001 to 32 in 2007. Out of the 32 enterprises, 26 were the property of Chilean companies, while three were owned by Norwegian companies, and the remaining three were owned by Spanish, Japanese and Canadian companies. Chilean companies were responsible for 65% of the total value exported in 2007 (67% in 2001).

Farming on marine sites in Chile can only take place in authorized areas which are included in zones previously approved by and locally named, Aquaculture Authorized Areas, AAA. Approved areas for the Xth and XIth Regions, where most farming activities take place, amount to 860 500 hectares, 10 200 out of which are occupied by salmon farms (1.2% of totals: 2.8% and 0.6% of available space in the Xth and XIth Regions, respectively).[17]

Handling of salmonid eggs and juveniles in fresh water until smolting is carried out very efficiently. Initially, rivers and lakes were used for these purposes. The use of lake water provided a substantial advantage for local producers, as higher average temperatures meant shorter production cycles and lower costs, compared to what was being achieved in other countries. In recent years and still to this day, authorization to grow more fish in lakes has not been granted. Therefore, the need to expand fish production in fresh water has resulted in the construction of very large recirculation facilities. Additionally, hatcheries and juvenile production are increasingly moving to the north of Puerto Montt (capital city of the Xth Region) an almost unthinkable idea only a decade ago, when fresh water resources seemed inexhaustible.

Salmon farmers, as well as scallop and mussel farmers, have developed very active producer associations that represent their interests in national and international fora. Several of these organizations are also involved in research and development activities, and they also engage in training and capacity building at all levels, ranging from production personnel to high ranking executives. Technical seminars throughout the year are widely available, and cover most areas considered of interest by industry members.

Salmon farming activities have been developed in geographic areas that were among the poorest in Chile, at a time where very few work alternatives existed. Nowadays, this industry has become one of the central economic activities in southern Chile and is responsible for reducing population migrations to Argentina and elsewhere in Chile, to the point that currently, the Xth and XIth Regions have to import manpower to satisfy the industry's requirements.

Table 2.15. Profile of industrial fishing fleet in 2007, by region and type of fishing gear

Region	Trawlers	Purse seiners	Gill netters	Long liners	Trap holder
XV	0	55	0	0	0
I	0	72	1	0	0
II	1	55	3	1	0
III	10	0	2	1	0
IV	12	4	1	5	1
V	31	4	2	1	0
VII	1	0	0	1	0
VIII	33	71	0	0	0
XIV	10	23	0	0	1
X	11	0	0	0	1
XI	3	1	0	0	0
Total (*)	**56**	**154**	**3**	**8**	**3**

Figures indicate the number of vessels working on a certain region, with a certain fishing gear. As one boat can work in various regions, and with different fishing gear, totals do not add nor do they coincide with the actual number of vessels, of 205.

Source : SERNAPESCA, (2008) *Anuario Estadístico 2007*,Preliminary figures

Diseases and other environmental problems, particularly in the marine phase of production, have been and continue to be a cause of concern and have seriously damaged salmon farmers' operations and profits (Table 2.15). While a number of mitigation and pro-active initiatives have been developed ('clean production' schemes; various Codes of Practices; integrated geographic information systems, etc.), several challenging issues confront policymakers. These include the level of antibiotic use, sanitary concerns, escapements from farms, environmental impacts below the salmon cages, and proximity between farms.

Currently, sanitary problems are causing a significant production crisis within the industry, severely affecting employment, exports and short term harvesting goals. A new set of improved sanitary protocols is currently under preparation by a newly created Commission appointed by the Ministry of Economy, locally called the 'Salmon Table'.

Table 2.16. Evolution of diseases present in Chilean salmon farms in recent years

Disease	Coho Salmon		Rainbow Trout		Atlantic Salmon	
	6-7 Years ago	Today	6-7 Years ago	Today	6-7 Years ago	Today
Bacterial Kidney Disease	▲	▲	▲	▲	▲	▲
Piscirikettsiosis	▲	▲	▲	▲		▲
Infectious Pancreatic Necrosis		▲	▲	▲	▲	▲
Vibriosis (*V.Ordalii*)						▲
Vibriosis (*V.Anguillarum*)				▲		▲
Ulcerative Vibriosis (% strains)				▲		▲
Streptococosis						▲
Francisellosis						▲
Atypical Furunculosis						▲
Kudoa						▲
Jaundice Syndrome	▲	▲				
Nucleosporidiosis					▲	▲
Flavobacteriosis	▲	▲	▲	▲	▲	▲
Columnaris	▲	▲	▲	▲	▲	▲
Yersiniosis					▲	▲
Saprolegniosis	▲	▲	▲	▲	▲	▲
Sealice (Caligus)		▲	▲	▲	▲	▲
Infectious Salmon Anemia ,ISA	▲ ?	▲				▲
Amoebic Gill Disease						▲

ADL Diagnostics is one of the best known and reputed enterprises dealing with fish pathologies in Chile. The list refers only to 'prevalence', that is, that a certain disease is present, but does not show which ones are the cause of high concerns.

Source: ADL Diagnostics, Chile, Personal communication, November 2008.

A good proportion of the salmon production is sold fresh, and with value added (fillets, steaks, etc.), requiring very sophisticated and efficient processing facilities and logistics, which are currently handled mainly by the large and vertically integrated firms. As already stated, it is a fact that Chilean processing capabilities and the quality of the end products substantially reinforce the desirability of salmon and trout farmed locally, thus favoring further expansion of exports and production.

About 33% of the labor force working in the salmon farming industry adheres to syndicates or unions, a figure that well exceeds the national average of 12%.[18]

Farming of marine fish is still very limited in Chile (salmon and trout are anadromous species), and to date, turbot is the only species produced in commercial quantities. Farming techniques for other marine fish such as local 'lenguado' (flat fish), Southern hake, the introduced 'hirame' (*Paralichthys Olivaceus*) and Atlantic halibut (*Hippoglossus hippoglossus)* are still under development at a pilot level only. Turbot harvests are not likely to grow much in the near future, as there is only one big company working with this crop, and it requires a large capital investment, a high technology and a very good marketing structure. The local level of production limits to the establishment of a well reputed supply center that might be of interest to foreign buyers. Products are likely to primarily enter the fresh and frozen markets, and as a result, adequate logistics and infrastructure are an issue.

In 2004, 38 400 persons were directly employed in the salmon farming industry while indirect jobs were estimated at 15 000.

Mussel farming

Mussel farming has grown dramatically since 1998-1999, following the arrival of Spanish enterprises that introduced new technologies and opened the gateway to exports. Nowadays, mussels are the second major aquaculture product in Chile, farmed production will likely surpass the 200 000 ton mark during 2008 or shortly thereafter, and will continue to expand if market prospects in Europe, the US and other destinations keep growing.

Mussel farming is currently handled by small, medium-size and big producers, most of whom sell at farm-gate to big processing plants that have a significant surplus capacity, a situation which is likely to persist for several years. Processing lines are the property of big companies, most of which have only recently started to farm their own mussels. They are likely to continue buying from small and medium-size producers in the short and medium term.

In 2007, there were 30 processing plants in operation, of which 21 owned by Chilean companies. Seven plants have Spanish owners, one plant has mixed Italian-Spanish owners, while the last one belonged to an Icelandic company.[19]

At the end of April 2008, there were 890 farming concessions granted in the Xth Region, with a total area of about 8 000 hectares.[20] This Region accounts for practically all the mussels farmed in Chile.

The similarity of Chilean mussel with its equivalent product grown in Galicia, Spain, facilitates enormously the marketing of this product in Europe, currently its main market. Due to logistic problems and associated costs, Chilean mussels compete at their best when frozen, and therefore have to rely on the development of these particular markets to continue expanding sales.

Mussel producers are already crowding the best production areas, and still depend on natural seed. The first issue has meant that production cycles have started to get longer, while the availability of natural seed might become a constraint for future expansion at some stage. Red tides are a continuous and recurrent threat in Southern Chile, and even though studies to mitigate their effect are constantly being undertaken, it is likely that red tides will keep appearing in mussel production areas during the coming years.

Scallop farming

In contrast, scallop farmers have limited site availability in the center-north part of Chile, where this crop is primarily grown. Annual production is restricted to a limited number of relatively well protected coastal areas, with depths of up to 50-60 meters. Local producers rely heavily on the collection of natural seeds, as hatchery output is still limited and meant mainly to complement wild seed availability.

Farms are mostly medium-size units, with only a few showing larger capacities. This affects the profitability and long-term sustainability of this industry. Scallop farmers sell most of their product to France, and compete with Peru as well as with scallops from other origins. The Peruvian wild harvest and farmed production of scallop is much larger than that of Chile, and also has lower costs and competitive advantages. In Chile, the property and size structure of this industry does not generate enough surplus to invest much further in research and development so as to improve production efficiency and competitiveness.

Abalone farming

Abalone production is still limited but bound to expand dramatically to 1 500-2 000 tonnes in the coming decade. Technology is still a limiting factor, particularly with respect to artificial feeding and the economics of

production with sea water pumped in-land. Production units are still relatively small, but bound to grow and become economically attractive in the medium turn.

Local production will probably evolve both in southern and northern Chile, related mainly to medium to big size enterprises. Requiring a production cycle of three years or more, abalones are not likely to become an interesting stand-alone farming venture for many operators. Therefore, in the medium term, abalone farms are likely to be a part of other farming facilities, probably dealing as well with mussels, scallops and/or salmon and trout. The majority of locally produced abalones is bound to be sold either live, fresh or frozen, a fact that requires solid and demanding logistic capabilities and facilities.

In the 1990s, red abalone was the first exotic species for which a formal environmental impact report was requested and approved in Chile. As a result of this process, farming in open marine sites is only authorized on a relatively narrow space in Southern Chile, close to Chiloe Island. The farming of abalone in northern marine sites was only recently authorized, but in this case there was a requirement imposed in terms of allowing the farming of only male or, alternatively female abalones per site. This requirement has prevented investments along these lines, as a system to determine the sex of juveniles is not yet available at a reasonable cost.

Algae and small-scale farming

To date, commercial macro algae production is almost exclusively restricted to gracilaria algae, largely in the hands of small-scale farmers, primarily located in southern Chile. This crop has shown many ups and downs throughout the years, and its future is still uncertain due to the high level of market volatility. The technology for this crop is well known and not considered a limiting factor, as is the context around natural environmental conditions and the availability of sites.

A normal farm can be as small as 0.5-1 hectares in size. Buyers of farmed algae are limited in numbers, and exercise significant monopsony power on prices, a fact which severely affects this crop's sustainability.

At the end of 2004, there were around 840 small-scale active farms, permanently employing about 4 400 persons and another 1 800 on a part-time or seasonal basis.[21] The farms occupied 2 700 hectares, representing 14% of total area used by fish farming in that year, while over 86% of these farms were located in the Xth Region. Generally speaking, small-scale farmers usually work on land of less than six hectares. The vast majority farm one species only and are not vertically integrated.

Small-scale farmers specialize in the production of species such as algae and mollusks (mainly gracilaria and mussels), where no artificial diets are necessary. Exactly the opposite occurs with industrial farms.

As opposed to other countries, small-scale farming in Chile is not a subsistence activity. Local farmers preferably sell their crops at farm gate, for further processing or for exports. The total production value of this sector was estimated to be USD 6,5-10 million in 2004.[22]

Notes

1. See the Annex for name equivalences. Hake is equivalent to' Merluza común'; Shrimps, to 'Camarones'; Prawns to 'Langostinos' and Jack mackerel to 'Jurel'. As translations to English vary from source to source, on several occasions Spanish names are used with their scientific equivalent located in the Annex.
2. Although at least 75 different species of fish are landed in total.
3. A closer look at export volumes indicate that during the last fifteen years there are two different periods. Between 1992 and 1998 volumes decrease at an annual rate of 9.1%, while between 1998 and 2007 they increase at 1.8% per year. The same applies with values, which diminish at 2.8% per annum in the former period, while they augment at 0.8% per year thereafter.
4. Reviewing FAO's FISHSTAT data for 1984-2006 it is apparent that average values per kilo (in constant USD) for most aquaculture products have sharply diminished along the years, a fact probably related to production increases.
5. Currently, local salmon farmers are facing a serious sanitary crisis, which will have severe effects on production and production structures. Therefore, new sanitary regulations will most probably be enforced in the coming months , and they will have economic effects, yet to be evaluated.
6. GRT : Gross registry tonnage, represents the total internal volume of a vessel, with some exemptions for non-productive spaces such as crew quarters. 1 gross register ton is equal to a volume of 100 cubic feet (2.83 M3), which volume, if filled with water, would weigh around 2,800 kg or 2.8 tonnes.
7. FAO, *Fishery and Aquaculture Country Profile*, www.fao.org/fishery/countrysector/FI-CP_CL/es, October 2008
8. Personal communication, October 2008
9. SONAPESCA, 2008, Annual Report 2007*,* Santiago.

10. This figure of 65 600 fishers differs slightly from that of 69.000 mentioned at the end of paragraph 2.5, as they were obtained from different sources. The 'Instituto Nacional de Estadística' (National Statistics Institute) is currently undertaking a national census on manpower in Chilean fisheries, and these results should help clarify this matter by the end of 2009 or early 2010.

11. Small-scale fishers refers to all categories of workers shown in Table 12.

12. SERNAPESCA states that 49% of those production units reported landings at least once during 2007. This fact can be, rather arbitrarily, interpreted by saying that reporting is not as "massive" or accurate as desirable. This fact may coincide with previous comments regarding inaccuracies of statistics available for local seafood consumption.

13. "Caballa" is the local common name for mackerel

14. The crisis of the anchovy fishery and fish meal industry of the 1960's, which partly resulted from unduly optimistic fishing plans backed mostly by the Government, is the only recorded time where official financial help was granted to industrial activities.

15. SONAPESCA (2008), Annual Report *2007*, Santiago.

16. Personal communications, October 2008

17. Salmon Chile, 2007 *Informe Económico Salmonicultura 2006*.

18. Salmon Chile, 2007, Table 17.

19. AQUA Magazine, personal communication.

20. Undersecretary of Fisheries, October 2008, www.subpesca.cl/carto_acuic3.htm

21. GESAM Consultores, 2005 Diagnóstico de la acuicultura de pequeña escala en Chile, Final Reports (documentos separados) , Phases 1 and 2, Project FIP 2004-26 , Santiago, Chile.

22. Wurmann C., 2008 *Problemática y Desafíos de la Producción Chilena de Bivalvos en Pequeña Escala,* in *Estado Actual y Manejo de Moluscos Bivalvos y su Proyección Futura: Factores que afectan sus Sustentabilidad en Latinoamérica, A.Lovatelli et.al. Editors,* FAO.

CHAPTER 3

Institutional framework

Chile has a well established governance system in place for fisheries and aquaculture activities, both in the public and private sectors. In broad terms, the public sector sets the basic rules for these activities as they are undertaken either in public waters or refer to common property renewable resources, while the State represents public interests and views. In turn, the private industry has well organized institutions representing their own interests, while fishers also have strong representative associations that operate on their behalf. These parties, working separately and together, focus on local and international issues, and are responsible for the sustainability of the available natural resources and the environment, social development and maximization of wealth accrued by all parties directly involved, as well as that of society as a whole.

Chilean fisheries and aquaculture are primarily governed by the Fisheries and Aquaculture Law (Law 18.892) of 1989 and its amendments, and several other legal bodies and administrative procedures. This chapter provides an overview of these laws and the institutional structure they govern.

Governance structure

Chilean fishing and aquaculture activities are governed by an executive policy-making body, the Under-Secretariat of Fisheries (SSP), which has a control and enforcement branch, the National Fisheries Service (SERNAPESCA). It is assisted by the Institute of Fisheries Development (IFOP) which supplies the basic information and analysis required to develop management proposals and recommendations.

The Undersecretariat of Fisheries (SSP)

The Undersecretariat for Fisheries ('Subsecretaría de Pesca', or SSP) is the principal executive authority responsible for fisheries and aquaculture. It is one of the two Sub-Secretariats of the Ministry of Economy, Development and Reconstruction, and was formally created in 1976 (Decree-Law 1.626) (Figures 3.1 and 3.2). It is headed by the Undersecretary of Fisheries, who reports directly to the Minister of Economy, and is named by the President. The SSP's functions and budget were defined and regulated under Decree-Law 2.442 in 1978. Prior to the formation of the SSP, fishing activities were regulated by the Ministry of Agriculture.

Figure 3.1. Structure of the Ministry of Economy, Development and Reconstruction

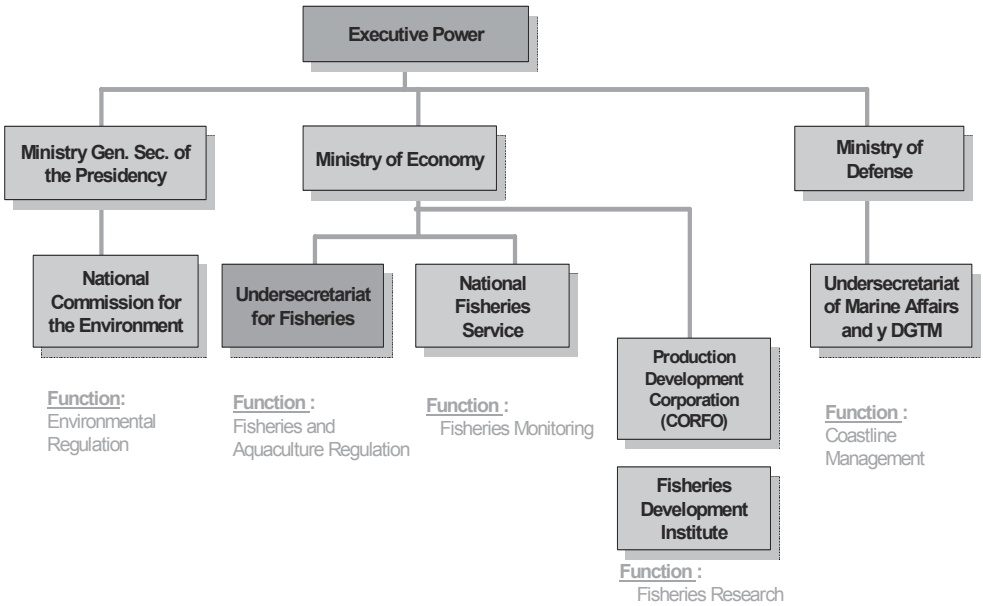
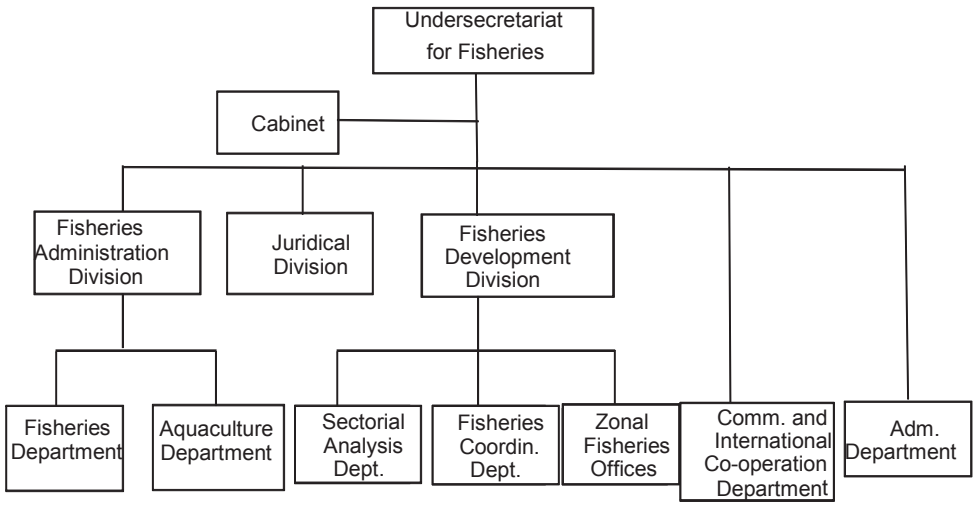


Figure 3.2. Structure of the Undersecretariat of Fisheries



The mission of the Undersecretariat is "promoting the sustainable development of the fisheries and aquaculture activity, defining policies and applying regulations that increase the social and economic benefits of the sector, in order to ensure the wellbeing of the present and future generations of the country". Following from the mission statement, the Ministry has the following strategic objectives:

- proposing, implementing and spreading sectoral regulations in a timely, transparent and participative way;
- maintaining institutional coordination bodies, especially those related to the sector, in order to adequately implement the sectoral regulation in a timely fashion; and
- monitoring the training of people, leading to an improvement of the technical and administrative processes.

To fulfill these objectives, the Ministry has the following functions and powers:

- to plan and coordinate the national fisheries policy, and to dictate the general compulsory norms which may be required to enforce it;
- adopt measures to avoid the introduction and further spreading of diseases that may affect natural marine and fresh water fisheries resources, and to combat existing ones;

- implement laws and regulations on fisheries and marine hunting; and
- manage the distribution of financial resources for research and development.

The SSP is based in Valparaíso, Vth Region, and had a staff of 63 individuals in 2007. It is not regionalized, meaning that the SSP has no direct representatives located in the various administrative Regions of Chile. However, the SSP has five zonal representatives, in each one of the geographic macro-zones designated for fisheries management purposes (described below with regard to the National Fisheries Council). While aquaculture has become more prominent over the last 20-25 years, the SSP's main activities are centered on fisheries, and particularly addressing regulatory and administrative problems regarding artisanal fisheries, as well as the way in which artisanal and industrial fishers interact.

Looking back at recent history, it is evident that the SSP has been instrumental in modernizing management systems for wild fisheries, a fact that has stabilized activities and led to sustainable investments and employment. With respect to aquaculture, however, it has had more of a 'reactive' rather than 'pro-active' focus due to the rapidly changing demands of a sector that has been dynamic in its development.

In relation to artisanal fisheries, a range of administrative schemes have been undertaken to exert control over the open access to fisheries. These include the National Registry for Artisanal Fishermen (NRAF) and the MAEBR scheme. While these have largely been effective in meeting their objectives, the SSP still faces a number of challenges in reducing the exploitation levels of coastal fisheries and ensuring the social sustainability of the artisanal sector. These issues include, the low prices received by artisanal fishers, the incentives for technological improvements in the sector, the quality of fish supplied, and the lack of social security coverage for many artisanal fishers.

The National Fisheries Service (SERNAPESCA)

Created by Decree-Law 2.442 of 1978, and with its structure modified by Decree Law (DFL) 1 of 1992, the National Fisheries Service (or SERNAPESCA) is headed by a National Director and falls under the direction of the Minister of Economy; it is therefore detached from the SSP's direct supervision. Unlike the SSP, this is a regionalized service, with direct representatives, personnel and offices in all Chilean Regions. Its head office is in Valparaíso and it has 44 offices spread along the coastline of Chile. In 2007, it had a staff of 348 individuals.

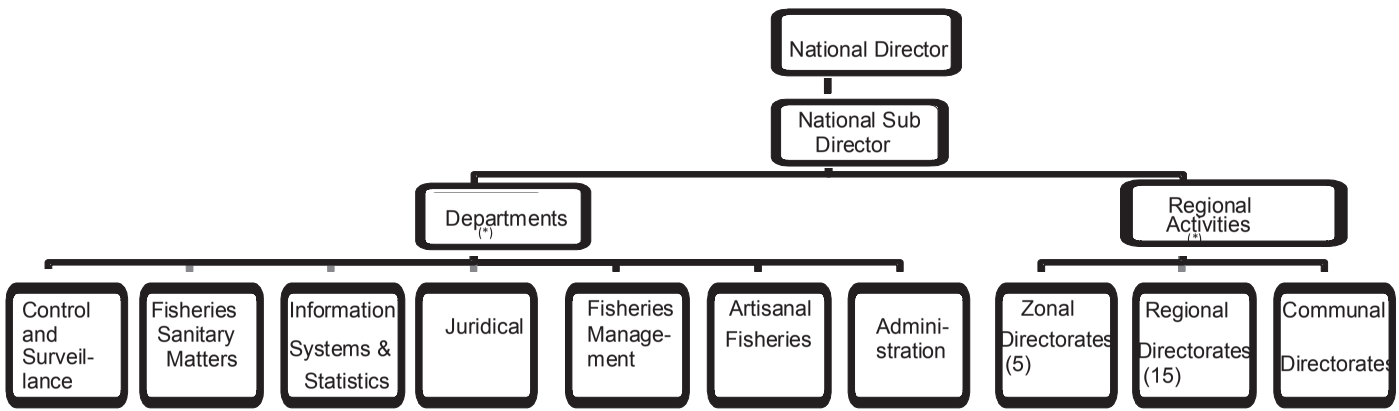
SERNAPESCA's mission is to "contribute to the sustainable development and the competitivity of the domestic fisheries and aquaculture sectors by enforcing the compliance of fisheries, aquaculture, health and environmental regulations that govern the activity and officially ensure the safety of exported fisheries products." Its goals are to:

- protect the status of fisheries resources through the enforcement of regulations that govern the activity to ensure its sustainability;
- collaborate with the export efforts of the country by providing the official support required by the destination markets through the certification of the safety of fisheries products for export;
- contribute to the productive development and the competitivity of domestic aquaculture, maintaining the condition of the aquatic environment and the health status of farmed species through the application of best practices, as well as enforcing environmental and health regulations that govern the activity;
- gather and process the information of the sectoral activity and manage the fisheries registries in order to facilitate decision making, enforce the compliance of fisheries regulations and issue the official fisheries statistics of the country; and
- contribute to the development of the artisanal fisheries sector through the dissemination of related rules and policies, sectoral technical support and the implementation and articulation of the production development program.

Until August 2008, SERNAPESCA also presided over the Zonal Fisheries Councils and the Regional Fisheries Councils created by the Fisheries and Aquaculture Law. However, this function is now performed by the Undersecretary for Fisheries. SERNAPESCA acts as the head and executive secretariat for the Fund for the Promotion of Artisanal Fisheries

The organizational structure of SERNAPESCA is shown in Figure 3.3. The dual institutional structure of SSP and SERNAPESCA requires strong coordination between the two bodies.

Figure 3.3. SERNAPESCA organizational chart



The Fisheries Development Institute (IFOP)

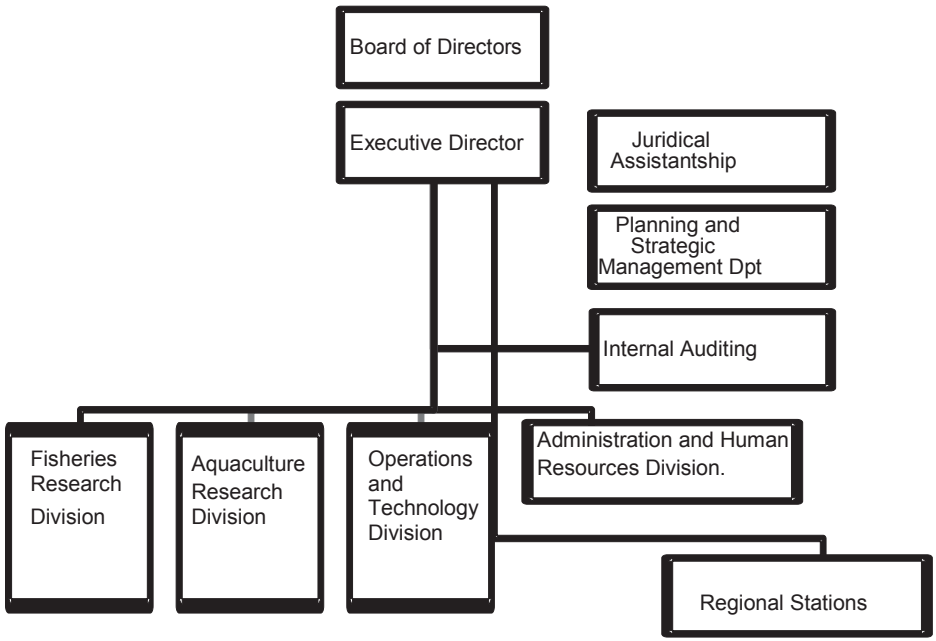
The Fisheries Development Institute (*Instituto de Fomento Pesquero*, IFOP) is a non-profit Corporation and was created in 1964 by CORFO (Corporation for the Promotion of Production from the Ministry of Economy) and the National Fisheries Association, SONAPESCA (a corporation representing the private sector's interests in fisheries and aquaculture) through a technical assistance agreement between the Chilean Government, the FAO and UNDP of the United Nations. Originally aimed at promoting fisheries development, IFOP is now the main government agency in charge of providing background information, analysis, and proposals to support the regulation of fisheries and aquaculture activities, and to undertake research to preserve wild fisheries resources and the environment. Its contributions are essential to the SSP, which relies on IFOP's advice to develop management strategies for local fisheries and aquaculture. IFOP is based in Valparaiso and had a staff of 498 in 2007.

The mission of IFOP is to be the provider of scientific and technical advice for the regulation of fisheries and aquaculture, as well as the conservation of hydrobiological resources and their ecosystems. This is achieved through the following strategic objectives:

- Evaluate, diagnose and recommend sustainable total allowable catches for the main hydrobiological resources, subject to industrial and small scale activities, through monitoring, direct evaluations and the study of the fishing oceanographic conditions.
- Evaluate, diagnose and recommend actions directed to the preservation and sustainability of aquaculture, from the environmental and sanitary points of view, through the monitoring of the activity and oceanographic behavior.
- Promote and develop the scientific and technical excellence needed to advice the fisheries and aquaculture management, together with the capacity building of the research and technical staff.
- Inform society of the concepts of responsible fishing and aquaculture and the sustainable development of fisheries.

IFOP's headquarters are located in Valparaíso, and it also has several regional stations. It is headed by an Executive Director, and employs 451 scientists and administrative personnel, based in 17 regional offices, and stationed in 37 different locations (Figure 3.4). It is directed by a Directive Council, which is normally led by the Undersecretary of Fisheries.

Figure 3.4. IFOP organizational chart



In strict legal terms, IFOP depends on CORFO for its funding and CORFO also nominates the Board of Directors and the Executive Director. However, its budget allocation is largely influenced by the SSP and also depends on funds either directly assigned by official bodies or obtained through open contests that assign public funding to projects of interest to society.

IFOP has been one of the pillars upon which the initial development of the Chilean fisheries and aquaculture industry during the 1970s has been based. Since then, this institution has been the subject of major organizational restructuring over the years following the completion of the FAO's initial mission to set up the institution. These restructures have tended to swing between regionalizing and centralizing activities, to shift the focus of development actions, and shrink or expand the number of people

involved (e.g. through the hiring of permanent or occasional staff). One of the major challenges facing IFOP at the moment is the ability to attract and retain high qualified staff.

The National, Zonal and Regional Fisheries Councils and the Aquaculture Commission

The National Fisheries Council was created by the Fisheries and Aquaculture Law 18.892. It aims at organizing the participation of all stakeholders involved in the fisheries and aquaculture sector, on matters related to production issues. As stated in its by-laws, it is a ruling, advisory and consultative body for matters such as establishing fishing quotas for industry and small-scale fishers; for dealing with the National Fisheries Development Plan; International Fisheries Policy; the National Fisheries Research Plan; modifications to the Fisheries and Aquaculture Law; development proposals for small-scale fishing; and similar high level policy actions.

It is headed by the Undersecretary of Fisheries, backed by the Directors of SERNAPESCA, IFOP and the Directorate General of the Maritime Territory and Merchant Marine (DIRECTEMAR). It also includes an additional seven members nominated by the President of Chile and approved by the Senate and by elected representatives from industry, worker organization and small-scale fishers. In total, the national Fisheries Council has 27 members. They meet at least once per quarter, and work *ad honorem* as established by law. Their role has been instrumental in facilitating consensus and social acceptance of management measures proposed by the SSP, which would otherwise be subject to open discussions in many other fora, thus complicating the decision making process. A high proportion of their activities are related to the approval of fishing quotas, limits or management systems.

Because of its extended membership, and their affiliation, decision making is not necessarily an easy task within the Council. However, the Council is a good mechanism to promote wider and quicker acceptance, and therefore better governance of fishery management policy.

There are also five Zonal Fisheries Councils aimed at contributing to the decentralization of management measures to be taken by authorities, and to enhance regional participation of fisheries and aquaculture stakeholders. Each Council represents a group of regions that are geographically close to one another. They are composed of 19 members that work on an *ad honorem* basis. They also have a consultative and leadership role, in order to

deal with matters of their concern (particularly those that have regional impact) as established by law.

The law also sets up Regional Fisheries Councils, which are aimed at studying fisheries and aquaculture problems affecting their zones, and to propose solutions and management measure to the corresponding authorities (SSP). Members of the Regional Councils also work *ad honorem.*

In addition to the above mentioned Councils, Chile has formed a National Commission for Aquaculture through Supreme Decree D.S 125 of 2003. This body advises the Chilean President on the formulation and evaluation of actions and programs that are necessary to implement the National Aquaculture Policy. It is presided over by the Minister of Economy, and has 17 members from different public services, private industry and organized labor. The representatives from industry and organized labor are nominated by the President, and represent associations and confederations that are specifically named in the statutes of the Commission. It convenes three times a year and has executive responsibilities in terms of adopting measures suggested by several sub-commissions that work in meetings organized in the intervening periods. Members work on *ad honorem* basis, and to date have dealt with a number of important issues such as authorized areas for aquaculture (AAA); statutes applicable to small-scale farmers; simplifying bureaucratic processes and regionalization; sanitary and environmental control, etc. Its executive secretariat is assigned to the Aquaculture Department at the SSP.

Parliament: Fisheries and Aquaculture Commissions

The lower house of the Chilean parliament, the Chamber of Deputies, has an *ad hoc* Commission of Fisheries, Aquaculture and Maritime Interest, with 13 members (including its President) and is responsible for the detailed analysis of all legal proposals submitted by the Executive power. The upper house, the Senate, has its own Maritime Interests, Fisheries and Aquaculture Commission, which is composed of five members, including a President.

Both chambers are the entities responsible for the creation of laws and the approval of international treaties. The Chamber of Deputies has the particular attribution of controlling Government's actions.

Other agencies involved in fisheries and aquaculture management and support [1]

Clearly, the main bodies responsible for managing wild fisheries and aquaculture in Chile are the SSP, with its regulatory powers, and SERNAPESCA, with its control obligations. The latter corporation is

supported by the Directorate General of the Maritime Territory and Merchant Marine, DIRECTEMAR, in several instances. Other institutions also contribute to the management of international affairs, such as the Directorate of Maritime Interests, of the Navy, and the Ministry of Foreign Affairs. On another dimension, the General Comptroller Office supervises the legality of public actions, and helps interpreting legal agreements, among other attributions.

When dealing with aquaculture, the SSP works closely with SERNAPESCA, the Undersecretariat of Marine Affairs, Ministry of Defense, and DIRECTEMAR. Other institutions also participate, such as the National Commission for the Environment (CONAMA), the Directorate of Frontiers and Boundaries (DIFROL), of the Ministry of Foreign Affairs, the General Comptroller Office and the Agriculture and Livestock Service (SAG) of the Ministry of Agriculture.

SERNAPESCA, SAG, CONAMA, the Ministry of Health and the National Customs Service (ADUANA) is responsible for monitoring processing control and certifying sanitary certification of fishery and aquaculture products intended for human consumption; dealing with liquid or solid residuals; environmental restrictions for processing plants, and certification of exports.

The SSP authorizes processing plants, with clear restrictions and limitations; the enforcement, verification and eventual sanctioning lie with other authorities, depending on the circumstances.

When dealing with research and development activities related to fisheries and aquaculture, there are several financial sources that help develop projects and research on management and control matters. For these specific purposes, the funds directly involved are the Integrated Project Bank, IPB; the Fund for Fisheries Management (FFM), the Fund for Fisheries Research (FFR) and the Fund for the Promotion of Artisanal Fisheries (FPAF). Other sources that generate knowledge used for management and control of fisheries and aquaculture are the National Fund for Regional Development (NFRD), and several funds from CORFO, and through different instances such as INNOVA, SERCOTEC, etc. In addition, the National System for Public Investment (NSPI) coordinates, evaluates and recommends the execution of studies and public investment projects of a different nature.

The private sector

Private entrepreneurs in the fisheries and aquaculture sector have been very well organized for many years now, and through their different

associations, they affiliate a substantial part of stakeholders involved in primary production and processing. There is a range of different associations and organizations covering the gamut of stakeholders. The two major ones are:

- The National Fisheries Association, SONAPESCA, representing most industrial producers working in wild fisheries and owning processing lines in land.

- The Association of the Chilean Salmon Industry, SalmonChile, where the most relevant salmon producers, processors and services are gathered.

SONAPESCA, the oldest and 'original' association of the Chilean fishing industry dates from 1949, and unlike other associations, is the only one that is composed of members from all parts of the country. Nowadays, it also represents seven smaller associations, four of which related to fishing, while the remaining three are focused on aquaculture in addition to its individual members. Its membership covers producers of different fishery products for human consumption, fish meal and oil and algae, as well as shipyards, manufacturers of fish diets, and several salmon producers.

In 1963 it contributed to the creation of IFOP and the Santiago Wholesale Fish Market, the latter of which was in operation until the early 1990s. Moreover, it has actively contributed to the formation of laws and management schemes applicable to this sector from its very beginnings, and has participated in countless international meetings representing the local industry's interests and point of view.

Through its members and directors, SONAPESCA is an active player in the National and Zonal Fisheries Councils, IFOP's Board of Directors, the Fisheries Research Council, the Permanent Commission of the South Pacific (CPPS), the Carlos Condell Educational Foundation, etc.

SalmonChile in turn, is a much younger institution, which was founded in 1986 when salmon farming was still being organized. Its principles and functioning have broken many innovative barriers in Chilean industry. It has been responsible for establishing voluntary quality control for salmon exports, a fact that accelerated the expansion of salmon sales abroad, and created an excellent image of the country. Originally, its membership extended only to salmon farmers, but currently it includes a wide variety of members, including providers of products and services.

With funding from CORFO, SalmonChile founded INTESAL, the Salmon Technical Institute. This is a very unique and innovative organization, dedicated to promoting and developing R&D that serves the

industry's needs, while also involving itself in extremely important activities, such as the elaboration of the farming Codes of Practices; rules for proper discarding of residuals; for handling of fish after slaughtering and during processing, etc. It is also responsible for a unique integrated geographic information system, SIGES, which covers a number of environmental issues of concern to its members and society as a whole.

A list of the main fisheries and aquaculture associations currently representing industrial activities and professionals in Chile is provided in Table 3.1.

Table 3.1. Private sector representative organisations

1	**SONAPESCA Members**
	Fisheries Associations
	Federación Gremial de Industrias Pesqueras de la Macro Zona X, XI y XII región "FIPES"
	Asociación de Industriales Pesqueros de la Región del Bío Bío A.G (ASIPES)
	Asociación Gremial Industrial de Pesqueros de X y XI Regiones
	Asociación de Armadores e Industriales Pesqueros del Norte Grande, I y II Regiones A.G. (ASIPNOR).
	Aquaculture Associations
	Asociación de Productores de Abalón A.G
	Asociación de Miticultores de Chile A.G.
	Asociación de Productores de Ostras y Ostiones de Chile A.G.
2	**Non Members of SONAPESCA**
	Professionals
	Asociación de Profesionales Pesqueros y Acuicultores de Chile
	Colegio de Acuicultores de Chile A.G.
	Fisheries Associations
	Asociación Industriales y Armadores Pesqueros IV Región A.G.
	Aquaculture Associations
	Asociación de Cultivadores de Moluscos de Calbuco, X Región
	SalmonChile- Asociación de la Industria del Salmón de Chile A.G.
	Other Associations
	Asociación Gremial de Empresas de Buceo para la Acuicultura
	Asociación de Industriales Pesqueros y Cultivadores Marinos, III Región

Employees of the industrial sector are very well organized across three unions, that cover the following interest groups: i) Industrial fishers, ii) Officers of industrial vessels, and iii) processing plants workers. These three organizations are very influential, and not only discuss employment and economic matters with their counterparts within the industry (plant and boat owners), but also represent their membership in Fisheries Councils and

many other instances where management systems, fishing quotas, social matters etc, are analyzed and determined.

In essence, all these associations and unions represent their members both in Chile and abroad, as well with local authorities, NGOs, worker's organizations, small-scale fishers, and the public at large. They are an essential part of the governance system in the Chilean fishing and aquaculture sector, and in collaboration with the Government, the most important management schemes applied in this sector of the economy are studied and negotiated.

Small-scale or artisanal producers

Artisanal fishers are distributed all along the Chilean coastline and on the interior of the country, and are usually organized into one of three basic legal structures: guild associations, unions or cooperatives. The number of each type of association has varied over the years, but in general terms, they are founded with approximately the same goal; which is to assist individual members on social and employment matters, and to become a valid representative of organized labor (in this case, individual small-scale producers) with respect to local authorities and in international fora. This attribute has been very relevant in Chile, as local authorities tend to favor those communities which demonstrate an adequate level of organization and good leadership.

Information from 2007 shows that there were 569 artisanal associations at the end of that year, 79% of which were unions; 4% cooperatives; 12%, guild associations, and the rest were various types of less formal associative schemes. About 40% of these organizations were located in the Xth Region, and an extra 16% in the VIIIth Region (Table3.2).[2]

The two largest federations of artisanal fishers are:

- CONAPACH, or National Confederation for Chilean Artisanal Fishermen,
- CONFEPACH, or National Confederation of Chilean Artisanal Fishermen's Federations

CONAPACH was founded in 1990, and its members are composed of artisanal organizations from all over the country. It is well organized and supported by technical staff, and its directors participate in the National Fisheries Council, Zonal Councils and other consultative bodies. It aims at representing its membership before the authorities; in the formation of laws; in discussion on quotas and other management schemes, etc. It is also

dedicated at perfecting the organizational levels and working conditions of individual members, as required.

CONFEPACH was founded more recently in 1998, and was born after several members of CONAPACH disagreed with their leadership on several issues being discussed at that time, who then decided to form a new institution. Its base is somehow narrower than that of CONAPACH, and its organizational level is generally less sophisticated.

Today, CONFEPACH represents 14 organizations, and claims to be the voice for about 17 000 members. Their aims are equivalent to those of the other Confederation.

Table 3.2. Artisanal organizations at the end of 2007

Region	Type of Organization				Total	% of Totals
	Union	Cooperative	Guild association	Other (1)		
I	16		1		**17**	**3,0**
II	22			1	**23**	**4,0**
III	19	1	1		**21**	**3,7**
IV	21	2	28	6	**57**	**10,0**
V	28	4	2		**34**	**6,0**
VI	14			1	**15**	**2,6**
VII	17			2	**19**	**3,3**
VIII	67	1	12	8	**88**	**15,5**
IX	1		1		**2**	**0,4**
X	187	6	20	14	**227**	**39,9**
XI	53	6	3		**62**	**10,9**
XII	3	1			**4**	**0,7**
Country	**448**	**21**	**68**	**32**	**569**	**100,0**
% of Totals	**78.7**	**3.7**	**12.0**	**5.6**	**100.0**	

(1) Less formal associative schemes

Source: Figures calculated by the study, on raw data provided by SSP, October 2008

Non-governmental organizations (NGOs)

With an unquestionably growing influence, and an increasingly stronger voice on several discussion panels, NGOs are a relatively new participant in fisheries governance in Chile. Until recently , NGOs have concentrated their efforts on discussing bans for whale and marine mammal exploitation;

handling environmental issues, for matters related to fisheries discards, trawling, etc. They have been particularly active in aquaculture related matters, where they have questioned a number of the industry's environmental practices such as fish escapes, the use of antibiotics, labor practices, salaries, etc. On several occasions they have acted with or through small-scale producer organizations, and they normally oppose large scale aquaculture.

Among others, the following institutions are known to be developing activities and lobbying on different issues related to fisheries, aquaculture and environmental matters:

- Ballena azul
- CCC-Center for the Conservation of Cetaceans
- Ecoceanos
- Greenpeace
- Foundation Terram
- Ecolyma
- FIMA

Notes

1. Most parts of this paragraph are extracted from an internal document provided by the SSP, 2008.
2. Figures do not include small-scale aquaculture, for which it has been reported that about 71% of small-scale farmers were affiliated to producer's organization of some sort in 2004 (GESAM, 2005, op.cit).

CHAPTER 4

Fisheries and aquaculture management policies

Chilean fisheries have evolved rapidly over the last 50 years. During this period, all the phases of what might be considered a "normal" path of development have been experienced: high development rates in landings and farming volumes in the early years, followed by overcapitalization in fisheries, overexploitation of the natural resources, bans in certain fisheries, and environmental and sanitary impacts in aquaculture. At the same time, management policies, systems and institutions have evolved to address these challenges and have been adapted to new circumstances in order to improve managerial systems and governance.

This chapter provides a review of the evolution and current status of Chile's fisheries and aquaculture management policies. Because the development of the policy framework for fisheries and aquaculture is closely interlinked, the chapter addresses both policy spheres together.

In terms of fisheries and aquaculture management policies, the last fifty years can be divided into four periods:

- 1958-1978: The promotional stage and the designing of the initial management schemes in fisheries and aquaculture.
- 1979-89: The new institutional framework and legislation; fisheries development and the birth of commercial aquaculture.
- 1990-2000: Enforcement of the new legislation, access regulations in fisheries and the aquaculture "boom".
- 2001-present: Consolidation and stability of major fisheries and the new environmental and sanitary regulations in aquaculture.

1958-78: Initial management schemes in fisheries and aquaculture

Initially, fisheries were governed through the Ministry of Agriculture (mainly SAG). Due to unemployment in the mining sector, coupled with high expectations in Northern Chile regarding the phenomenal growth of pelagic fisheries in Peru (e.g. anchovy), the Chilean government designed promotional policies aimed at developing fisheries for small pelagics, and fish meal production (Decree Law 208 of 1953, and 266 of 1960).[1] During this phase, Chile changed its basic economic policies, opening its frontiers to international trade, encouraging exports and discarding older strategies based on the substitution of imports.

For the first time, fishing authorizations were requested from all industrial participants in fisheries and fish processing (Agriculture Decree 94 of 1958, and 597 of 1960). Artisanal fisheries were still subject to open access without restrictions. Aquaculture was in its infancy, limited to the seeding of lakes and rivers with juvenile trout, in order to studying an eventual farming operation with salmon in Southern Chile, and to producing limited quantities of mollusks, particularly mussels and the native oyster.

The promotional policies aimed at developing the anchovy fishery in Northern Chile were initially successful, attaining a record 1 million tonnes landing of anchovy in 1964, but collapsing shortly thereafter. The Government intervened with a rescue plan intended to assist investors that were about to go bankrupt. This is the only occasion over the last fifty years where the State has subsidised private producers in order to limit excess fishing and processing capacities.

Other important developments throughout this period were in the common hake fishery in Central Chile, with a landing record of 128 000 tonnes in 1968, and the shrimp and prawn fisheries, which recorded a maximum catch of 62 000 tonnes in 1976.

In 1952, Chile, together with Peru and the Equator, sign the *Declaración de Santiago* under which a 200 mile EEZ zone was adopted by each of the signing countries. This declaration was to become the basis for the 1982 international agreement on EEZ, with UN and worldwide acceptance. Additionally, in 1975 Chile subscribed to the Convention for International Trade in Endangered Species of Wild Fauna and Flora (CITES).

1979-89: The new institutional framework and legislation

General developments

In 1978, the Ministry of Economy was assigned the responsibility of managing all fisheries and aquaculture matters in Chile; to that end the Undersecretariat of Fisheries (Sub Secretariat de Pesca, or SSP) and the National Fisheries Service (SERNAPESCA) were created, directly reporting to the Minister of Economy (Decree Law 1.776 of 1976, and 2.442 of 1978). This new political visibility of fisheries and aquaculture within the Government, augmented the portion of the budget directed to the sector and enhanced its development possibilities.

Fisheries were governed by the new Decree 175 of 1980, and Decree Law 5 (1983) which regulates the functioning of the newly created administrative bodies, as well as by an update to Decree Law 34 of 1931. Under these laws, authorizations to work in fisheries, aquaculture and fish processing were strengthened through a higher legal status. Authorizations were also declared non transferable and were defined as non negotiable. Local laws and regulations state that fishing boats carrying the Chilean flag are the only ones authorized to operate in the Chilean EEZ.

Artisanal fisheries were still managed under an open access system. Aquaculture site concessions were only assigned after the corresponding production project description was submitted to the SSP, and was further approved by the Undersecretariat of Marine Affairs.

In 1986 the Civil Code was updated, modifying the concept of free access to fisheries to one that "in due course, specialized bodies such as SSP might propose for these purposes". This same modernization incorporated the EEZ concept to the Civil Code (Article 596), and described Chilean sovereignty rights on those territories.

Finally, with respect to aquaculture, Decree 660 of 1988 established new requirements in order to be granted marine site concessions.

As a result of the opening of the Chilean economy, fishing and aquaculture investments were no longer restricted by the size of the domestic demand. External demand–led processes influenced the development of two important industrial fisheries: sardines, in Northern Chile; and demersal fish (Southern hake, conger eels) in the outer oceanic part of the Xth to XIIth Regions, starting from parallel 43°S. To a lesser extent, the jack mackerel fishery was also enhanced in Northern and Central Chile. These demersal fisheries were mainly developed by foreign capital from Japan, Korea and Spain, as they were able to incorporate their trawlers and long-liners according to rules established in Decree Law 600 of 1974.

For the first time, fishing factory vessels were authorized in Chile, albeit restricted to work solely in these fisheries.

In 1985, the high demand for fishing permits to work in the pelagic fisheries (anchovy, sardine, jack mackerel) forced the SSP to regulate access to the fisheries, freeze the size of the fleet and the related fishing power and refuse new permits (Decree 436 of 1985). For the first time, all these fisheries were declared to be 'fully exploited', a definition that had not been used before in Chilean fisheries. In fact, sardine landings reached a record level of 2.6 million tonnes in 1985, the same year these restrictions were imposed.

In the Southern demersal fisheries, before a Decree was passed to limit fishing power, landings reached about 30 000 tonnes in 1988[2], a year in which these fishery resources were declared as being 'fully exploited'; as such further fishing permits were denied. During 1989 a Decree was passed to regulate further access to these fisheries.

These management schemes enforcing limited access to these fisheries created strong opposition from many interested parties, arguing that imposing these regulations were against the free exercise of economic activities, which was guaranteed by constitutional rights (1980). On several occasions these matters were the subject of judicial proceedings, where the State's standing ultimately prevailed.

These regulations imposed on several fisheries during this period are a clear demonstration that during the 1980s the State implemented policies leading to the control of free access.

Other important demersal fisheries, such as common hake and prawn, also decreased noticeably during this period. In the case of prawns, the SSP imposed a three year total ban on fishing between 1980 and 1982. In 1983, that fishery was opened again, but subject to fishing seasons and a global annual catch quota. This scheme failed, as it did not only encourage producers to fish very intensively for a short period of time, resulting in high losses because of poor quality, but also shortened the fishing season to about one week per year only, with the corresponding economic losses. The process ended with the enforcement of another fishing ban for an additional three years (1989-1991) as control of these regulations was fragile and resulted in illegal catches that negatively affected the resource's sustainability.

In the common hake fishery, landings diminished from a record 128 000 tonnes to 30 000 tonnes by the mid-1980s, and global annual quotas were imposed by the SSP from 1985.

It is important to add that in a transitory article, Law 18.892 declares the common hake industrial fishery under 'full exploitation', adding it to the list of other industrial fisheries (sardine, anchovy, jack mackerel, Southern hake and conger eel) that had already been closed to further access. The entrance of additional vessels is banned in all of these fisheries. In the case of jack mackerel, where access had been previously banned only in the Ist, IInd and VIIIth Regions, this prohibition is extended to the Vth to VIIth Regions, plus Region IX.

Another transitory article of this same law declares the prawn fishery 'under recovery', and in consequence, the ITQ regime was as well.

As artisanal fishers also experienced strong foreign demand for their products, fishing effort intensified, particularly for benthic resources such as "loco" and gracilaria algae. In the case of loco, landings of this valuable gastropod reached 25 000 tonnes in 1980, and thereafter the SSP imposed fishing bans during the reproduction season for the years 1981-1984. Afterwards, and due to a continuous deterioration of the "loco" resource base, global annual landing quotas were added to the aforementioned restriction (1985-1989). All these schemes failed in the end, as the restrictions imposed were not observed by fishers, and were poorly controlled by authorities, thereby resulting in overexploitation of the "loco" and the need to impose a total fishing ban for 1989-1992.

Gracilaria algae extraction followed the loco's fishery patterns, reaching a volume of 113 000 tonnes by 1985, a situation that made natural algae prairies collapse. As a result of this, areas were assigned to algae collectors, that were composed exclusively of small artisanal producers, so that they could start farming this resource. These areas were assigned on the basis of historic landing records for the different fishers and represented a new method of assigning property rights to artisanal fishers in Chile.

Commercial salmon farming was established in Chile at the end of the 1970s, and reached 1 000 tonnes only by 1985. This attracted the attention of local entrepreneurs who, based on the new economic policies, tended to favor exports. The promising economic result of this activity started a quick and intensive investment movement that resulted in the speculative handling and transfer of marine and fresh water sites, and a rapid growth in production.

Initially, salmon farming developed under very basic official restrictions. The most important regulations covered the sanitary control of imported eggs and a compulsory minimal distance among fish farming sites (1.5 miles on the sea; 3 km for fresh water sites). Additionally, permits to farm salmon juveniles in lakes were restricted. Perhaps one of the most important deficiencies at the beginning of this extremely interesting

development process was the lack of adequate protocols and procedures to evaluate the eventual environmental impact of this production system.

This relatively relaxed attitude towards salmon farming in the beginning is most probably related to the fact that in the previous 100 years, the Chilean government had been involved in promoting and financing the seeding of trout and salmon juveniles in Southern rivers and lakes. Moreover, regional State organizations financed the first research initiatives to evaluate the technical and economic viability of salmon farming in net-pens.

During the first years of intensive salmon farming, a very high proportion of salmon and trout eggs were imported live. Even though there were rather strict sanitary regulations in place, the environmental risks involved were very high. Eventually, it can be argued that through egg imports, several diseases were brought to Chile.

No research, aimed at devising more sophisticated management schemes for intensive fish farming in Chile, was carried out by official institutions in those early days. IFOP focused its research on wild fisheries to help facilitate the SSP's management work. In fact, as from 1985, the SSP directly hired IFOP to carry out appropriate research with these aims. In 1980, IFOP also incorporated a research vessel (R/V Itsumi), donated by the Japanese government, which made direct stock assessment possible for a number of fishery resources. In 1990, this vessel was replaced by R/V Abate Molina, which was also a donation of the Japanese government and which continued Itsumi's work. Both research vessels were endowed with state of the art equipment, particularly with respect to hydro acoustics.

The fishing and aquaculture law of 1989

Growth in landing volumes, the failure of several management schemes, growing disputes regarding access to different fisheries, and the artisanal sector's crises ("loco", algae, etc.) were key factors indicating a need for new legislation to govern the fisheries and aquaculture sector. The government of the day also felt that a comprehensive new law was required to provide it with the capability to face the emerging challenges in the sector and to introduce changes to institutional structures. After about three years of work by the SSP, Law 18.892 was enacted in December 1989. However, in March 1990 it was decided to postpone its application until September 1991, in order to facilitate important reforms that the newly appointed Parliament considered necessary. The final result of this process was enacted through Decree 430 of 1991, after which this law came in to force. The law resulted in the creation of the dual structure of the SSP and SERNAPESCA.

The fundamental management concepts of this law listed below.

Industrial Fisheries

Industrial fisheries can either be defined as 'fully exploited', 'under development', or 'under recovery (rehabilitation)'.

- In fully exploited fisheries, the State can only limit access on an annual basis. Quotas under this regime can be imposed, and if so, they must be approved annually by the National Fisheries Council. Fishing boats are required to pay an annual fee in relation to the GRT of each unit. Under this regime, fishing rights become transferable with the respective vessel, and are declared indivisible, *i.e.* no one can replace a fishing permit assigned to a big boat for various permits assigned to smaller units, which in total add up to the capacity of the bigger unit.

- When an industrial fishery is declared 'fully exploited', and access is closed, admission should also be closed for artisanal fishers exploiting this same resource.

- Fishing rights, for boats working under the 'fully exploited' regime are permanent, and therefore they do not expire on any particular date, unless some of the causes for revocation established by law are made applicable.

- In fisheries under development or under recovery, individual transferable catch quotas (ITQs) are allocated through a public bidding process, for a period of ten years (Box 1). No annual fees are payable.

- To be considered as an 'under recovery' regime, the fishery must be overexploited, and a total fishing ban is to be applied for at least three years. Of course, it should be identified that the natural fishery resource is recuperating in the absence of fishing effort.

- In the 'under development' system, available fishing effort applied on the fishery should be sufficient to catch only less than 10% of the annual quota suggested as viable by the SSP for this fishery. Additionally, there should be a high demand to participate in this fishery.

For all fisheries not considered under any of these three new categories, the old system applies. That is, new boats must request permission to fish in the corresponding fishery, and are thereafter subject to management

schemes devised by the authorities as they feel fit. Fishing permits are permanent and non negotiable, but they can be transferred.

Box 4.1. The Use of ITQs in Chilean fisheries

Chile has been discussing the introduction of Individual Transferable Quotas, (ITQs) as a management tool for industrial fisheries since the early 1980s. The Fisheries Law of 1991 introduced this management scheme for a limited number of fisheries, and for restricted periods of time. In effect, the 1991 Law allowed ITQs in the following cases:

I. **Fully exploited fisheries**

These fisheries are basically defined as those in which annual catches are equivalent to fish population growth, taking into consideration all biologic concerns so as to guarantee long term stock sustainability. Under these circumstances, and with annual quotas imposed, ITQs are applicable by Decree, only upon request of the SSP and with the approval of the corresponding Fisheries Councils. The system, if applied, allows the SSP to allocate annually, through public auction, 5% of the annual catch quota, for a period of 10 years. The allocation process cannot exceed a 50% limit of the annual allowable catches. This management option has never been used this far in Chile.

II. **Fisheries Under Recovery**

These fisheries are defined as having been overexploited, and subject to a total fishing ban for at least 3 years. The natural fishery resource should be recuperating so that annual quotas can be estimated. Again, under these circumstances, ITQs are applicable by Decree, only upon request of SSP with the approval of the corresponding Fisheries Councils. The system, if applied, allows the SSP to allocate annually, through public auction, a 10% of the annual catch quota, for a period of 10 years.

The first allocation process refers to 100% of the annual allowable catch, for a period of 10 years. Thereafter, year after year a 10% of the respective annual quota is auctioned, gradually reducing the original stakeholders‘s participation so that their allocations are completely extinguished in a matter of 10 years. Generally speaking, 1% of the annual quota is the basic partition used in the auctions. No party can become the owner of over 50% of any annual quota. The prices of the ITQ rights are payable on an annual basis, in advance, during 10 years. Each auction has a minimum price tag assigned.

Under the 1991 Fishing Law, this management option has been used in the following cases:

Red prawn demersal fishery, Vth to VIIIth Regions.

- This fishery was declared ‘under recovery’ in 1992.
- ITQs were applied from 1992 to 2000 (nine years)
- From 2001 to 2008 a biologic-based fishing ban was established
- Annual quotas for the late part of the 1990s were of the order of 10.000 tonnes per year, after a start with significantly lower quantities (4.000 tonnes in 1992).
- Approximate number of participants per year : 11

Yellow prawn demersal fishery, Vth to VIIIth Regions

- This fishery was declared 'under recovery' in 1996
- ITQs were applied from 1998 to 2000 (3 years)
- From 2001 to 2007 a biologic fishing ban was established
- In 2007 auctions were reinitiated for operations as from 2008
- Annual quotas are of the order of 4 000 tonnes per year in 1998-2000 and of 2 500 ton for 2008
- Approximate number of participants per year : 17

III. Fisheries Under Development

This definition is applicable to demersal and benthic fisheries only, where either there is no fishing activity, or if it exists, available fishing effort applied on the fishery suffices to catch only less than 10% of the annual quota suggested as viable by the SSP for this fishery. Concurrently, a high demand to participate in this fishery should exist.

Under these circumstances, ITQs are applicable by Decree, only upon request of SSP with the approval of the corresponding Fisheries Councils. The system, if applied, allows the SSP to allocate annually, through public auction, a 10% of the annual catch quota, for a period of 10 years.

The first allocation process refers to 100% of the annual allowable catch, for a period of 10 years. Thereafter, year after year a 10% of the respective annual quota is auctioned, gradually reducing the original stakeholders's participation, so that their allocations are completely extinguished in a matter of 10 years. Generally speaking, a 1% of the annual quotas is the basic partition used in the auctions. No party can become the owner of over 50% of any annual quota. The prices of the ITQ rights are payable on an annual basis, in advance, during 10 years. Each auction has a minimum price tag assigned.

This system has been used as a management tool only in the following cases:

Chilean seabass demersal fishery, South of 47°S

- This fishery was declared 'under development ' in 1992
- ITQs were applied from 1992 to 2008 (17 years)
- Annual quotas in recent years (3 000 tonnes per year) are significantly lower than those at the beginning of the period (15 000 tonnes per year)
- Approximate number of participants per year : 19

Orange roughy demersal fishery throughout continental and insular Chilean EEZ

- This fishery was declared 'under development ' in 1998
- ITQs were applied from 1999 to 2005 (7 years)
- From 2006 to 2008 a biologic fishing ban was established
- Annual catches are lower than allowable catches
- Approximate number of participants per year : nine

Artisanal fisheries

Artisanal fishers are properly defined. With respect to boat owners, it is established that their vessel's capacity should be limited in overall length and carrying capacity, as detailed earlier. These parties, along with divers, algae and mollusk collectors, etc. are also required to work commonly on these activities to become a viable artisanal fisherman. Artisanal fishers are also to be registered on the National Registry for Artisanal Fishermen, NRAF, in the particular area where they live. They can only operate in the Regions where they reside, apart from exceptional cases.

- Artisanal fishers are allocated exclusive fishing rights in the first 5 miles contiguous to the coastline and on interior marine waters from the Xth to the XIIth Regions. Only under exceptional and regulated conditions can industrial fishing be authorized in these areas.

- In general terms, artisanal fisheries are granted free access. However, when the natural resources are declared "fully exploited", as per the SSP's assessment, access can be limited.

- With respect to benthic resources, artisanal fishers have the option to request for MAEBRs, which allow them to exclusively exploit specific areas, under the condition of having a previously approved adequate management plan.

Aquaculture

Four types of site concessions for aquaculture purposes are defined. These are for: beach sites; beach-front sites; water sites including sea/fresh water beds and their corresponding water columns; and sites with rocks. The key regulations attached to concessions are:

- Site concessions are transferable and negotiable.

- Only Chilean natural or legal persons are authorized to carry out aquaculture activities in Chile. Foreigners interested in these matters, must first create a Chilean company.

- Owners of site concessions have to pay annual patent rights, on the basis of a fixed amount per surface unit. These fees do not vary in terms of species, size or technology.

- Appropriate aquaculture areas (AAA) for all regions are established and these are the only areas where aquaculture activities can take place. All

approved enterprises and aquaculture sites have to be registered in the National Registry for Aquaculture Concessions and Authorizations (NRACA), which is publicly available.

- Procedures are established to govern the import of exotic live aquatic resources. In case the background information provided to the SSP indicates that there are serious sanitary or environmental risks involved, a formal environmental impact report may be required before approval is granted.

- Specific procedures are established to prevent and control fish diseases and their spreading.

- Small-scale farmers are not separately defined under this law; this aspect is currently being analyzed by the SSP.

Marine parks and reserves

The law enabled the creation of Marine Parks and Reserves. The former, to be supervised by SERNAPESCA, were aimed at preserving ecologic units of interest to science and maintaining biologic diversity, while Marine Reserves were intended to guarantee protection for the reproduction of marine species, and for reseeding activities. They can also include formerly overfished areas.

Sanctions

Sanctions, crimes and expirations are codified in this law. Formerly, sanctions were dealt with by local Police judges at a communal level. Under the new law, these matters go before Civil Judges in normal Civil Courts, a fact that assigns higher importance to these issues.

The general principle applied here is that whoever commits a crime, or damages third parties or the environment, is responsible for repairing any such problem, and indemnifying those that were affected. Sanctions and crimes are penalized with proportional pecuniary payments, higher than in the past, aiming at deterring eventual transgressions. Penalties can be imposed by Police, Marine personnel and SERNAPESCA.

Fisheries Councils and other administrative bodies

Three different Council levels (Regional, Zonal and National Fisheries Councils) were established to discuss and approve the most important

management measures applicable in fisheries and aquaculture, as detailed in Chapter 3.

The Fund for Fisheries Research (FFR) was formed to finance research and studies that help design and improve managements systems in Chile. Studies are assigned through public biddings and all reports produced are in the public domain. FFR is managed by the SSP, and is headed by its Executive Secretary. However, it hierarchically reports to the Minister of Economy.

The Fund for the Promotion of Artisanal Fisheries (FPAF) was established under the law. It is managed by SERNAPESCA, and is devoted to enhancing infrastructure, technical assistance, fish farming, ranching and marketing.

Factory vessels and the high seas

Factory vessels are prohibited in the Chilean EEZ. Exceptionally though, and in fisheries that still have room for further expansion, these vessels can be authorized for limited periods of time only to operate in the West of the 150 mile zone and to the South of parallel 47°S (Article 162).

For highly migratory species and straddling stocks, management plans that affect fisheries within the Chilean EEZ, can be extended to the contiguous oceanic zones beyond the EEZ (Article 165).

1990-2000: Consolidation and the aquaculture boom

Chile consolidated its role in global fisheries and aquaculture during this decade, becoming one of its main players. Aquaculture in particular, exploded in terms of production and Chile became established as the second producer of farmed salmon and trout in the world, and the major supplier of these products to the US and Japanese markets. Scallop farming also advanced substantially, and mussel farming, a neglected activity for many decades, started an impressive development process from 1998 onwards.

Industrial fisheries

During this period the majority of industrial fisheries were declared 'fully exploited', two were declared 'under recovery' and two' under development'. Only a few small industrial fisheries were still managed under traditional rules, such as annual quotas, closed seasons, and gear selectivity.

In fully exploited fisheries (sardine, anchovy, jack mackerel, hake, Southern hake -and other hakes caught in Southern seas-, conger eel), access was limited on an annual basis, and in many cases, annual global quotas were also imposed. This regime helped control a trend towards overinvestment, but nevertheless it did not stop participants from competing for higher shares of the total allowable catch. This "Olympic" fishing resulted in shorter fishing seasons and other inefficiencies associated with fish processing and marketing. Even though the entrance of further vessels was not allowed under this management regime, replacements were authorized.

In the swordfish and jack mackerel fisheries ("fully exploited"), where fishing takes place within and outside the Chilean EEZ, applicable management schemes were extended so as to include international waters. This meant that authorized Chilean vessels were then subject to the same management rules in international and domestic waters, in contrast to the "free fishing" approach that is normally applicable in high seas to unregulated fisheries.

With regard to fisheries under recovery (red and yellow prawns), the introduction of ITQs did not lead to the rapid recovery of stocks and bans were introduced as stocks did not recover as originally expected. Contributing factors included:

- The ten-year limit to the ITQ system which did not provide adequate incentives to promote long-term sustainability, and may have induced illegal or unauthorized fishing.

- Fishing regulations were not effectively enforced, and were therefore subject to unreported catches.

- The rules imposed for managerial purposes were neither necessarily precise nor adequate enough considering the high biological risk inherent to fisheries that had previously been depleted.

In relation to orange roughy and Chilean seabass (to the south of 47°S) fisheries, fisheries 'under development' schemes were applied with the introduction of ITQs. However, in neither of these fisheries were results satisfactory. The same issues that arose in the management systems applied to the prawn fisheries also arose in these fisheries.

In the case of Chilean seabass a ten-year period with ITQs was completed for the first time. A second period was initiated immediately thereafter. During the first part of the initial ten-year period, registered landings were far higher than the originally authorized quotas. The

explanation was that all excess catches had been taken in international waters, where fishing was not restricted by Chilean authorities. In those years, GPS systems were still not in place so these explanations had to be accepted by local authorities.

Strengthened enforcement measures

During 1997, Law 19 521 was enacted enforcing a compulsory Global Positioning System for fishing and research vessels. This system, regulated by Decree 139 of 1998, became fully operational in August 2000, and allows authorities to establish at given moment, the position, course and speed of all industrial fishing boats working on the Chilean EEZ. This information is sent on-line to SERNAPESCA and the Directorate General of the Maritime Territory and Merchant Marine (DIRECTEMAR). It serves the purpose of ensuring that industrial vessels do not enter the exclusive artisanal five-mile zone, nor that they fish in other unauthorized areas, beyond what is established on the respective fishing authorizations. [3]

Artisanal fisheries

Three major events characterize artisanal fisheries during this period:

- Implementation of the National Registry for Artisanal Fishermen (NRAF).
- Some artisanal fisheries are declared to be 'fully exploited', and are subject to limited access, for the first time in the history of artisanal fisheries.
- Management Areas for the Exploitation of Benthic Resources (MAEBR) are established.

The idea behind the National Registry for Artisanal Fishermen NRAF is to control unregulated access to artisanal fisheries, and to restrict the fishers' activities within the Region where they are originally registered. However, the full process has not fulfilled its purpose; the NRAF cannot be updated easily and has limited success as an effective control tool for management purposes. Whatever the case, the number of artisanal fishers has augmented substantially along the years, as previously discussed.

In cases where a fishery resource, exploited jointly by industrial and artisanal fishers, has been declared 'fully exploited', this declaration has affected both industrial and artisanal fishers by controlling access and eventually by limiting annual landings. In the case of artisanal fisheries, limitations affect both fishing boats and fishers. In this last case, for

instance, the NRAF is closed and newcomers to the particular fishery are not accepted. Only fish resources are being managed through these mechanisms, including the highly migratory swordfish which is one of the most important species exploited by small-scale producers because of its high economic value.

Rules for developing Management Areas for the Exploitation of Benthic Resources (MAEBR) were established in 1995, and from 1997 these allocations became more widely considered by fishers. The 'loco' was probably the main species attracting the fishers' interest in establishing MAEBRs. Benthic species fisheries that are not included in MAEBRs are not subject to access restrictions.

At least initially, management plans required by the authorities from fishers wanting to apply for MAEBRs were financed by the State. These management plans have to be updated annually by specialized consultants.

Aquaculture

From a managerial standpoint, this period was characterized by an important effort to establish Aquaculture Authorized Areas (AAA) as required by law, thus facilitating the expansion of aquaculture throughout the country. Even though the determination of AAAs should have simplified the procedures to have a concession approved, the massive amount of site requests (associated mainly with salmon and trout farming) significantly slowed the public approval system. The private industry suffered from the lack of capacity and inefficiencies of the public offices, where applications were not dealt with in a timely fashion. Detailed regulations and process site concession requests were also given high priority during this period.

Regulations to import live exotic species were also put in place. For the first time these regulations were very specific as to the species to be imported for the first time to Chile, including a description of the technical terms of reference for impact report studies that have to be conducted for these purposes.

In this decade, turbot and abalone farming became commercially established in Chile, while white sturgeon, halibut, hirame, channel catfish and other species were also imported for research purposes.

Farming was also regulated in relation to 'acceptable practices' to be applied to marine sites. Decree 550 of 1992 established the proportion of total available space on any one site that can be occupied by net-pens; the number of mussel or scallop long-lines per hectare, etc. In 1995, new regulations regarding imports, storage, use, etc. of veterinary drugs were also enacted.

The tremendous growth in salmon and trout production also generated the first high-impact disease outbreaks in Chile, with the corresponding usage of antibiotics; new research with regard to vaccines, etc. During this decade, local producers invested very heavily in the production of salmon and trout ova. However, imports of eggs continue, even if they were likely to be banned completely in the near future.

By the end of this period, Chile was farming 14 different species, including six native species (scallop, Gracilaria algae, mussels, cholga mussel, choro zapato mussel and native oyster), four salmonid species (Atlantics, Coho, Chinook and rainbow trout) and four exotic species (turbot, red and green abalones and the Pacific Oyster).

Environmental impact assessment of aquaculture sites

In 1994, Law 19.300 (General Law on the Environment, GLE) was enacted, enforcing new regulations to deal with environmental issues in Chile, and imposing the Environmental Impact Evaluation System, EIES, applicable to all relevant production activities. In the case of aquaculture, all projects have to be evaluated on environmental terms from that point forward, under the rules established by Decree 30 of 1997.

All requests for new site permits (concessions) now had to be complemented with an environmental impact assessment study, which should not only identify any negative effects of any farming project to be established in that particular site, but also mitigation measures that are to be applied in case of eventual environmental damages. The environmental assessment required depends of the nature and size of the project to be implemented. Smaller projects (up to a certain size) are only required to produce a Declaration of Environmental Impact, DEI, while bigger ones are requested a full Environmental Impact Study.

Sanitary regulations

With regard to the sanitary conditions of fishery products exported by Chile, SERNAPESCA signs agreements with different sanitary authorities from interested countries and becomes the official Chilean certifying agency for sanitary matters of exportable fishery products. For these purposes, and based on protocols produced by the importing countries and adapted in Chile, SERNAPESCA certifies local laboratories and specialized firms to audit, on its behalf, productive processes and end products. All exporters of fishery products to the EU and the US have to certify the processing lines and end products and are committed to follow either HACCP or ISO norms and regulations.

Research and development

In this period, IFOP became SSP's research branch on fishery matters, while continuing to work on development issues related to aquaculture. Research and development activities were enhanced through the growing participation of the National Commission for Science and Technology (CONICYT) which through different financial funds helped universities and technological institutions to finance infrastructure and equipment, and afterwards, basic and applied research. CORFO became heavily involved in connected matters, although more directly related to the actual production.

2000-present: Strengthening fisheries and aquaculture management

Maximum Catch Limit per Firm (MCLF)

After a decade of applying the Fisheries and Aquaculture Law 18.892 of 1989, it became obvious that wild fisheries required further management measures to address ongoing issues of overexploitation in a number of fisheries and to stabilize fishing activities. The management measures applied to fully exploited fisheries resulted in Olympic fisheries, with each firm intensifying their individual fishing effort in order to appropriate a higher share of the total annual quota. This resulted in severe overinvestment, shorter fishing seasons, extra pressures to re-open closed fisheries in order to give continuity to employment and to help ease supplies in periods where the quota had already been exhausted. Excess capacity was also the result of a "race to authorization" in different fisheries whereby firms sought to maximize the number of vessels authorized in fisheries before they became closed to further access. This ensured that, when the fishery was eventually closed, the firms would have as many rights as they could.

The Law 19.713 of 2001 was enacted establishing a new management scheme, named Maximum Catch Limit per Firm (MCLF).[4] This scheme, which is still in place, is applicable to 'fully exploited' fisheries. Under the MCLF, authorities determine an annual total catch quota in a fishery which is then distributed among the firms who have legally acquired rights to fish, on an annual basis. The quota is distributed under the following criteria:

- In the case of demersal fisheries, each firm is assigned a share of the total catch quota, in accordance with historic rights calculated on the base of catch records of their authorized vessels during the last two-year period.

- In the case of pelagic fisheries, a firm's allocation is calculated on the hold capacity of their authorized fishing vessels and historic rights related to actual catches during the last four-year period by authorized fishing boats, together with a geographic criteria which restricts vessels to particular areas.

Under this scheme annual license payments are paid by the firms. In fact, these payments have increased by 33%, 66% and 110% in consecutive years. The additional fees collected were intended to supplement the *Fondo Investigación Pesquera* (Fund for Fisheries Management, or FAP).

The MCLF regime is applicable for 12 years, up to 31 December 2012, and it is still unknown what management regime will be used after that date.

The MCLF scheme operates under the following rules:

- SERNAPESCA has to certify landings for each fishing trip through auditing agencies duly certified for these purposes. The cost of this auditing process is born by the corresponding firms.

- This law establishes, for each fishery, the fraction of the allowable annual quota which should be allocated to industrial and artisanal fishers. This new measure has substantially diminished the periodic confrontations and conflicts between industrial fishers and small-scale operators.

- The total quota is fixed on annual basis, based on stock evaluations prepared with the same frequency.

- A new and stricter sanction system is imposed, this time handled by the SSP, carrying much heavier penalties than before.

- Fish discards are incorporated in this new management scheme, prohibiting them altogether.

- SSP is forced to assign, and fishing boats to accept, scientific observers onboard on selected fishing trips with the aim of collecting meaningful information. These observers are paid by the SSP. Information gathered should only be used for research purposes. The rule describing the functioning of scientific observers was only enacted in 2008.

Under the new law, the *Fondo de Investigación Pesquera* (FIP or Fund for Fisheries Research) was also created. It is aimed at: financing research projects on fisheries and aquaculture; promoting and developing artisanal

fisheries; financing monitoring, control and surveillance activities related to fisheries and aquaculture; and financing capacity building, social aid and reconversion of displaced workers.

With regard to the Fisheries Councils, the number of representatives from the artisanal sector was increased at National and Zonal levels. In the former case, the number was increased by four, while in the latter, by two.

Artisanal fisheries management schemes were also modified when dealing with fully exploited fisheries and when limited access has been imposed. This regime, called the Artisanal Extraction System (AES), distributes a fraction of a global fishing quota to the artisanal fishing. This fraction is then distributed across Regions and within Regions according to one of the following criteria: geographic area; boat size; fishing cove; artisanal fishers' organization; and by fisher. The AES is discussed in more detail in the following section.

Since 2000, the number of fisheries that are managed under catch quota systems have increased from 13 to 28 during 2007 (Table 4.1). The majority of these quota systems employ an MCLF management system.

With the application of the MCLF management system, a high proportion of the most important Chilean fisheries became subject to a form of ITQ system. Unlike ITQ systems used in other countries, whenever a firm wants to sell a part of its fishing quota, that share is linked to the corresponding vessels and their respective licenses. In addition, there is a time limit on the duration of the rights under the Chilean system. Chilean seabass is the only fishery that has been continually managed under an ITQ system since 1992.

The MCLF regime has had a number of significant outcomes. First, there has been a major reduction in fishing capacity in all regulated fisheries (Table 4.2). Importantly, this has been achieved without State intervention, and no decommissioning payments have had to be made to achieve the capacity reductions. However, the government has had to address the social adjustment implications of this downsizing through the financing of social assistance programs, primarily involving the reconversion and retraining of employees that became unemployed. Second, there has been an apparent improvement in the profitability of the industrial fishing sector, although hard data are not available to verify this. Third, there has been a better use of available processing capacities and a higher proportion of fish devoted to human consumption and further processing into value-added products. Fourth, there does not appear to have been an increase in the concentration of quota in the industrial fishing sector as a result of the MCLF system.

Table 4.1. Fisheries under quota management system 2000-2007

Species	Regions/area	Year				
		2000	2001	2002	2005	2007
Pelagic fisheries						
Anchovy	I and II			▲	▲	▲
Anchovy	III and IV		▲	▲	▲	▲
Anchovy	V to X		▲	▲	▲	▲
Sardine	I and II			▲	▲	▲
Sardine	III and IV		▲	▲	▲	▲
Common sardins	V to X		▲	▲	▲	▲
Jack mackerel	I and II			▲	▲	▲
Jack mackerel	III and IV		▲	▲	▲	▲
Jack mackerel	V to IX		▲	▲	▲	▲
Jack mackerel	X		▲	▲	▲	▲
Demersal fisheries						
Hake	IV to 41° 28,6'S	▲	▲	▲	▲	▲
Southern hake	41° 28'S to47°S	▲	▲	▲	▲	▲
Southern hake	47°S to 57°S	▲	▲	▲	▲	▲
Hoki	V to X		▲	▲	▲	▲
Hoki	XI and XII		▲	▲	▲	▲
Blue whiting	41° 28'S to XIIth		▲	▲	▲	▲
Conger eel	41° 28'S to47°S	▲	▲	▲	▲	▲
Conger eel	47°S to 57°S	▲	▲	▲	▲	▲
Raya	VIII to 41° 28'S	▲	▲	▲	▲	▲
Alfonsino	All				▲	▲
Cardinal fish	III to X				▲	▲
Chilean seabass	47°S to 57°S	▲	▲	▲	▲	▲
Orange roughy	All	▲	▲	▲	▲	▲
Crustacean fisheries						
Red prawn	I to IV	▲	▲	▲	▲	▲
Red prawn	V to VIII	▲	▲	▲	▲	▲
Yellow prawn	III and IV	▲	▲	▲	▲	▲
Yellow prawn	V to VIII	▲	▲	▲	▲	▲
Nylon Shrimp	II to VIII	▲	▲	▲	▲	▲
Total		**13**	**23**	**26**	**28**	**28**

Source: SSP, 2007 National Fisheries Policy, Santiago.

Resource stocks for most of the Chilean industrial fisheries have stabilized (Tables 4.3 and 4.4). In many fisheries, the spawning biomass is stable at around or over target levels (for example, anchovy, common sardines, conger eel; XII Region in Table 20). In other fisheries, the spawning biomass is stable but at levels below targets set by scientific and management authorities (for example, common hake, jack mackerel, raya). The orange roughy fishery was classified as under development when included in the ITQ regime, but was temporarily closed due to insufficient scientific data to sustain expansion of fishing activities without serious risk to the sustainability of the stock. Table 4.4 provides a summary of the exploitation status of the major fishing stocks and their current management regimes.

The biomass of many crustacean stocks is low by historical levels and the stocks are generally still recuperating, although the levels are largely stable. For example, the red and yellow prawn stocks, which are caught as by-catch of other fisheries, collapsed in 2000 due to poor enforcement of individual quotas and were closed by a total ban (although the yellow prawn fishery was re-opened in 2008 after a public bid in 2007).

Table 4.2. Capacity reduction following the introduction of the MCLF management system

Species	Regions/Area	Number of Fishing boats		Reduction (%)
		Before MCLF	After MCLF	
Anchovy	I and II	120	81	33
Sardine	I and II	120	81	33
Jack mackerel	I and II	120	81	33
Anchovy	III and IV	66	2	97
Sardine	III and IV	66	2	97
Jack mackerel	III and IV	108	7	94
Jack mackerel	V to IX	172	44	74
Jack mackerel	X	191	31	84
Hoki	V to X	166	21	87
Anchovy	V to X	129	16	88
Common sardine	0	129	16	88
Hake	IV to X	56	36	36
Nylon shrimp	II to VIII	36	21	42
Red prawn	I to IV	17	8	53
Yellow prawn	II to IV	23	12	48
Conger eel	41°28,6'-47°S	16	9	44
Conger eel	47°-57°S	13	10	23
Southern hake	41°28,6'-47°S	15	8	47
Southern hake	47°-57°S	14	9	36
Hoki	Xi and XII	19	10	47
Blue whiting	X to XII	16	8	50

Source: SSP, 2007, *Política Nacional Pesquera*, Santiago

Table 4.3. Exploitation status of the major fishing resources in Chile, 2007

Resource	Scientific name	Management Regime as defined by the GLFA (LGPA) (1)	Exploitation biological condition (2)
Camarón nailon	*Heterocarpus reedi*	Full exploitation	Fully exploited
Langostino amarillo Zona Norte	*Cervimunida johni*	Full exploitation	Fully exploited
Langostino amarillo Zona Sur	*Cervimunida johni*	Recovering	Fully exploited
Langostino colorado Zona Norte	*Pleuroncodes monodon*	Full exploitation	Fully exploited
Langostino colorado Zona Sur	*Pleuroncodes monodon*	Recovering	Fully exploited
Alfonsino	*Berix splendens*	Full exploitation	Fully exploited
Bacalao de profundidad	*Dissostichus eleginoides*	Under development	Fully exploited
Besugo	*Epigonus crassicaudus*	Full exploitation	Fully exploited
Congrio dorado	*Genypterus blacodes*	Full exploitation	Fully exploited
Merluza común	*Merluccius gayi gayi*	Full exploitation	Fully exploited
Merluza de cola	*Macruronus magellanicus*	Full exploitation	Fully exploited
Merluza de tres aletas	*Micromesistius australis*	Full exploitation	Fully exploited
Merluza del Sur	*Merluccius australis*	Full exploitation	Fully exploited
Orange roughy	*Hoplostethus atlanticus*	Under development	Fully exploited
Raya volantín	*Dipturus chilensis*	Full exploitation	Fully exploited
Anchoveta	*Engraulis ringens*	Full exploitation	Fully exploited
Jurel	*Trachurus murphy*	Full exploitation	Fully exploited
Sardina común	*Strangomera bentincki*	Full exploitation	Fully exploited
Sardina española	*Sardinops sagax*	Full exploitation	Fully exploited

(1) The General Law on Fisheries and Aquaculture, GLFA (LGPA) defines the management regimes as follows: *Full exploitation regime:* applied to fisheries in full exploitation status (Art. 2 N° 21 and Art. 21 LGPA).*Under Development Regime:* applied to a demersal or benthic fishery subject to the general access regime, in which an annual global catch quota can be established, where no fishing effort is carried out, or where the effort is estimated in terms of the annual catch of the target species at less than ten percent of such quota, and in regard to which there is a considerable number of parties interested in participating (Art. 2 N° 33 y Art. 39 LGPA). *Recovery Regime:* applied to a fishery that is overexploited and subject to an extractive ban of at least three years, for the purpose of its recovery, in which an annual global catch quota can be established.

(2) The full exploitation status means that the fishery reaches such a level of exploitation that the catch in authorized extractive units yields no productive surplus of the hydrobiological species (Art. 2 N° 21 LGPA).

Source: GLFA, LGPA

Table 4.4. State of main fisheries with annual catch quotas, 2006

Species	Regions/Area	Status/Trend of fishery, 2006
	PELAGIC FISHERIES	
Anchovy	**I and II**	Spawning biomass over target level
Anchovy	**III and IV**	Spawning biomass over target level
Anchovy	**V to X**	Spawning biomass over target level
Sardine	**I and II**	Depressed spawning biomass (because of unfavorable env. conditions)
Sardine	**III and IV**	Depressed spawning biomass (because of unfavorable env. conditions)
Common sardins	**V to X**	Spawning biomass over target level
Jack mackerel	**I to X**	Stable spawning biomass. However, below target level
	DEMERSAL FISHERIES	
Hake	**IV to X**	Spawning biomass below desired levels. However, stable
Southern hake	**X to XII**	Spawning biomass slightly under desired levels
Hoki	**V to XII**	Spawning biomass apparently on target. High uncertainty on calculations
Blue whiting	**X to XII**	Very stable spawning stocks since beginning of fishing activities
Conger eel	**X and XI**	Spawning biomass slightly under target levels
Conger eel	**XII**	Spawning biomass slightly over target levels
Raya	**VIII to X**	Spawing biomass uncertain, but thought to be below target levels
Alfonsino	**All**	Spawing biomass highly uncertain, but though to be below target levels
Cardinal fish	**III to X**	Spawing biomass uncertain, but thought to be below target levels
Chilean seabass	**South of 47°S**	Low spawning biomass, below target levels
Orange roughy	**All**	Spawning biomass uncertain, but considered over target levels
	CRUSTACEANS	
Red prawn	**I to IV**	Biomass growing during last 3 years
Red prawn	**V to VIII**	Biomass under recuperation, but still small compared with 1990's levels
Yellow prawn	**III and IV**	Stable biomass. Last 3 years considered healthy
Yellow prawn	**V to VIII**	Stable biomass. Levels close to 1995/97 levels
Nylon Shrimp	**II to VIII**	Stable biomass, last 3 years. However, levels lower than in the 1990's
Penaeid shrimp	**I to IX**	Highly uncertain. Fishing effort diminished strongly during last years.

Source: SSP, 2007, *Política Nacional Pesquera*, Santiago

It is worth examining the cases of jack mackerel and common hake in some more detail to identify issues in the management of these fisheries. In the case of jack mackerel, severe oceanographic disruptions have occurred resulting in lower availability of fish on traditional fishing grounds inside the Chilean EEZ. Therefore, during this decade, local vessels have begun to fish in more distant waters in and outside the EEZ, and for the first time, Chilean purse seiners have become actively involved in international waters. These changes have also meant that past knowledge on the resource distribution, biomass, etc. have become partly obsolete, and so have the corresponding management schemes. Therefore, these new circumstances require an urgent updating of scientific information to lower the risk of devising poorly based management regulations that might affect the system's credibility.

The active presence of foreign fishing vessels operating outside the Chilean EEZ for straddling jack mackerel during the last decade has also increased the levels of unregulated effort applied to the stock. As mentioned before, this highlights the need for the creation of internationally agreed management schemes that help stabilize jack mackerel's availability, and define with accuracy Chile's share in the arrangement.

In the case of common hake, current biomass and landing levels are much lower than in previous seasons; they were at their highest in 2001-2002. This resource's reduction has been associated with the appearance of jumbo squid (*jibia*) in high quantities along the Chilean coastline for several years. There is conjecture that this would explain the reduction in spawning stocks tentative, although this claim has not been duly backed by scientifically based evidence. After over four years, the resource has not clearly shown signs of recovery, thus affecting industrial vessels and many artisanal fishers that depend heavily on this fishery for income and food.

Artisanal fisheries

With respect to the management of artisanal fisheries, three developments are worth highlighting: the Artisanal Extraction System (AES); extending the system of management areas for the exploitation of benthic resources (MAEBRs); and concerns over the general access system.

The artisanal extraction system (AES)

As a result of increasing artisanal fishing effort, particularly in certain fish fisheries coupled with ongoing conflicts among Regions, fishing grounds, and communities over resource access, the SSP devised the Artisanal Extraction System (AES), initially on a trial basis and then as a

formal management scheme from 2004 onwards. The AES distributes a fraction of a global fishing quota to the artisanal fishing sector. This fraction is then distributed by Region and within Regions according to one of the following criteria: geographic area; boat size; fishing cove; artisanal fishers' organization; and by fisher (based on historical rights). All fisheries managed under the AES are mixed industrial-artisanal fisheries, and therefore the science on which annual fishing quotas are based is the same for both fractions.

The following artisanal fisheries are managed under the AES:

- Anchovy, sardine and jack mackerel from IVth, Vth, VIIIth, Xth and XIV Regions.
- Common hake, from IVth, Vth, VIth, VIIth and VIIIth Regions.
- Southern hake, from XIth Region.

The strength of the access right accorded to artisanal fishers under the AES is not clear. As the allocations are determined on an annual basis and in indirect competition with the industrial sector, much relies on the bargaining skills and political strength of the artisanal fishers' organizations at the regional level (primarily COFEPECH and CONFEPECH). In addition, the AES requires data on landings per boat, per species and per fishing ground. This information is usually supplied by fishers and is the base on which historic fishing rights are established, raising concerns over the incentives for fishers to supply accurate data. On occasion, fishing history has to be estimated on the basis of technical appraisals or informal information provided by different stakeholders. From 2005 onwards, the AES has incorporated certifying officers that have to duly register catches per boat. These certifying officers are members of consulting companies that have won SERNAPESCA's public bids to carry out this mission and are financed through the FFM fund.

Management areas for the exploitation of benthic resources (MAEBR)

In 2004, the MAEBR system was extended in order to authorise artisanal fishers to carry out aquaculture activities (Decree 314 of 2004) within the structure of existing MAEBRs. This has been undertaken with the intention of expanding the possible sources of income and employment for artisanal fishers, as well as an attempt to improve the popularity of the system as a management tool (only around a third of the MAEBRs appear to be active, focusing mainly on the valuable loco resource). Regulations

establish which species can be farmed and to which extent (*i.e.* total allowable surfaces), while the environmental and health regulations applicable to normal aquaculture activities are also enforced.

It is anticipated that the new legislation, including aquaculture in MAEBRs, will enhance the prospects for this innovative management scheme.

General access system

In general, most other coastal fish, shellfish and algae fisheries function under an open access system, and are primarily regulated through the registration of artisanal fishers in the National Registry for Artisanal Fishermen. Total catch quotas, minimal size regulations, closed fishing grounds and seasons, and gear regulations, are also employed to manage the fisheries.

Three key issues arise in these fisheries. First, there are concerns over the availability of meaningful and complete scientific information on which to propose adequate management schemes. This helps to explain why many of the resources have been heavily overfished in past years. Second, the geographic fragmentation of production reduces the prospects for artisanal fishers to be able to play a greater role in the value chain and gain access to broader markets and better prices. In many areas, they are restricted to selling their products to local markets with little or no value-added. This has implications for economic viability and economic development in coastal regions. Third, the effective open access nature of the fisheries will inevitably result in overfishing in the future, with consequent effects on employment, incomes and community well-being.

It has to be stressed, however, that in small and/or relatively isolated fishing communities, fisheries management problems are generally only a small fraction of the challenges faced. Very often those fishers are inadequately organized, highly dependent on intermediaries for their sales, poorly trained, lack capital and technology, and are faced with few alternative employment opportunities. In the end, fisheries management cannot, on its own, provide the solution to the development challenges faced by fishing-dependent coastal communities. A holistic policy approach encompassing social, regional development, infrastructure, transport, education, and fisheries police is required to meet these challenges.

Aquaculture policy initiatives

Aquaculture production during this decade continued to grow rapidly. Chile grew to be the second largest producer of salmon and trout in the

world (behind Norway), although the annual growth rate was lower than in the previous decade. Production per site grew substantially and the number of enterprises declined. Several Codes of Practices for farming and processing were developed through INTESAL (Instituto Tecnológico del Salmon), while Clean Production Agreements were signed between salmon farmers and the Ministry of Economy. However, this decade is a period where diseases have had a high prevalence, particularly SRS (Piscirickettsiosis), sea lice ('Caligus'), and more recently, Infectious Salmon Anemia Virus (ISA).

Mussel production increased significantly in southern Chile through the employment of fairly new technologies, and Chile became the most important supplier of frozen mussels to Europe and started exporting to the US. The number of mussel farms increased rapidly along with the production of seeds and end products, and the development of processing capacity. At the same time, several areas in the Xth Region became overcrowded with production farms, resulting in longer production cycles. Scallop production in the IIIrd and IVth Regions ceased to expand, stabilizing at around 15 000-20 000 tonnes a year. This was because Chilean producers do not have many further sheltered areas to expand facilities, and because Peru has dominated production and export markets, out-competing Chilean producers.

Three important legal regulations aimed at improving aquaculture management were put in place during this period: Environmental Regulations for Aquaculture (ERA); regulations on high risk diseases; and regulations to deal with aquaculture plagues.

Environmental Regulations for Aquaculture (ERA)

These regulations, enacted by Decree 320 of 2001, replace and complement former regulations, and are aimed at regulating aquaculture activities, proposing administrative measures to ensure that production takes place on a sustainable manner, compatible with the carrying capacity of the respective water resources. The carrying capacity of a water resource is defined as having been surpassed when sediments in the area become anaerobic. An anaerobic conditions is here defined as one where, on the first three centimeters of the interface sediment-water, dissolved oxygen is absent in interstitial waters. Should anaerobic conditions be detected on any farm for two consecutive years, production in the following period should be reduced by 30%.

The ERA also define regulations to maintain cleanliness, and to handle residuals properly (including mortalities) on farms and surrounding areas. In particular, they require firms to have in place adequate measures to prevent

fish escapements. Each site should have an approved contingency plan describing actions to be taken in case of eventual occurrence of situations that may damage the environment. In the case of escapements, farms are required to recapture fish within a 400 meters distance from it, and during the five days following the occurrence of the respective event. Building on previous regulations, the basic minimum distances between farms of all kinds are established, and production of salmon juveniles in fresh water is restricted to the handling of juveniles and brood stock (the latter under controlled conditions).

With respect to new projects, ERA protocols require a Preliminary Site Characterization document to be submitted, which, among other things, has to demonstrate that sediments in that area have aerobic conditions. For farms already in operation, the ERA requires firms to submit annual environmental information regarding their water and sediments conditions, for further evaluation. All procedures and methods that should be used by industry to comply with these regulations are described in detail (SSP's Resolution 404 of 2003, replaced by Resolution 3.411 of 2006).

Regulations on high risk diseases

Regulations to protect and control the introduction of high risk diseases that may affect hydro biologic species are enacted through Decree 319 of 2001, which replaces and complements several former rules and regulations. In case diseases are introduced, these regulations deal with their isolation, propagation and, eventually, their elimination.

These regulations delegate to SERNAPESCA the responsibility of designing, implementing and controlling sanitary programs dealing with general and specific situations. In the former case, rules to maintain healthy farms are established. In turn, specific programs deal with inspecting, controlling and eliminating high risk diseases. In the latter case, the zoning of Chile (disease free territories; territories under surveillance; infected areas) is permitted, and on each zone, different regulations are made applicable. The SSP shall also annually determine a list of high risk diseases to be named under List One, reportable compulsorily with the OIE, World Organization of Animal Health. List Two contains all other high risk diseases. This decree is applicable to imports, farming, and transportation, reseeding and processing, including related effluents.

A permanent Technical Committee was formed with the aim of preparing annually List One and List Two high risk diseases, and formulating and reviewing sanitary programs. This Committee is composed of representatives from SSP, SERNAPESCA and from the various producer associations.

Regulations on aquaculture plagues

Prepared in 2005, and enacted at the end of 2006, Decree 345 aims at establishing protection and control regulations to prevent the introduction, isolate, limit propagation, and eventually eliminate hydro biologic species that are considered to be plagues. Plagues are defined as populations of hydro biologic species, because their abundance or their density may damage human health, other hydro biologic species or the environment, with noticeable economic detrimental effects.

As in the regulations governing high risk diseases, the SSP can also classify different geographic areas according to the risk or prevalence level of different plagues. In turn, SERNAPESCA is responsible for producing and controlling anti plague programs. Algae blooms are included as a plague and territories where they occur are subject to be categorized as "non plague-free areas." SERNAPESCA is required to produce specialized mitigation programs, according to each 'level' of 'infection' or prevalence.

A permanent Technical Committee is also formed to deal with these issues, with representatives from SSP, SERNAPESCA, farmer associations and artisanal fishers.

Additionally, Decree 314 was enacted in 2004, regulating aquaculture activities in MAEBR, and establishing that in those areas farming of algae and invertebrate benthic resources is permitted. However, the species to be farmed have to be chosen only from those naturally available in the same zone; the area should not occupy over 20% of that available in totals, excluding natural banks; and a farm should not be greater than 60 hectares.

Other significant legal initiatives

A number of other legal initiatives enacted during this period are worth mentioning

In 2003, Decree 125 was approved enacting the National Aquaculture Policy (NAP). This document establishes as the basic objective of Chilean aquaculture which is the attainment of maximum economic growth possible through aquaculture, subject to environmental sustainability and equal access rights to all parties involved. To implement these policies, the National Aquaculture Commission was created, reporting directly to the President and headed by the Minister of Economy.

In 2004 (Decree 78, Ministry of Foreign Affairs), Chile enacted an international agreement adopted by the UN in 1993 to promote compliance with international conservation and management regulations affecting fishing vessels on the high seas. These regulations impose responsibilities

on countries for the behavior of vessels registered in their country. However, it was not until 2005 through Decree 360, that this agreement was regulated and put in place, detailing that Chilean vessels working in international waters have to be previously approved by the SSP and have to comply with Chilean and international regulations on the high seas, or those established by Regional agencies with the same aims. Authorized vessels also have to accept on board inspectors and scientific observers, when requested by local authorities.

In 2004, Decree 123 was enacted, detailing the Chilean policy on port usage by foreign fishing vessels working in open ocean waters adjacent to the national EEZ. In order to accept the use of local ports by foreign fishing boats, it is required that: countries where boats are originally from should apply management policies of highly migratory and straddling species, compatible with those applied by Chile on its own EEZ; and vessels should permanently use GPS systems compatible with those used by Chilean fishing boats.

In 2007, Law 20.116 was enacted prohibiting and at the same time regulating imports and production (farming) of genetically modified organisms (GMOs). GMOs are defined as those species whose genetics have been altered in a manner which does not naturally occur in nature. It is stated that imports could eventually be authorized, if so specifically decided and approved by the SSP, and only upon completion of a report establishing eventual sanitary and environmental impacts.

In 2008, Law 20.256 was approved aimed at promoting sports fisheries, the protection of species devoted to sports fisheries and their ecosystems, and developing tourism related to these activities. For the first time, these regulations acknowledge that duly qualified private operators manage water courses where they can seed, grow and control fishing activities, under previously defined conditions. The allocation of these permits (officially called Preferential Areas) is made through public biddings, which can assign exclusive rights for up to 20 years, provided management plans are approved, and the corresponding patents are paid. The private operator, in turn, can charge, at his will, for the corresponding licenses to sport fishers, within his 'fishing territories'. The operator can also re-seed his water course, if so desired and approved in his management plan. In addition, this law describes in detail the regulations applicable to normal sports fisheries and fishers, under different circumstances, keeping always in mind the wish of developing sports fisheries, subject to resource and environmental constraints.

Legal initiatives in progress

Discards

Currently, Congress is discussing a legal initiative that will facilitate the otherwise complicated application of the principle that fisheries discards are nor permissible. Eventually, congressmen will come up with a solution that will make this principle applicable, even if it is in partial terms only.

Trawling ban

Artisanal trawling is prohibited in Chile (Law 19.907 of 2003) within the exclusive five miles artisanal fishing grounds, with the exception of fisheries for crustaceans. Congress is currently discussing a formal initiative to ban all trawling activities within the Chilean EEZ, arguing that trawling damages the environment and fish resources, and that if trawling is already prohibited on artisanal fishing grounds, it should also be banned from the rest of the EEZ.

South Pacific Regional Fisheries Management Organization

As described earlier, Chile is also engaged in fishing activities in international waters, and it is in the country's best interest to have fishing effort and catches regulated in nearby zones outside the local EEZ. In 2006, Australia, Chile and New Zealand initiated a process for the establishment of a Regional Fisheries Management Organization for the South Pacific High Seas (SPRFMO). SPRFMO was deemed necessary because of the growth and uncontrolled presence of foreign fleets in the high seas adjacent to Chile that are dedicated to fishing for straddling species, particularly jack mackerel.

The National Fisheries Policy (NFP)

In December 2007, the SSP made public a proposal to define a National Fisheries Policy (NFP). This draft plan provides a high level policy framework and defines its main objective as promoting the maximum development possible of the national fishing sector, along with sustainability, economic growth, equity and governance. The NFP, originally prepared in 2005, was submitted for comments to different stakeholders. After that process ended, the current version was elaborated and made available for public review. To date, the NFP has not been officially enacted.

The NFP addresses the following broad areas: sustainability; allocation; governance; monitoring, control and surveillance (MCS) and the penalty system; research; and institutional arrangements. The proposed policy framework can be summarized as follows:

- When dealing with sustainability, the following main guiding principles are incorporated.
  - Design of well based Management Plans, with high stakeholder participation
  - Application of the precautionary principle to fisheries management
  - Planning to include a 'multispecies' approach
  - Protection of high value ecosystems
  - Promotion of responsible attitudes towards environmental issues (discards, etc.)
  - Promotion of further activities by the Chilean fishing fleet on the high seas
  - Favoring the application of sustainable principles to manage highly migratory and straddling species on international waters, and ensuring that these principles are enforced in international treaties.
- On allocation, the NFP seeks to develop equitable, transparent and participatory procedures to allocate fisheries resources.
- On governance, the NFP stresses, among other ideas, its aim to decentralize fisheries management; to improve coordination with other public agencies; to enhance stakeholder's participation; to promote open access to relevant information used for management purposes and to promote international agreements, so as to improve control and sustainability in high seas fisheries of interest to Chile.
- With respect to MCS, the NFP aims to apply an effective MCS system, design and apply a more effective and expedite penalty system able to deter further transgressions, design an open access information system regarding the actual compliance level on fisheries management schemes and regulations, and control unregulated fishing activities on the high seas.
- On research, the NFP proposes evaluating current institutions and institutional arrangements with respect to efficacy, independence, transparency and quality, and thereafter proposes to improve local

abilities to evaluate all major issues of concern within fisheries, including the high seas, and to establish long term guidelines for local research.

- On institutional arrangements, the plan refers to the need to improve its current standing, promoting a better, more efficient and higher quality Public Service.

National Fisheries Research Framework, NFRF

The proposal for a National Fisheries Research Framework (NFRF) was made publicly available in May 2008. This proposal, currently under public review, is aimed at reinforcing and coordinating local research capabilities in science and technology on fisheries and aquaculture so as to increase the competitiveness of the Chilean fishing sector, and to provide better support to fisheries and aquaculture management systems and regulations. Three major issues are addressed in the NFRF:

- Institutional arrangements: it is proposed to devise a new bureaucratic structure to elaborate, coordinate and lead in defining long term research plans, with high stakeholder participation, and to reinforce networking.
- Procedures: the NFRF intends to improve research quality, networking and availability of results to the general public.
- Capacity building: improving and creating international co-operation agreements on research, while improving networking and quality on the national scene.

Financial support programs

One of the distinguishing features of Chile's fisheries and aquaculture policy framework is the lack of extensive government programs providing direct financial payments to the sector. Most of the Chilean government financial transfers (GFTs) to the fisheries and aquaculture sector are in the form of general services.[5] These transfers are for management, research and enforcement services provided primarily by the SSP, SERNAPESCA and IFOP. Preliminary data for 2007 indicate that the Chilean government spent around CLP 33.5 billion (equivalent to USD 40 million) on general services in that year (Table 4.5). As is detailed further in the next chapter, research services to support fisheries and aquaculture management are funded from a number of sources including:

- *Banco Integrado de Proyectos* (Integrated Project Bank, or BIP): A State fund coordinated by the Ministry of Planning, financing diverse research initiatives originated in the different Ministries. In the case of fisheries and aquaculture, this is the main source financing basic studies regarding fish stock evaluation; fisheries management, etc. Projects financed by this fund can be hired directly, without public bids.

- *Fondo de Investigación Pesquera* (Fund for Fisheries Investigation, or FIP): A fund from the Ministry of Economy, administered by a public-private council, chaired by the Undersecretary of Fisheries. This fund finances research dealing with the conservation of fishery resources; aquaculture; the environment; on fisheries, economic and social matters; etc. Projects are funded through a competitive public bidding process.

- *Fondo de Fomento de la Pesca Artesanal* (Fund for the Promotion of Artisanal Fisheries, or FFPA) is managed by SERNAPESCA and is the main financial source used to assist artisanal fishers to put in place infrastructure, upgrade fishers' organizations, technically train fishers, restock coastal areas, and to improve marketing practices. In this case, funds are granted through public biddings and require a proportion of co-financing.

The general services category of GFTs also includes infrastructure expenditures. In Chile, the Ministry of Public Works is responsible for the construction of fishing ports. Data on fisheries-related expenditure through this Ministry were not available at the time of preparation of this report.

As demonstrated in Table 4.5, Chile provides a small amount of direct payments to support artisanal fishers (providing social aid, retraining and conversion of displaced fishers), totaling CLP 12.8 million in 2007. No cost-reducing transfers are provided to companies or individual fishers. In the case of capacity reduction, Chile relies on market mechanisms and the fisheries management regime of the MCLF to achieve fleet rationalization and does not employ vessel decommissioning subsidies.

Table 4.5. Government financial transfers to marine capture and aquaculture sector, 2007

(Preliminary estimates[a])

Type of transfer		CLP thousand
Direct payments		**12 793**
Support to artisanal fishers (*Apoyo Pescadores Artesanales)* [b]		12 793
Cost reducing transfers		**0**
General services		**33 526 653**
Management, research and enforcement services		33 526 653
- Undersecretariat of Fisheries (SSP)		24 704 271
Of which	*Fondo de Investigación Pesquera* (FIP)	3 187 128
	Fondo Administracion Pesquera	1 072 345
	Fondo de Fomento de le Pesca Artesanales (FFAP)	724 090
	Costs for Research Vessel *Barco Abate Molina*	969 071
	Transfers to IFOP	862 953
- SERNAPESCA [c]		8 822 382
Infrastructure services		n.a.
License fees directed to FIP		**n.a.**
Total		**33 539 446**

a. Preliminary estimates obtained from the annual financial reports of key institutions, SSP, SERNAPESCA, and IFOP. Data do not include transfers paid from other funds administered by other Ministries and public bodies (such as CORFO, CONICYT). b. Includes retraining and social support for artisanal fishers. c. Includes transfer of CPL 3 049 062 thousand from SSP.

Source: *Subsecretaria de Pesca, Balance de Gestión Integral Año 2007; Servicio Nacional de Pesca, Balance de Gestión Integral Año 2007; Instituto de Fomento Pesquero, Memoria 2007*.

Summary

The policy framework governing the Chilean fisheries and aquaculture sector has evolved considerably over the last 50 years. The industrial, artisanal and aquaculture industries have each followed a different path of policy development and their current management reflects the particular challenges and policy pressures confronting each segment of the sector. This has been a lengthy and, at times, traumatic process, with issues of

overinvestment, sharp declines in catch levels, disputes among stakeholders, fleet downsizing, aquaculture diseases, and so on. The process of policy evolution is continuing with a range of initiatives underway to meet the current policy challenges.

In the case of the industrial fisheries, the management regime has evolved from open access systems to policy instruments such as global quotas and the allocation of individual quota shares. The introduction of the MCLF system has provided a flexible operating environment for the fishing sector, with firms able to self-adapt capacity and catching patterns to maximize profits. Landings in the industrial fisheries have stabilized and the economic performance of the fishing fleet is reported to have improved (although hard data on costs and earnings of the industrial fleet are not available). Fishing seasons have been extended, facilitating a more efficient use of on-shore processing facilities, and employees have more stable and better quality jobs. The government is also moving towards a multi-annual, rather than annual, management regime for the fisheries, as well as exploring the options for shifting to a multi-species and ecosystem approach to fisheries management rather than the single species management at present.

There remain a number of issues confronting the government in the future management of the industrial fishing sector. First, while there is 100% VMS coverage in the industrial fleet and the number of violations that have been prosecuted by the service has declined from 150-200 a year in the late 1990s to three-four a year now, there remains a need to further improve the monitoring and surveillance of catches. This is recognized by the government and an extra 250 staff will be recruited into SERNAPESCA in 2009, accompanied by a 22% budget increase.

Second, the future of the MCLF system presents a significant challenge. While the scheme has many of the positive attributes of ITQs and provides a good incentive structure for the fishing industry, the 2012time limit on the scheme generates a degree of uncertainty amongst the industry over the future value of their access rights. This undermines the effectiveness of the scheme to some extent and may compromise the incentives for long term conservation of the resource base.

Third, Chile is becoming an increasingly important player in international fisheries in the South Pacific, particularly for jack mackerel. It is necessary to adapt current management schemes to the new realities of high seas fishing, beyond the EEZ, and to continue to actively pursue the development and implementation of cooperative international agreements to sustainably manage and exploit these fisheries.

The artisanal fisheries, as in many other countries, present a greater management challenge due to the sheer numbers of fishers involved, the difficulties in enforcing regulations at a local level in a country with a very long coastline and many landing sites, and the high dependence on the artisanal fishing industry by coastal communities with limited alternatives for food and income. These fisheries have been traditionally managed under an open access system and, while some progress has been made towards a more restrictive entry regime with the introduction of the National Register of Artisanal Fishermen, the artisanal sector effectively remains an open access system.

Through effective political negotiation, artisanal fishery organisations have obtained exclusive access rights over a five mile zone adjacent to the Chilean coastline, and have negotiated important shares of different fisheries that straddle this zone. The AES has provided a higher degree of stability for artisanal fishers over access to resources that straddle the five mile limit, although the strength of the access right is open to question as it is very short term. However, the combination of effective open access and exclusive access for the artisanal sector to the five mile zone has resulted in the overexploitation of a number of important coastal fisheries. It is clear that further efforts are required to manage and control the artisanal sector, recognizing that this is a difficult and challenging policy problem that will require a broad range of policy tools to be brought to bear in a coherent package, including policies regarding social welfare, education, regional development and infrastructure, as well as fisheries management policies. Current studies by the SSP on the feasibility of extending the VMS system to cover vessels 12-18m in length will be important in moving towards more effective monitoring and control.

The introduction of an area-based cooperative, co-management scheme in the form of the MAEBR system has been an innovative development that can usefully be further developed. Ten years after their introduction, the artisanal sector is still coming to terms with the system and its potential advantages, with the uptake varying considerably around the country depending on the local resource base and the strength of local fishers' organizations. Only in the case of 'loco' has there been a major use of MAEBRs. The recent decision to allow aquaculture activities within MAEBRs will help to make the scheme more flexible and attractive to coastal communities. However, a long term solution to the sustainable exploitation of benthic resources along the coastline employing this system will require further investment in capacity building and education on decentralized management concepts and practice within the coastal communities, coupled with regulatory and monitoring regimes that provide the appropriate incentives, accountability and sanctions.

Finally, it is clear that the aquaculture industry has been and will continue to be the major source of growth for the Chilean fisheries and aquaculture sector in the future. The aquaculture sector, mainly based on salmon and trout farming, has grown at very high annual rates over the last twenty years, although the rate of growth has slowed in recent years. However, the industry is currently in crisis and is severely affected by ISA, Caligus sealice and SRS, diseases which are having a major impact on the profitability and short-term prospects of many companies in the industry. Industry sources project that salmon production in 2009 will be around 25% of the expected production levels. It can be argued that the present problems with disease are at least partially a result of the rapid growth in the industry outstripping the pace of regulatory change to effectively manage, monitor and control the sanitary and environmental impacts of the dynamic aquaculture industry. The rapid growth also outstripped the capacity of the industry itself to organize and manage its operations effectively, and a strong industry focus on environmental management has only emerged in the last five years.

Considerable resources are now being devoted to addressing the issue of disease in the Chilean aquaculture sector and a number of policy initiatives indicate that Chile is shifting towards a more proactive management mode for the industry. The development of the National Aquaculture Policy (NAP) in 2003 was a useful first step in articulating a new model for aquaculture. Under the NAP, the value of production was expected to double by 2013: it only took five years for this to happen. However, the disease crisis has been the catalyst that is likely to drive deeper governance and institutional changes in the industry. The establishment of the Salmon Round Table in April 2008 signaled the beginning of a major policy response to the salmon health issue. Chaired by a former Undersecretary of Fisheries and reporting direct to the President, the Salmon Round Table is examining a wide range of ambitious initiatives to strengthen aquaculture policy framework and institutions. A broad range of policy measures is being addressed, including regulations on egg importation, siting of aquaculture operations (proximity between farms, stocking densities, etc), improvements to laws governing aquaculture concessions, and measures to encourage operators and agencies to work together to improve coordination of environmental health. Public discussion on the results and proposals of the Salmon Round Table are expected to take place during 2009-2010.

Notes

1. Up to this point, fisheries had been governed by Decree Law 34 of 1931 (Fisheries Development Law) and its regulations, which established free access to resources and management tools, such as bans, minimal sizes, closed seasons, etc.

2. Concurrently, about an extra 30 000 tonnes were landed by artisanal fishermen, but this time, fishing in interior marine waters of the Xth to Xth Regions.

3. The information is concurrently sent on line to DIRECTEMAR

4. It should be noted that the proposal to introduce an ITQ system was first discussed 20 years ago and has been raised again whenever modifications to managerial schemes were discussed. However, political maturity and economic interests of different sorts prevented for long the formal application of ITQs to their current extent. In fact, the original proposal for law 18.892 of 1989 was based on the use of ITQs in the most important Chilean fisheries.

5. The OECD defines government financial transfers as the monetary value of interventions associated with fisheries policies, whether from central, regional or local governments. They consist of direct payments (which are paid direct from governments' budgets), cost reducing transfers (which reduce the costs of fixed and variable inputs, such as fuel subsidies, and reduced interest loans), and general services (which are transfers to the fishing sector as a whole rather than to individual fishers and include fisheries management, research and enforcement expenditures, infrastructure development, etc).

CHAPTER 5

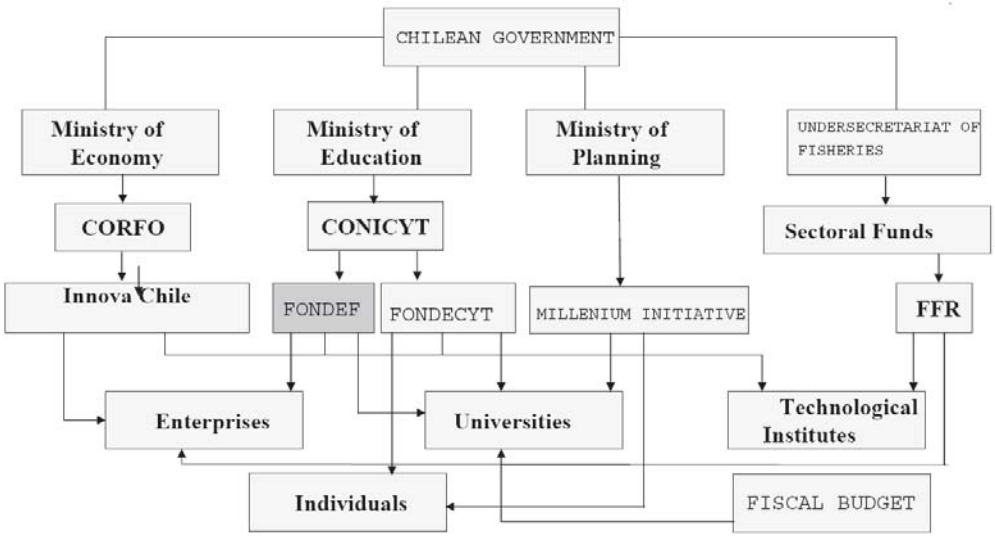
Research support for fisheries and aquaculture management

The efficient and effective regulation of fisheries and aquaculture requires scientific information based on the best available knowledge on fish populations, environmental conditions, oceanographic dynamics, social realities, etc. The role of science in managing and developing fisheries and aquaculture is significant and is a perquisite for a profitable industry and a healthy environment. This chapter reviews the delivery of scientific inputs to the management process in Chile.

State supported and financed research

Basic research to be carried out annually to support management and control within fisheries and aquaculture is identified by the SSP, SERNAPESCA and by the various Fisheries Councils. As noted earlier in the paper, IFOP is the main research organization providing scientific support for the sector. Universities and technological institutions are also engaged independently or participate in public biddings to undertake research work ordered by the State. However, they act on a case by case basis only. Figure 5.1 provides a schematic of the structure of science research organizations and funds providing scientific support to the fisheries and aquaculture sector.

Figure 5.1. Public institutions and funds supporting innovation in fisheries and aquaculture



Source: Herrera, G., FONDEF, *Lineamientos y Visión del Quehacer de I+D en FONDEF*,Power-Point presentation, August 2006

IFOP has a highly regionalized structure with research stations situated the length of Chile. IFOP also owns and operates an oceanic research vessel (the *Abate Molina*), and rents others (as necessary) to carry out basic work on population dynamics, population surveys, etc. There are currently plans to buy extra vessels in order to be able to cope with innumerous tasks all along a very lengthy and wide EEZ (and beyond). IFOP's annual budget has grown in recent years from CLP 7 500 million in 2004 to CLP 8 500 million in 2008, or at about 3% a year in constant 2007 pesos.[1] Salaries represent between 45% and 50% of budgeted expenditures for those years.

There are three main financial sources through which specific projects are funded:

- *Banco Integrado de Proyectos* (Integrated Project Bank, or BIP): A State fund coordinated by the Ministry of Planning, financing diverse research initiatives originated in the different Ministries. In the case of fisheries and aquaculture, this is the main source financing basic studies regarding fish stock evaluation; fisheries management, etc. Projects financed by this fund can be hired directly, without public bids.

- *Fondo de Investigación Pesquera* (Fund for Fisheries Investigation, or FIP): A fund dependent on the Ministry of Economy, administered by a public-private council, chaired by the Undersecretary of Fisheries. This fund finances research dealing with the conservation of fishery resources; aquaculture; the environment; on fisheries, economic and social matters, etc. Projects are funded through a competitive public bidding process.

- *Fondo de Fomento de la Pesca Artesanal* (Fund for the Promotion of Artisanal Fisheries, or FFPA) is managed by SERNAPESCA and is the main financial source used to assist artisanal fishers in putting in place infrastructure, upgrading fishers' organizations, technically train fishers, restock coastal areas, and to improve marketing practices. Funds are granted through public biddings.

BIP's funds come directly from the annual budget of the government. IPB funds of about USD 4.5 million were spent during 2007, aimed at collecting and monitoring biological and fishing information, to evaluate stocks, and to determine the state of the most important fisheries.

In the case of the FIP, at least part of the resources available come from license payments corresponding to different fisheries. The parties involved can, at their choice and according to the applicable rules, pay part of their fees directly to the FIP. Figures available for the FIP indicate that this fund has financed research for a total of about USD 53 million between 1993 and 2006. Furthermore, annual budgets have increased during recent years, from about USD 5 million in 2004 to USD 8 million in 2006 and 2007.[2] The number of projects carried out since 1991 exceeds 300.

A number of other public funding sources are financing research in marine sciences, aquaculture and fisheries, among other sectors:

- FONDECYT, National Fund for Scientific and Technologic Development ('Fondo Nacional de Desarrollo Científico y Tecnológico'): managed by the National Council for Science and Technology, CONICYT, it aims at promoting basic research in several disciplines. It is extensively used by scientists working on fisheries and aquaculture related matters.

- FONDEF, Fund for the Promotion of Scientific and Technological Development ('Fondo de Fomento al Desarrollo Científico y Tecnológico'), also managed by CONICYT, aims at promoting and enhancing local R&D, particularly for projects focusing on innovation. This is one of the most attractive funds to scientists and technologist

working in fisheries and aquaculture, as it has devoted around USD 5 million annually to these areas since 1991.

- FONDAP, Fund for Advanced Research in Priority Areas (*Fondo de Investigación Avanzada en Áreas Prioritarias*), is managed by CONICYT and finances the establishment of Centers of Excellence that focus on the most advanced scientific research work on specific subjects. It is aimed at reinforcing the education of post graduate students, and to provide them with good employment opportunities.

- National Contest for Scientific and Technologic Research on the Antarctic (*Concurso Nacional de Proyectos de Investigación Científica y Tecnológica en la Antártica*), is managed by the Ministry of Finance and promotes research activities related with the Antarctic environment.

- CIMAR Program, (Research Cruises for Scientific Marine Research Program; 'Programa CIMAR', *Cruceros de Investigación Científica Marina*), funded by the Ministry of Finance, aims at interdisciplinary research on oceanography, meteorology, submarine morphology, etc.

- Innova Chile, probably the best funded and more active fund of late, is managed by CORFO, and started operations in 2004 with the aim of improving the competitiveness of the Chilean industry through innovation, entrepreneurship, etc. INNOVA has innumerous initiatives with different aims and targets with the funds mainly directed to the interface between innovation and enterprise. INNOVA absorbed the former FONTEC and FDI funds.

- NFRD, National Fund For Regional Development (*Fondo Nacional de Desarrollo Regional*), managed by the Subsecretariat of Regional Development, aims at financing initiatives leading to sustainable development and environmental improvements, together with initiatives on social and economic promotion of disadvantaged populations, so as to provide equal opportunities for development across the different Chilean Regions.

It is also worth noting that due to the Government's concern about current investment levels in R&D in Chile, it has created the National Innovation Council for Competitiveness. Through this Council new resources will be applied in coming years to selected economic areas, one of which is aquaculture. The Council will manage the National Fund of Innovation for Competitiveness, which will supposedly handle a substantial budget coming from a new royalty applicable to the mining industry.

Aquaculture was among the eleven sectors of the Chilean economy that have been targeted for further State support on R&D initiatives, and it is expected that current funds will be strongly supplemented in the future, but to what extent is still unknown.

Research and development through private agents

Research to support the State in fisheries and aquaculture management are almost exclusively carried out and financed through the public sector. However, in recent years, industry from the VIII Region had become organized and financed their own research institution, INPESCA, aimed at studying those fisheries and related matters of particular interest to their members. The resulting research is used by fishers in the region to discuss management proposals suggested by the SSP.

More research from private industries on management issues is undertaken by INTESAL, the technical branch of SalmonChile, which was created in 1995. They have specialized on environmental issues associated with salmon farming, and have played a major role in developing and promulgating Codes of Practice for various farming or processing processes, including effluent management, garbage disposal, etc. As noted in Chapter 4, most of SalmonChile's members are already certified with regard to those standards and they have also adhered to Clean Production Practices as part of an agreement signed in 2002 with the Minister of Economy. INTESAL has also undertaken research on a number of other issues concerning farming methods and controls, the results of which have applied by their membership.

This very unique experience is associated with former agreements between SalmonChile and Foundation Chile ('Fundación Chile'), whereby that Foundation developed Quality Seals and Codes of Practices for salmon products meant for exports, becoming the first voluntary agreement of this nature implemented in Chilean aquaculture[3], back in 1986. Through these agreements, SalmonChile had all exported salmon certified in terms of quality, guaranteeing foreign buyers the level of compliance associated with standards that were supported by Quality Seals. These very basic measures, supported by all their members, became a powerful marketing tool, at a time when Chile was only starting to export salmon, and its credibility as supplier was still unknown.

Foundation Chile is a technology transfer institution aimed at promoting new business developments in Chile, through the application of innovative technologies. In fact it was the institution which originally led the introduction of salmon farming in Chile. They have done the same work by

introducing abalone farming; Pacific oysters; sturgeon; channel catfish; halibut; turbot; hirame and other species. While a few of these species are farmed on commercial terms by now (salmon, trout, abalones, turbot, Pacific oyster), the remaining ones are still only being handled in pilot operations. The Foundation is also engaged in quality control of export products, and use to run the best ictiopathology laboratory in Southern Chile. They have various pilot scale farming operations along the length of Chile, where they experiment with new farming technologies, some of which are already used at commercial level. They also work on vaccines, genetics, etc.

Two foundations complement the list of private actors on these matters, but this time, their support to research, like that of Foundation Chile, relates more to aquaculture and fisheries diversification and productivity improvements rather than to management issues: i) Foundation COPEC-Catholic University, and ii) Foundation Andes. Both have rather limited funding for research purposes, but support research initiatives, and supplement scholarships to facilitate post-graduate courses in fisheries, aquaculture and other subjects.

On top of these institutional frameworks that in one way or another helped financing research to achieve their goals, there are many other highly qualified scientific and technological institutions that carry out research and development tasks that back fisheries and aquaculture development in Chile. The areas of focus range from product development and control (INTA, University of Chile; SECTA, University of Santiago; Foundation Chile; CIENTEC, Austral University, etc.), to genetics, sanitary issues, etc.

Several of these institutions currently operate on premises originally built and equipped throughout the 1990s and early 2000s, with support from FONDEF. This State fund has been the main supporting means for these purposes across Chile. As soon as that phase was completed, and most Chilean Regions had been fairly well equipped in terms of basic infrastructure and laboratory facilities and equipment, FONDEF turned its financial support towards development projects that made good use of these installations. Also, it is worth noting that a fairly high proportion of projects financed by FONDEF during the last decade (not channeled to support diversification ideas) were destined to research on salmon farming sanitary issues (vaccine development, etc); environmental matters and projects related to feed improvements, digestibility, the search for alternative vegetable components, etc.

Notes

1. Values and calculations expressed in pesos of December 2007. However, the budget, expressed in current USD values has expanded from USD 11 million to USD 18 million, at a rate of approximately 13% per year between 2004 and 2008.

2. 2004-2006: FFR's anual Yearbooks. 2007: SSP, *Política Nacional Pesquera*, *op.cit*.

3. In fact, this voluntary agreement applied 'compulsorily' to whoever wanted to be a permanent member of SalmonChile in those years, but it was not imposed by the State. This initiative is unique in the recent history of local industrial activities.

CHAPTER 6

International co-operation and agreements

Chile is an active member in many of the international forums and agreements governing fisheries and the oceans. Indeed, Chile was in the vanguard of the movement to extend the EEZ out to 200 nautical miles. Chile is one of the original signatories of the 1952 Declaration of Santiago on Maritime Zone ('Declaración de Santiago sobre Zona Marítima'), in which Chile, Peru and Equador proclaimed their exclusive sovereignty and jurisdiction over their coastal waters '... up to a minimum distance of 200 miles' from their coastlines, including the corresponding seabed and its subsoil. This declaration proclaimed the right to impede an irrational exploitation of the natural resources, which might jeopardize their existence, integrity and conservation, negatively affecting local populations that possess in those waters and land irreplaceable sources of livelihood and economic wealth that are vital to them.[1] To implement this agreement, the three countries created the Permanent Commission of the South Pacific, CPPS, an international juridical body with full capacities to undertake agreements, etc. In 1979, Colombia joined the CCPS. In 1982, the rest of the world followed with the UNCLOS agreement establishing the 200 miles EEZs on a worldwide basis.

This chapter reviews the status of Chile's engagement in the international fisheries arena. While Chile is also a member of many international financial, foreign investment and trade-related agreements that have an impact in fisheries, the focus in this chapter is on those international instruments that directly concern fisheries.

Overview

Table 6.1 provides a summary of the fisheries-related treaties and conventions to which Chile is a signatory. It is clear from the summary that Chile has ratified the major treaties and conventions that are in place. The

notable exception is the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and High Migratory Fish Stocks. Known as the UN Fish Stocks Agreement (UNFSA), it came into force on 11 December 2001 and currently has 68 signatories. The UNFSA is the implementing framework for the operation of regional fisheries management organisations (RFMOs) and the management of international fisheries.

Chile is also participating in an initiative with Australia and New Zealand to form a new RFMO aimed at managing unregulated fishing effort in areas adjacent to the Chilean EEZ and in the South Pacific, where Chilean interests are mainly focused on the straddling jack mackerel fishery. Negotiations began in 2006 and are still underway to form this RFMO, known as the South Pacific RFMO (or SPRFMO), and no end date for negotiations has been set. A Science Working Group and a Data and Information Working Group have been established. There are now over 20 states, as well as IGOs and NGOs, engaged in the process. The SPRFMO has yet to come into force.

An ongoing international issue is the dispute with Peru over the international maritime limits between the two countries. This issue is currently before the International Court of Justice in The Hague.

Table 6.1. International fisheries-related treaties and conventions signed by Chile

Treaty-Convention	Year of enactment
Declaration of Santiago on Maritime Zone (200 miles)	**1954**
The Antarctic Treaty	**1961**
Convention for the protection of flora, fauna and scenic views	**1967**
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	**1975**
International Convention for the Regulation of Whaling (International Whaling Commission)	**1979**
Convention for the Conservation of Antarctic Seals	**1980**
RAMSAR Convention on Wetlands	**1981**
Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR)	**1981**
Convention on the Conservation of Migratory Species of Wild Animals, CMS	**1981**
Convention for the Environmental Protection of Coastal Zones in the Pacific South East	**1986**
FAO´s Code of Conduct for Responsible Fisheries (CCRF)	**1991**
United Nations Conference on Environment and Development (Río Summit or Earth Summit, Agenda 21)	**1992**
Convention on Biological Diversity (Biodiversity Convention)	**1994**
United Nations Convention on the Law of the Sea (UNCLOS)	**1997**
Agreement Proposal for the Conservation of Live Marine Resources on the Pacific South East Seas	**2001**
Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas(1)	**2004**
(1) Enacted only in 2005, after specific regulations are put in place	
Action Plan to Prevent, Discourge and Eliminate Illegal, Unregulated and Unreported Fishing (IUU)	**2005**
Agreement for the Conservation of Albatroses and Petrels (ACAP)	**2005**
Multilateral and bilateral Free Trade Agreements (various countries and years)	**various**

Source: Chapter 5 of this report.

Review of individual agreements

The Antarctic Treaty of 1961('Tratado Antártico')

Locally enacted in 1961, through Decree 361 (Foreign Affairs), this agreement was originally signed by 13 countries in 1959, including Chile, and aims at ensuring that the continent of Antarctic be used for peaceful purposes only, favoring international co-operation and scientific research, while preventing actions that may lead to international disputes.

Convention for the protection of flora, fauna and scenic views of 1967 ('Convención para la Protección de la flora, fauna y bellezas escénicas')

This agreement, enacted through Decree 531 of 1967 (Foreign Affairs) aims at preserving America's flora and fauna from extinction, and asserts that areas of extraordinary scenic beauty, geological, historic or scientific interests neither be threatened nor irrationally intervened.

Convention on International Trade in Endangered Species of Wild Fauna and Flora, of 1975 CITES,('Convención sobre el Comercio Internacional de Especies Amenazadas de la Flora y fauna silvestre')

This agreement was approved through Decree Law 873 of 1975, and was enacted as a law by Decree 141 (Foreign Affairs) of the same year. It aims to control international trade in endangered species.

International Convention for the Regulation of Whaling, 1979, International Whaling Commission. ('Convenio Internacional para la regulación de la caza de la ballena')

The International Whaling Commission (IWC) is an international body set up by the terms of the International Convention for the Regulation of Whaling (ICRW) which was signed by fourteen countries – among them, Chile- in Washington on 2 December 1946 to "provide for the proper conservation of whale stocks and thus make possible the orderly development of the whaling industry". This Convention was only enacted locally in 1979, through Decree 2.700 (Foreign Affairs).

More recently, and through Decree 179 of 2008, Chile prohibits whaling on forty three cetaceans in local jurisdictional waters.

Convention for the Conservation of Antarctic Seals, 1980 ('Convención sobre Conservación de Focas Antárticas')

Dating from 1978, this complements the Antarctic Treaty. It was officially enacted in Chile by Decree 191 of 1980 (Foreign Affairs), to protect Antarctic seals and balance local ecosystems. Through it, capture areas are designated, and closed seasons established. No related commercial activity has been registered since this agreement was signed.

RAMSAR Convention on Wetlands, 1981 ('Convención sobre zonas húmedas de importancia internacional,especialmente como hábitat de aves acuáticas ')

This international agreement, locally enacted in 1981 by Decree 771 (Foreign Affairs), aims at stopping the progressive occupation and disappearance of wetlands, the fragile ecologic systems that are generally home of a varied wild life. The official document recognizes the importance of wetlands, their ecological functions, and their economic, historic, scientific and recreational values.

Convention on the Conservation of Antarctic Marine Living Resources, CCAMLR ('Convención sobre la Conservación de los Recursos Vivos Marino Antárticos 1981')

This agreement was enacted locally in 1982, and was originally signed in Australia in 1980. In Chile it was approved by Decree 662 de 1981 (Foreign Affairs). Conservations measures approved by the Commission in 2007 have been officially adopted by Decree 205 (Foreign Affairs) of that year.

This act came into force in 1982 as part of the Antarctic Treaty System in pursuance of the provisions of Article IX of the Treaty. It was established mainly in response to concerns that an increase in krill catches in the Southern Ocean could have a serious effect on populations of krill and other marine life; particularly on birds, seals and fish, which mainly depend on krill for food.[2]

The aim of the Convention is to conserve marine life of the Southern Ocean. However this does not exclude harvesting carried out in a rational manner. Achievement of this aim is far from simple – it requires the collection of large quantities of information and the development of appropriate scientific and analytical techniques. A 'precautionary' approach has been implemented to minimize risk associated with unsustainable practices in conditions of uncertainty. This approach is complemented by the need to take into account ecological links between species and 'natural' as opposed to 'human-induced' variability – the 'ecosystem approach'.

Convention on the Conservation of Migratory Species of Wild Animals , CMS, 1981 ('Convenio sobre la conservación de especies migratorias de la fauna Salvaje')

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention) aims at conserving terrestrial, marine and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Program, concerned with the conservation of wildlife and habitats on a global scale. Since the Convention's entry into force, its membership has grown steadily to include 109 (as of 1 August 2008) parties from Africa, Central and South America, Asia, Europe and Oceania.[3] In Chile it was enacted by Decree 868 of 1981 (Foreign Affairs).

Convention for the Environmental Protection of Coastal Zones in the Pacific South East, 1986 ('Convenio para la protección del medio ambiente y la zona costera del Pacífico Sudeste')

Originally signed in 1981 in Lima, Peru, it was enacted in Chile by Decree 296 (Foreign Affairs) of 1986. Signatory countries include Chile, Peru, Equator, Panama and Colombia. It aims at improving regional co-operation to reduce, control and prevent marine pollution in the area through different mechanisms.

Convention on Biological Diversity, known informally as the Biodiversity Convention ,1994 ('Convenio sobre Diversidad Biológica')

This convention was enacted in Chile through Decree (Foreign Affairs) 1.963 of 1994, and is a treaty that was adopted in Rio de Janeiro in June 1992, with three main goals: i) conservation of biological diversity (or biodiversity); ii) sustainable use of its components; and iii) a fair and equitable sharing of benefits arising from genetic resources. In other words,

its objective is to develop national strategies for the conservation and sustainable use of biological diversity. It is often seen as the key document regarding sustainable development.

The Convention was opened for signature at the Earth Summit in Rio de Janeiro on 5 June 1992 and entered into force on 29 December 1993.

United Nations Conference on Environment and Development - alternatively, Rio Summit or Earth Summit- 1992, Agenda 21 ('Conferencia sobre el Medio Ambiente y el Desarrollo, o Cumbre de Río de Janeiro, Agenda 21'),

Agenda 21 is a program run by the United Nations related to sustainable development. It is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the UN, governments, and major groups in every area of human impact on the environment. Chile was among the 188 signatories that subscribed to the document in 1992, aimed at promoting sustainable development.

UNCED's proposal to establish National Councils for Sustainable Development motivated Chile to create one of his own, the Chilean Council for Sustainable Development, CCSD, through Decree 90 (Secretariat General for the Presidency) of 1998. This Council aims at implementing all major actions included in Agenda 21, and makes the point of involving all social groups in the decision making process leading to sustainable development, through the required instances.

United Nations Convention on the Law of the Sea (UNCLOS), 1997, ('Convención de las NU sobre el Derecho del Mar, CONVEMAR')

UNCLOS was enacted in Chile by Decree 1.393 (Foreign Affairs) of 1997. It is an international agreement resulting from the third United Nations Conference on the Law of the Sea (UNCLOS III), between 1973 and 1982. UNCLOS defines the rights and responsibilities of nations in their use of the oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. It was concluded in 1982, replacing four 1958 treaties. UNCLOS came into force in 1994, a year after the 60th state signed the treaty. To date, 156 countries and the European Union have joined in the Convention.

Agreement to Promote Compliance with International Conservation and Management
Measures by Fishing Vessels on the High Seas, 2004 ('Acuerdo para

promover el cumplimiento de las medidas internacionales de conservación y ordenación por los buques pesqueros que pescan en alta mar')

Approved through Decree 78 of 2004 (Foreign Affairs), Chile accepted Resolution 15/93 of the 27th. Session of the FAO Conference of 24 November 1993. However, regulations to enact this agreement in Chile were only approved through Decree 360 of 2005. These regulations are applicable to all fishing vessels that catch on the high seas, requesting all countries to ensure that their fleets comply with international regulations on conservation, etc.

Action Plan to Prevent, Discourge and Eliminate Illegal, Unregulated and Unreported Fishing, IUU, ('Plan de acción nacional para prevenir, desalentar y eliminar la pesca ilegal, no declarada y no reglamentada')

By Decree 267 of 2005, Chile adheres to FAO proposals to prevent, discourage and eliminate illegal, unregulated and unreported fishing activities in the high seas and on its EEZ, on its triple condition of coastal nation, flag state and state port authority.

Agreement Proposal for the Conservation of Live Marine Resources on the Pacific South East High Seas, 2001 ('Propuesta de Acuerdo marco para la conservación de los recursos vivos marinos en la alta mar del Pacífico Sudeste o Acuerdo de Galápagos')

Under this agreement proposal – not signed at this stage - the Permanent Commission for the South Pacific and its four members, Chile, Peru, Equator and Colombia agree on how to preserve marine resources available on the high seas, beyond their EEZ's, from parallel 5°S to 60°S, and up to meridian 120°W.

As the CPPS has not been approved to date by the CPPS's members, Chile has opted for a parallel alternative, with similar aims. This parallel initiative, the formation of the SPRFMO, is being discussed with New Zealand and Australia.

Agreement for the Conservation of Albatrosses and Petrels, ACAP, 2005 ('Acuerdo para la conservación de Albatros y Petreles')

After Chile signed this agreement, it was discussed in Parliament in 2004 and enacted in 2005. It had already been adopted in Australia in 2001.

It aims at protecting these birds and their habitats against contamination, lack of feed, the use of inadequate fishing gear etc, prohibiting harming and transporting them, their eggs and nests.

FAO's Code of Conduct for Responsible Fisheries, CCRF, ('Código de Conducta para la pesca Responsable de la FAO')

The Code of Conduct for Responsible Fisheries was elaborated by the FAO Committee on Fisheries (COFI) and adopted by the FAO Conference in 1995.

The concept of responsible fisheries and the possibility of elaborating guidelines or a code of practice for responsible fisheries were first mooted at the 1991 Session of the FAO Committee on Fisheries (COFI) within the context of its discussions relating to large-scale pelagic driftnet fishing. This led to the holding of the International Conference on Responsible Fishing in Cancun, Mexico in May 1992. The Conference culminated in the adoption of the Declaration of Cancun, which, called upon FAO, in consultation with relevant international organizations, to draft an International Code of Conduct for Responsible Fishing.

The purpose of the Code is to encourage the rational and long-term sustainable utilization of fisheries. The Code takes a holistic view of the world's fisheries. In so doing, it prescribes principles and standards for the conservation and management of all fisheries, and addresses the capture, processing and trade in fish and fishery products, fishing operations, aquaculture, fisheries research and the integration of fisheries into coastal area management.

The Code is a voluntary instrument, and it is the first international instrument of its type to have been concluded for the fisheries sector. As a voluntary instrument the Code does not require formal acceptance by governments. However, there is a moral obligation for governments and other stakeholders to act in a responsible manner and to address urgent management and related sectoral issues.

Multilateral and bilateral Free Trade Agreements ('Tratados multilaterales y bilaterales de Libre Comercio')

Being a major exporter of fish products, and having a fairly open economy, Chile reached Free Trade Agreements (FTAs) with different countries and the European Union. FTAs have been signed with the EU, the USA, Canada, Mexico, Japan, China, Korea, MERCOSUR (Argentina, Brazil, Uruguay, Paraguay), Australia, Central America, Caribbean

Countries, and others. This will certainly help expanding Chilean fish exports in the coming years and decades. Eventually, these FTA might as well help promoting further imports of adequate fish products by Chile, thus helping to ease the relative scarcity of cheaper white-fish species in the domestic market.

Notes

1. Chile enacted this agreement in 1954, through Decree 432 of the Ministry of Foreign Affairs.
2. From CCAMLR's web page : www.ccamlr.org/pu/e/gen-intro.htm
3. CMS web page: www.cms.int/about/intro.htm

ANNEX A

Common and scientific names of species caught or farmed in Chile

Common name	Scientific name Family
Algae	
Carola	Callophyllis variegata Kallymeniaceae
Cochayuyo	Durvillaea antarctica Durvillaceae
Cotoni	*Eucheuma cottonii* Solieriaceae
Chasca	*Gelidium rex* Gelidiaceae
Chascón o huiro negro	*Lessonia nigrescens* Lessoniaceae
Chicorea de mar	*Chondracanthus chamissoi* Gigartinaceae
Haematococcus	*Haematococcus pluvuaslis* Polyblepharideaceae
Huiro	*Macrocystis spp.* Lessoniaceae
Huiro palo	*Lessonia trabeculata* Lessoniaceae
Lechuguilla	*Ulva lactuca* Ulvaceae
Liquen gomoso	*Gymnogongrus furcellatus* Phyllophoraceae
Luche	*Porphyra columbina* Bangiaceae

Luga-Luga	*Mazzaella membranacea* Gigartinaceae
Luga-Roja	*Gigartina skottsbergii* Gigartinaceae
Luga negra o crespa	*Sarcothalia crispata* Gigartinaceae
Luga cuchara o corta	*Mazzaella laminarioides* Gigartinaceae
Pelillo	*Gracilaria spp.* Gracilariaceae
Spirulina	*Spirulina spp.* Oscillatoriaceae

Fish

Acha o hacha	Medialuna ancietae Khyphosidae
Agujilla	*Scomberesox saurus scombroides* Scomberesocidae
Albacora o pez espada	*Xiphias gladius* Xiphiidae
Alfonsino	*Beryx splendens* Berycidae
Anchoveta	*Engraulis ringens* Engraulidae
Anguila	*Ophichthus spp.* Ophichthyidae
Apañado	*Hemilutjanus macrophthalmus* Serranidae
Atún aleta amarilla	*Thunnus albacares* Scombridae
Atún aleta larga	*Thunnus alalunga* Scombridae
Atún ojos grandes	*Thunnus obesus* Scombridae
Ayanque	*Cynoscion analis* Sciaenidae
Azulejo	*Prionace glauca* Carcharhinidae
Bacaladillo o mote	*Normanichthys crockeri* Normanichthyidae
Bacalao de Juan Fernández	*Polyprion oxygeneios* Polyprionidae
Bacalao de profundidad	*Dissostichus eleginoides* Nototheniidae

Bagre de agua dulce	*Ictalurus punctatus* Ictaluridae
Barrilete negro	*Auxis spp* Scombidae
Besugo	*Epigonus crassicaudus* Epogonidae
Blanquillo	*Prolatilus jugularis* Pinguipedidae
Bonito	*Sarda chiliensis chiliensis* Scombridae
Breca o Bilagay	Cheilodactylus gayi Cheilodactylidae
Brótula	*Salilota australis* Moridae
Caballa	Scomber japonicus Scombridae
Cabinza	*Isacia conceptionis* Haemulidae
Cabrilla	*Sebastes capensis* Sebastidae
Cabrilla común	*Paralabrax humeralis* Serranidae
Cachurreta o barrilete	*Katsuwonus pelamis* Scombidae
Canque	*Stellifer minor* Sciaenidae
Cochinilla	*Thamnaconus paschalis* Monacanthidae
Cojinoba del norte	*Seriolella violacea* Centrolophidae
Cojinoba del sur	*Seriolella caerulea* Centrolophidae
Cojinoba moteada	*Seriolella punctata* Centrolophidae
Congrio colorado	*Genypterus chilensis* Ophidiidae
Congrio dorado	*Genypterus blacodes* Ophidiidae
Congrio negro	*Genypterus maculatus* Ophidiidae
Corvina	*Cilus gilberti* Sciaenidae
Chancharro	*Helicolenus lengerichi* Sebastidae

Dorado de altura	*Coryphaena hippurus* Coryphaenidae
Draco rayado	*Champsocephalus gunnari* Channichthyidae
Esturión de siberia	*Acipencer baerii* Acipenseridae
Hirame	*Paralichthys olivaceus* Bothidae
Huaiquil o corvinilla	*Micropogonias manni* Sciaenidae
Jerguilla	*Aplodactylus punctatus* Aplodactylidae
Jurel fino	*Decapterus macrosoma* Carangidae
Jurel	*Trachurus symmetricus* Carangidae
Konso	*Ruvettus pretiosus* Gempylidae
Lenguado	*Paralichthys spp.* Bothidae
Lisa	*Mugil cephalus* Mugilidae
Machuelo o tritre	*Ethmidium maculatum* Clupeidae
Marlin	*Tetrapturus audax* Istiophoridae
Matahuira	*Heteropriacanthus cruentatum* Priacanthidae
Merluza común	*Merluccius gayi gayi* Merlucciidae
Merluza de cola	*Macruronus magellanicus* Merlucciidae
Merluza de tres aletas	*Micromesistius australis* Gadidae
Merluza del sur o austral	*Merluccius australis* Merlucciidae
Merluza del atlántico	*Merluccius hubbsi* Merluccidae
Nanue	*Girella nebulosa* Kyphosidae
Orange roughy	*Hoplostethus atlanticus* Trachichthyidae
Pampanito	*Stromateus stellatus* Stromateidae
Pejegallo	*Callorhinchus callorhynchus* Callorhinchidae

Pejeperro	*Semicossyphus darwini* Labridae
Pejerrata o granadero	*Caelorhynchus chilensis* Macrouridae
Pejerrey de mar	*Odontesthes regia* Atherinidae
Pez sol	*Lampris guttatus* Lamprididae
Poo po	*Caranx cheilio* Carangidae
Pejesapo	*Tomicodon chilensis* Gobiesocidae
Pejezorro	*Alopias vulpinus* Alopiidae
Puye	*Galaxias spp* Galaxiidae
Raya aguila	*Myliobatis peruvianus* Rajidae
Raya espinosa	*Dipturus trachyderma* Rajidae
Raya negra	*Sympterygia brevicaudata* Rajidae
Raya moteada	*Sympterygia brevicaudata* Rajidae
Raya volantín	*Dipturus chilensis* Rajidae
Reineta	*Brama australis* Bramidae
Remoremo	*Elagatis bipinnulata* Carangidae
Róbalo	*Eleginops maclovinus* Eleginopsidae
Rococo	*Paralonchurus peruanus* Sciaenidae
Rollizo	*Pinguipes chilensis* Pinguipedidae
Roncacho	*Sciaena delicioa* Scianidae
Ruhi	*Caranx lugubris* Carangidae
Salmón artico	*Salvelinus alpinus* Salmonidae
Salmón del atlántico	*Salmo salar* Salmonidae

Salmón plateado	*Oncorhynchus kisutch* Salmonidae
Salmón rey	*Oncorhynchus tshawytscha* Salmonidae
Salmón rosado	*Oncorhynchus gorbusscha* Salmonidae
Sardina austral o del sur	*Sprattus fuegensis* Clupeidae
Sardina española	*Sardinops sagax* Clupeidae
Sardina común	*Strangomera bentincki* Clupeidae
Sargo	*Anisotremus scapularis* Haemulidae
Sierra	*Thyrsites atun* Gempylidae
Tiburón o marrajo	*Isurus oxyrinchus* Lamnidae
Tollo de cachos	*Squalus acanthias* Squalidae
Tollo	*Mustelus mento* Triakidae
Tomoyo	*Labrisomus philippii* Labrisomidae
Trucha arcoiris	*Oncorhynchus mykiss* Salmonidae
Turbot	*Scophtalmus maximus* Scophthalmidae
Vidriola, palometa, dorado o toremo	*Seriola lalandi* Carangidae

Fish

Vieja o mulata	*Graus nigra* Kyphosidae

Mollusks

Abalón japonés	*Haliotis discus hannai* Haliotidae
Abalón rojo	*Haliotis rufescens* Haliotidae
Almeja o taca	*Protothaca taca* Veneridae

Calamar	*Loligo gahi* Loliginidae
Calamar illex o pota del atlántico	*Illex argentinus* Omastrephidae
Caracol locate	*Thais chocolata* Muricidae
Caracol palo palo	*Argobuccinum spp.* Ranellidae
Caracol picuyo	*Odontocymbiola magellanica* Volutidae
Caracol piquilhue	*Adelomelon ancilla* Volutidae
Caracol real o gigante o voluta angulosa	*Zidona dufresnei* Helicidae
Caracol rubio	*Xantochorus cassidiformis* Muricidae
Caracol tegula	*Tegula atra* Trochidae
Caracol trophon	*Trophon gervesianus* Muricidae
Caracol trumulco	*Chorus giganteus* Muricidae
Chitón o aretador	*Chiton spp.* Chitonidae
Chocha	*Trochita trochiformes* Calyptraeidae
Cholga	*Aulacomya ater* Mytilidae
Chorito	*Mytilus chilensis* Mytilidae
Choro	*Choromytilus chorus* Mytilidae
Culengue	*Gari solida* Garidae
Huepo o navaja de mar	*Ensis macha* Pharidae
Jibia o calamar rojo	*Dosidicus gigas* Ommastrephidae
Juliana o tawera	*Tawera gayi* Veneridae
Lapa	*Fissurella spp.* Fissurellidae
Lapa bonete	*Fissurella costata* Fissurellidae

Lapa negra	*Fissurella latimarginata* Fissurellidae
Lapa reina	*Fissurella maxima* Fissurellidae
Lapa rosada	*Fissurella cumingi* Fissurellidae
Loco	*Concholepas concholepas* Muricidae
Macha	*Mesodesma donacium* Mesodesmatidae
Navajuela	*Tagelus dombeii* Psammbiidae
Ostión del norte	*Argopecten purpuratus* Pectinidae

Mollusks

Ostión del sur	*Chlamys vitrea* Pectinidae
Ostión patagónico	*Chlamys patagonica* Pectinidae
Ostra chilena	*Ostrea chilensis* Ostreidae
Ostra del pacífico	*Crassostrea gigas* Ostreidae
Pulpo	*Octopus mimus* Octopodidae
Taquilla	*Mulinia edulis* Mactridae
Tumbao	*Semele solida* Semelidae

Crustaceans

Camarón de roca	*Rhynchocinetes typus* Rhynchocinetidae
Camarón nailon	*Heterocarpus reedi* Pandalidae
Camarón navaja	*Campylonotus semistriatus* Campylonotidae
Camarón ecuatoriano o penaeue	*Penaeus vannamei* Penaeidae
Camarón de río del norte	*Cryphiops caementarius* Palaemonidae

Cangrejo o panchote	*Taliepus dentatus* Majidae
Cangrejo dorado de Juan Fernández	*Chaceon chilensis* Geryonidae
Centolla	*Lithodes santolla* Lithodidae
Centolla del norte	*Lithodes spp.* Lithodidae
Centollón	*Paralomis granulosa* Lithodiidae
Centollón del norte	*Paralomis spp.* Lithodiidae
Gamba	*Haliporoides diomedeae* Solenoceridae
Jaiba	*Cancer spp.* Cancridae
Jaiba limón	*Cancer porteri* Cancridae
Jaiba marmola	*Cancer edwardsi* Cancridae
Jaiba mora	*Homalaspis plana* Xanthidae
Jaiba patuda	*Taliepus marginatus* Majidae
Jaiba peluda o pachona	*Cancer setosus* Cancridae
Jaiba reina	*Cancer coronatus* Cancridae
Jaiba remadora	*Ovalipes Trimaculatus* Portunidae
Langosta de Juan Fernández	*Jasus frontalis* Palinuridae
Langosta de Isla de Pascua	*Panulirus pascuensis* Palinuridae
Langosta enana	*Projasus bahamondei* Palinuridae
Langostino amarillo	*Cervimunida johni* Galatheidae
Langostino enano	*Pleuroncodes sp.* Galatheidae
Langostino colorado	*Pleuroncodes monodon* Galatheidae
Picoroco	*Austromegabalanus psittacus* Balanidae

Pulga saltarina o gambita	*Gammarus sp* Gammaridae

Echinoderms

Erizo	*Loxechinus albus* Echinidae
Pepino de mar	*Athyonidium chilensis* Holoturoidae

Tunicates

Piure	*Pyura chilensis* Pyuridae

Note: (*) Under the common name of Luga-Luga, several non properly specified red algae from Mazzaella, Sarcothalia and Gigartina genders are also included

OECD PUBLISHING, 2, rue André-Pascal, 75775 PARIS CEDEX 16
PRINTED IN FRANCE
(53 2009 04 1 P) ISBN 978-92-64-07394-4 – No. 57039 2009

An Appraisal of the Chilean Fisheries Sector

Chile is one of the major players in the world fishing scene. In 2006, Chile was ranked fifth in the world in terms of production from capture fisheries, seventh with respect to aquaculture production, and was the seventh largest exporter of fish and fish products. In the Chilean capture fisheries, the most abundant species are the pelagic ones – jack mackerel, sardine, anchovy and "caballa" mackerel – which are primarily fished by a modern industrial fleet. Salmon and trout farming dominate in aquaculture production. There is also a large artisanal fleet that has exclusive access rights to the waters five miles from the coastline, providing employment and food for many coastal communities.

This report describes the challenging and complex learning process that the Chilean fisheries and aquaculture sector has undergone and the evolution of its policies and management systems. The policy framework governing the sector has evolved considerably during the past fifty years. Governance of the industrial, artisanal and aquaculture industries has followed different paths of policy development and current management reflects the particular pressures confronting each segment of the sector. Chile has had to face issues of overinvestment, sharp declines in catch levels, disputes among stakeholders, fleet downsizing, and aquaculture diseases, among others. And policy evolution continues, with a range of initiatives underway to meet the current challenges. The Chilean state has been one of the main forces behind these developments, laying the foundation for a strong and robust fisheries and aquaculture sector.

Further reading

Strengthening Regional Fisheries Management Organisations

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ISBN 978-92-64-07394-4
53 2009 04 1 P

