

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 1988², 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.

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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 reseeded 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 to 47°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 to 47°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 LGPA (1)	Exploitation condition (2)	biological
Camarón nailon	<i>Heterocarpus reedi</i>	Full exploitation	Fully exploited	
Langostino amarillo Zona Norte	<i>Cervimunida johni</i>	Full exploitation	Fully exploited	
Langostino amarillo Zona Sur	<i>Cervimunida johni</i>	Recovering	Fully exploited	
Langostino colorado Zona Norte	<i>Pleuroncodes monodon</i>	Full exploitation	Fully exploited	
Langostino colorado Zona Sur	<i>Pleuroncodes monodon</i>	Recovering	Fully exploited	
Alfonsino	<i>Berix splendens</i>	Full exploitation	Fully exploited	
Bacalao de profundidad	<i>Dissostichus eleginoides</i>	Under development	Fully exploited	
Besugo	<i>Epigonus crassicaudus</i>	Full exploitation	Fully exploited	
Congrio dorado	<i>Genypterus blacodes</i>	Full exploitation	Fully exploited	
Merluza común	<i>Merluccius gayi gayi</i>	Full exploitation	Fully exploited	
Merluza de cola	<i>Macruronus magellanicus</i>	Full exploitation	Fully exploited	
Merluza de tres aletas	<i>Micromesistius australis</i>	Full exploitation	Fully exploited	
Merluza del Sur	<i>Merluccius australis</i>	Full exploitation	Fully exploited	
Orange roughy	<i>Hoplostethus atlanticus</i>	Under development	Fully exploited	
Raya volantín	<i>Dipturus chilensis</i>	Full exploitation	Fully exploited	
Anchoveta	<i>Engraulis ringens</i>	Full exploitation	Fully exploited	
Jurel	<i>Trachurus murphy</i>	Full exploitation	Fully exploited	
Sardina común	<i>Strangomera bentincki</i>	Full exploitation	Fully exploited	
Sardina española	<i>Sardinops sagax</i>	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	Spawning biomass uncertain, but thought to be below target levels
Alfonsino	All	Spawning biomass highly uncertain, but thought to be below target levels
Cardinal fish	III to X	Spawning 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		Stable biomass, last 3 years. However, levels lower than in the 1990's
Shrimp	II to VIII	
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, reseeded 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 not 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 (<i>Apoyo Pescadores Artesanales</i>) ^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 <i>Fondo de Investigación Pesquera</i> (FIP)	3 187 128
<i>Fondo Administracion Pesquera</i>	1 072 345
<i>Fondo de Fomento de le Pesca Artesanales</i> (FFAP)	724 090
Costs for Research Vessel <i>Barco Abate Molina</i>	969 071
<i>Transfers to IFOP</i>	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 2012 time 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.

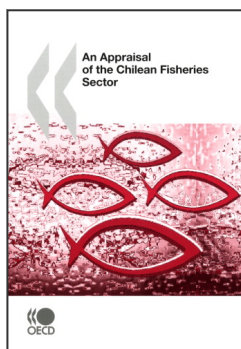
The introduction of an area-based cooperative, co-management scheme in the form of the MAEBR system has been an innovative development that can usefully be further developed. Ten years after their introduction, the artisanal sector is still coming to terms with the system and its potential advantages, 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).



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