Fishing quotas for small scale fishers' groups, the Chilean example

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Abstract
Fisheries management is necessary to avoid the overexploitation of fishery resources. The Chilean legislation recognizes as key elements of the management of fisheries the fixing of quotas, restrictions on entry and assignment of user rights, in its various forms. This fisheries management includes coastal reserve for use (exclusive use of artisanal fisheries), allocation of quotas between artisanal and industrial, allocation of quotas to the industrial fisheries as individual transferable quotas (ITQs), allocation of ITQs via auction for any user, and other forms of quota assignment inside the small-scale fisheries sector. This case study highlights the advances in the allocation of individual quotas inside the artisanal fisheries. It analyzes the risks, challenges and opportunities that these models involve through an in-depth study of the Bío Bío Region with a focus on common the sardine and anchovy fishery.

Keywords: Chile; Artisanal fisheries; Bio Bio region; ITQs, sardine, anchovy

1. INTRODUCTION

1.1 Description of the fishery

The small pelagic fishery in the Center-South of Chile is a purse seine fishery that operates between the regions of Valparaiso (V region) to the Lakes region (region X). The fishery targets anchovy (*Engraulis ringens*) and common sardine (*Strangomera bentincki*).

Pelagic resources play an important ecological role and are fundamental in food chains. Studies carried out in Chile show that these resources are important in the diet of sea lions, sharks, mackerel, hake and conger eels. Common sardine and anchovy possess a geographical distribution linked to the coast, a short life cycle, with a maximum life span of five years, and a high natural mortality. They are species that make up dense schools and that are heavily influenced by environmental factors, such as the availability of food, predation or superficial variations in temperature. Biologically, these species have a continuous annual spawning with maximum reproductive activity in the second period of the year. The size at first sexual maturity is 12 centimeters (cm) for the anchovy and 11.5 cm for the common sardine, within the first year of life.

Two different fleets target these species: the industrial fleet, which operates off the reserved fishing area (five miles from the coastline measures) under ITQs, and the small-scale fleet, which operates inside the first five nautical miles but can also operate offshore depending on the autonomy of the boats. The main landing sites for both fleets are San Antonio in the region of Valparaiso, Colonel, San Vicente and Talcahuano in the region of Bio Bio, Corral in the region of Los Ríos and Calbuco and Puerto Montt in the region of Los Lagos.

Sardine and anchovy landings are used as raw material for the production of fishmeal, which is either exported or marketed internally for the elaboration of feed for poultry, pigs and aquaculture. The global catch quota is split between artisanal and industrial subsectors, in line with Law 20.657 of the year 2013, with 78 percent (300 000 tonnes) of the overall quota assigned to the artisanal sector.

The industrial fleet includes 16 vessels in the anchovy fisheries and 17 in the sardine fisheries. It is estimated that about 9 800 people—86 percent fishing crew members and 14 percent ship-owners—participate in the artisanal small pelagic fisheries. Of the total, 40 percent are registered in the Bio Bio region, leaving in evidence the importance of this region for the anchovy and sardine fisheries. The fisheries involve 1 400 vessels, with 48 percent of them listed in the Bio Bio region. It should be noted that only a fraction of them are operational, with 26 percent of fishers in macro-regions V - X, and 52 percent of the fishers registered in the Bio Bio region.

The business model of this industrial fishery is a vertically integrated one with fleet, plant and marketing, while the artisanal fleet is the main supplier of raw material. The processing takes place in approximately 20 fishmeal factories, with 15 in the Bio Bio region.

1.2 Economic contribution and social implications of the fishing activity

The estimated ex-vessel value of the anchovy and sardine production in the central-southern regions of Chile was USD 82 million in the year 2017. It is difficult to estimate the total value of the fisheries. However, taking into account the fact that the total export of fishmeal in the year 2017 was USD 255 million, and that approximately 39 percent of fishmeal production in Chile derives from anchovy and sardine fisheries of the central and southern region, total export earnings amount already to at least USD 100 million. Then, given that domestic consumption accounts for about 24 percent of the total production, an additional USD 30 million can be added, which indicated that the total value of the anchovy and sardine fisheries is about USD 130 million.

2. MANAGEMENT OF THE FISHERY AND RIGHTS-BASED APPROACH

2.1 Management of the fishery

Chilean legislation recognizes as fundamental to the management of the fisheries, the limited entry in the fisheries and, as a complement, four different types of allocation of rights of use:

- allocation of quotas between artisanal and industrial;
- allocation of quotas to the industrial fisheries as individual transferable quotas (ITQs);
- allocation of ITQs via auction for any user; and
- four forms of quota assignment inside the small-scale fisheries sector:
  - benthic regime of extraction and management;
  - artisanal management areas;
  - artisanal extraction areas (RAE from the Spanish acronym Régimen Artesanal de Extracción); and
  - the particular case of toothfish allocation which is accessed via auction.

The RAE allocates individual quotas among artisanal fishers, generating incentives for the best use of the resource, decreasing the race for fish and creating the administrative regime for more efficient use. This regime recognizes historic rights and does not create new rights. It is a tool complementary to the suspension of the access via closed fishers registry and an assignment inside fishing that recognizes the validity of vessels and/or fishers registration in the fishery concerned. This recognition is given to all that are enrolled in the artisanal fisheries register and for the volumes that are historically recorded for each fisher. The RAE has been applied to the anchovy and the sardine fisheries in the Central Southern regions of Chile since 2004. No new entries are allowed in these two fisheries.

2.2 Brief history of former rights-based approaches used in the fishery

The anchovy and sardine fisheries in the Central-Southern area of Chile has three types of allocations, the ITQs for the industrial fisheries, the ITQs via auction for the industrial fisheries, and the RAE for the

artisanal fisheries. Table 1 shows the changes in the allocations of catch quotas over the years. It is important to note that the total quota has been reduced in recent years.

Table 1. Quota allocations of Anchovy and Sardines among fisheries (in tonnes).

	Anchovy		Total	Sardine		Total	Total
Year	Industrial	Artisanal	Anchovy	Industrial	Artisanal	Sardine	Fisheries
2001	67.771	87.169	154.940	105.543	249.577	355.120	510.060
2002	163.020	207.480	370.500	119.250	278.250	397.500	768.000
2003	149.882	234.480	384.362	90.204	270.613	360.817	745.179
2004	129.960	240.768	370.728	75.800	290.320	366.120	736.848
2005	170.925	276.236	447.161	80.043	239.470	319.513	766.674
2006	170.984	197.616	368.600	89.870	359.480	449.350	817.950
2007	185.856	236.544	422.400	102.720	308.160	410.880	833.280
2008	183.920	234.080	418.000	225.150	525.350	750.500	1.168.500
2009	181.830	231.420	413.250	261.900	611.100	873.000	1.286.250
2010	119.931	152.639	272.570	260.243	607.232	867.475	1.140.045
2011	29.466	37.502	66.968	315.176	735.411	1.050.587	1.117.555
2012	30.435	38.735	69.170	312.849	729.981	1.042.830	1.112.000
2013	25.528	90.509	116.037	128.462	455.458	583.920	699.957
2014	9.091	32.233	41.324	123.307	437.181	560.488	601.812
2015	7.380	26.165	33.545	76.721	272.009	348.730	382.275
2016	8.574	30.398	38.972	70.375	249.363	319.738	358.710
2017	12.558	44.524	57.082	72.402	256.698	329.100	386.182
2018	10.626	37.676	48.302	74.242	263.223	337.465	385.767

2.3 Rights-based approach: allocation and characteristics

The following text will concentrate on the evolution of the RAE in the Bio Bio region:

1. The annual renewal system for the years 2004 to 2008 had intensive regional work led by the fisheries authority. It determined the enabling parameters to achieve the allocation of a more equitable fee, which was then used as the basis for long-term determinations.
2. Collaborative work carried out in 2008 led to the establishment of a quota allocation for the period 2009-2011. This exercise was successful in achieving a consensus in the formula of determination, which resulted in the redistribution of a ten percent share of the quota from the largest shareholders to those who had less presence in the fishery.
3. Following the period of three years and with the experience of years 2004-2011, there was already a greater consensus on the need to establish better certainty to the operation of the fleet. This resulted in the redistribution of an 18 percent share based on criteria of consensus. This led to the extension of the regime in the long term (for 15 years).

It should be noted that transfers of quotas are possible, but the holder of the quota can only sell over a three-year period, up to 50 percent of the quota allocated to that period and only to registered artisanal fishers or fishing boat owners.

3. CONTRIBUTION OF THE RIGHTS-BASED APPROACH TO ACHIEVING SUSTAINABILITY

3.1 Sustainable use of the resources

According to the latest report on the situation of the fishery in the year 2017, the anchovy resource is over-exploited while sardines are fully exploited. It is important to note that it is difficult to assess the impact of the RAE system on the sustainability of anchovy and sardine resources as it is an environmental variable and its consequent effect on global availability of resource, climate change, and pollution from other areas, all contribute to changes in the resource's performance.

A survey for the year 2013 shows that RAE is not necessarily better for the resource than a simple global quota or an 'Olympic race'. The reason is that it is a 'mixed fishery', where the catch does not determine which resources will be targeted and nets can contain species for which the quota is already exhausted. The above study also carried out a survey on the perceptions of fishery participants, which showed that flawed fishing practices in the past were believed to have played an important role in the current condition of the anchovy resource. The participants also believed that regulatory asymmetries between the types of fleets in favor of the smaller vessels fostered unreported catches as well as the practice of declaring one species caught for another, not covered by the quotas.

3.2 Economic viability of the fishery

As pointed out before, since the introduction of catch quotas, there has been a steep decrease in overall catch quotas. At the same time, there has been a significant increase in catches labelled as by-catch, which are a cause of concern for fisheries managers.

Statistics of the year 2017 show an important decline in the number of vessels in the pelagic fleet of the VIII region operation, accompanied by a registered drop in the fees from the year 2012 until today. These occurrences put at risk the economic viability of vessels and encourage transfers between organizations within the same region, from other regions inside the macro-region, and to and from the industrial sector. This shows that the distribution of quota systems improves efficiency through the selection of those most efficient operators.

3.3 Social equality

The closed register of fishers aims to improve the condition of the fishery operators. The improvement is twofold. First, it provides certainty of access to a fixed quota. Second, it achieves a better distribution of the quota, from industrial towards artisanal fisheries.

In practical terms, this resulted in a reallocation of 17 percent of the quota in favor of artisanal fisheries. In addition, the flexibility in terms of the transfer of quotas provides additional income through the sales of quotas. In fact, field research shows that there is a perception among fishery participants that the allocation of fishing rights has generated improvements in the welfare of fishers' households thanks to the secure access to quotas and borrowing capacity due to the ownership of future fishing quotas.

4. MAIN CHALLENGES AND WAY FORWARD

4.1 Challenges for the fishery

It is necessary to improve the monitoring of the recruitment and breeding process in order to be timelier in the establishment of the respective periods of fishing bans. There is a need to improve the compliance with the regulations, in particular in the field of operation of illegal vessels.

More financial resources are needed for research in the economic and social arena, with special regard to the RAE. It is necessary to address the issue of the mixed fishery for anchovy and sardine common, which

constitutes a challenge for management and is responsible for practices such as the underreporting, misreporting and discards of catches.

4.2 Improving fishery sustainability in the future

The model of management of this fishery has strengthened over the years through the implementation of the technical Scientific Committee and its Management Committee. In particular, it has encouraged the participation of fishers in the decision-making process, particularly during the stages of information gathering and analysis, as well as during the design and implementation of control and supervision processes.

On the other hand, the authority must continue its efforts to communicate the most sensitive issues of management and manage the expectations of users in the short term concerning the operation, namely closed periods, quotas and management in general. This will require a permanent review of communication and transparency policies.

The complex territorial dynamics in which the fishery is developed and the large and heterogeneous number of operators make it necessary to constantly rethink models of control and supervision. It is also crucial to review the research model upon which fishery management is built. Both of these models are fundamental pillars for the projection of fisheries management in the long run.

On the other hand, an urgent review is required of the different types of operators to remove any regulatory voids that would constitute an incentive to underreport or misreport catches, and other bad practices. It is necessary to design strategies that would allow for a business that is more efficient; in particular, it is important to create an alternative to fishmeal production as it would create more value-added. In turn, this would generate higher revenues for operators with lower quotas and more viable economic activity, thus diminishing incentives to transgress the norm.

5. LESSONS LEARNED

The distribution of fishing quotas between industrial and artisanal fishers was quite successful. However, some fishermen misreport their catches once the quota of the target fish is filled. Strong enforcement of the quotas and control of fishing boats and landing sites is required to avoid exceeding the fishing quotas.

Nevertheless, the closing of the fishers' registry has created a great economic benefit for the fishers in the system, avoiding the change in generations. The fixed quota allocation every year is an asset that can be used as collateral for loans. The possibility to sell quotas is interesting for the fishers, but it can also put their livelihoods at risk when fishermen sell all of their left-over quotas prematurely.

A positive impact of the quota system on the sustainability of the resource, especially the anchovy resource, has yet to be demonstrated. On the contrary, the quotas, as suggested by scientists are far lower than what they were ten years ago. Water temperature evidently plays an important role in the availability of the small pelagic resource, but the misreporting of catches can also contribute significantly to the overfishing of the quota, and thus have a destructive impact on the resource.