

## Appendix 4: Analysis of Iceland Commissioned for this Report

### Icelandic fisheries: Economic perspectives

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#### Abstract

Icelandic fisheries have become substantially more profitable over the last 20 years, primarily due to changes in the fisheries management system. Total allowable catch (TAC) management has brought about more cost-effective fishing operations and individual transferable quotas (ITQ) have further improved the economic performance. Alaska can learn from Iceland's experience in fisheries management, both from an economic and social perspective.

#### Introduction

Iceland is located in the North Atlantic Ocean, midway between mainland Europe and North America. The sea around Iceland is highly productive, due to constant mixing of warm and cold currents. The annual catch is on the order of 1.5–2 million tons, worth around 800 million US dollars. Groundfish make up most of the catch value, with Atlantic cod alone providing half of the total value. The groundfish fleet is diverse, ranging from small but high-tech open boats to large factory trawlers. Fisheries are of great economic importance in Iceland, with marine products being around 60% of exported goods and services, an 8% direct contribution to the national GDP.

Fisheries management decisions are made by the Ministry of Fisheries, based on scientific advice from the Marine Research Institute and discussions with stakeholders. The management objective is defined legally, to protect and efficiently utilize the stocks and thus provide employment around the country. The tendency has been to emphasize long-term net profit on a national scale as the measurement of success, treating local and social aspects as side effects of secondary importance.

The management system has developed over the last few decades, away from effort control (limited days at sea) to output control (total annual catch, TAC) for each boat. This removed the economic incentive to overinvest in fishing capacity and has resulted in a more profitable fishing industry, where some boats participate in a fishery throughout most of the year, while others switch between seasonal fisheries.

Another important step in making the fishing industry more profitable was taken when a comprehensive individual transferable quota (ITQ) system was adopted for all Icelandic fisheries in 1991. The system has enabled more efficient companies to buy out and merge with less efficient ones, making the fisheries more profitable for the country as a whole.

The Ministry of Fisheries has adopted clearly defined harvest rules for two fisheries, to streamline the annual decision-making process. The cod stock is of central importance to the Icelandic economy, and capelin is the main prey in their diet.

Since 1980, an escapement rule of 400 thousand tons has been applied to the capelin stock, to guarantee there is enough left for the cod to eat. The harvest rule for cod, followed since 1996, is to catch 25% of the estimated stock size. This rule has maintained a relatively stable stock size, although the aim was to rebuild it to a somewhat higher level. Another aspect of the harvest rule is that it tells quota owners exactly how they will benefit from rebuilding the cod stock.

This paper focuses on the economic benefits and costs that have resulted from changes in the Icelandic fisheries management system, while a companion paper highlights the social perspectives.

### **TAC management since 1984**

The total annual catch (TAC) management system was introduced in the groundfish fishery in 1984. The annual catch is set for each species every year by the Ministry of Fisheries, divided between vessels as annual quota. The initiative came from the industry, particularly vessel owners in East Iceland. It was also supported by scientists at the Marine Research Institute, since the catches had consistently exceeded their recommendations under the effort control (limited days at sea) system. The initiative met resistance in the Westfjords where people preferred the old effort control system, since they were living right next to abundant fishing grounds.

The main problem with the old effort control system was economic waste. To squeeze the most catch out of each allowable day at sea, there was an incentive to overcapitalize in more boats, with bigger engines and newer equipment than would be required if the fisheries were spread more evenly over the year. TAC management also meant a more direct control over the amount caught, at a time when the resource was clearly being overfished. Between 1945 and 1983, fishing capital increased by over 1200% while catch values increased by 300%, after correcting for inflation. The pelagic fisheries had switched to TAC management in 1975 (herring) and 1980 (capelin) with good results, as the number of boats declined and catches increased.

The initial allocation had been simple in the pelagic fisheries: every herring boat was granted the same fraction of the TAC, but in the case of capelin two thirds were allocated equally and one third by vessel hold capacity. The groundfish fleet was much more diverse, so the initial allocation was based on the catch history over the preceding three years. Vessel owners were given the option to stay in the old effort control system, and the smallest boats were managed in a separate system until 1988. Today, almost all of the fleet has moved from effort control to TAC, with only a small fraction of the cod catch taken by boats under the old effort control system. The allowable fishing days were 323 in 1977, 215 in 1981, 84 in 1997, 40 in 1998, and 18 days in 2005.

Some flexibility is included in the TAC management system, to make it easier for vessel owners to plan and conduct their fishing operations. The landed catch can exceed the annual quota by up to 2%, but the quota for other species is then subtracted by the same value as the overrun, within a given year. Furthermore, annual quotas can be transferred between years, borrowing in advance up to 5% or saving up to 20% for the next year.

### **ITQ management since 1991**

Individual transferable quota (ITQ) shares constitute a right to catch a certain proportion of the TAC of a given species every year. Quotas are bound to vessels and are therefore the property of the vessel owner, but quota ownership and terms of trade remained somewhat unclear until 1991. Of the several steps made that year to make the fisheries management system more uniform and comprehensive, the most important was to make the quotas transferable. They were to be sold, leased, and taxed as property.

The issue was, and still is, a matter of heated debate. The natural resources that used to be regarded as the common property of all Icelanders, indeed an extremely valuable one, was to be privatized. Among the main proponents were the Federation of Icelandic Fishing Vessel Owners (representing quota owners) and two leading authorities in fisheries economics, professors Ragnar Arnason and Rognvaldur Hannesson. The argument was that the free market was the best tool to reduce fleet overcapacity and reshape the fishing industry so it would operate in the most profitable ways and locations.

Opposition to the ITQ initiative came from the National Association of Small Boat Owners (many of whose members favor the old effort control system) and a large part of the public, i.e. the former owners of the resource. A number of parliament members and professors raised legal questions about the interpretation of the constitution, as well as ethical questions about distributing the profit from natural resources in general. Many have also voiced concern over how rural communities might be impacted, and the possible consequences of several large companies accumulating most of the quota.

An effort has been made in the implementation of the ITQ system to address those points of criticism. First, the smallest boats (<6 GRT) were allowed to stay with the old effort control system for a while, if they chose to. Secondly, the opening clause of the law states that the Icelandic marine resources are the common property of the Icelandic people. Taxes are quite high in Iceland, so fishing industry operations generate tax revenues that benefit the population as a whole, and a special resource tax was added in 2005. The Minister of Fisheries administers an annual reserve of groundfish quotas (up to 12 thousand tons of cod equivalents, around 6% of the annual TAC) to distribute to vessel owners in communities where the fishing industry is facing hardship. Finally, the law forbids any single company to own more than 12% of the total cod quota.

There has been a global trend towards ITQ management during the last couple of decades. New Zealand (1986) and Iceland (1991) have implemented a comprehensive and uniform ITQ system for their main fisheries, and are often cited by fisheries economists as success stories. Many other countries have adopted ITQs to manage particular fisheries, including Australia, Canada (e.g. BC groundfish), Chile, Namibia, Netherlands, and USA (e.g. AK halibut and sablefish). These ITQ systems vary substantially with respect to transferability. Restrictions on quota trade are often used, for example, to dampen possible negative effects on communities.

### **Trading and leasing quota**

Quotas can be bought, or leased within the fishing year. Permanent quota shares are usually traded with the assistance of independent brokers or the Federation of Icelandic Fishing Vessel Owners, for brokerage charge of 0.5% of the trade value. Temporary quota leases, on the other hand, take place at a central ITQ exchange which was established by law in 1998. It resembles a computerized stock exchange and market information can be found on the web, updated in real time.

A large volume of groundfish quota is leased, often more than once within a fishing year. In recent years, these transactions amounted to around 80–90% of each year's TAC, suggesting speculative trades at different times of the year. Quota leases are less frequent for pelagic species and most crustaceans. Permanent quota shares have been traded at the level of 10–20% of the TAC, and the price difference between a permanent quota share and annual lease is around tenfold, fluctuating considerably. Quota trade has generally increased between years, both in permanent shares and leases. Quotas of different species are often exchanged with little or no money changing hands, according to the current exchange rate.

Restrictions on quota trade have been kept to a minimum, heeding the advice of economists, although restricting clauses have been added to the law as experience accumulates and debating parties come closer to agreement.

Quotas have from the onset been bound to fishing vessels, so only vessel owners can trade and lease quota. If a boat fails to catch at least half of its quota for two years in a row, the quota is forfeited and divided between the rest of the fleet, unless the interruption is due to repairs of damage. Net quota leases cannot exceed half of the quota for a given boat.

The law forbids any single company to own more than 12% of the total cod quota, 20% of other stocks (35% of redfish), or 12% of the grand total of all ITQ-managed stocks. Any quota trade between geographic regions is subject to permission by the Minister of Fisheries, but this rarely if ever been an issue. The purpose of these restrictions is to avoid short term destabilization of regional employment.

### **Fleet size and economic efficiency**

Iceland's adoption of the TAC management system, later combined with ITQs, has yielded considerable economic benefits. New investment in fishing capital has been reduced, the fleet size has reduced, and so has fishing effort. These changes have been slow but steady.

Over the last 20 years, groundfish catches have decreased somewhat, in an attempt to rebuild the cod stock after decades of overfishing. In spite of this, the catch value has increased due to improved processing techniques and global market trends. The groundfish fleet size, measured in total engine power, kept increasing during the days of effort control, but in later years the growth has halted, and the fleet has shifted slightly from trawlers to other boat types. In the pelagic fisheries, which have been managed with TAC and ITQ for a longer time, the fleet size has clearly decreased while herring catches have been increasing.

The overall profit of Icelandic fisheries, as percentage of total revenues (annuity method with 6% rate of return), has increased from an average of 2.5% in the 1990s to around 10% in recent years. This profit increase has been slightly greater in the fishing sector than the processing sector, and more consistent for the groundfish than other fisheries. The rising prices of quota leases also reflect an improved economic efficiency of the fisheries as a whole.

### **Resource tax**

The opening clause of the Icelandic Fisheries Management Act states that the marine resources are the common property of the people. As the fisheries became more profitable, a debate about how to distribute this profit mainly focused on three alternatives. The status quo was to have the fishing industry pay taxes like other businesses, plus special service fees for monitoring, enforcement, vessel decommissioning fund, and part of the research, but then keep the profit. A second option was to let quotas decay by a certain fraction every year, and have the government auction the recycled quota as a form of taxation and a redefinition of quota ownership.

The third option was taken in 2004, when the government introduced an annual fishing fee of 9.5% of the catch value minus operating costs. To make it easier for the industry to adapt, some older fees were abolished at this time, and the fishing fee will increase in gradual steps, from 6% in 2004 to 9.5% in 2009 and onwards.

### **Economic waste due to discarding**

One drawback of TAC management is that it creates an incentive to highgrade, discarding smaller fish that are less valuable per ton than larger fish. This is illegal, but onboard monitoring is limited in the Icelandic fisheries. In the ITQ system, quota owners lose as a group when fish are discarded and needlessly killed, and public discussion condemns this wasteful practice.

It is important to distinguish between the discarding incentives created by TAC and ITQ management. Under TAC management without ITQs, the economic incentive to discard can be quite strong, depending mainly on the price difference between fish size categories, catch composition, and risk of punishment. Under ITQ management, quota owners have a reason to avoid harming the stock by discarding, and are able to trade quota so they can match their portfolio to the species found on their fishing grounds.

Icelandic estimates of groundfish discards have been placed around 5–10% of the annual catch, but the estimates have decreased substantially in the most recent years. Discarding is much less common in the pelagic fisheries.

## Conclusions

The economic and social effects of ITQ management in Iceland can be summarized with the following diagram:

Pros	Cons
Improved economic performance of the fishing industry	Economic and social hardship in communities where quota holdings have decreased
Quota owners support sustainable fisheries management	Windfall profits for vessel owners at the time of initial quota allocation

From an economic perspective, the Icelandic fisheries have improved considerably over the last 20 years, primarily due to changes in the fisheries management system. The predictions of fisheries economics have by and large come true: TAC management gave fishing companies the right incentives to run their operations more profitably than before, and ITQ management allowed more efficient companies to buy permanent quota shares from less efficient companies. The fishing industry as a whole is more profitable than before and the national economy benefits through taxation, but some local economies have suffered as less efficient companies have sold their quota.

Ownership has led to stewardship and responsibility, since it is in the interest of quota owners to rebuild the cod stock to a more productive level. The 25% harvest rule tells quota owners exactly how catches will increase with the stock. The value of permanent quota shares depends on current belief about future stock status, not unlike shares on a financial stock market. The interaction between vessel owners and scientists has gradually matured from skepticism to cooperation, and in 2000 the industry purchased a large new research vessel as a symbolic and practical gift for the Marine Research Institute. Occasionally, the industry asks the Ministry of Fisheries to go further in protecting a particular stock they suspect is being overfished.

The implementation of TAC and ITQ management system in Iceland was simpler and more popular in the pelagic fisheries than in the groundfish fisheries. The groundfish fleet was more diverse, complicating the initial quota allocations, and different regions had different interests. Vessel owners in the Westfjords, for example, preferred the old effort control system (limited days at sea) since they were living right next to abundant fishing grounds. Owners of smaller boats, some of them working part-time, also feared that they would not have the financial flexibility to participate in quota trade where price fluctuations could be unpredictable.

Alaska adopted an ITQ management system for the halibut and sablefish fisheries in 1995. If other Alaskan fisheries were managed in a similar manner, it is quite possible that economic improvement would follow, as was the case in Iceland. It is an option that should be evaluated carefully, and tailored with appropriate rules to meet the goals.

Some analogies can be drawn between recent changes in Alaskan and Icelandic fisheries management. The Alaska Community Development Quota (CDQ) program resembles Iceland's allocation of up to 6% annual quota allocation to communities facing economic hardship. The Pollock Conservation Cooperative (PCC) and Chignik Coop initiatives are comparable to Iceland's adoption of TAC management, moving from a short and crowded derby fishing season to a more profitable way of fishing. The debate on TAC and ITQ management is ongoing both in Iceland and Alaska, and lessons can be learned from both regions.

## References

- Althingi. 2005. Fisheries Management Act 1990 No 38 with amendments. In: Icelandic Law 1 Oct 2005. Available online (in Icelandic) at <http://althingi.is/lagas/nuna/1990038.html>.
- Arnason, R. 1995. *The Icelandic fisheries: Evolution and management of a fishing industry*. Oxford: Fishing News.
- . 1997. The Icelandic individual transferable quota system: Motivation, structure, and performance. In: E.L. Pikitch et al. (eds.) *Global trends: Fisheries management*. Bethesda, MD: American Fisheries Society, pp. 225–236.
- . 2002. A review of international experiences with ITQs. CEMARE Report 58. Available online at <http://statistics.defra.gov.uk/esg/reports/fishquota/revitqs.pdf>.
- Danielsson, A. 1997. Fisheries management in Iceland. *Ocean and Coastal Management*. 35:121–135.
- Gissurarson, H.H. 2000. *Overfishing: The Icelandic solution*. London: Institute of Economic Affairs. Available online at <http://fisherieswatch.org/docs/301.pdf>.
- Hannesson, R. 1996. On ITQs. *Rev. Fish Biol. Fish.* 6:91–96.
- . 2004. *The privatization of the oceans*. Cambridge, MA: MIT Press.
- Marine Research Institute. 2005. State of marine stocks in Icelandic waters. MRI Report 121. Available online at <http://www.hafro.is/Bokasafn/Timarit/astandid-05.pdf>.
- Ministry of Fisheries. 2005. *Icelandic fisheries in figures*. Information booklet. Available online at [http://sjavarutvegsraduneyti.is/media/sjavarutvegur\\_i\\_tolum/allur\\_baklingurinn\\_2005.pdf](http://sjavarutvegsraduneyti.is/media/sjavarutvegur_i_tolum/allur_baklingurinn_2005.pdf).
- National Research Council. 1999. Iceland's individual transferable quota program. In: *Sharing the fish*. Washington: National Academy, pp. 77–87, 322–342.
- . 1999. *Sharing the fish: Toward a national policy on individual fishing quotas*. Washington: National Academy.
- Runolfsson, B. 1999. *On the management measures to reduce overcapacity in Icelandic fisheries*. Report for Ministry of Fisheries. Available online at <http://www.hi.is/~bthru/Capacity.pdf>.
- Shotton, R. (ed.). 2000. *Use of property rights in fisheries management*. 2 vols. FAO Fisheries Technical Paper 404.
- (ed.). 2001. *Case studies on the allocation of transferable quota rights in fisheries*. FAO Fisheries Technical Paper 411.
- (ed.). 2001. *Case studies on the effects of transferable fishing rights on fleet capacity and concentration of quota ownership*. FAO Fisheries Technical Paper 412.