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ENSURING A SUSTAINABLE AND EFFICIENT FISHERY IN ICELAND

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ABSTRACT/RESUME

Ensuring a sustainable and efficient fishery in Iceland

Iceland has managed its large fishing industry in a sustainable and profitable way. The foundations of this success are setting Total Allowable Catches (TACs) based on scientific recommendations of what is biologically sustainable and the Individual Transferable Quota (ITQ) system, which gives each holder the right to catch a certain of the TAC in various species. The efficiency of this system could be under threat from potential policy responses to the perceived unfairness of quotas having initially been given away and by Iceland's possible accession to the EU. However, there is nothing the government can do now to do undo the unfairness of the initial allocation. Nevertheless, it could be attractive to increase the special fisheries resource rent tax as it is likely to be a more efficient tax than most others, although the increase should not be so great as to damage the fisheries management system. The resource rent could also be increased by reducing TACs from the current, biologically sustainable level to the level that maximizes rent. Provided that Iceland is able to negotiate to maintain the authority to set TACs and to keep the ITQ system, joining the EU, and hence the Common Fisheries Policy (CFP), should not reduce the efficiency of the Icelandic fisheries management system.

This Working Paper related to the 2011 OECD Economic Survey of Iceland. (www.oecd.org/eco/surveys/Iceland)

JEL classification: Q01, Q22, Q28
Keywords: fisheries management system; Total Allowable Catches (TACs); Individual Transferable Quota (ITQ) system; Rights Based Management; resource rents; resource rent tax; EU accession.

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Pour une pêche durable et efficiente en Islande

L'Islande a géré son vaste secteur de la pêche de façon durable et rentable. Ce succès repose sur l'instauration de totaux admissibles de captures (TAC) fondés sur des recommandations scientifiques concernant la durabilité biologique, et sur le système des quotas individuels transférables (QIT) qui confère à chaque détenteur d'un quota le droit de pêcher une part du TAC défini pour chacune des espèces. L'efficience de ce système pourrait être menacée par des mesures publiques possibles en réponse au sentiment d'injustice lié à l'attribution initiale des quotas, et par l'adhésion éventuelle de l'Islande à l'UE. Toutefois, les autorités islandaises ne peuvent rien faire à présent pour remédier au caractère inéquitable de la distribution initiale. Néanmoins, il pourrait être intéressant d'augmenter la taxe spéciale sur la rente halieutique car elle devrait être plus efficiente que la plupart des autres taxes, à condition que cette augmentation ne soit pas trop forte pour ne pas porter atteinte au système de gestion des pêches. On pourrait aussi augmenter la rente halieutique en réduisant les TAC de façon à passer du niveau actuel qui est biologiquement durable à un niveau qui permette de maximiser la rente. Sous réserve que l'Islande soit en mesure de négocier pour conserver le pouvoir de fixer ses TAC et pour maintenir son système de QIT, l'adhésion à l'UE, et donc à la politique commune de la pêche (PCP), ne devrait pas réduire l'efficience du système islandais de gestion des pêches.

Ce Document de travail se rapporte à l'Étude économique de l'OCDE de l'Islande 2011 (www.oecd.org/eco/etudes/Islande).

Classification JEL : Q01, Q22, Q28
Mots clefs : système de gestion de la pêche ; total admissible de captures (TAC) ; système de quotas individuels transférables (QIT) ; régime de gestion fondé sur les droits ; les rentes de ressources ; la taxe sur la rente des ressources ; adhésion à l'UE.

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ENSURING A SUSTAINABLE AND EFFICIENT FISHERY IN ICELAND

by Gunnar Haraldsson and David Carey[1]

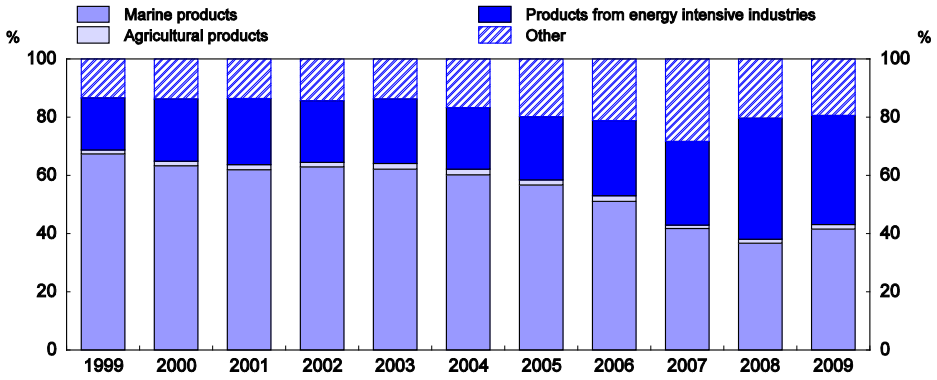
1. Iceland has managed fish stocks that are not shared with other countries in a sustainable and profitable manner. This success has mainly been achieved by broadly following scientific advice in the setting of total allowable catches (TACs), which has led to sustainable resource use, and by the use of an Individual Transferable Quota (ITQ) system, which is a specific type of Rights Based Management (RBM) regime. Efficient and sustainable management of fisheries resources makes an important contribution to economic prosperity in Iceland given the large scale of the industry (Box 1).

Box 1. The role of the fishing industry in the Iceland economy

The Icelandic economy is heavily reliant on the fishing industry. Fish products account for around 40% of merchandise exports (measured in value), down from around 70% in 1990 (Figure 1). This reduction in the share of merchandise exports is mostly due to increased aluminium production. With a total catch of about 1.4 million tons, Iceland is among the 20 biggest fishing nations in the world. Fishing and seafood processing accounted for more than 11% of GDP in 2010, although this was boosted somewhat by the low value of the exchange rate; the average share of fisheries in GDP over the last decade (2000-09) was 9% Around 5 000 people work in harvesting while around 3 600 people work in the fish processing industry. This represents 3% and 2.2% of the total workforce, respectively.

Figure 1. Shares of different industries in total merchandise exports

As per cent of total



Source: Statistics Iceland

Although the role of the fishing industry in Icelandic exports has decreased in recent years, there are important secondary effects of the fishing industry throughout the economy. Various industries are closely linked to the fisheries, such as shipyards, electronic companies, shipbrokers and marketing firms. Agnarsson and Arnason (2007) find, using historical data, that a 1% increase in the production value of the fishing industry results in a 0.3% short run increase in GDP. On the declining role of the fishing industry in the Icelandic economy, see also Danielsson (2004) and Danielsson (2008).

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2. Nevertheless, the efficiency of the fisheries management system could be reduced by potential policy responses to the perceived injustice of quotas initially having been given away as well as being transferable and by Iceland's possible accession to the EU and hence conformity to the Common Fisheries Policy (CFP). Policymakers will need to chart a course that allows progress to be made on these fronts without damaging the features of the fisheries management system that have made it so successful. The industry will also need to contribute to meeting Iceland's challenging obligations to reduce Green House Gas (GHG) emissions, the fishing industry being a major source of emissions in Iceland.

Scientifically-based TACs and the ITQ system are the foundations of Iceland's successful fisheries management system

Previous fisheries management arrangements failed to prevent overfishing in Iceland

3. Iceland struggled for several decades to gain full control over its fishing grounds. The Exclusive Economic Zone (EEZ) was set at 12 miles in 1958 and then increased to 50 miles in 1972. Even after this increase, foreign fleets' catches in the fishing grounds around Iceland remained substantial. For example, they caught around 100 thousand tonnes of cod in 1975, amounting to around one third of the total cod catch that year from these fishing grounds.[2] Lacking control over these fishing grounds, it was impossible for the Icelandic authorities to implement a fisheries management system to achieve a sustainable and efficient industry. With the enlargement of the EEZ to 200 nautical miles in 1975, most of the commercially important fish stocks in the fishing grounds around Iceland fell within Iceland's EEZ.[3] Following the extension of the EEZ, foreigners' share of the catch diminished rapidly. Since the early 1980s foreign catches have been almost negligible and are restricted by special contractual arrangements.

4. Overfishing remained a chronic problem, however, until the Individual Transferable Quota (ITQ) system was introduced, starting in 1984 (see below). The various measures from 1976 to 1983 restrict catches, mostly TAC restrictions and effort controls, proved all but useless. These controls failed owing to the substitutability of inputs (OECD, 2006).

The cornerstone of the fisheries management system is catch limitation (TAC)

5. The total catch of each species in Iceland's fishing grounds is restricted to a specified Total Allowable Catch (TAC). The TAC for each fishing year is decided by the Minister of Fisheries based on recommendations from the Marine Resource Institute (MRI).[4] [5] Stock assessments are based on systematic research of the major fish stocks and the ecosystem. Before the MRI presents its advice to the Minister, the stock assessments and outlook are evaluated by the International Council for the Exploration of the Sea (ICES). The MRI also collaborates with other multi-national organizations, such as the Northwest Atlantic Fisheries Organization (NAFO), to evaluate the state of stocks outside Iceland's EEZ.

2. Foreign vessels caught around one fourth of the haddock and around half of the saithe and redfish at this time.

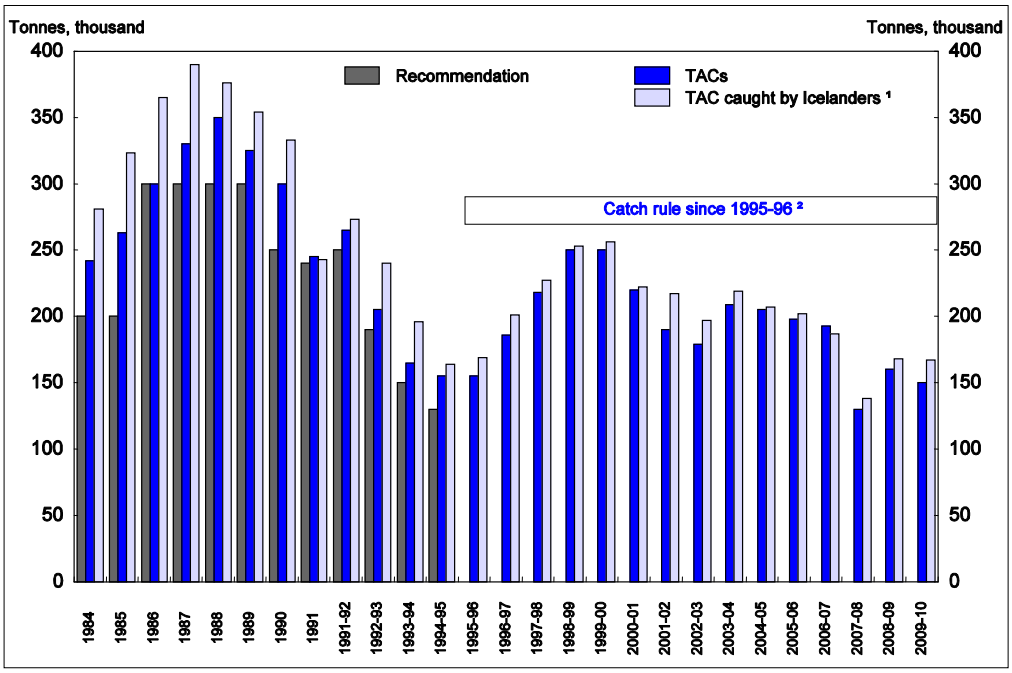
3. There are, however, a few fisheries that Iceland shares with other nations, notably the Norwegian-Icelandic herring stock, capelin and more recently, mackerel.

4. The MRI is an independent research institute which conducts stock assessments and fisheries advice in conformity with international criteria and is active in the international scientific community, such as the International Council for the Exploration of the Sea (ICES).

5. Although the mainstay of the fisheries management system is the setting of the TAC, there are numerous other fisheries management measures in place, such as area closures (temporary and permanent) and restrictions on fishing gear.

6. While TACs for cod, the most economically important species, typically exceeded the MRI's recommendations somewhat in the early years of the current management system, this ceased to occur following the adoption of a total catch rule in 1995-96, which aligned TACs and recommendations (Figure 2). Catches have, however, slightly exceeded TACs owing to various factors at various times, such as catches for research, economic incentives (notably the right to overfish as by-catch, but with the fish concerned being sold at no profit to the fisherman) to counter discards and, in two consecutive fishing years (2008-09 and 2009-10), not deducting the coastal catches from quotas (such catches are now deducted). For mackerel stocks, which are not the focus of this study as they are shared with other countries and hence not fully controlled by the Icelandic fisheries management system, quotas set by the EU, Faroe Islands, Iceland, Norway and the Russian Federation have not been compatible with the International Council for the Exploration of the Seas' (ICES) scientific advice on sustainable catches (Box 2).

Figure 2. Recommendation, Total Allowable Catches (TACs) and actual catches of cod



1. All catches must be landed. Fishing by foreign fleets is negligible.

2. A harvest control rule has been in place since 1995-96. It specifies the percentage of the biomass that may be caught.

Source: Marine Resource Institute and Fisheries Directorate.

Box 2. The mackerel dispute

The North-East Atlantic mackerel stock straddles a number of Exclusive Economic Zones (EEZs). It was co-managed by the EU, Norway and the Faroe Islands. In recent years, however, the mackerel stock has changed its migration pattern, probably due to changes in sea temperatures, and large quantities of mackerel have migrated into the Icelandic EEZ. In light of this change, Iceland requested to participate in the co-management of this fishery but was initially rejected by the other parties, who considered that Iceland was not a coastal state in this fishery. Iceland responded by unilaterally setting a national quota for its fisheries from this stock. In 2010, Iceland was finally recognized as a coastal state in the mackerel fishery and the four coastal states, as well as the Russian Federation, have since held regular consultations. They have not been able to reach agreement on the comprehensive management of the mackerel stock but have unilaterally set national quotas. The aggregated quotas considerably

exceed the total allowable catch recommended by International Council for the Exploration of the Seas (ICES).

North-East Atlantic mackerel catches have been considerably in excess of ICES advice since 2007 (ICES, 2010). The main reasons for this overfishing are the absence of effective international agreement on catch limitation between all nations involved in the fishery as well as inter-annual transfer of quotas not fished in 2009 to 2010, discards, and estimated overshoot of catches.

7. The success in keeping catches close to the recommended TACs is to some extent attributable to an efficient monitoring and enforcement system. Ensuring that the catches are not greater than the TAC is the task of the Fisheries Directorate, which receives records of landings for each vessel. Landings take place only in designated landing ports with certified weighs and weight personnel. The Fisheries Directorate uses a computerised catch registration system to collect, store, process and disseminate information on the catches of all Icelandic vessels. All ports of landing are connected to the Directorate's database and as soon as catch has been landed and weighed by authorised weigh-masters the results are entered into the registration system and sent to the Directorate. This ensures that the Directorate has up-to-date information on the catch of each vessel, classified by species, port of landing, fishing gear, fishing grounds and the buyers of the catch. This system makes it possible to deduct the catch from the quota of the relevant vessel.

8. To investigate whether illegal catches have been sold to processors, the Fisheries Directorate performs back-calculations. This is done by converting processed products into live weight and comparing the result with the legally registered catch landed in the relevant processing plant. If the investigation reveals that the weight of the converted product exceeds the volume of officially recorded catch, this is taken as a proof of illegal catches and results in fines on the relevant fish processing plant. The Coast Guard is responsible for at-sea surveillance of the fishing fleet, which includes regular monitoring of boats and gear and enforcing area and seasonal closures.

The other building block of fisheries management in Iceland is the ITQ system

9. The ITQ system was introduced in 1984 for the cod fishery and subsequently applied to other species (Table 1). With the Fisheries Act in 1990, all important fisheries were under an ITQ system. Under this system, each fishing entity owns or has a right to a certain percentage of the TAC in various species. These quotas are to a large extent tradable and can be leased with some limitations or sold. Small scale fishermen were originally excluded from the system and operated under effort limitations. Additional exceptions included measures such as regional quotas and special rules regarding long-liners[6].

Table 1. Chronology of the key steps in the evolution of the ITQ system in Iceland

1984	Individual transferable vessel quotas in the demersal (near bottom living) species fisheries
1985	Effort quota option introduced into the demersal species fisheries
1988	Transferable vessel quotas in all fisheries. Effort quota option retained
1991	Comprehensive uniform system of individual transferable share quotas in all fisheries for all vessels over 6 Gross Registered Tonnes (GRT).
2004	Individual transferable share quotas for vessels under 15 GRT with special quotas for boats fishing with long-line.

Source: Arnason and Runolfsson (1999) and OECD.

6. Fishers using a long-line which is baited onshore may double their catches in demersal (living near the bottom) species. This exception is to increase employment in coastal communities.

10. A major advantage of ITQs over simply setting allowable catches annually is that ITQs give holders a strong interest in the fisheries resource being exploited in a biologically sustainable way. This ensures that the quotas continue to be valuable. These incentives in turn result in political pressure to limit TACs, which contrasts with pressure in other fisheries management systems, where industry participants have no incentive to restrain TACs as there is no guarantee that they will profit from the future increase in fish stocks.

11. Another advantage of ITQs is that they permit rationalisation of the industry to increase efficiency. In the absence of ITQs, the fishing fleet had expanded much more quickly than the catch, resulting in declining productivity and incomes. Following the introduction of ITQs, the overcapacity of the fishing fleet has declined and the average size of boats increased. Smaller fishermen sold their ITQs to larger fishing companies, which use larger, more efficient boats.

12. Since the introduction of the ITQ system the industry has become much more economically efficient, with labour productivity now higher than in the Norwegian and Swedish fisheries (Eggert and Tveteras, 2007). The increase in efficiency has lifted the value of the resource rent and hence, of licences. Recent estimates of the net resource rent amount to ISK 14-34 billion (0.9-2.2% of GDP) per year (Kristofersson, 2010 and Steinsson, 2010). This is in line with the experiences of other rights based management systems (see Arnason, 2002).

13. This economic success is shared with the other countries that operate ITQ systems such as New Zealand, Canada, Denmark (OECD, 2006; Arnason, 2002; Andersen *et al.,* 2010). Governments in these countries have also generally followed scientific evidence in setting TACs. By contrast, countries relying on traditional input controls have generally failed to prevent overfishing and overcapitalisation. This has, for example, been the case in many European fisheries (Commission of the European Communities, 2009). Politicians have frequently overridden scientific recommendations on TACs to increase their fishing industry's short-term income at the expense of its long-run survival. The pressures for politicians to behave in this way have been intensified by overcapacity in the industry, a phenomenon that also plagued Iceland before it introduced ITQs (OECD, 2006).

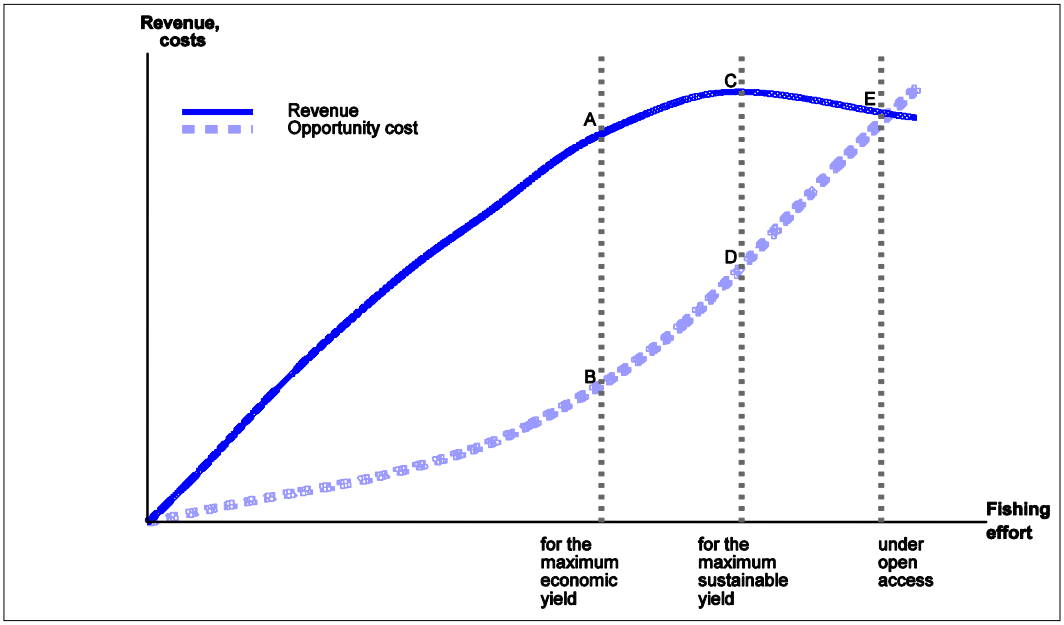
Resource rents could be increased by restricting fishing effort to below the level compatible with biological sustainability

14. Keeping TACs close to scientific recommendations may guarantee biological sustainability and yield a higher fisheries-resource rent than at higher TACs, but does not maximise the value of the rent, which is the most economically efficient outcome. Due to increasing marginal costs of fishing and the self-renewable nature of fish stocks, setting lower TACs would increase net rent from the fishery (Box 3).

Box 3. Incorporating economics when determining TACs

From a fisheries management viewpoint the choice of the extraction level is important. Contrary to common belief, choosing the level that maximizes sustainable yields or catches is generally not the optimal policy, as demonstrated in Figure 3, which depicts the fundamental economic problem with managing fisheries. Figure 3 shows a theoretical revenue curve and a cost curve of general shapes. The cost curve shows economic cost, *i.e.* the opportunity cost associated with fishing activity. The revenue curve shows all the revenue that can be extracted from the industry, given the effort level. Both the revenue and cost curves reflect simple but common biological characteristics.

Figure 3. The resource rent is lost in open fisheries[1]



1. On the vertical axis, total revenue is drawn assuming a general biological growth function and assuming that prices are exogenous and that yields are sustainable. Total costs are economic costs (opportunity cost), taking into account the economic return on capital and also reflect common biological characteristics. The horizontal axis shows fishing effort, not catch volumes. Fishing effort is a vector of various inputs, such as fishing time, vessel size, engine power, labour and other factors.

Source: OECD.

As Figure 3 is drawn, there is a simple relationship between effort on the one hand, and catches and revenues on the other. All the points on the revenue curve correspond to sustainable catches. Given such a relationship, the setting of TACs is equivalent to choosing effort levels that result in corresponding catches.

There are three different effort levels shown on this graph that each have an important economic meaning:

- At the effort level (theoretically) associated with open access, rent is zero. As long as there is rent to be extracted from the fishery (*i.e.* where revenue exceeds opportunity cost) under open access, there is an incentive for new entry. This will continue until all economic rent has been dissipated (point E).
- The effort level associated with the maximum sustainable yield also corresponds to the level where sustainable catches are at their maximum (prices are exogenous). Rent, which is the difference between revenues and opportunity costs, is given at this point by the distance CD in the graph.
- The effort level that maximizes economic yield. At this point, rent, which is equal to the distance AB in the figure, is maximized. Due to increasing marginal costs of fishing and the self-renewable nature of the fish stocks, leaving more fish in the sea to grow than corresponds to maximum sustainable catches increases rent by lowering unit harvesting costs. This is the so-called stock effect.

Some progress has been made in how targeting the effort level associated with the maximum economic yield could be implemented in commercial fisheries (see *e.g.* Dichmont *et al* (2010) and Larkin *et al* (2010)).

15. Although the theory of restricting TACs to the effort level that maximises the resource rent instead of sustainable revenue is well established, there are few fisheries that are actually managed in this way. An exception is the Australian Northern Prawn Fishery. Estimates from this fishery point to substantial stock effects – stocks should be 9-26% bigger than the level that produces maximum sustainable catches (and revenues) to maximise resource rents. The harvest control rule for cod takes into account economic aspects and therefore partly addresses this for the cod stock, which is the most important one in economic terms.

16. For Iceland, Arnason (2011) estimates that cutting TACs from the level that maximizes sustainable catches to the level that maximises rent could increase rent in the cod fishery, which usually generates around one-third of the marine export value, from USD 240 million (in 2005) to around USD 667 million annually. The biggest part of this potential rent gain is due to a rebuilding of the cod stock, which was greatly overexploited in the past. A smaller part is due to reduced fishing effort and capital. These estimates are subject to various uncertainties but are nevertheless indicative. One should be careful to assume that such economic gains can be quickly realized as they would call for a difficult and costly transition. In view of these potential gains, scientists and policymakers in Iceland should aim to set TACs at levels that maximise the resource rent. In practice, this would mean that TACs should be set below, not above, the levels specified by the MRI. In the longer run, research work might help to estimate more precisely the rent-maximising catch. In the event that TACs are reduced towards the rent-maximising level, the government should increase the special fisheries resource rent tax to capture all of this estimated increase in rent. This should not affect the value of ITQs as this gain in fisheries rents has not been anticipated and hence, has not been capitalised into quota prices.

Nothing can be done now to correct the perceived unfairness of the initial free allocation of quotas

17. Despite the good performance of the ITQ system, it is under political pressure because quotas were initially allocated on the basis of fishing boats' average catches during the preceding three years instead of being auctioned off or sold. This initial distribution is widely perceived to have been unfair because the resource rent from this common resource accrued to those with catch history rather than the general public.[7] However, it should be borne in mind that this allocation of quotas was made in the context of placing limits on the right to fish, this being a move from an open access system.

18. The government could claw back the resource rent from quota holders either by increasing the fisheries resource rent tax (Box 4) to the point where ITQs have no value or, if it wanted to preserve the ITQ system, by confiscating ITQs and auctioning them. The problem with the first option is that the incentives that fishers have to lobby for lower TACs and to monitor other fishers – both of which increase the value of ITQs – would vanish. This would likely lead to an increase in catches and a decline in resource rents. The second option would avoid these pitfalls but, like the first option, could harm Iceland's reputation for protecting perceived property rights. Moreover, experience in other countries suggests that it is politically difficult to auction fishing rights owing to opposition from fishers who would have to pay for access to the resource that they already have (Box 5).

7. The initial allocation of quotas and the accompanying barring from entry of others than quota holders has also been contested by the United Nations High Commissioner for Human Rights, who concluded in 2007 that there had been a violation of the equality principle inherent in Article 26 of the International Covenant on Civil and Political Rights (Views, adopted by the Human Rights Committee on 24 October 2007, concerning communication No. 1306/2004: http://eng.sjavarutvegsraduneyti.is/news-and-articles/nr/9306). It is clear that this conclusion goes against the conclusions of Icelandic national law.

Box 4. The current fisheries resource tax

The current resource tax was introduced by Parliament in 2002 and replaced levies that previously financed the Fisheries Development Fund (*Þróunarsjóð sjávarútvegins*) and a levy for monitoring and surveillance. The tax is levied on all species. The effective tax is calculated in such a way that it depends both on the amount of quota held by the fishing firm as well as its economic performance. The reference period is the 12 months to 30 April in the preceding calendar year. The total catch value for that year is calculated and fuel, wages and other operating costs are then deducted. The total tax revenue for that fishing year equals 9.5% of this amount. The tax is then calculated per cod-equivalent by dividing total tax revenue by the catch on cod-equivalent kilos. This results in a tax per cod-equivalent kilo that is levied for the next fishing year.

A demonstrative example

Total catch value May-April 2010-2011	100 billion ISK
Wages (39.8%)	39.8 billion ISK
Fuel	10 billion ISK
Other operating costs	24 billion ISK
Base for tax	**26.2 billion ISK**
9.5% of base	2.49 billion ISK
Catch in cod-equivalent kg	450 million kg
Tax on cod-equivalent kg for fishing year 2010/2011 (ISK/kg)	**5. 53 ISK/kg**

In this way the tax paid takes account of fluctuations in the profitability of the industry as well as the amount of quota issued the year before. The tax is paid for all catches. Hence, if the quotas are increased from last year, firms pay the tax per kilo on the increase as well. In the same way, if quotas are reduced, firms pay the tax for fewer kilos. In this way the taxation takes into account fluctuations in the catch between fishing years.

Box 5. Other countries' experience in auctioning fishing rights

A number of countries have proposed to auction fishing rights but have backed down owing to opposition from fishers who would have had to pay for a right that they currently enjoy free. This was the case in Estonia, for example (Eero *et al.*, 2005, OECD, 2009). Fishermen considered it unfair to pay for fishing rights while competing in international markets with fishermen who did not pay for such rights. At the same time the implementation of the auctions themselves became problematic as the bidders engaged in cooperative behaviour in the bidding process, which is a well-known problem in auction theory (Laffont and Tirole, 1983). Similarly, in Russia the auctioning of quotas was introduced in 2001 but was for all practical purposes abandoned in 2004 (Honnelund, 2005). The only seemingly successful case where fishing rights have been auctioned is in the Washington State Puget Sound geoduck fishery, which has specific characteristics and is managed under a devolved management system with extensive stakeholder participation (Huppert, 2005).

19. The current government set up a special committee and commissioned a report on what could be done to claw back the fisheries resource rent. The committee reported in summer 2010, and concluded that it was in many ways problematic to take back ITQs from current holders and redistribute them, for example, through an auctioning mechanism. Such an action would not only be technically difficult but also unfair to existing owners, many of whom have bought a high proportion of the ITQs that they hold. Those that received quotas in the beginning may have benefitted from windfall gains but they can hardly be drawn back into state coffers by taking quotas from companies that bought them at market prices. Taking

quotas from the fishing companies would also have negative effects on the balance sheets of companies in the fishing industry and ultimately financial institutions if the companies went bankrupt. According to a recent study, a linear confiscation over a 20-year period would result in fishing companies that together hold 40-50% of the TACs in all species going bankrupt (Gunnlaugsson *et al.,* 2010).

20. The transferability of quotas has also been questioned for social and political reasons. The point has been made that the quotas are user rights to a common resource and those who receive such rights should profit from renting or selling those rights. From an economic viewpoint, the transferability of quotas is crucial to achieve economic efficiency. The quota market allows for an efficient reallocation of quotas as well as the easing of entry and exit into the fishery through the market system. A recent study shows that the quota markets are efficient (Agnarsson and Thrainsson, 2010). Trade in quotas is substantial, with around 35-40% of the total TAC being traded on the markets each year.

The special resource rent tax should be increased but not by so much as to undermine the ITQ system

21. Nevertheless, increasing the resource-rent tax beyond the cost recovery level would be attractive as a means of reducing the deadweight costs of taxation. From the point of view of economic efficiency, a resource rent tax is in principle the best tax as it does not distort economic decisions and hence has no excess burden (*i.e.,* no costs beyond the amount of money raised) (Box 6)). Increasing a resource-rent tax would thus make room for reductions in other taxes that have excess burdens, increasing economic efficiency and hence national income, although the gains are likely to be smaller for a resource tax on a self-renewable resource, such as fishing stocks, than for other natural resources, such as mineral deposits, because the tax affects the size of the rent on a self-renewable resource but not on a non-renewable resource. Accordingly, the benefits of reducing other taxes that distort economic decisions would need to be weighed against the costs of reducing the resource rent by progressively diminishing the value of quotas (which capitalise expected resource rents) and hence incentives to lobby for lower TACs and to monitor other fishermen, and of reducing the financial viability of fishing enterprises. This suggests that the special fisheries resource tax should be increased from the current level, which still does not quite cover the operating costs of the fisheries management system, but that the increase should not go so far as to undermine the political and monitoring benefits of the ITQ system or to jeopardise the financial viability of fishing enterprises. In the event that an increase in the special resource rent tax succeeds in creating a political consensus for the ITQ system, which has been lacking since its creation, the fishing industry would be compensated to some extent by increased certainty over their property rights.

Box 6. The taxation of resource rents

Rent from natural resources is usually defined as the returns from resource exploitation in excess of the opportunity cost of extraction. In theory, taxing resource rents is non-distortionary as it does not alter investment or production incentives (Grafton, 1995, 1996, Miller *et al.,* 2000). The implementation of resource taxes, however, poses practical challenges.

The historical roots of the non-distortionary nature of resource taxes date back to Ricardo (1821) when analyzing resource rents from land. The basic justification is that land is a fixed and indestructible input in production which generates land rents. Taxing those rents does not reduce land use and is therefore seen as an ideal tax base. Rent taxes have been used extensively in resource based industries such as mining, but also in fisheries. Australia has recently adopted a special Mineral Resources Rent Tax (MRRT) which is based on the concept of a Brown tax (Brown, 1948), where a tax is levied on all real transactions on a cash flow basis. As cash flows can be positive or negative, the MRRT has been modified in a way to deal with such fluctuations as well as with the time inconsistency of tax revenues and tax rebates.

Although the theoretical superiority of resource rent taxes is widely accepted, there are some important issues which should be kept in mind when it comes to self-renewable resources, like fish stocks. In particular, in analysis of resource rents it is assumed that they depend on an input factor in fixed supply, which is not the case of fish stocks, that linear extraction technologies are used and that firms are identical. However, rents are not fixed in fisheries and

can be expanded in various ways. Examples include: productive investment in fish stocks and habitat; finding new fishing opportunities (innovation); improving fishing practices; and developing new products. One of the tasks of fisheries management and economic policy in general is to encourage the expansion of such rents (Anderson, Arnason and Libecap, 2010).

As taxing resource rents discourages firms from expanding them, it distorts economic decisions, leading to costs (*i.e.*, excess burden) in excess of the amount of revenue raised. If the rent is completely removed by taxation, there are no more incentives to expand it. This means that the rebuilding of fish stocks is not in the interest of the fishers and must be implemented by command-and-control measures.

This does not mean that resource taxes should not be considered as a tool for collecting rent from fisheries. Rather, the fisheries resource rent tax should be set at a rate where its marginal excess burden is no higher than for other taxes.

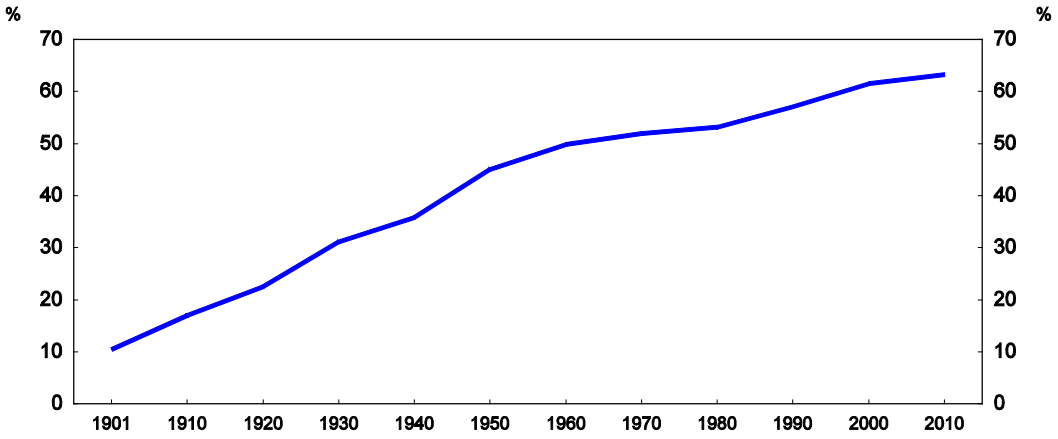
The fisheries management system should not be undermined in the pursuit of social objectives

22. The increases in efficiency in the fishing industry in recent decades have taken a toll on employment opportunities in rural areas highly dependent on the fishing industry. In part, this has been caused by the success of the ITQ system in encouraging rationalisation of the industry and thus increased efficiency. Fishers in these areas have sold their quotas to more efficient operators elsewhere. The decrease in labour use in the fishing industry due to technical advances, where machines have taken over manual labour, has also been a factor.[8] Yet another factor has been the decrease in TACs, which has been necessary to secure the sustainability of the fish resources.

23. This has raised concerns about population loss on these areas. However, migration from rural areas to the capital area is not a new phenomenon (Figure 4). In the 20th century, Iceland changed from being a rural society to having more than half of the population living in the capital and adjacent municipalities.

Figure 4. Population living in the capital area

As a percentage of total population



Source: Statistics Iceland.

8. However, there has been an increase in the number of people working in the fish processing industry since 2007 and the number of fishers has increased since 2008. The reasons for this increase in the number of labourers have not been thoroughly studied. Fluctuations in catches and catch composition can play a role in explaining this increase. There has been a slight increase in the number of part-time workers in Iceland since 2008, but data on how much of that increase is in the fishing industry are not readily available.

24. The government has introduced various measures to work against the migration from the countryside to the capital area. The fisheries management system has partly been used to that effect. As has been mentioned already, the small scale fishers were exempt from the ITQ system when it was first implemented, mostly due to fears that they would be bought out of the industry. Various measures were taken to safeguard their livelihoods while at the same time there was an increased pressure on this fleet to adopt some form of quotas to limit their catches. To increase employment in coastal communities, fishers using a long-line that is baited onshore have been allowed to double their catches in demersal (living near the bottom) species.

25. Since 2009 specific catch quotas have been allocated to so-called coastal fishing to support small scale fishermen in rural areas. Boats that operate under this system must obtain a special licence from the Directorate of Fisheries. They may only catch during specified times of the day. Those boats may only use hand-lines and their catches per fishing trip are limited. Once the total allowed catches have been reached all those licences are halted. Some of those that are allotted licences for coastal fishing are former quota holders who have sold their quotas. In that way they re-enter the fishery after having already sold out. The coastal fishery is notably less efficient than the ITQ fleet managed with a cap on catches and days at sea limits.

26. All such exemptions have a negative effect on the efficiency of the fisheries management system. Keeping in mind the importance of the fisheries to the Icelandic economy, the government should be cautious in making amendments to the Fisheries Act that weaken the ITQ system by authorising such measures. It would be preferable to use other measures to strengthen rural areas, such as investments in infrastructure and education.

Iceland is negotiating to maintain the key features of its fisheries management system in its EU accession negotiations

27. Iceland is currently negotiating conditions for its possible accession to the European Union (EU). Joining the EU means that Iceland would participate in the Common Fisheries Policy (CFP). The EU has generally not succeeded in setting TACs at sustainable levels and faces huge challenges with regards to economic efficiency (See OECD, 2010, Commission of the European Communities, 2009). The EU is currently revising the CFP with a view to making it more effective in achieving its objectives. Given the economic and political significance of the fishing industry, the special conditions that Iceland is able to negotiate for the sector will have an important bearing on whether joining the EU is attractive to Icelanders or not. The Icelandic authorities plan to negotiate to maintain the key features of Iceland's fisheries management system that underpin efficiency and sustainability – the right to set TACs nationally based on scientific advice and the rights based management system (ITQs) – as well as foreign ownership restrictions on ITQs (see below).

28. It is possible under EU rules for individual member countries to manage some of their fisheries with ITQ systems. As for other EU member states, the Common Fisheries Policy (CFP) defines the overall framework for the management of fish resources for these countries. One of the main elements of the CFP is that TACs allocated to member states for specific species and areas are based on the principle of relative stability. This means that fishing opportunities are allocated among the Member States in such a way as to ensure the relative stability of the fishing activities of each Member State for each stock concerned. According to this principle, national TACs are based on historical catch levels and imply the maintenance of a fixed percentage of authorised fishing effort for the main commercial species for each Member State. Another element is an overall capacity ceiling for national fleets to hinder overexpansion. Due to the principle of relative stability, countries have the flexibility to manage their fisheries according to their national legislation, as long as it does not circumvent the CFP general framework. As examples, the

Netherlands introduced an ITQ system for the sole and plaice fisheries in 1976 and in Denmark ITQs have been used since 2003 (Andersen, *et al.*, 2010).

29. There are currently restrictions on foreign ownership in the harvesting sector. Direct foreign investment is prohibited but companies that are up to 25% foreign-owned (33% in some circumstances) may own fisheries companies. Combined indirect ownership is allowed up to 49%. Such restrictions on ownership are permitted under the European Economic Area agreement. It is unlikely that such restrictions would be allowed if Iceland were to join the European Union.

30. Provided that the ITQ system can continue to be enforced, removing the restrictions on foreign ownership of ITQs should not pose a problem for industry efficiency. Foreign owners of ITQs, like their domestic counterparts, would have an incentive to lobby for TACs to be constrained to a level that maximises rents, and hence the value of the quotas, and to monitor quota enforcement.

31. Removing the restrictions on foreign ownership of ITQs is, in any case, unlikely to provoke large scale sales to foreigners. So long as foreign-based fishing companies are not able to reduce labour costs by replacing Icelandic fishing crews with lower-paid foreign crews, there is no reason to believe that they would have a lower cost structure and, therefore, systematically be prepared to pay more for Icelandic companies to acquire their ITQs than domestic investors. Icelandic fishing companies are already amongst the most efficient in the world, reducing the scope for foreign investors with plans to raise efficiency to outbid local investors. Even in the event that foreign companies did not have to respect Iceland union-based wage minima, giving these companies a potential cost advantage over their Icelandic rivals, it is still unlikely that there would be large scale sales to foreigners because domestic companies could replicate this cost advantage by transferring their ITQs to foreign subsidiaries and hiring cheaper foreign crews.

32. If foreign companies do not have to respect Iceland union-based wage minima, there is a risk that removing restrictions on foreign ownership of ITQs could result in a loss of employment for Icelandic fishers, although it would be limited by their higher productivity stemming from local knowledge of Icelandic fishing grounds, fishing techniques and handling. In view of this risk, it would be preferable to have a transition period for the removal of restrictions on foreign ownership of ITQs to reduce adjustment costs of transferring labour from the fishing industry to other activities.

33. There is also a risk of foreign owners relocating processing facilities, although it is difficult to see why Icelandic fishing companies would not already have done so if this were profitable, especially as they have already acquired fishing companies in other countries. Icelandic companies appear to have found that proximity to fishing grounds and the availability of immigrant labour have made it attractive to keep processing in Iceland. In the event that such facilities were to be relocated, the transition period for the removal of restrictions on foreign ownership of ITQs referred to above would help to reduce the adjustment costs of transferring labour and capital to other uses.

34. The entry of foreign vessels into Icelandic waters would be unlikely to affect the system of enforcement. The bulk of Icelandic catches are landed and processed in Iceland or on-board Icelandic freezing trawlers. The Icelandic surveillance and monitoring systems are highly developed and verification of catches is not a major problem in Iceland, although discards occur as in most other fisheries. Foreign vessels would be subject to the same, effective system of surveillance as Icelandic vessels to hinder illegal catches and unreported landings.

Reducing the Icelandic fishing industry's Greenhouse Gas (GHG) emissions

Iceland has adopted ambitious targets for reducing GHG emissions (30% below the 1990 level by 2020). While significant reductions in the fishing fleet's emissions have already been achieved – from 655

Gg in 1990 (38% of emissions from fuel combustion) to 517 Gg in 2008 (27% of emissions from fuel combustion) – further progress will be required given the importance of the industry in total emissions if Iceland is to meet its emission reduction targets.

35. In 2009, a Committee appointed by the Minister of the Environment published a report on reducing GHG emissions (Ministry for the Environment, 2009). According to the report, from a purely technical viewpoint the fishing industry can contribute considerably. Emissions from fish meal factories could be reduced by almost 100% by using electricity rather than burning fuel. Similarly, emissions of the fishing fleet could be reduced by 75% by increased use of bio-fuels and energy saving measures. Considerable costs would be involved in such a transformation, especially in securing reliable electricity to fish meal plants, which would call for large investments in electrical power plants and infrastructure.

36. A recent study (Bernódusson, 2010) indicates that the growing of rapeseed and the transformation of rapeseed oil into bio-fuel is a promising way to mitigate the GHG emissions of the fishing fleet. Whether domestically grown rapeseed oil, or other bio-fuels, will replace more traditional fuels depends on many factors, including oil prices.

37. Concerning the GHG emissions of the fishing fleet, there are currently no fossil fuel subsidies or tax expenditures for Icelandic fishing vessels. However, the fishing fleet does not pay a special road and infrastructure tax on its fuel, in common with other off-road users. Revenue from this tax is not higher than necessary to fund road development and maintenance. Accordingly, exemption from it should not be considered as an indirect subsidy.

38. A carbon tax is levied on all fossil fuels used for combustion. This tax was introduced at the beginning of 2010. In the beginning, it was set at approximately 50% of the annual average price of emission rights on the EU ETS (Emission Trading Scheme) auction market. At the beginning of 2011, this rate was raised to 75%. The tax is based on the carbon content of fuels and is thus different for different fuel types. If such a carbon tax is not levied on competing fishing fleets, this could lead to the Icelandic fishing becoming less competitive on the global market.

39. The substitutability between fuel and other inputs is inelastic and fuel use is mostly determined by the amount of catches and the effort exerted. With rising oil prices, Icelandic fishing firms have concentrated more than before on fuel efficiency and the possibility of moving away from fossil fuel. Fuel consumption of the fishing fleet has in fact been steadily decreasing over the last few years and according to forecasts it may further decrease by 10% until 2050 (Orkuspárnefnd, 2009). However, higher oil prices have incited vessel owners to replace standard vessel fuel with more crude oil, which increases emissions (*ibid*. pp. 10). The carbon tax should reduce this effect by raising the price of crude oil relative to standard vessel fuel. Even so, policymakers should look into the effects of fuel prices and taxation on substitutability between different fuels and the effect on emissions.

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