

# Evolution and Performance of the Icelandic ITQ System

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## Introduction

In recent years there has been a clear movement toward property rights based fisheries management systems around the world. This trend toward property rights in fisheries mirrors to a certain extent the corresponding development in the organisation of economic activity on land in earlier times. The spreading of the ITQ (individual transferable quota) fisheries systems may in fact be regarded as yet another stage in the historical expansion of property rights as a method of economic organisation. Economic history informs us that the extension of the private-property system has generally been motivated by the desire to increase economic efficiency (North 1981). In fact, the private property rights system is generally believed to be fundamental to the current high level of economic productivity on land (Hayek 1976, Buchanan 1975). Just as with property rights on land, the ITQ system may be expected to yield substantial economic benefits.<sup>1</sup>

Iceland and New Zealand have been the front-runners in this development, with others following suit. These countries were the first to introduce IQs (individual quotas) and ITQs (individual transferable quotas) in major ocean fisheries. In Iceland IQs were introduced in the herring fishery in 1975. In 1979 these quotas were made transferable creating a fully fledged ITQ system in that fishery. In New Zealand ITQs were introduced in 1982. Their experience seems, generally speaking, to have been favourable (Arnason 1992a, Arnason 1996b).

The purpose here is to look at the ITQ system as it has developed in the Icelandic fisheries. IQs and subsequently ITQs were introduced in to other Icelandic fisheries during the 1980s. Since 1991 all major fisheries within the Icelandic economic exclusive zone have been subject to a uniform system of ITQs with only minor exceptions. A description of the current structure of the system will be presented as well as some evaluation of its performance. Also, the regional and community impacts of the ITQ system will be analyzed.

## The Icelandic Fisheries

The Icelandic economy is heavily dependent on the fisheries. Fish-product export accounts for around 80% of the commodity exports in Iceland or 50% of the foreign exchange earnings. The fishing industry's direct contribution to GDP is about 17%, but total contribution (direct and indirect) is estimated to be as high as 45% of GDP. In other words, without the fisheries Iceland's GDP would be only about 60% of current GDP (Arnason 1995a:85-86).

The fishing industry's size relative to the whole economy means that any fisheries' policy has far reaching implications for the economy. The fishing industry is a major determinant of personal incomes and income distribution and in many parts of Iceland the fishing industry is virtually the only basis for economic activity. This means that anything that affects the fishing industry has a regional aspect that often turns out to be very potent politically. Fisheries management is as a result of all this a major component of the public discourse and on the formulation of Iceland's economic and regional policy.

The most important of the Icelandic fisheries is the demersal or groundfish fishery. In recent years this

fishery has usually generated over 80% of the total wetfish value. The most important demersal species are cod (*Gadus morhua*, Gadidae), haddock (*Melanogrammus aeglefinus*, Gadidae), redfish (*Sebastes* sp., Scorpaenidae: mostly *S. marinus* and *S. mentella*) and saithe (*Pollachius virens*, Gadidae). Pelagic fisheries based on capelin (*Mallotus villosus*, Osmeridae) and herring (*Clupea harengus*, Clupeidae) are also important, yielding up to 10% of the total catch value. In addition to demersal and pelagic fisheries, there are significant shrimp, lobster and scallop fisheries. A more detailed numerical description of these fisheries and their relative importance is provided in Table 1.

**Table 1. Icelandic fisheries: catch and value data**

	Average catch 1980-1995 (1000 MT)	Estimated catch values* (US\$M)	Estimated MSY (1000MT)	Estimated MSY values (US\$M)
<b>Demersal species</b>				
Cod	322.4	351.9	400.0	436.5
Haddock	52.6	59.4	60.0	67.7
Saithe	68.3	48.8	85.0	60.8
Redfish	96.9	104.8	120.0	129.8
Other**	85.0	122.3	85.0	122.3
Total	625.2	687.2	750.0	817.1
<b>Pelagic species</b>				
Capelin	676.1	49.7	700.0	51.5
Herring	92.7	9.1	150.0	14.8
Total	768.8	58.8	850.0	66.3
<b>Crustaceans</b>				
Shrimp	33.1	58.3	50.0	88.0
Lobster	2.3	8.8	2.5	9.6

Total	35.4	67.1	52.5	97.6
<b>Shellfish</b>				
Scallop	12.0	6.0	10.0	5.0
<b>Grand Total</b>	1441.4	819.1	1662.5	986.0
<i>Notes: * At 1995 average unit catch prices and exchange rates.</i>				
** Mainly Greenland halibut, catfish, plaice, tusk and ling.				

The current fishing fleet measures about 129 000 GRT and consists of several vessel types. It is convenient to decompose the fleet into four main categories as follows:

### ***Deep-sea trawlers***

These are relatively large fishing vessels usually between 200 and 1200 GRT (gross registered tonnes) and 130 and 250 feet (40-75 m) in length. They are engaged mostly in the demersal fisheries employing bottom and occasionally mid-water trawl. Some are also engaged in the deep-sea shrimp fishery. Due to their size, the deep sea trawlers have a wide operating range and are able to exploit practically any fishing ground off Iceland, as well as international waters. Each trip in domestic fishing grounds usually lasts for about 5-15 days. A number of the deep-sea trawlers have in recent years been turned into freezer trawlers. The fishing trip of a typical freezer trawler is about 20-30 days, and longer if they go into distant waters.

### ***Specialised purse seiners***

From 200 GRT and up, these vessels are primarily engaged in the capelin fishery. Most participate also in other fisheries, particularly the deep sea shrimp fishery and the herring fishery. The specialised purse seiners usually follow the capelin schools over great distances and land their catches where it is most convenient.

### ***Multipurpose vessels***

The multipurpose vessels cover a wide size range, from 12 GRT to over 200 GRT. The typical multipurpose vessel is smaller than those previously discussed, the average size being just over 100 GRT. The multipurpose fleet is, for the most part, neither specialised with respect to fishing gear nor fishery. Most of the multipurpose fleet is designed as gillnetters or longliners although technically capable of employing trawl and purse seine as well. The geographical range of the smaller multipurpose vessels is limited and they are normally confined to 1-3 day fishing trips exploiting grounds relatively close to their home port. The fishing trips of the larger vessels can be up to 2 weeks.

**Table 1. The Icelandic fishing fleet (decked vessels, 1996)**

	Number	Total tonnage (1000 GRT)	Average age (years)	Change in average age 1984-1996
<b>Deep Sea trawlers</b>	120	71.428	18.0	8
<b>(i) Standard</b>	69	NA	NA	
<b>(ii) Freezer</b>	51	NA	NA	
<b>Purse-seiners</b>	43	21.040	27.5	12
<b>Multipurpose fleet</b>	339	34.307	25.5	5
<b>Over 200 GRT</b>	44	12.311	23.5	8
<b>111-200 GRT</b>	78	12.387	26.6	8
<b>51-110 GRT</b>	84	6.536	30.8	5
<b>13-50 GRT</b>	123	3.073	22.5	2
<b>0-12 GRT</b>	326	2.495	12.4	-6
<b>Total</b>	818	129.270	19.2	
<i>Source: Fisheries Association of Iceland</i>				
NA = Not available				

### **Part-time fleet**

This class of fishing vessels covers numerous vessels of sizes up to 12 GRT although most are under 10 GRT. These vessels are typically owner operated and employed on a seasonal basis. This fleet employs handline, gillnets and longline. Depending on the gear and fishery, the crew size is one to three persons.

As the smaller of the part time fleet, namely vessels under 10 GRT, were not subject to vessel quota restrictions until 1991, this component of the part time fleet mushroomed in the precedent years (see Figure 1). Vessels under 6 GRT are still allowed to opt for effort restrictions instead of quotas.

Further details about the Icelandic fishing fleet are set out in Table 2. As shown in that table, the average age of the fishing fleet is rather high. This reflects the effects of somewhat restrictive fishery management measures and official efforts in recent years to halt new investment in the fishing fleet.

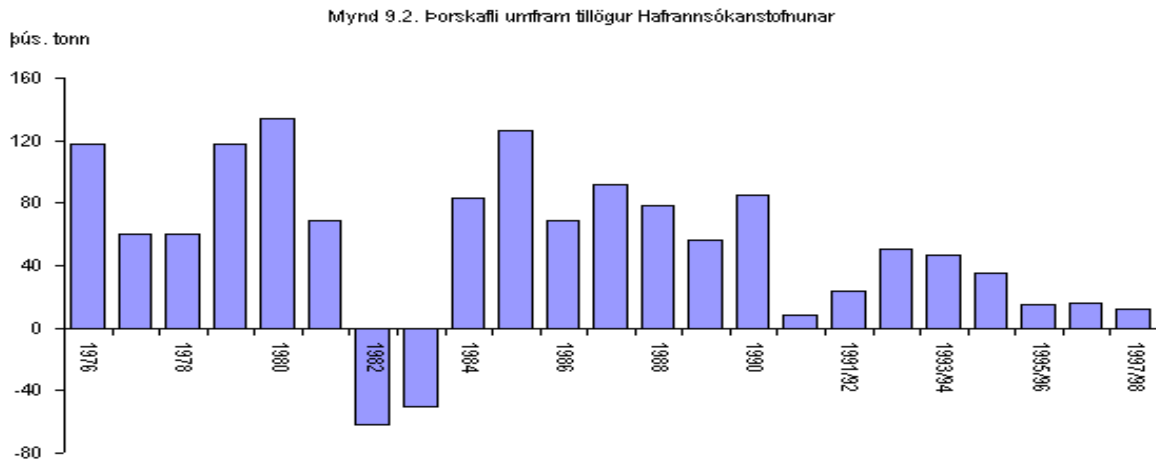


Figure 1. Number of vessels in part-time fleet 1983-1995. Source: *Utvegur 1983-1994* and *Kvotabokin 1995/96*.

## Evolution of the Fisheries Management System

Until the extension of the fisheries jurisdiction to 200 miles in 1976, the Icelandic fisheries were, for all intents and purposes, international and common property fisheries. Large foreign fishing fleets featured prominently on the fishing grounds, taking almost half of the demersal catch. The extension of the fisheries jurisdiction to 200 miles all but eliminated foreign participation in the Icelandic fisheries. However, the initial management measures taken in the demersal fisheries following the extension of the fisheries jurisdiction in 1976 were inadequate and therefore did not alter the common property nature of these fisheries as far as domestic fishers were concerned. They were still forced to compete for shares in the catch. Therefore not surprisingly, the development of the Icelandic fisheries in the post-war era closely followed the path predicted for common property fisheries exhibiting increasingly excessive fishing capital and effort compared to reproductive capacity of the fish stocks.

The post-war development of fishing capital and catch values before the introduction of the demersal vessel quota system in 1984 are illustrated in Figure 2.

The value of fishing capital employed in the Icelandic fisheries increased by well over 1200% from 1945-1983. Real catch values, on the other hand, only increased by 300% during the same period. Thus the growth in fishing capital exceeded the increase in catch values by a factor of more than four. This means that in 1983 the output-capital ratio in the Icelandic fisheries was less than one-third of the output-capital ratio in 1945.2

This long-term decline in the economic performance of the Icelandic fisheries did not go unnoticed by the authorities. In fact, over the years, various measures were taken in an attempt to reverse this trend. However, before the extension of the exclusive zone to 200 miles in 1976, effective management of the fisheries, especially the demersal ones, appeared impractical due to the presence of large foreign fleets on the fishing grounds. For this reason, fishery management subsequent to the extension of the fishing limits to 200 miles was limited.

Mýnd 9.4. Hlutfall úthlutaðs aflamarks af heildarafia þorsks

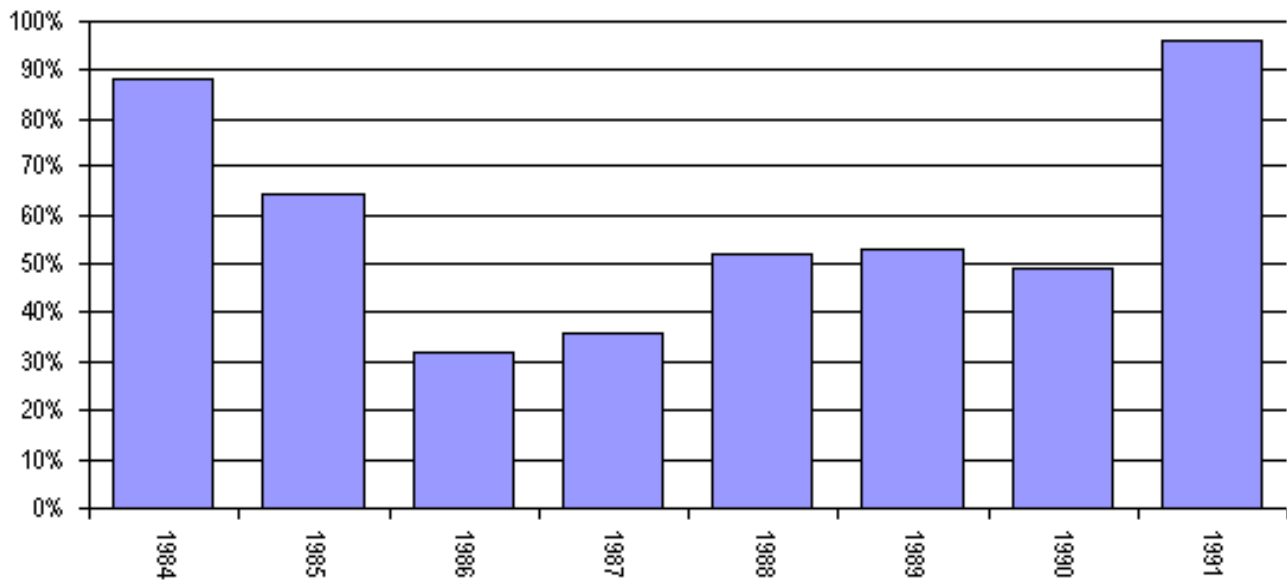


Figure 2. Fishing capital and catch values 1945-1994, both expressed in constant prices (index set to 100 in 1960).

Source:

National Economic Institute.

With the *de facto* recognition of the exclusive 200 mile zone in 1976, the situation dramatically changed. Since that time the Icelandic fisheries have come under gradually increasing management, culminating in a uniform ITQ system in practically all fisheries since 1991. The chronology of this development is summarised in Table 3.

Table 3. Chronology of the Key Steps in the Evolution of the ITQ Management System

1975	The herring fishery: Individual vessel quotas
1979	The herring fishery: Vessel quotas made transferable
1980	The capelin industry: Individual vessel quotas

- 1984 The demersal fisheries Individual transferable vessel quotas
- 1985 The demersal fisheries: Effort quotas option introduced
- 1986 The capelin fishery: Vessel quotas made transferable
- 1988 Transferable vessel quotas in all fisheries. Effort quota option retained
- 1991 A complete uniform system of transferable quotas in all fisheries
- 

A more detailed review of the evolution of the ITQ fisheries management system in individual Icelandic fisheries is as follows.

### ***Herring Fishery***

Due to an alarming decline in the herring stocks, an overall quota was imposed on this fishery in 1969. Since this did not halt the decline in the stocks, a complete herring moratorium was introduced in 1972. In 1975, when fishing from the Icelandic herring stocks was partly resumed, it was obvious that the whole fleet could not participate. Hence, an individual vessel quota system with limited eligibility was introduced in 1975. Vessel quotas were small and issued on a year to year basis.<sup>3</sup> In 1979 spokesmen for the industry suggested fairly unrestricted transfers of quotas between vessels, which the Ministry of Fisheries permitted.<sup>4</sup> The *Fisheries Management Act* of 1990 made the vessel quota system in the herring fishery part of the general ITQ system.

### ***Capelin Fishery***

The capelin fishery, which became big in the 1970s, was subjected to limited entry and individual vessel quotas for licence holders in 1980, at a time when the stock was seriously threatened with overfishing. Again the arguments were the same as in the herring fishery previously.<sup>5</sup> The positive experience with the vessel quota system in the herring fishery also proved a convincing argument for adopting a similar system in the much more important capelin fishery. In 1986, in conjunction with an increasing transferability of demersal vessel quotas, capelin vessel quotas became partly transferable. The capelin vessel quota system became a part of the general ITQ system with the adoption of the *Fisheries Management Act* of 1990.

### ***Demersal Fisheries***

In connection with the extension of the exclusive fishing zone to 200 miles in 1976, the major demersal fisheries were subjected to overall catch quotas. The quotas recommended by the marine biologists soon proved quite restrictive and thus difficult to uphold. Therefore, individual effort restrictions, taking the form of limited allowed fishing days for each vessel, were introduced in 1977. However, as new entry remained possible and the demersal fleet continued to grow, the allowable fishing days had to be reduced from year to year.<sup>6</sup> Thus, it gradually became obvious to everyone concerned that this system was economically wasteful.

Consequently, in 1984, following a sharp drop in the demersal stock and catch levels, a system of individual vessel quotas was introduced.<sup>7</sup> Initially regulations to this effect were issued for one year

only. Due to generally favourable results of the system, it was extended. However, to ensure sufficient support for the system, a very important provision was added. Vessels were allowed to opt for effort restrictions instead of catch quotas. In 1988, the Icelandic parliament enacted a general vessel quota legislation applying to all Icelandic fisheries effective for 1988-1990.<sup>8</sup> This legislation retained the effort quota option but made it somewhat less attractive. In 1990 a comprehensive ITQ legislation, the *Fisheries Management Act*, was passed by the parliament. This legislation abolished the effort quota option and closed certain other loopholes in the previous legislation, especially as regards the operation of vessels under 10 GRT. It, moreover, extended the ITQ system indefinitely albeit with a stipulation for a revision in 1992.<sup>9</sup>

### ***The shrimp, lobster and scallop fisheries***

The inshore shrimp, lobster and scallop fisheries are relatively recent additions to the Icelandic fisheries. These fisheries were largely developed during the 1960s and 1970s and have from the outset been subject to extensive management consisting primarily of limited local entry as well as overall quotas. An overall TAC was set in the lobster fishery in 1973, with vessel size restrictions and subsequently licensing and vessel quotas. New legislation on the processing and fishing of inshore shrimp and scallop was passed in 1975. That legislation gave the Ministry authority to issue quotas for these fisheries, to the processors. There are seven inshore shrimp areas and each had its specific regulations, two areas already had IQqs in 1974. In recent years there has been a move towards vessel quotas. In 1988, the deep-sea shrimp fishery was also subjected to vessel quotas. The management of shrimp and scallop fisheries became part of the general ITQ system with the *Fisheries Management Act* of 1990.

As may be inferred from this description, the course towards a complete ITQ fisheries management system in Iceland has evolved more by trial and error than by design. In most countries, and Iceland is no exception, there is a strong social opposition to radical changes in the institutional framework of production and employment. A great deal of this opposition seems to derive from traditional values and vested interests rather than rational arguments. Therefore, in Iceland, it was probably unavoidable from a socio-political point of view to pass through an evolutionary process during which various management methods were tried in different fisheries. The knowledge and understanding gained from these experiments were probably crucial for the eventual acceptance of a more efficient ITQ system.

At the same time, it should be noted, that the key steps in the evolution of the ITQ system have usually only been taken in response to crises in the respective fisheries due to a sudden reduction in stock levels. Thus, individual vessel quotas were introduced in the herring fishery in 1975 following a collapse in the herring stocks and a prolonged moratorium on herring catches. Similarly, vessel quotas in the capelin fishery and the ITQ system in the demersal fisheries were introduced in 1984 in response to a perceived danger of a corresponding collapse in the stock levels and a serious financial crisis in these fisheries.

This pattern reflects the reluctance of members of the fishing industry to accept changes in the traditional organisation of the fisheries. Only when faced with a disaster in the form of significant fall in income due to fish stock reductions or a drop in the world market price for fish products, have interest groups been willing to consider changes in the institutional framework of the fisheries.<sup>10</sup>

The passing of the comprehensive ITQ fisheries management legislation in 1990 constitutes a break with



this pattern. For the first time, the fishing industry has agreed to a significant improvement in the fisheries management system without being threatened with the alternative of a financial disaster. This must be attributed to the potentially immense economic benefits of the vessel quota system that were now becoming apparent to most of the participants in the fisheries.

## The current ITQ Fisheries Management System

Let us now turn to a description of the current ITQ fisheries management system in Iceland. Although this system was instituted at different times and in somewhat different form in the various fisheries, it was, as mentioned above, made uniform by the *Fisheries Management Act* of 1990.

The fisheries management system is based on individual transferable quotas (ITQs) and is therefore appropriately referred to as an ITQ system. The essential features of the current ITQ system are as follows: all fisheries are subject to vessel catch quotas. The quotas represent shares in the Total Allowable Catch (TAC). They are permanent, perfectly divisible and fairly freely transferable.<sup>11</sup> They are issued subject to a small annual charge to cover enforcement costs. The ITQ system is fairly uniform across the various fisheries. However, slight differences between the fisheries exist, mostly for historical reasons and especially in some local shrimp and scallop fisheries.

It should be noted that the ITQ system was superimposed on an earlier management system designed mainly for the protection of juvenile fish. This system involving certain gear, area and fish size restrictions are still largely in place. The ITQ system has not, in other words, replaced these components of the earlier fisheries management system.

Further details of the ITQ system in the Icelandic fisheries are given below.

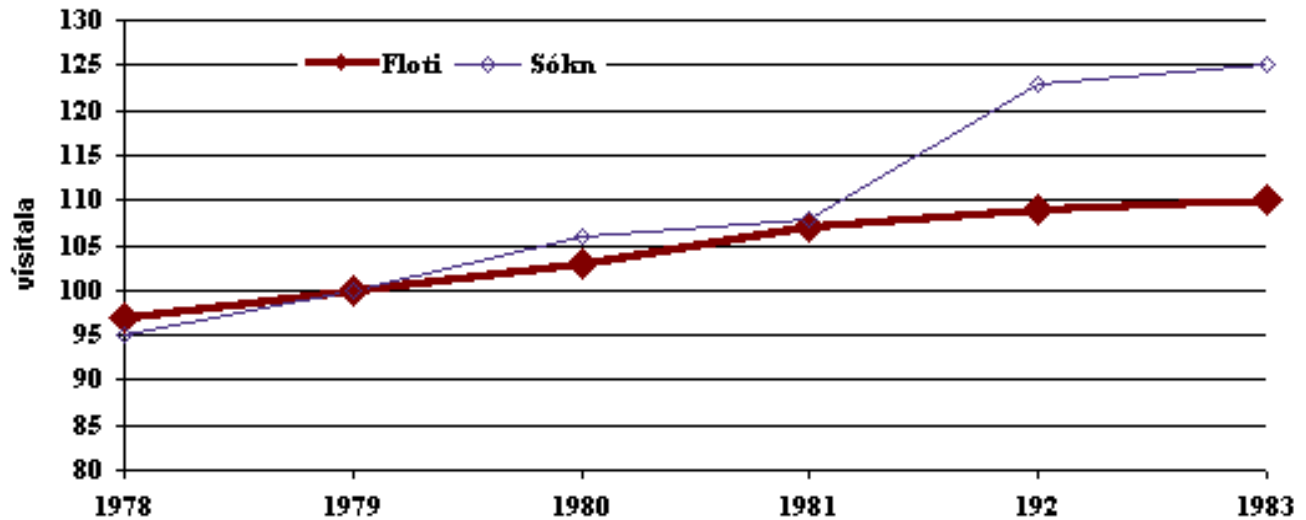
### **Total Allowable Catch (TAC)**

The Ministry of Fisheries determines the Total Allowable Catch (TAC) for each of the most important species in the fisheries. This decision is made on the basis of recommendations from the Marine Research Institute.<sup>12</sup> In the recent years the Ministry of Fisheries has followed the recommendations of the Marine Research Institute quite closely, except in the cod fishery.<sup>13</sup>

Currently thirteen species are subject to TACs and consequently IQs.<sup>14</sup> Several species, those on which fishing pressure is regarded as slight, are not currently subject to TAC. This means that the corresponding fisheries can be pursued freely. These fisheries are commercially negligible.

**Figure 3. Recommended TAC's and actual catch 1976-1994. Source: Herbertsson and Benediktsdottir (1996)**

Mynd 9.5. Þróun fiskiskipafloðs og sóknar í botnfisk á skrapdagatímabilinu



### **Permanent Quota Shares**

Each eligible vessel is issued a permanent share in the TAC for every species for which there is a TAC. These permanent quota shares may be referred to as TAC shares.

### **Initial Allocation of Permanent Quota Shares**

The initial allocation of TAC shares to individual vessels varies somewhat over fisheries. In the demersal, lobster and deep-sea shrimp fisheries the TAC shares are normally based on the vessel's historical catch record during certain base years. In the demersal fisheries this usually equals the vessel's average share in the total catch during the 3 years prior to the introduction of the ITQ system in 1984. There are noteworthy exceptions to this rule, however. If, for instance, the vessel in question was not operating normally during 1981-1983 due for instance to major repairs or having entered the fleet after 1981, the calculated share is adjusted upwards. Also, during the years 1985-1987, it was possible to modify the TAC shares by temporarily opting for effort restrictions instead of vessel quotas and demonstrating high catches during this period.

In the herring and inshore shrimp fisheries the initial TAC shares were equal for all eligible vessels.<sup>15</sup> The same holds for the capelin fishery except that a third of the TAC shares were initially allocated on the basis of vessel hold capacity.

### **Annual Vessel Quotas**

The size of each vessel's annual quota in a specific fishery is a simple multiple of the TAC for that fishery and the vessel's TAC share.<sup>16</sup> While the TAC share is a percentage, annual quotas are denominated in volume terms.

As the Icelandic demersal fisheries are a mixed-stock fishery and vessels are bound to catch other species than aimed for, the ITQs (or TAC shares) are also denominated in cod equivalent terms. That is, the cod, being the most important species in the Icelandic fisheries, is used as the common denominator for the whole ITQ system.<sup>17</sup> This provides some flexibility for the vessels, as they can subtract bycatch

of other species from their quota at fixed values (see Arason 1995).

### **Transferability**

Both the TAC shares and the annual quotas are fairly freely transferable and perfectly divisible. This means that any fraction of a given quota may be transferred to another vessel.

TAC shares are transferable without any restrictions whatsoever. Transfers of annual vessel quotas, on the other hand, are subject to some restrictions. Annual vessel quotas are freely transferable between vessels within the same geographical region. Transfers of annual quotas between geographical regions are, on the other hand, subject to revision by the respective fishers' unions and the local authorities. Offsetting transfers of different species with equal value are not subject to such restrictions. The rationale for this stipulation is to stabilise local employment in the short run. In practice, however, it appears that few inter-regional transfers are actually blocked.

In addition, the parliament amended, in 1992 and 1994, further restrictions to the Fisheries Management Act of 1990. These restrictions are relatively insignificant. They are designed to discourage speculative quota holdings and stabilise regional and fishers' employment in the short run.<sup>18</sup>

**Table 4. Transfers of quota between vessel 1984-1993, As percentage of total groundfish catch<sup>1</sup>**

Transfer <sup>2</sup>	1984	1985	1986	1987	1988	1989	1990	1991 <sup>3</sup>	1991/92 <sup>4</sup>	1992/93
Type A	4.2	3.3	2.6	1.8	4.0	5.1	5.5	12.2	18.7	24.6
Type B	3.8	3.4	2.2	1.9	3.1	3.7	3.6	9.0	8.8	12.2
Type C	1.1	1.7	1.1	0.1	2.4	2.7	1.7	4.3	5.3	8.1
Type D	3.6	5.8	2.7	2.2	4.7	4.4	6.9	7.8	13.5	21.6
Total	12.6	14.2	8.5	6.0	14.3	16.0	17.8	33.4	46.3	66.5

1. These groundfish quotas are measured in kilograms of cod equivalents and represent temporary annual quota transfers only.

2. Type A: Transfers between vessels with the same owner. Type B: Transfers between vessels with different owners operated from the same port. Type C: Offsetting transfers of different species with equal value between vessels with different owners. Type D: Transfers between vessels with different owners operated from different ports.

3. First eight months of 1991.

4. September to August fisheries year.

*Source: OECD (1994)*

Apart from this, transfers of quotas are only subject to registration with the Ministry of Fisheries. The particulars of the exchange, including price, are not registered.<sup>19</sup>

### **Restricted Access**

In addition to the ITQ system, the Icelandic fisheries are subject to restricted access. All commercial fishing vessels must hold valid fishing licences, in addition to catch quotas. Fishing licences moreover, are issued only to vessels already in the fishery in 1990 and their replacements provided they are deemed comparable in terms of fishing power. The fishing licences are only transferable with the vessels.<sup>20</sup>

One of the impacts of a well designed ITQ system is to provide the socially appropriate incentive for investment (disinvestment) in the fishing fleet. The fishing licence stipulation clearly adds a deterrent to investment in fishing vessels.

### **Exemptions from the ITQ System**

There is one minor exemption from the current ITQ system - in demersal fisheries. Hook and line fisheries by vessels under 6 GRT are allowed exemption from quota restrictions and are instead subject to limited fishing days and an overall TAC. This arrangement was to be temporary and to end in 1994. The exemption was extended, with fewer fishing days. With the 1996 amendment of the Act, these vessels now choose between a share quota and an effort quota. As a group they receive a common share of the general TAC.

### **Quota Fees**

The annual vessel quotas calculated in the above described manner were initially issued by the Ministry of Fisheries free of charge. However, in accordance with the *Fisheries Management Act* of 1990, the Ministry collects fees for catch quotas to cover the cost of monitoring and enforcing the ITQ regulations. The law imposes an upper bound on this fee amounting to 0.4% of the estimated catch value.

The Icelandic ITQ system has most of the crucial features of an ideal ITQ system, as discussed in the literature (see Arnason 1990). However, there are particular aspects of the Icelandic ITQ system that deviate from the theoretical ideal and almost certainly subtract from its economic efficiency.

First, in the Icelandic ITQ system, the ITQs are closely associated with fishing vessels. More precisely, only those who own vessels with valid fishing licence can hold quotas. In addition, the total holdings of quotas must not exceed the fishing capacity of the vessel in question. The set of potential holders of ITQs is thus severely restricted. This clearly subtracts from the ability of the quota market to generate the most economically beneficial allocation of quotas.

Second, the holders of TAC shares must harvest at least 50% of their TAC share every second year to retain the share. This stipulation is designed to obstruct speculative quota holdings. However, in doing so, it reduces the efficiency of the quota market and induces more vessels than would be optimal.

Third, the ITQ system in the demersal fisheries was combined with an optional limited effort system already in 1985. This option was not abolished until 1991 and in the meantime a large fraction of the demersal fleet opted for limited effort rather than IQs. Further, the part-time fleet has only partially been subjected to ITQs and longline catch during winter is partially exempt. Table 5 shows what fraction of the demersal catch has been subject to ITQs. The performance of the ITQ system in the Icelandic demersal fisheries has to be interpreted with this in mind.

**Table 5. Annual demersal ITQs as a fraction of total catch. A ratio in excess of unity indicates that the total issued ITQs exceed the actual catch.**

Year	Cod	Haddock	Saithe	Redfish	Greenland halibut
1984	0.88	1.38	1.25	1.09	1.00
1985	0.64	0.94	1.05	0.97	0.76
1986	0.32	0.51	0.52	0.37	0.29
1987	0.36	0.68	0.46	0.40	0.24
1988	0.52	0.74	0.66	0.43	0.33
1989	0.53	0.63	0.60	0.41	0.29
1990	0.49	0.58	0.54	0.39	0.46
1991*	1.00	1.24	1.00	0.99	1.10
91/92	0.94	1.09	0.90	1.02	0.85
92/93	0.79	1.34	1.22	1.01	0.87
93/94	0.73	1.14	1.28	0.97	1.06
94/95	0.73	1.00	1.46	0.84	1.14
95/96	0.71	1.05	1.70	0.84	0.94

*Source: Ministry of Fisheries, Utvegur 1984-1994, Aegir 1996, Arnason (1996).*

\*The fishing year under the *Fisheries Management Act* of 1990, that is 1 January to 1 September. Subsequent fishing years from 1 September to 1 September the following calendar year.

## Performance of the ITQ System

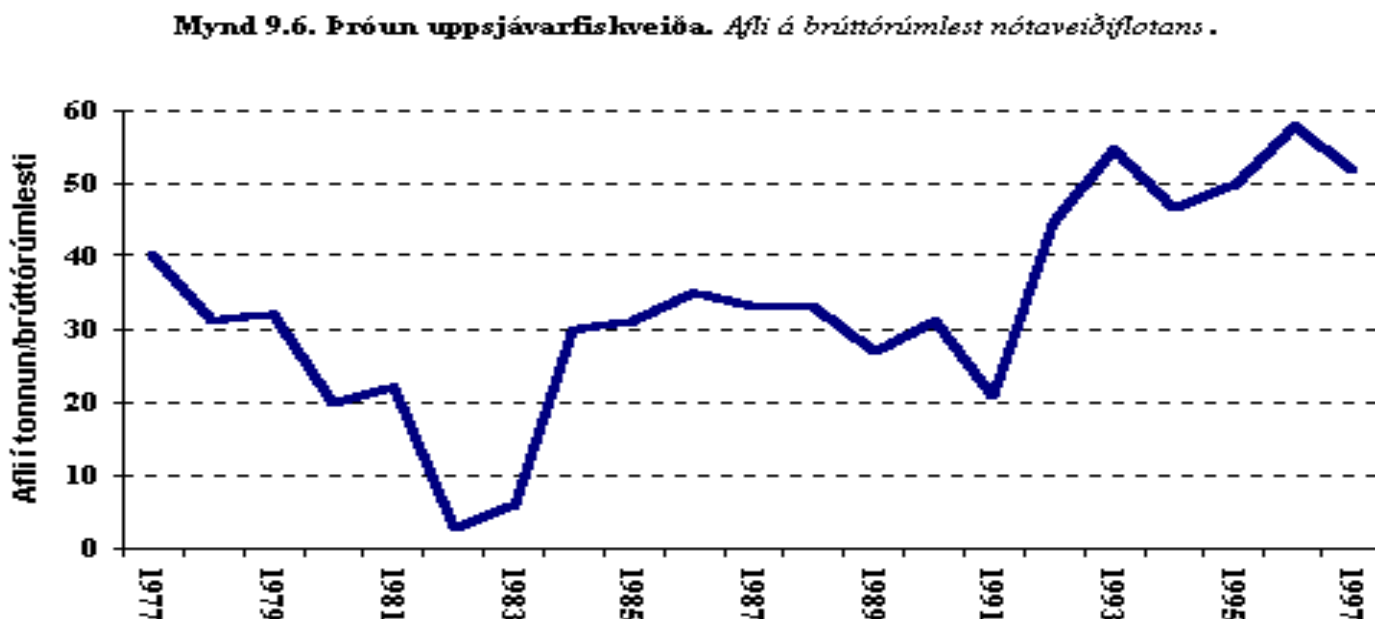
The main purpose of the vessel quota system is to improve the economic efficiency of the fisheries. The Icelandic fisheries are biologically very productive and should be able to generate high economic rents. Until the adoption of the vessel quota system, however, comparatively low rents were generated in the industry. In fact, during the years preceding the introduction of the vessel quota system in the various fisheries industry profits were often highly negative.<sup>21</sup>

The ITQ system was introduced at different times and in different forms in the various fisheries and it is therefore appropriate to discuss the impact of the system on these fisheries separately.

### Herring Fishery

The herring fishery was resumed in 1975, after three years of fishing moratorium. A system of individual vessel quotas was imposed on the fishery, with eligibility for quota allocations limited to small vessels with a history of herring fishery participation. The larger purse-seiners were excluded on the grounds that they were capable of pursuing the North Sea herring fishery and the Icelandic capelin fishery. Due to the generally favourable experience with this system, the quotas were made perfectly divisible and transferable in 1979. In 1990, the herring fisheries management system was incorporated - largely unchanged - in the comprehensive fisheries management system for the Icelandic fisheries.

Figure 4. Development of the Herring fishery (index). Number of boats and the herring catch 1975-1994. *Source: Fisheries Association of Iceland and Arnason (1996).*



The ITQ system in the herring fishery has been very successful. Since 1975 herring catches have increased almost tenfold. Fishing effort, on the other hand has not increased. In fact it has declined substantially. The number of vessels in the fishery has decrease from about 65 vessels in 1975 to less than 40 in recent years.<sup>22</sup> Technical efficiency in the herring fishery is now roughly 10 times higher than it was at the outset of the vessel quota system in the fishery 20 years ago (Arnason 1993).

The development of the herring fishery in terms of number of vessels and catches is described in Figure 4.

### Capelin Fishery

An individual vessel quota system was introduced in the capelin fishery in 1980. In 1986 the quotas were made transferable. In 1990 the capelin management system was incorporated in the overall Icelandic fisheries management system.<sup>23</sup>

The capelin is a short lived species and the fishery is very volatile. Since the introduction of the vessel quota system in 1980 there has been no trend in catch levels. Mean catches have remained roughly unchanged. The capelin fleet, on the other hand, has been substantially reduced. The number of vessels has declined from 68 in 1979 to 43 in 1995, or by more than 30%, and the number of vessels is expected to decrease further this year.<sup>24</sup> The total tonnage (GRT) of the fleet has been reduced by over 25%. Thus, there are strong indications that the efficiency of the capelin fishery has been substantially increased since the introduction of the vessel quota system. The development of the capelin fishery, in terms of vessel number and catches, is illustrated in Figure 5.

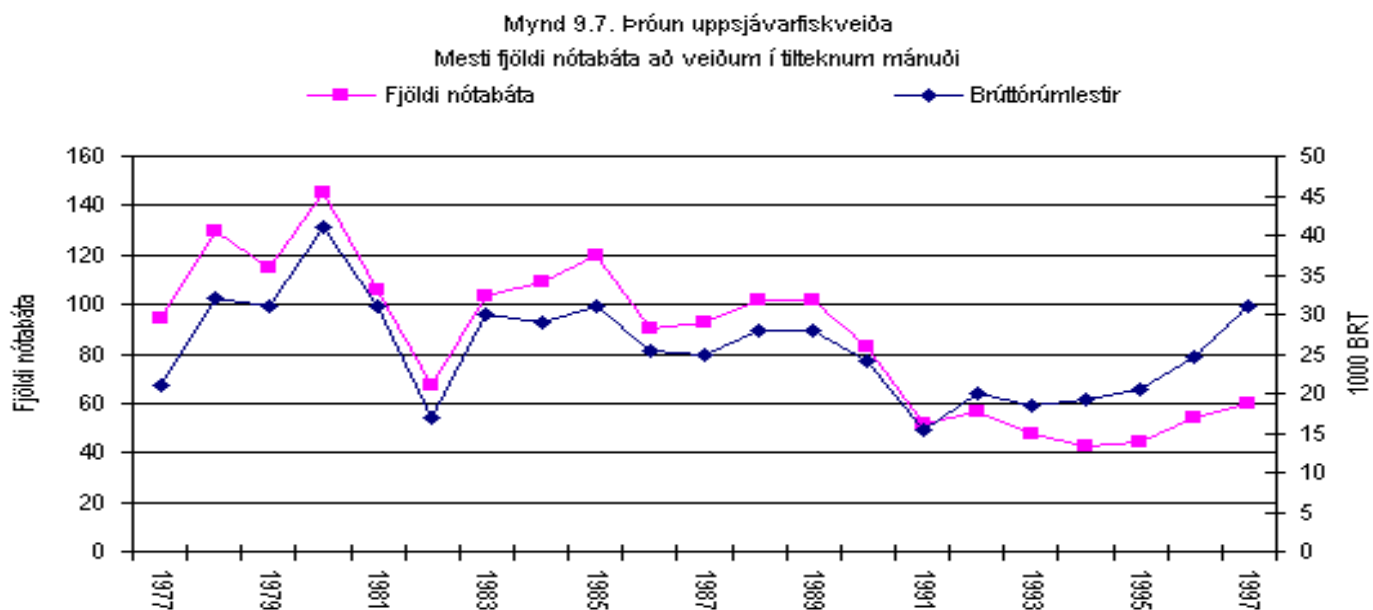


Figure 5. Development of the capelin fleet (index). Number of boats in capelin fishery and the capelin catches 1977-1995.

Source: Fisheries Association of Iceland and Arnason (1996).

## ***Demersal Fisheries***

The demersal fisheries are by far the most important Icelandic fisheries, accounting for around 80% of the total wetfish value. These fisheries were subjected to an individual transferable quota system in 1984. The system has subsequently been under almost continuous revision, even after the adoption of the comprehensive *Fisheries Management Act* of 1990.

### ***The Trend in Fishing Capital and Fishing Effort***

We have seen that one of the reasons for the dissipation of economic rents in the Icelandic fisheries is overinvestment in fishing capital and excessive fishing effort. Therefore one of the tests of the efficacy of the vessel quota system is the development of fishing capital and aggregate fishing effort since the introduction of the system.

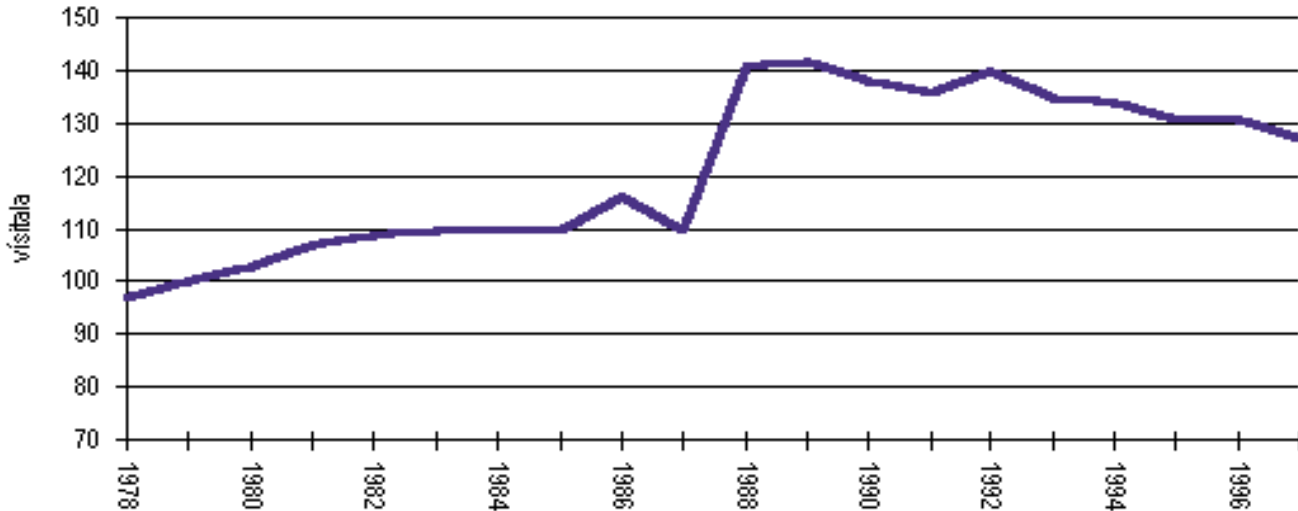
The trend in fishing capital and fishing effort in the demersal fisheries in recent years is illustrated in Figure 6.

As shown in Figure 6, the previous growth in the value of aggregate harvesting capital halted abruptly in 1984 when the vessel quota system was introduced. In fact, fishing capital contracted 1984-1985. This was the first time since 1969 that the value of the fishing fleet actually decreased. In the preceding 15 years this capital value had grown at an annual rate of over 6%. Thus, at this point, the vessel quota system seems to have generated beneficial results, although this halt in investment can hardly be attributed exclusively to the vessel quota system. The years 1982-1984 were periods of heavy losses for the fishing industry. In 1986 investment in fishing capital resumed at a high rate. This resumption of investment should not, however, be interpreted as a failure of the vessel quota system as such. After all, the increase in the value of fishing capital since the inception of the ITQ system has amounted to just over 2% annually while during the preceding 15 years this annual increase was over 6%. Moreover, most of the investment since 1986 can be explained by factors extraneous to the ITQ system.

**Figure 6. Demersal fishing effort (index 1979=100) and fishing capital (index 1979=100) 1978-1995. Source: Fisheries Association of Iceland.**



Mynd 9.8. Þróun verðmætis fiskiskipafloðans 1978-1997



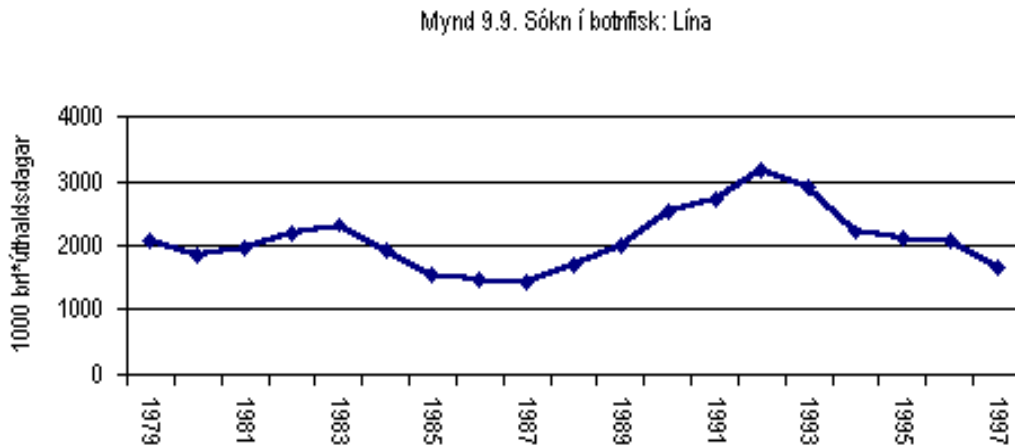
First, a good deal of the investment in fishing capital from 1986 onwards has consisted of installation of freezing equipment and the corresponding modifications of several deep-sea trawlers. In 1983 there were 3 freezer trawlers, in 1990 they were 28, and in 1996 they were 50. This part of the investment is, in other words, in fish processing capital employing new and profitable techniques. Second, a part of the investment was in specialised trawlers for the emerging and very valuable deep-sea prawn fishery which was not subject to vessel quotas until 1988. Third, by the mid 1980s a significant fraction of the deep-sea trawler fleet was due for replacement. As the years 1986 and 1987 were unusually profitable for the harvesting sector, many firms took the opportunity to replace their ageing vessels. Fourth, during this period there was a very significant investment in small vessels (under 10 GRT) that were not subject to the vessel quota system. Last but not least, the effort quota option in the demersal fisheries, introduced in 1985, undermined the efficiency incentives of the ITQ system inducing many vessel owners to upgrade or replace their vessels. The effort quota option was abolished in 1990 and, in fact, we see a significant reduction in fishing capital in that year and the following years.

The course of the demersal fishing effort tells a similar story. As indicated in Figure 6, fishing effort in the demersal fisheries dropped by some 15% in 1984, the first year of the vessel quota system, and by an additional 6% in 1985. From 1986-1990, on the other hand, fishing effort increased considerably. This is no doubt due to the widespread selection of the effort quota option within the ITQ system. Another important explanation for the increase in fishing effort in 1989 and 1990 is the decline in the demersal fish stocks without a commensurate reduction in the TACs thus requiring more fishing effort to fill the catch quotas. From 1991 and onwards demersal fishing effort has declined substantially.<sup>25</sup>

The important question, however, may not be whether fishing effort has been reduced from its 1983 level. A more crucial measure of the impact of the vessel quota system would be the difference, if any, between the actual fishing effort from 1984 onwards compared to the fishing effort level that would have prevailed had the vessel quota system not been introduced.

**Figure 7. Predicted fishing effort, assuming no vessel quota system, (index 1979=100), and actual fishing effort 1978-1990 (index**

1979=100). *Source: Arnason (1995a).*



Although, it is by no means straightforward to predict the course of fishing effort under the earlier management regime, attempts have been made to do so. Arnason (1993:213-214;1995a:125-127) uses a simple trend model to produce some interesting results (see Figure 7). He estimates that the vessel quota system appears to have reduced total demersal fishing effort from 1984 to 1990 by over 30% compared to the expected fishing effort under the previous management system.<sup>26</sup> The financial benefits of this kind of an effort reduction are very substantial. In interpreting these results, however, one should be mindful of the extreme simplicity and mechanistic nature of Arnason's underlying model. In fact, Arnason claims that these results should be regarded as indicative only.

### ***More Direct Estimates of Economic Benefits***

Let us now turn to more direct estimates of the economic benefits generated under the vessel quota system. Unfortunately, little research has been done in this area and the available information is consequently rather scant.

From a theoretical point of view, the economic benefits of a vessel quota system should include the following items:

#### **A Reduction in Fishing Effort**

Under the vessel quota system competition between vessels for a limited stock of fish is eliminated. Consequently, the fishing firms will attempt to catch their vessel quota with minimum fishing effort. It is important to realise, however, that aggregate fishing effort will not necessarily be reduced if the TAC is excessive relative to the size of the fish stocks.

#### **Reduced Cost of Fishing Effort**

Having secured property right of a certain volume of catch under the vessel quota system, the fishing

firm can concentrate on taking that catch with minimal costs.

### **Improved Quality of the Catch**

Being bound by its vessel catch quotas, the fishing firms can only increase revenues by improving the quality of this catch.<sup>27</sup>

### **Enforcement of fisheries management regulations**

Monitoring and enforcement is necessary to counter any tendency to high grade and quota bust. Such violations, and violations of fisheries regulations, are subject to fines, expropriation of catch and gear and cancellation of fishing licences, depending on the seriousness of the violation. The Ministry of Fisheries and its agencies have rather discretionary powers to assess these penalties and a proven willingness to use them. Alleged violators have recourse to the court system in cases where they do not accept the Ministry's penalties.

As far as quota busting is concerned, an effective landings control system is in place in Iceland. There is a legal requirement that all marine catch be weighed on officially approved scales at the point of landing and public officials record the landings, as well as verifying the species composition. The landings control system covers every landing port, which number 67 in Iceland, as well as the major foreign export ports.

In addition the Coast Guard has an important role in monitoring and enforcing domestic fisheries regulations. To further monitor adherence to quota rules and other fisheries regulation, the Ministry maintains a group of fisheries observers. At any point of time, some observers are based aboard fishing vessels during actual fishing trips while others travel between the landings ports.

Despite elaborate monitoring and enforcement, there are some violations of the various regulations. All together though, they are negligible.

### **Weaknesses in the Fisheries Management System**

There are certain weaknesses, alleged and real, in the current fisheries management system, especially from the point of view of economic efficiency. The most serious ones appear to be the following.

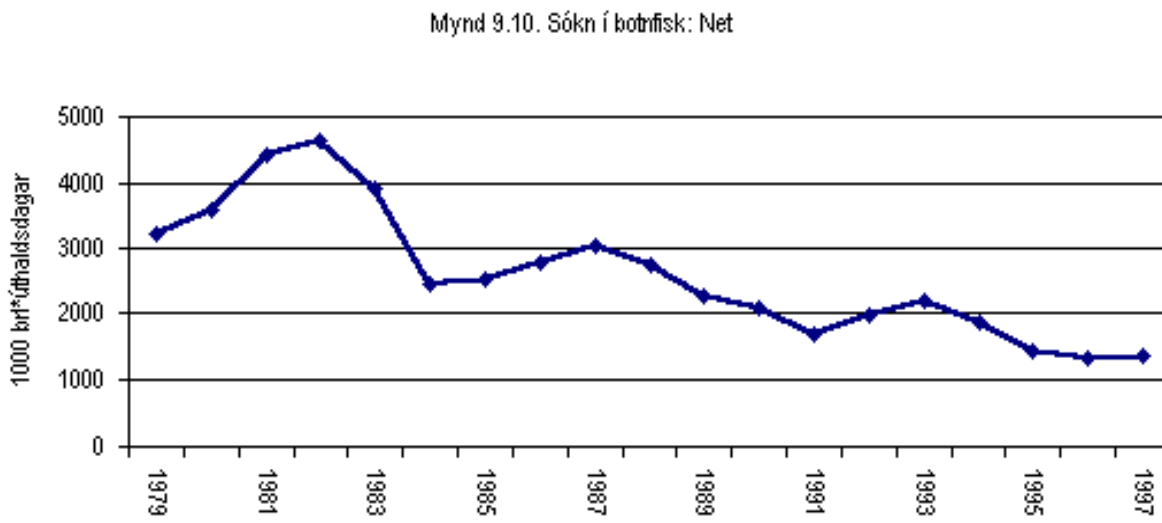
#### ***High grading***

High grading is an often cited problem with ITQ systems especially in mixed fisheries. The Icelandic demersal fisheries are certainly mixed fisheries. Nevertheless, and despite claims to the otherwise, there is little evidence of increased discarding under the ITQ system. According to measurements published in a 1993 report by a government commission, demersal discards range from 1-6% of total catch volume depending on gear and vessel type. Moreover, according to this report there has been no detectable increase in discards since the introduction of the vessel quota system in 1984 (Arnason 1994).

#### ***Loopholes***

Although the comprehensive *Fisheries Management Act* of 1990 closed many of the loopholes of the previous ITQ system(s), one worrisome loophole remain.

**Figure 8. Hook-licence fleet: Number of vessels (left) and share of the cod catch (right) 1989-1996 (the share of the cod catch in 1995/96 is an estimate).** *Source: Kvotabokin 1995/96.*



Fishing vessels under 6 GRT in size were offered the option of remaining outside the ITQ system provided they restricted their operations to hook and line fishing for demersal species. This exemption, usually referred to as the hook licence, was to expire in 1994. In 1996 the Act was amended and these vessels as a group now receive a common share of the TAC. As a group these vessels receive permanent 13.9% share of the cod TAC. Of the 1.009 vessels in this group, 533 chose IQs.

This exemption has resulted in distortion in the composition of the fishing fleet and effort. The fleet of small boats has increased its share in the demersal catch. The hook-license fleet has expanded its share in the catch of cod from less than 3% in 1989 to over 20% in 1995, as shown in figure 8.

After the introduction of the ITQ system in the demersal fisheries in 1984 the number of small vessels mushroomed, almost doubled in number in 1990 compared to 1983. Further, investment in small vessels accounts for almost 15% of total investment in the fishing fleet since 1984.<sup>28</sup>

### ***Quota holdings***

Quota holdings are limited to owners of fishing vessels. This restriction obviously reduces the number of potential quota market participants. As a consequence it severely limits the scope for quota arbitrage in the market. The efficiency of the market is correspondingly impaired and its effectiveness in allocating quotas to the most efficient operators reduced.

### ***Imprecision in stock management***

The current ITQ system allows quota holders to postpone the harvesting of up to 20% of the annual quota allotment until the following year. It also allows quota holders to exceed their quota allotment by up to 5% in any year subject to a corresponding quota reduction in the following year. These provisions provide a certain operational flexibility to vessel owners. At the same time they also reduce the precision in the biological management of the stocks. With these provisions actual catches in a given year can

deviate as much as 25% from the TAC. This degree of imprecision in the harvesting policy appears excessive.

### **Quality of the ITQ property right**

Economic theory suggests that the efficiency of an ITQ system stems from its creation of private property in harvesting rights.<sup>29</sup> This suggests that the higher the quality of this property right, in terms of security of title, permanence, exclusivity, flexibility, divisibility and transferability, the greater will be the resulting efficiency of the ITQ system.<sup>30</sup>

Article 1 of the *Fisheries Management Act* of 1990 states that the fish stocks in Icelandic waters are the common property of the Icelandic people. It further states that the allocation of ITQs to individual firms and vessels does not give irrevocable property right in these TAC shares. The article has created uncertainty concerning the permanence and exclusivity of the ITQs and undermined its economic effectiveness. Not only are the property rights uncertain and insecure, but further this has created problems for tax authorities and the banks.

The problem for the tax authorities concerns the issue of whether a vessel quota should be regarded as an asset in the firm's books or if expenditures on quotas should be regarded as outlays, that are deductible from taxable income. Even the tax authorities and the Ministry of Finance could not agree on rules, so it was left for the courts to decide on this matter. The courts have reached a decision, which can be described as a compromise of differing views. Transfers of annual quotas are to be treated as taxable income/outlays, while transfers of TAC shares are to be treated as assets and depreciated over 5 years. Allocated quotas, whether annual or shares, are not subject to these tax rules and are to be treated as freebies.

The problem for the banks concerns the issue of whether a vessel quota should be regarded as part of the vessel's equity (value), when a vessel is put up as collateral for a bank loan. The courts have ruled that the quotas are not to be regarded as a property of a vessel owner and are therefore not a legitimate collateral for loans. Vessel owners and banks have, of course, figured out ways to circumvent this ruling, i.e. the bank has to approve of any transfers of TAC shares.

Besides these rulings by the courts, legal scholars in Iceland have debated these issues in recent years and there seems to be a rather general consensus among them that Article 1 of the *Fisheries Management Act* of 1990 lacks grounding in other legislation.<sup>31</sup> These scholars, it should be noted, do not consider the fishery as the property of TAC shareholders, but rather that they do have a property (an asset) in the harvesting rights.

### **Regional and Community Impact**

In public and parliamentary discourse on the merits of the ITQ system in Iceland, some claim that one of its faults is in undermining regional policy. The transferability of the quotas will lead to concentration of quota holdings in the urban Southwest region. This will have impact in various villages around the country, some of which rely exclusively on the fisheries. The result will be increasing unemployment in those regions and migration to the Southwest.

In the course of this debate various proposals have come forth on restricting the transferability of quotas.<sup>32</sup> Some have even suggested attaching quotas to certain regions and restrict transfers, while others have proposed giving local governments, town councils or fishers' unions some veto power on transfers. The current fisheries management act makes TAC shares are transferable without any restrictions whatsoever. Inter-regional transfers of annual vessel quotas, however, are subject to some restrictions, unless they are offsetting transfers of different species with equal value. Fishers' unions are to discuss such inter-regional transfers of annual vessel quotas. Further, local governments have the right to match any offer for annual vessel quotas to block inter-regional transfer. In practice, however, it appears that few inter-regional transfers are actually blocked.

### ***ITQ Management and Regional Impact***

The purpose of any fishery management system must be to increase efficiency and rents in the fishery. This will be accomplished, at least partly, through a smaller fishing fleet, lesser effort and larger fish stocks, with increased TAC. A smaller fleet and decreased efforts are likely to alter the structure of employment and regional development. Fewer vessels may mean fewer fishers, although the decrease in their number should be proportionally smaller. With fewer vessels and increased TAC, catch per vessel will increase. The emphasis should also be on increased quality of the landed catch. All this should increase fishers' income, at least in total. Fewer vessels and decreased effort will also affect the suppliers of the fishing industry, such as shipyards and gear makers.

Although the increased efficiencies of the fisheries through the ITQ system are may decrease employment for fishers and in industries that are suppliers for the fishing vessels, employment in other industries should increase. The increased rent in the fisheries and therefore higher income of those in the industry should create demand for other domestic services and industries. There is no reason to expect the net effect to be negative for total employment. Actually the opposite is probably true.

### ***Structure of the Fishing Industry***

The harvesting and processing sectors of the Icelandic fishing industry are characterised by numerous relatively small firms. Frequently these firms exhibit a high degree of vertical integration across the harvesting and processing sectors, but there is little horizontal integration.

The typical firm in the fishing industry is based in one fishing town or village. Vertical integration is the norm, although there are exceptions. Integration across regions is rare but on the increase. The firm operates one or more processing plants and usually runs one or more fishing vessels that supply most of its wetfish needs. Independent vessels provide for any additional needs, on the basis of implicit or explicit contracts or through wetfish floor markets. The first 3 floor markets were established in 1987 and there are now 15 markets, at least 1 in every geographical region.<sup>33</sup>

### ***Regional Shares in Quotas and Catch***

It is now over a decade since the introduction of the ITQ system in the Icelandic fisheries. It is possible therefore to look at what impact the system may have had so far on regional development in Iceland.

In an ITQ system the quotas are the key to receiving catch landings. Quota holdings decide, at least for the most part, how much catch will be landed in a village and they therefore determine the employment

opportunities in the village's fishing sector. To estimate the impact of the ITQ system on regional development it is interesting to look at changes in regional quota holdings since the adoption of the ITQ system.

**Table 6. Regions' quota holdings 1984-1996 (cod equivalents, registered port of vessel). Source: Fisheries Office, Arnason (1992b)**

Region	Southwest	West	Western fjords	Northwest	Northeast	East	South
1984	29,7%	8,9%	13,6%	6,1%	14,9%	13,2%	13,5%
1985	29,3%	9,0%	13,7%	6,2%	15,1%	13,3%	13,4%
1986	27,8%	9,7%	13,9%	6,3%	14,8%	13,7%	13,8%
1987	24,9%	9,9%	14,1%	6,9%	16,9%	13,7%	13,6%
1988	24,6%	9,6%	14,2%	7,4%	16,7%	13,5%	14,0%
1989	22,8%	9,3%	14,6%	7,9%	17,6%	13,2%	14,7%
1990	24,1%	9,0%	14,0%	7,6%	17,1%	12,9%	15,2%
1991	23,7%	9,4%	13,9%	7,9%	17,7%	12,5%	14,8%
1991/92	24,3%	9,3%	13,8%	7,2%	18,4%	12,6%	14,4%
1992/93	24,5%	10,1%	13,5%	6,6%	18,2%	13,2%	13,9%
1993/94	24,7%	10,0%	12,2%	6,9%	18,4%	13,4%	14,5%
1994/95	25,0%	10,0%	11,9%	7,0%	18,8%	12,4%	15,0%
1995/96	26,1%	10,2%	11,5%	7,4%	19,9%	11,4%	13,5%
1996/97	24,4%	9,9%	12,2%	7,4%	20,8%	11,4%	13,9%
Average	25,4%	9,6%	13,4%	7,1%	17,5%	12,9%	14,2%

The initial allocation of quotas was based on vessel catch history in 1980-1983. This allocation therefore mirrors the regional distribution of the fishing industry in terms of catches in those years. Since the initial allocation of quotas, subsequent allocation may have changed for any of four reasons. First, it may have changed with regard to catch history of vessels in the period 1985-1990, when vessels were allowed to opt for effort quota. Second, it may have changed as a result of a larger part of the fishing fleet coming under the ITQ system, as the effort quota option and small vessel exemption (6-10 GRT) were abolished in 1991. Third, it may have changed because of transfers of TAC shares between vessels. Fourth, it may have changed with the sale of ITQ vessels between regions. Only the latter two changes of quota allocation result from the ITQ system.

Table 6 lists each regions share of allocated quotas, in terms of cod equivalents.<sup>34</sup> As table 6 shows, the changes in quota holdings for the regions are rather insignificant. The most significant change is the gain

in the Northeast region and the loss in the Southwest.

Even if quota holdings define the opportunities villages have for job creation in a fishing industry, what determines the realised number of jobs is the actual catch landings in the village. Quota holdings and landed catch does not necessarily go hand in hand. Vessel owners may choose to land the vessel catch in another village, region or even export the catch unprocessed. It should therefore be of interest to look at data on the catch landings from the demersal fisheries.

**Table 7.** Regions' share in groundfish landings 1983-1995 (cod equivalents for cod, haddock, saithe, redfish and Greenland halibut) as a fraction of groundfish landings for domestic processing. *Source:* Fisheries Association and Arnason (1992b)

Region	Southwest	West	Western fjords	Northwest	Northeast	East	South
1983	27,9%	11,2%	13,4%	5,3%	14,3%	13,7%	14,2%
1984	26,5%	10,9%	15,3%	6,1%	14,6%	13,0%	13,6%
1985	25,3%	11,0%	13,6%	6,8%	15,9%	14,3%	13,1%
1986	25,2%	11,8%	13,2%	6,8%	16,8%	15,2%	11,0%
1987	25,4%	12,0%	12,7%	7,7%	17,4%	15,1%	9,7%
1988	25,8%	10,2%	13,8%	7,3%	19,5%	14,1%	9,3%
1989	27,3%	10,4%	13,6%	6,5%	19,2%	13,0%	10,0%
1990	29,7%	9,4%	12,4%	7,6%	20,1%	11,2%	9,6%
1991	30,4%	8,9%	13,0%	7,8%	20,0%	11,3%	8,6%
1992	30,6%	7,7%	13,2%	7,9%	20,7%	11,6%	8,3%
1993	30,6%	8,8%	12,7%	7,8%	21,8%	10,1%	8,2%
1994	34,3%	7,9%	11,8%	6,4%	20,3%	10,7%	8,7%
1995	34,2%	10,3%	12,4%	4,4%	17,2%	12,5%	8,9%
Average	28,7%	10,0%	13,2%	6,8%	18,3%	12,8%	10,2%

Table 7 lists regional landings of the ITQ species from the demersal fisheries. The five species included are cod, haddock, saithe, redfish and Greenland halibut, and are presented as cod equivalents.

The table shows that the regional patterns of demersal landings have a much greater volatility than quota holdings. The Northeast shows an increased share of the landings, as it did in the quota holding. Another significant change is that the Southwest increases its share of landings substantially, despite its smaller share of quota holdings. This must be attributed to the introduction of floor markets but the three first floor markets are located there. These three floor markets are also among the biggest. They handled close to 50% of the total volume of all floor markets in 1994. From their introduction in 1987 they have grown to handle about 37% of all groundfish landings of the domestic processing plants in 1994.



Another significant change concerns the exports of unprocessed groundfish, especially in containers that started in the 1980s. Export of unprocessed groundfish accounts for about 6% of the volume of demersal catches (ITQ species) in 1983, about 17% in 1990 and 10% in 1994. In cod equivalent terms the export in 1994 accounted for almost 9% of demersal ITQ catches. The Southern region has traditionally been the leading exporter of unprocessed fish. In 1994 they exported almost 20% of their groundfish ITQ catches unprocessed, the Northwest close to 17%, but all others were below 9%.

Yet another explanation for the divergence between quota holdings and catch landings is found in the increasing number of freezer trawlers. In 1996 there were 50 such processing vessels in Iceland, up from 3 in 1983. Of those, 15 were registered in the Southwest, 14 in the Northeast, 6 in the Western fjords, 5 in the Northwest, 4 in the South, 4 in the East, and only 2 in the West.

**Table 8. Hook licence catch landings by region 1991-1994. Source: Fisheries Association of Iceland.**

<b>Region</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>
Southwest	8.887	12.465	8.649	14.272
West	2.426	2.328	2.784	2.613
Western fjords	3.283	6.290	6.826	9.971
Northwest	1.144	1.660	1.663	2.029
Northeast	4.176	3.925	4.417	6.566
East	2.333	2.865	2.501	4.409
South	1.183	790	709	1.082
Abroad	573	164	249	144
<b>Total</b>	<b>24.005</b>	<b>30.478</b>	<b>27.791</b>	<b>41.086</b>
Number of vessels	912	980	962	990

When the ITQ system was adopted in 1984 small vessels were excluded from the system. Until 1991 all vessels under 12 GRT and subsequently 10 GRT were excluded. From 1991 onwards only vessels under 6 GRT are excluded. These small vessels are allowed to choose between ITQs and effort-days

restrictions. The latter option restricts the number of fishing days and limits the vessels to hook and line gear, and is generally referred to as the hook licence. A decreasing majority of these small vessels has opted for the hook licence since 1991. From 1990 to 1994 the hook licence vessels more than doubled their catch volume, from under 20 000 GMT to over 40 000. Table 8 shows the catch by the hook licence vessels in 1991-1994 and the regional distribution of that catch. As can be seen in the table, the regions have had mixed success in holding their share in this catch.

Despite initial claims that the ITQs would not only result in a decrease in the number of fishing vessels but also in a decrease in fishers employment, the opposite has actually occurred. In 1983 there were about 5.800 fishers employed in the harvesting sector, in 1990 they were 7.000, and in 1995 about 6.800. This increase is to be explained mainly by the increase in the number of freezer-trawlers, as mentioned above, but also by the increase in the number of small vessels. There has, on the other hand, been a decrease in processing employment, from 10.200 in 1983 to less than 7.000 in 1993. This decrease is in some explained by the increasing number of freezer-trawlers, but mainly with smaller demersal catches and increased emphasis on export of fresh fish. Despite the increased number of fishers, the catch value per fisherman has increased by over 20% since 1990 (Arnason 1996b).

### Regional transfers of quotas

A substantial portion of annual vessel quotas are traded every year (as shown in table 4 above). A smaller but very significant portion of TAC shares is also traded each year, resulting in fewer vessels in the fishery. Table 9 shows the transfers of permanent quota rights between regions for the period 1991-1993/94.35

**Table 9. Transfers of permanent quotas (TAC shares) between regions 1991-1993/94. Expressed in cod equivalents and as fraction of total allocated quotas for each year. Source: National Economic Institute (1996)**

	1991	1991/92	1992/93	1993/94
% of total allocation	7,3%	10,1%	14,1%	7,6%

Despite these rather high fractions, the net transfers to or from any particular region are smaller, amounting to about 1% point at the most.<sup>36</sup>

### Quota Holdings of the Largest Harvesting Firms

Shortly after the introduction of the ITQ system in the demersal fisheries there was discussion on the potential concentration of quotas. If TAC shares were transferable, it was argued, the bigger and richer harvesting firms would in a short time buy the quotas from the smaller firms. It was even suggested that if permanent quotas were made transferable a limit should be set for quota holdings of any single firm.<sup>37</sup> Table 10 shows the quota holdings of the 11 largest firms in the demersal fisheries.<sup>38</sup> Together they hold about 33% (30% if we use the constant cod equivalent values) of the demersal quotas and a little less than 32% of all ITQs.<sup>39</sup>

As Table 10 shows only five of these eleven firms have increased their share in the last five years to any extent. One of these harvesting firms has lost some share in the same period. In total these firms have increased their share by some 8% points (5% points in constant cod equivalent values), about 1.5% points of which are explained by the Sildarvinnslan Ltd. joining the ten largest harvesting firms.

Harvesting firm	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1996/97**
Grandi Ltd. (Southwest region)	4,34%	4,93%	4,89%	5,06%	6,12%	5,75%	4,68%
Utgerðarfelag Akureyringa (NE)	4,02%	4,60%	4,64%	4,97%	5,41%	5,41%	4,71%
Samherji Ltd. (NE)	3,20%	3,40%	3,38%	3,45%	3,60%	4,18%	3,71%
Skagfirdingur Ltd. (NW)	1,47%	1,46%	1,66%	2,21%	2,93%	3,34%	2,93%
Haraldur Bodvarsson Ltd. (W)	2,22%	2,30%	2,27%	2,30%	2,56%	3,32%	2,84%
Skagstrendingur Ltd. (NE)	2,24%	2,32%	2,29%	2,25%	2,23%	2,19%	2,11%
Ogurvik Ltd. (SW)	1,60%	1,67%	1,76%	1,89%	2,13%	2,08%	1,65%
Vinnslustodin Ltd. (S)	2,48%	1,96%	2,95%	2,53%	2,19%	2,04%	2,13%
Sildarvinnslan Ltd. (E)			1,49%	1,84%	1,81%	1,73%	1,74%
Saeberg Ltd. (NE)	1,68%	1,67%	1,64%	1,66%	1,73%	1,71%	1,59%
Midnes Ltd. (SW)	1,31%	1,60%	1,65%	1,68%	1,78%	1,61%	1,44%
<b>Total</b>	<b>24,56%</b>	<b>25,91%</b>	<b>28,62%</b>	<b>29,84%</b>	<b>32,49%</b>	<b>33,36%</b>	<b>29,53%</b>
* Shares of total cod equivalent values for each year.							
* TAC share using cod equivalent values from 1994/95. These values changed very little during the five year period, except in 1995/96							

That the 11 largest harvesting firms hold roughly 33% of all demersal quotas may be seen as a sign of concentration, especially considering that these same firms have increased their share by more than 20% in only 5 years.<sup>40</sup>

Harvesting firm	1993/94	Stockholders	Institutional*	Other corp.	Individuals
Grandi Ltd. (Southwest region)	4.89%	700	9%	91%	0%
Utgerðarfelag Akureyringa (NE)	4.64%	1804	100%	0%	0%

Samherji Ltd. (NE)	3.38%	7	0%	0%	100%
Skagfirdingur Ltd. (NW)	1.66%	124	31%	69%	0%
Haraldur Bodvarsson Ltd. (W)	2.27%	634	41%	0%	59%
Skagstrendingur Ltd. (NE)	2.29%	507	66%	24%	10%
Vinnslustodin Ltd. (S)	2.95%	183	72%	28%	0%
Ogurvik Ltd. (SW)	1.76%	7	0%	0%	100%
Sildarvinnslan Ltd. (E)	1.49%	311	100%	0%	0%
Midnes Ltd. (SW)	1.65%	4	0%	0%	100%
Saeberg Ltd. (NE)	1.64%	8	0%	50%	50%
<b>Total</b>	<b>28.62%</b>	<b>4289</b>			
* Under this heading are municipalities, pension funds, stock funds, etc.					

But looking only at the number of harvesting firms and their quota holdings can be somewhat misleading. Another view would be to look at number of shareholders that hold stock in these harvesting firms, since they should really be regarded as the owners of the harvesting rights. Table 11 shows how the top 50% of stocks are distributed in the eleven largest harvesting firms at the end of 1994. The number of stockholders in these corporations is well over 4 000, hardly a sign of concentration.<sup>41</sup>

### **Population Growth and Regional Migration**

Every government in Iceland has since the early 1950s had some platform on regional development, a regional policy if you will. For the most part these policies have not been articulated in detail but rather had the common emphasis on keeping the whole island populated. This has manifested itself in supplying credit and grants to marginal areas, such as providing capital to harvesting firms in the various villages around the island.

In the period following World War II the government put the emphasis on providing credit to renew the deep-sea trawler fleet and the herring fleet (multipurpose). Capital was also provided for new demersal freezing plants and herring reduction plants around the island in the following years. From about 1960 another injection of capital was provided to renew the multipurpose vessel fleet. Around 1970 credit was offered to renew the deep-sea trawler fleet and to renew freezing plants and expand capacity. Within a decade the policy of "a new stern-trawler in every port" had delivered just that and a few more. By 1980 there were 83 deep-sea stern trawlers and still only 67 official landing ports, not all which could receive these trawlers.

Despite all this investment in renewing the fleet, in expanding processing capacity and dock improvement, rural islanders voted for the comforts of urban living.

**Table 12. Population and population change 1940-1995. Source: Statistical Bureau of Iceland**

	1940	1950	1960	1970	1980	1990	1995

<b>Population</b>							
Southwest	47460	70648	98417	119822	135000	161182	174231
Other	74014	73325	78875	84756	94187	94526	93578
<b>Total</b>	<b>121474</b>	<b>143973</b>	<b>177292</b>	<b>204578</b>	<b>229187</b>	<b>255708</b>	<b>267809</b>
<b>Population share</b>							
Southwest	39.1%	49.1%	55.5%	58.6%	58.9%	63.0%	65.1%
Other	60.9%	50.9%	44.5%	41.4%	41.1%	37.0%	34.9%
<b>Population index</b>							
Southwest	1.00	1.49	2.07	2.52	2.84	3.40	3.67
Other	1.00	0.99	1.07	1.15	1.27	1.28	1.26
<b>Total</b>	<b>1.00</b>	<b>1.19</b>	<b>1.46</b>	<b>1,68</b>	<b>1.89</b>	<b>2.11</b>	<b>2.20</b>
	<b>1940-1950</b>	<b>1950-1960</b>	<b>1960-1970</b>	<b>1970-1980</b>	<b>1980-1990</b>	<b>1990-1995</b>	<b>1940-1995</b>
<b>Population change</b>							
Southwest	48.9%	39.3%	21.7%	12,7%	19,4%	8,1%	267,1%
Other	-0.9%	7.6%	7.5%	11,1%	0,4%	-1,0%	26,4%

Table 12 shows a rather continuous trend of increasing share of the population settling in the urban Southwest. Only in the period 1970-1980, during the rural investment boom, did the rural regions keep their share of the population increase. When the credit flow stopped the Southwest continued its gain.

The development of increasing share of the population becoming urban is of course nothing peculiar to Iceland. The same trend has been evident even longer in other Western industrial democracies. The ever increasing importance of the service industries explain this urbanisation to a large extent. Iceland has been lagging behind the others, as it is a latecomer to the group of developed countries.

### ***A Closer Look at Development in the Regions***

Above we have looked mainly at regional development in Iceland as if only a comparison of the Southwest to the other regions as a whole matter. The other regions are of course only similar and have common characteristics to some degree. In other respects these regions are somewhat different, both in terms of urbanisation and the structure of local industry. A brief description will therefore be presented here of each particular region.

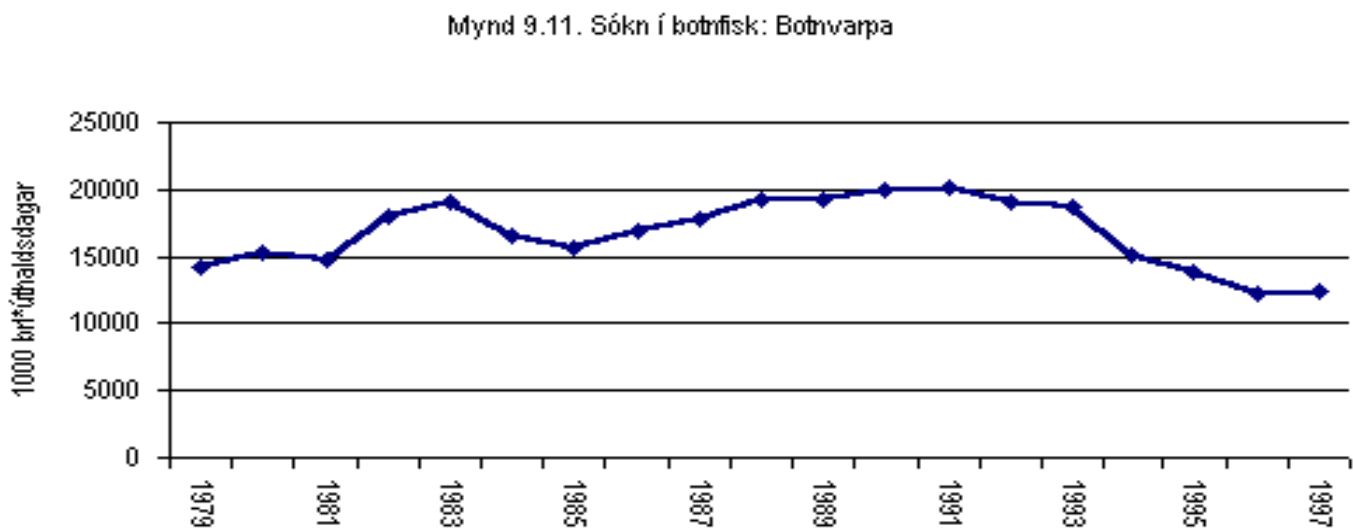
#### **Western Region**

The West is the fourth most (and least) populous region in Iceland with a little over 14.000 inhabitants (see Table 13). The region includes the seventh largest town in Iceland, Akranes, with a population of 5.100.

	1940	1950	1960	1970	1980	1990	1995
<b>Population</b>	9.936	9.975	11.973	13.205	14.884	14.537	14.154
<b>Share</b>	8.2%	6.9%	6.8%	6.5%	6.5%	5.7%	5.3%
	<b>1940-1950</b>	<b>1950-1960</b>	<b>1960-1970</b>	<b>1970-1980</b>	<b>1980-1990</b>	<b>1990-1995</b>	<b>1940-1995</b>
<b>Change</b>	0.4%	20.0%	10.3%	12.7%	-2.3%	-2.6%	42.5%

For the region as a whole a little over a fourth is employed in fishing and fish processing. About 15% are engaged in agriculture and another 15% in heavy industry.

**Figure 9. The West's share in demersal TACs and landings. Source: Fisheries Office, Fisheries Association**



The Western region has increased its share of the TACs by more than 1% point since 1984. Its share of demersal landings has decreased by less than 1% point in the period (see Figure 9). This decrease can be explained by the fact that the fishing grounds off this region have not been productive in recent years and vessels from elsewhere no longer fish there. In 1994 the region's vessels exported less than 6% of their demersal catches unprocessed.

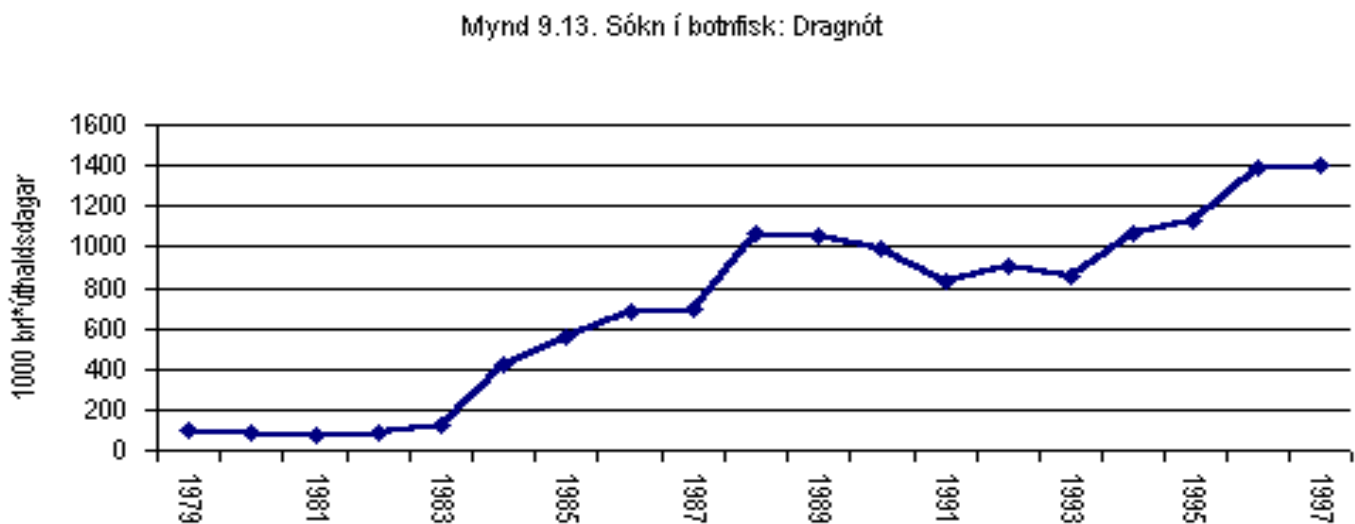
### Western Fjords Region

The Western fjords is the least populous region in Iceland with only 9.000 inhabitants, having lost close to a third of the population since 1940 (see Table 14). More than a third reside in the town of Isafjordur. The Western fjords are heavily dependent on the fisheries and in the region over 40% are employed in fishing and fish processing. Less than a tenth is engaged in agriculture.

	1940	1950	1960	1970	1980	1990	1995
<b>Population</b>	12.953	11.166	10.507	10.050	10.479	9.798	9.018
<b>Share</b>	10.7%	7.8%	5.9%	4.9%	4.6%	3.8%	3.4%
	<b>1940-1950</b>	<b>1950-1960</b>	<b>1960-1970</b>	<b>1970-1980</b>	<b>1980-1990</b>	<b>1990-1995</b>	<b>1940-1995</b>
<b>Change</b>	-13.8%	-5.9%	-4.3%	4.3%	-6.5%	-8.0%	-30.4%

The region has lost about 2% points of the TAC shares since 1984 and its share of demersal landings has decreased by about 1% point in the period (see Figure 10). In 1994 the region's vessels exported about 5% of their demersal catches unprocessed.

**Figure 10. The Western fjords' share in demersal TACs and landings. Source: Fisheries Office, Fisheries Association**



## Northwest Region

The Northwest is the second least populous region in Iceland with only 10.200 inhabitants. Since 1940 the region has lost almost 3% of its residents (see Table 15). Fishing and fish processing employs just over fifth and agriculture employs a similar portion.

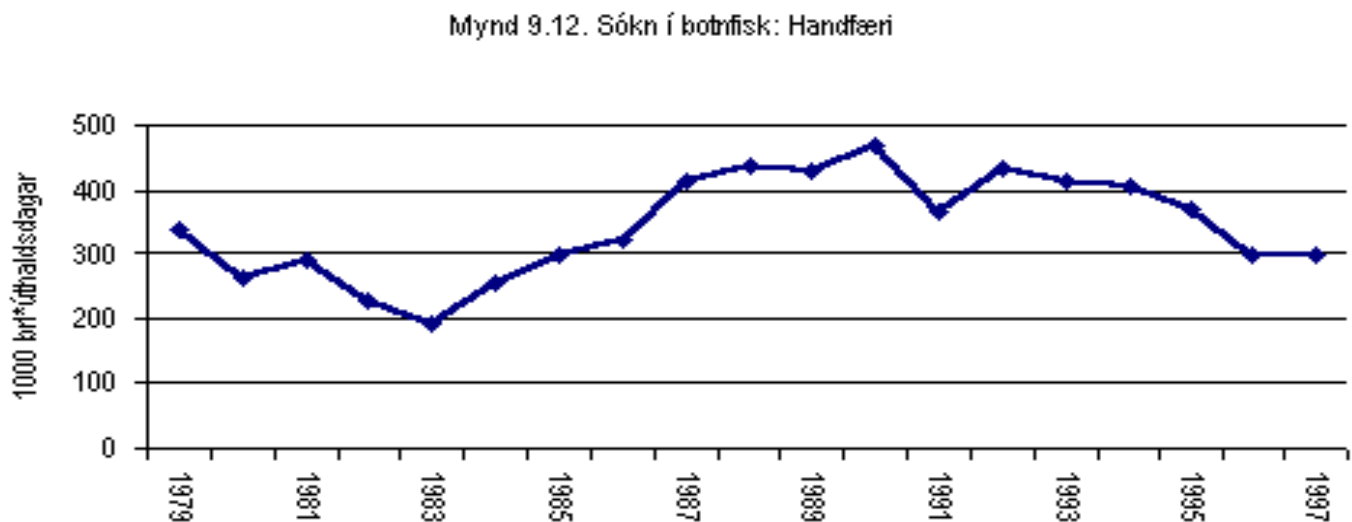
	1940	1950	1960	1970	1980	1990	1995
<b>Population</b>	10.496	10.264	10.241	9.909	10.631	10.446	10.208



<b>Share</b>	8.6%	7.1%	5.8%	4.8%	4.6%	4.1%	3.8%
	<b>1940-1950</b>	<b>1950-1960</b>	<b>1960-1970</b>	<b>1970-1980</b>	<b>1980-1990</b>	<b>1990-1995</b>	<b>1940-1995</b>
<b>Change</b>	-2.2%	-0.2%	-3.2%	7.3%	-1.7%	-2.3%	-2.7%

The Northwest region has increased its share of the TACs by more than 1% point since 1984. Its share of demersal landings has decreased by a little less than 1% point in the period (see Figure 11). This decrease may be explained by export of unprocessed fish. The region's vessels exported almost 17% of their demersal catches in 1994.

**Figure 11. The Northwest's share in demersal TACs and landings.** *Source: Fisheries Office, Fisheries Association*



## Northeast Region

The Northeast is the second most populous region with almost 26.700 inhabitants (see Table 16). Close to 60% of the regions' population reside in Iceland's fourth largest city, Akureyri, and its vicinity.

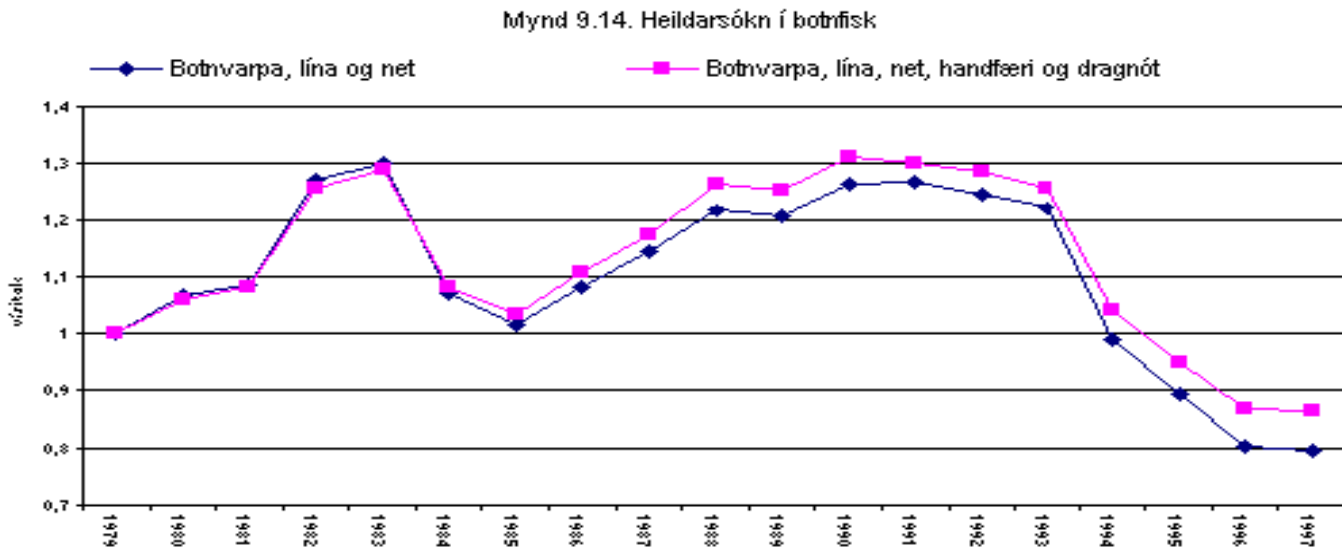
	<b>1940</b>	<b>1950</b>	<b>1960</b>	<b>1970</b>	<b>1980</b>	<b>1990</b>	<b>1995</b>
<b>Population</b>	16.910	18.368	19.769	22.225	25.700	26.127	26.664
<b>Share</b>	13.9%	12.8%	11.2%	10.9%	11.2%	10.2%	10.0%
	<b>1940-1950</b>	<b>1950-1960</b>	<b>1960-1970</b>	<b>1970-1980</b>	<b>1980-1990</b>	<b>1990-1995</b>	<b>1940-1995</b>
<b>Change</b>	8.6%	7.6%	12.4%	15.6%	1.7%	2.1%	57.7%

About a fifth of the employment in the region is in fishing and fish processing. Less than a tenth is



engaged in agriculture and about 15% are engaged in various small scale industries.

**Figure 12. The Northeast's share in demersal TACs and landings.** *Source: Fisheries Office, Fisheries Association*



The region has increased its TAC share by about 5% points since 1984, far more than any other region. The region's share of demersal landings have also increased by about 3% points (see Figure 12). In 1994 the region's vessels exported only about 3.5% of their demersal catches unprocessed, less than any other region.

### Eastern Region

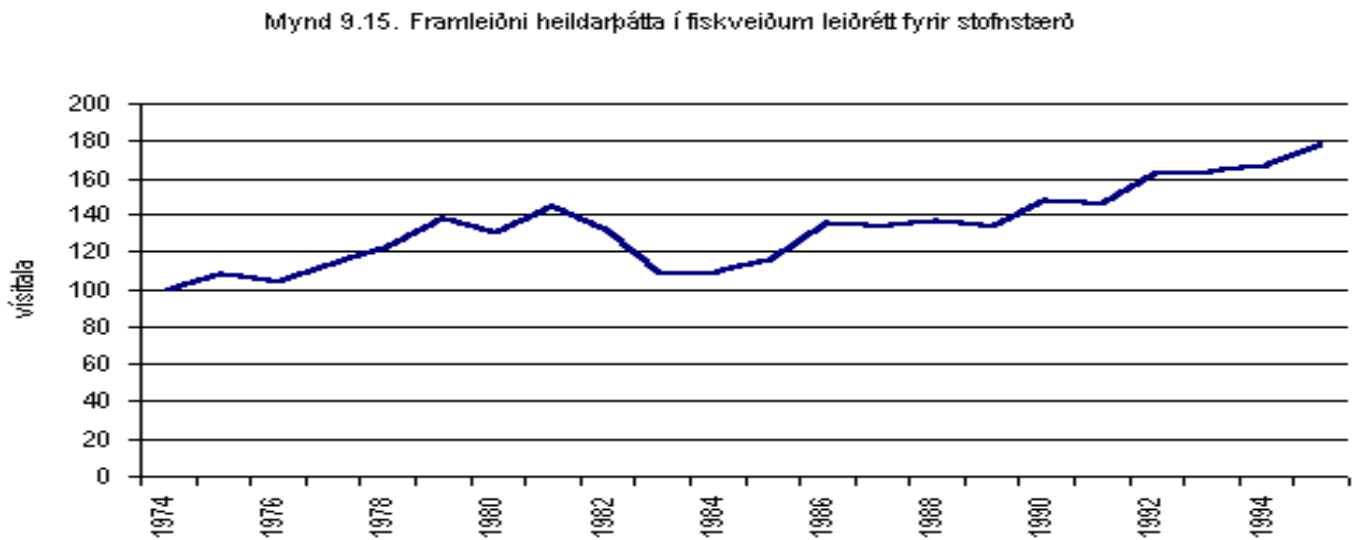
The Eastern region is the third least populous region in Iceland with a little less than 13.000 inhabitants (see Table 12). A third of the employment in the region is in fishing and fish processing and a tenth is engaged in agriculture.

	1940	1950	1960	1970	1980	1990	1995
<b>Population</b>	10.123	9.705	10.367	11.315	12.856	13.216	12.780
<b>Share</b>	8.3%	6.7%	5.8%	5.5%	5.6%	5.2%	4.8%
	<b>1940-1950</b>	<b>1950-1960</b>	<b>1960-1970</b>	<b>1970-1980</b>	<b>1980-1990</b>	<b>1990-1995</b>	<b>1940-1995</b>
<b>Change</b>	-4.1%	6.8%	9.1%	13.6%	2.8%	-3.3%	26.2%

The Eastern region has decreased its share of the TACs by a little more than 1% point since 1984. Its share of demersal landings has decreased by about the same (see Figure 13). In 1994 the region's vessels

exported 8% of their demersal catches unprocessed.

**Figure 13. The East's share in demersal TACs and landings.** *Source: Fisheries Office, Fisheries Association*



### Southern Region

The South is the third most populous region in Iceland with close to 21.000 inhabitants (see Table 18). The region includes the Westman Islands with a population of almost 5.000. The Westman Islands are almost exclusively dependent on the fisheries, but for the region as a whole a little over a fifth is employed in fishing and fish processing. Another fifth is engaged in agriculture, this being the most important farming region Iceland.

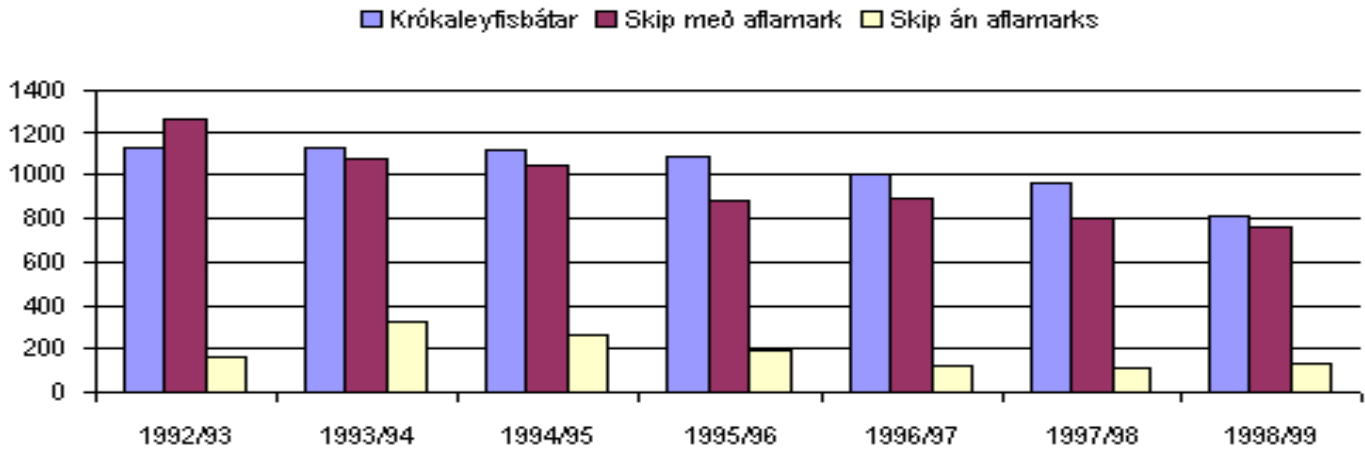
	1940	1950	1960	1970	1980	1990	1995
<b>Population</b>	13.596	13.847	16.018	18.052	19.637	20.402	20754
<b>Share</b>	11.2%	9.6%	9.0%	8.8%	8.6%	8.0%	7.7%
	<b>1940-1950</b>	<b>1950-1960</b>	<b>1960-1970</b>	<b>1970-1980</b>	<b>1980-1990</b>	<b>1990-1995</b>	<b>1940-1995</b>
<b>Change</b>	1.8%	15.7%	12.7%	8.8%	3.9%	1.7%	52.6%

Despite having the same share of the TACs in 1995/96 as the region had in 1984, its share of demersal landings has decreased by about 5% points in the period (see Figure 14). Most of this difference between TAC shares and landings can be explained by the fact that this region has been in the forefront of unprocessed fish exports. In 1994 the region's vessels exported about 20% of their demersal catches unprocessed. No other region exported as large a share and only the Northwest was close with about 17%. From the mid 1980s the export of unprocessed catches in containers has become common, these

exports average a little over 10% of all demersal catches of the country's fishing fleet. Another explanation can be found in the rise of wetfish floor markets in the Southwest in 1987 and subsequently in the Southern region.<sup>42</sup>

**Figure 14. The South's share in demersal TACs and landings. Source: Fisheries Office, Fisheries Association**

Mynd 9.16. Fjöldi skipa með veiðileyfi



## Southwest Region

The Southwest is the most populous region by far with close to 175 000 inhabitants (see Table 19). The region includes the capital city of Reykjavik with a population of over 104 000 and additional 54 000 in the surrounding suburbs. The capital city area has very little reliance on the fishing industry, only about 3% of employment, and for the region as a whole a little over 6% are employed in fishing and fish processing. For the region, almost a fifth are in public employment and another fifth are in manufacturing and construction. More than half are engaged in the services and agriculture is almost non-existent in the region.

**Table 19. Population and population change in the Southwest 1940-1995. Source: Statistical Bureau**

	1940	1950	1960	1970	1980	1990	1995
<b>Population</b>	47.460	70.648	98.417	119.822	135.000	161.182	174.231
<b>Share</b>	39,1%	49,1%	55,5%	58,6%	58,9%	63,0%	65,1%
	<b>1940-1950</b>	<b>1950-1960</b>	<b>1960-1970</b>	<b>1970-1980</b>	<b>1980-1990</b>	<b>1990-1995</b>	<b>1940-1995</b>
<b>Change</b>	48.9%	39.3%	21.7%	12.7%	19.4%	8.1%	267.1%

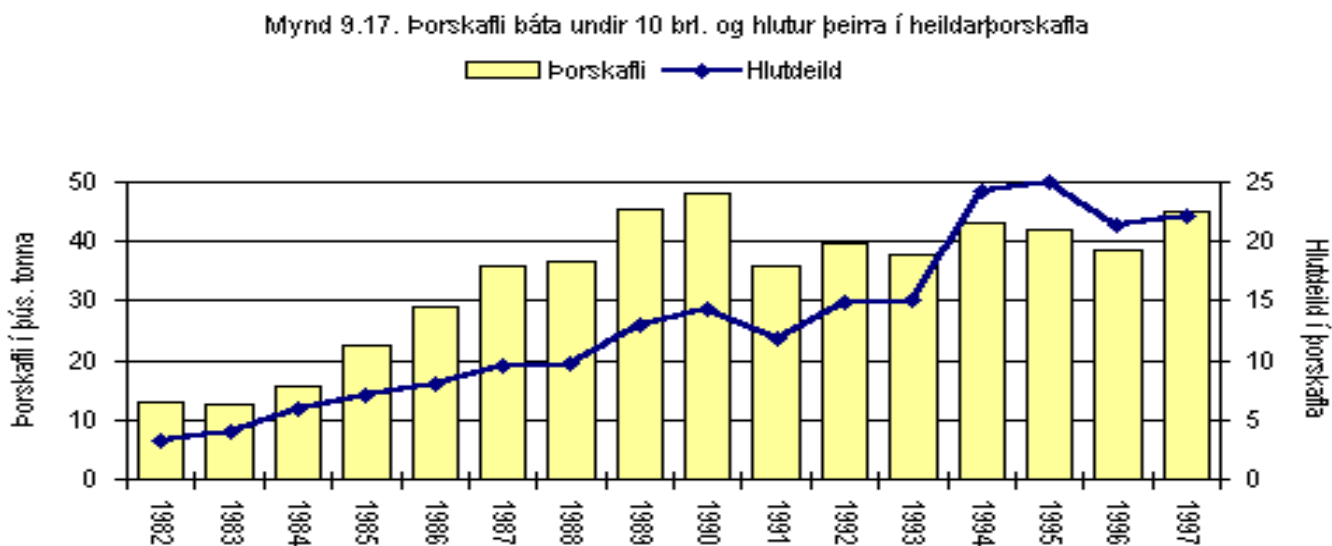
The Southwest region has lost some share of the TACs from 1984. Its share of demersal quotas has

decreased by over 3% points in the period. As Figure 15 shows the decrease was mainly in the first half of the since the inception of the ITQ system. Since 1990 its TAC shares have been increasing again. Landings of demersal catches, on the other hand, have risen by over 6% points since 1983. Most of this difference between TAC shares and landings can be explained by the fact that this region has the leading floor markets. Three of the four largest wetfish floor markets are located in the region and they have attracted vessels from the other regions.

Wetfish prices also tend to be higher in this region because of the floor markets, but also because the region has several firms that specialise in exporting little processed and fresh fish products by air freight. The only international airport in Iceland is located in the region and the region also has the best and biggest ports.

In 1994 the region's vessels exported close to 9% of their demersal catches unprocessed, which is about the average for all regions.

Figure 15. The Southwest's share in demersal TACs and landings. *Source:* Fisheries Office, Fisheries Association



### Regional and Community Prospects

Overall the verdict on the regional and social impact of the ITQ system must be favourable, if anything. In terms of Iceland's regional policy, successive governments have since the early 1950s attempted to support and expand employment opportunities outside of the South-western region. This policy has a record of failure, except in the 1970s. During the seventies' government encouraged investment in new fishing vessels and processing plants and provided almost unlimited credit to these regions. The result was a halt in the flow of urban migration, which then resumed as the credit flow stopped.

The continuous depopulation of the rural regions, in terms of population share and sometimes in terms of fewer people, can not be attributed to the introduction of ITQs. There has been a trend of depopulation throughout the century, with a brief halt in the seventies, and this is likely to continue. The trend is not peculiar to Iceland, it can be observed in any Western economy. The urbanisation simply

manifests the increased service orientation of these economies.

The ITQs have not resulted in a flow of quotas to the Southwest. In terms of TAC shares in the demersal fisheries the Southwest has actually lost over 3% points (more than 10% of its 1984 quota holdings) to the other regions. The North-eastern region has gained 5% points (a fourth of their current quota holdings) and the West and Northwest has gained slightly, while the East and Western fjords have lost some. The Southwest which accounts for about two thirds of Iceland's population but only a fourth of the TAC shares in the demersal fisheries.

In terms of demersal landings for domestic processing plants (excluding unprocessed exports) the Southwest has gained considerably. Since 1983 the Southwest's share in the demersal landings has increased by almost a fourth (roughly 6% points). The Southwest's gain seems to come mainly from the Southern region, which has lost roughly 5% points in the same period. The basic explanation for this is the increased catch volume that is handled by the wetfish floor market in the Southwest. These markets attract landings from the other regions, especially the Southern region as it is geographically rather integrated with the Southwest. The South region also exports a large portion of its catches unprocessed.

The ITQ system has therefore not had any adverse regional or social impact in Iceland. It has, if anything, had rather a favourable impact in some regions. There is no reason to expect that the ITQs will in the future have negative regional effects. The opposite is a more probable development. With a better state of the fish stocks today, TACs will be going up in the future, starting with the TAC for cod that increased by some 20% for the 96/97 fishing year.<sup>43</sup> Increased quota holdings in the rural regions can produce increased landings and income. Whether that will materialise may depend on other variables, such as market prices for various fish products, the changing structure of the processing plant industry, and the increased share of the processing vessels, to name a few.

## **Additional Fisheries Management Methods**

As the ITQ is only a harvesting right and not a right in the fishery itself, the role of the government in the fisheries management is large. In addition to the ITQ system described above there are several other supplementary management measures in effect. These are mostly designed for conserving the fish stocks and increasing the value of the landed catch. The most important of these additional management measures are: Area closures, seasonal closures, gear regulations, and rules on the minimum size of catch.

## **The New Fish Wars**

Each time Icelanders have claimed an extended exclusive fisheries zone around the island, they have had to fight off foreign vessels who would not bide by the new limits. These episodes have commonly been referred to as the Cod Wars, especially as they relate to British fishing vessels. The last Cod War was fought in 1976, when the Icelanders gained control of all Icelandic fish stocks, i.e. all fish stocks within 200 miles of the island.

In recent years Icelanders have turned to the offensive - Icelandic fishing vessels have sailed into far away international waters to compensate for smaller quotas in domestic fisheries. In 1995 the demersal catch of these Icelandic vessels in international waters was around 42 000 MT, of which 75% was cod

and 20% shrimp. Further, vessels have increased their effort in catching deep-sea redfish, which migrates from Greenland waters, through international waters, into Icelandic waters, and blueling just inside and outside of the 200 mile exclusive zone. The catch in these stocks is about 45 000 MT in recent years.

The Icelandic government has been participating in international negotiations on several fronts in recent years. They negotiated with Norway and Greenland on the capelin stock, which migrates into their waters. They negotiated with Norway and the EU on the Norse herring stock, which migrates into Icelandic waters in the Summer. Icelandic vessels were allowed a catch of 190 000 MT in 1996. The Ministry allocated IQs for that fishery to 67 vessels, 59 purse-seiners and 8 deep-sea trawlers.

There were also talks with Norway, Russia, Faeroe Islands and Poland on the deep-sea redfish, as these nations claim history of catch in that stock. Although these talks have not produced sufficient results, the Ministry will issue ITQs, based on catch history, in that fishery in 1997. The government also negotiated with Canadian authorities and reached an agreement on the shrimp fishery on the Flemish Cap. In continuation of the agreement, the Ministry has allocated ITQs to all Icelandic vessels with catch history on the Flemish Cap. There have also been on and off talks with Norway, Finland and Russia on demersal fishing in the Barents Sea.

## Conclusion

Versions of the ITQ fisheries management system have been in operation in Icelandic fisheries since 1979. The evidence on the performance of this system is generally favourable.

The ITQ system in the herring fishery appears to have resulted in increased efficiency. In the capelin fishery the ITQ system also appears to have produced economic benefits, although the evidence is less conclusive. In the demersal fisheries the evidence is more mixed. The fishing fleet has only decreased in the most recent years. Aggregate fishing effort decreased immediately after the introduction of the ITQs in 1984 only to increase again in 1986-1990. From 1992 onwards there has, however, been a dramatic decrease in effort.

In interpreting the development of the demersal fisheries since 1984, one should bear in mind the imperfections of the ITQ system especially in the period 1985-1990. During that period there was widespread use of the effort quota option and the fisheries management system was in fact only partially an ITQ system in those years.

Despite increasing evidence on the favourable impact of the ITQ system there is still a debate on its merits. The debate is focused on three main issues: economic efficiency, equity, and regional implications.<sup>44</sup> A fourth issue has also been raised in this discussion and it concerns the condition of the fish stocks. Although this issue is based somewhat on a misunderstanding of the ITQ system, it has been associated with it.

The Icelandic ITQ system does not appear to have had an adverse regional impact so far. In spite of very substantial transfers of temporary and permanent quotas, their regional allocation has remained remarkably invariant. In fact, the regional pattern of demersal landings show a much greater volatility

than quota holdings both before and after the introduction of the ITQ system. The main discernible trend is some movement of quotas from the south-west region including Reykjavik to the northern part of the country. This movement, incidentally, conforms nicely with the objectives of regional policy in Iceland.

All this should increase support for the system and its continuation.

### Endnotes:

1. ITQs are, of course, imperfect property rights. An ITQ is a harvesting right and not a property in the fish stock. They are therefore different from what we refer to as property right in land. As pointed out by Hannesson (1994), ITQs are comparable to a right to extract a certain quantity of timber from a given forest or the right to harvest a certain number of deer from a given colony. Although this may give the necessary incentives to cut the timber and catch the deer in efficient ways, it may not be suitable for the optimal husbandry of the forest or the colony of deer. See also Scott (1988, 1996) and Edwards (1994) for a clear presentation on the different property rights arrangement.
2. See Arnason (1995a:102-103).
3. The quotas were not permanent, but determined annually by dividing the TAC by the total number of eligible vessels applying to participate in the fishery.
4. In fact, it had been observed that there were various methods for bypassing the non-transferability of the IQs (Arnason 1996a).
5. Owners of the bigger purse-seine vessels met in June 1980 and decided that they would ask the Ministry of Fisheries to limit entry into the capelin fishery and allot a TAC share to each licensed vessel. Only 52 vessels received a licence but there had been 68 vessels engaged in the capelin fishery the preceding year.
6. In 1977, deep-sea trawlers were allowed to fish for cod 323 days a year but in 1981 they were only allowed 215 days a year.
7. On December 22, 1983, the parliament passed an amendment to the *Fisheries Act* of 1976. The amendment basically gave the Minister of Fisheries discretionary power to put a vessel quota system in place. In the upper house of the parliament, the amendment received only the minimum majority necessary, 11 of 20 MPs in support. The annual meeting of the Fisheries Association of Iceland had been held on December 2 and 3. At the end of that meeting, after some heated discussion, a proposal was agreed on to ask the Ministry of Fisheries to experiment with IQs for the demersal fisheries for one year, in 1984.
8. The *Fisheries Management Act* of 1988, became law on January 8, 1988.
9. The *Fisheries Management Act* of 1990 was amended in 1992 and 1994, both dealt with restricting temporary transfers of quotas and the latter also extended the part-time fleet's exemption from the ITQ system. The *Act* was again amended in 1996. See further, below.
10. That rule changes in the fisheries are always a response to crises, i.e. lower income for fishermen, fits nicely with Libecap (1989). One should bear in mind, though, that even if the adoption of an ITQ system is a rather radical rule change, it was not new to the Icelandic fisheries as IQs already existed in the herring and capelin fisheries at this time. The favourable experience of quotas in these fisheries had as early as 1981 influenced many vessel owners that nothing short of an ITQ system was needed. Despite increasing catches of demersal species the fishing industry was running at heavy losses in 1981-1983.
11. It might be more accurate to say that the ITQs are indefinite rights, rather than permanent rights. The parliament can, in principle, at any time decide to return to open-access fisheries. See Edwards (1994) on clear presentation on property rights concepts.
12. The Marine Research Institute has its own vessels to research the state of the fish stocks. In addition the

- Institute relies on information from the fishers, such as with the annual trawler-rally and the gillnetters-rally.
13. The cod fishery plays a very substantial role in the economy and therefore, not surprisingly, successive governments have been reluctant to curtail the cod TACs in accordance with the recommendations of the MRI. Only in the 1990s has the Ministry followed this advice and even stood firm on that decision despite political pressure, even from within the government. In addition to the government fisheries researchers, the vessel owners association employs its own researchers.
  14. They include eight demersal species - cod, haddock, saithe, redfish, Greenland *halibut* (*Reinhardtius hippoglossoides*, Pleuronectidae), plaice (*Hippoglossoides platessoides*, Pleuronectidae), catfish and witch, two pelagic species - herring and capelin - as well as shrimp, lobster and scallops. Together these species account for over 90% of the catch value.
  15. The management of inshore shrimp has moved from processor quotas to vessel quotas.
  16. In some fisheries, such as the capelin and inshore shrimp fisheries, the management periods are less than a year (seasonal). The same rule nevertheless applies.
  17. Cod equivalent values in 1996/97 are: Cod 1.00, haddock 1.00, saithe 0.60, redfish 0.80, plaice 1.20, Greenland halibut 2.40, catfish 0.70, witch 1.50, capelin 0.07, herring 0.10, lobster (tails) 9.80, shrimp 1.00 and scallops 0.40.
  18. One amendment stipulates that if a fishing vessel did not harvest at least 25% of its annual quota for 2 years in a row, it would forfeit its TAC share. In another amendment this harvesting requirement was doubled. It was also stipulated that no vessel can more than double its quota corresponding to its TAC share by temporary quota purchases. It may, however, acquire permanent quota shares without limit. In a temporary amendment, expired at the end of 1995, no vessel could buy annual quotas if it had during the same year sold more than 15% of its quota, nor could it sell if it had previously bought more than 15% of its annual quota.
  19. Vessel owners are not allowed to have the crew share costs in quota transfers.
  20. One consequence of restricting access and licencing is that the licences become valuable if they are transferrable. As restricted access and licencing usually accompanies an ITQ system, this "wealth effect" or "windfall" is often associated wrongly with the ITQs. This "wealth" or "windfall" is the result of the licencing, not the ITQs.
  21. See Arnason (1995a)
  22. These 40 vessels catch from the Icelandic herring stock in the Autumn and Winter months. Roughly half of these vessels also participate in the Norse herring fishery which resumed in 1994. The Norse herring stock migrates between Norwegian jurisdiction and into Icelandic and Greenland waters. IQs were issued for this fishery in 1996. It is highly probable that the Ministry will issue permanent ITQs in 1997.
  23. A part of the capelin stock migrates seasonally (in the Summer-Autumn) into Greenland and Norwegian fisheries jurisdiction. The capelin is therefore a shared stock, but by an agreement with these two countries Iceland determines the annual TAC, which is then shared between the three countries. Iceland's share is 78% of the TAC and Norway and Greenland receive 11% each. In Winter the capelin is exclusively fished in Icelandic waters.
  24. The number of vessels participating in the capelin fishery in 1993 was down to 39. In the Summer of 1994 the Norse herring fishery was resumed and that seems to have induced some vessel owners to revert to purse-seine fishing. The TAC for the Norse herring in 1995 was 150 000 MT and will be 190 000 MT in 1996. The size of the capelin stock has also been growing and the TAC increasing as a result. The capelin catch has averaged less than 680 000 MT since 1980. The total catch in 1995/96 fishing year was 1 135 000 MT.
  25. It could be argued that a decline in effort and capital should be expected since the demersal catch in domestic waters has been declining. But it should be remembered that Icelandic vessels have increased their catches in international waters in recent years.
  26. Arnason (1995a:126-127) tests the hypothesis that there is no structural break in the evolution of fishing effort



between the two management regimes. The hypothesis is resoundingly rejected.

27. Arnason (1996:86-87) estimates that the economic rents in the demersal fisheries in 1994 amounted to a little over 200 million US\$, or just over 50% of the maximum attainable rents.

28. Here is a clear example of rent-seeking in the fisheries. In 1988 vessels in size between 10-12 GRT had to convert to ITQs. At the same time it was announced that other smaller vessels would have to convert to ITQs in 1991, and the vessel's catch in the years 1988-1990 would determine its quota share. This fuelled investment in small vessels and increasing fishing effort on their part. In 1990 there were almost 1800 vessels under 12 GRT in the fleet. Since then their number has decreased by more than 300. These vessels have officially retired, cashing in on their licences by selling their TAC shares.

29. See for example Scott (1989, 1996), Arnason (1990, 1995b), and Libecap (1989).

30. See Scott (1988;1989) for more details.

31. See *Ulfjotur*, 1995.

32. There was of course some debate on the initial allocation of quotas, which may be separated into three aspects. The first concerns the base years for catch history. This was basically solved by allowing vessels to adjust their quotas through an effort restrictions option in 1985-1990. The second aspect concerns whether others than vessels should receive quota, such as processing plants and fishers. The fact that a large majority of the demersal catch was caught by vessels owned by firms with processing plants quickly made this a none-issue. The third aspect concerns whether the government should have charged the vessels for the initial allocation of quotas. In continuation a debate has arisen on whether the government should charge the vessels "rent" for using the resource (see Arnason, *et. al.*, 1992). For arguments on the efficiency and justness of the initial allocation, see Gissurason (1990), Arnason and Runolfsson (1991), and Runolfsson (1992).

33. This description applies to most of the demersal, crustacean, shellfish fisheries, and to a lesser extent to the herring fisheries. Together these account for around 90% of the total value of the Icelandic fisheries. The reduction fisheries, based primarily on capelin and herring, are organised somewhat differently. See Arnason (1995a; 1996a) for further details on the organisation of the fishing industry.

34. The weight for the different species, except cod, changes slightly each year. The Ministry of Fisheries puts out new regulation for each fishing year, announcing the various TACs, cod equivalent values, etc. By changing the cod equivalent values for the different species they approximate closer the actual market value of the catches of these species. Changes in cod equivalent values explain some of the variation in quota holdings and groundfish landings listed in Tables 1 and 2. These changes in cod equivalent values are rather insignificant between single years, except for the fishing years 1995/96 and 1996/97.

35. Transfer of permanent TAC shares between vessels with different owners has been allowed since 1988.

36. Quota holdings by foreigners is not an issue in Iceland, since foreigners are not allowed to own fishing vessels in Iceland. Foreign investment in Icelandic fish processing firms is also restricted. Icelanders have, on the other hand, invested in harvesting and processing firms abroad.

37. The *Fisheries Management Act of 1990* has a clause on a limit to the quota holdings of any single vessel. The clause states that no vessel can have a larger TAC share than it could possibly catch within the fishing year. This clause became part of the Act to counter circumvention by the wetfish floor markets, as they had been buying TAC shares and registering them on a single small vessel. They did this for the purpose of increasing market activity, that is providing quotas for vessels who sell on the market. Further, in January 1997 the Minister of Fisheries appointed a workgroup to address the issue of whether an upper limit should be set on ITQ holdings of individual firms.

38. Table 10 is not quite correct. The 9<sup>th</sup> largest demersal ITQ firm is Utgerðarfélag Dalvíkinga Ltd. (NE) with 1,75% (1,71% in constant cod equivalent values).

39. The 50 largest harvesting firms held roughly 60% of all ITQs at the start of the 1996/97 fishing year (Arason

1996:120-122).

40. Of these 11 firms, 8 exhibit a high degree of vertical integration, i.e. processing almost all the catches of their vessels in their own plants.

41. It is interesting to note that the firm Samherji Ltd., although founded in 1972, came under current ownership only in 1983. At the change of ownership in 1983, the only asset of the firm was one deep-sea trawler. Samherji Ltd. has since grown to be the largest quota holder in Iceland and has also invested in other firms, domestic and foreign. Samherji Ltd, and its subsidiaries, today operate 20 vessels from 4 countries. In addition they operate 2 shrimp processing plants, 2 reduction plants, 1 freezing plant and a marketing office in England. This is an interesting example to counter arguments that new entry is difficult within an ITQ system.

42. Both sellers and buyers at any particular floor market can come from any region. There is no need to travel, since most of the floor markets offer bidding through telecommunication. Actually, some of the floor markets do not even require the vessels to land the fish before a sale. The vessel captain can telephone the market and register his catch (or estimated catch) and announce at which port he will be arriving. The catch is then sold unseen to the buyers. This apparently does not create any problems since about a fourth of the volume of the floor markets are sold this way.

43. This was the first increase in the TAC for cod in 12 years.

44. The equity issue is based on Article 1 of the *Fisheries Management Act* of 1990, which states that the fish stocks in Icelandic waters are the common property of the Icelandic people. There is an ongoing political debate on whether the rents now accruing to ITQ (licence) holders should be partly or fully expropriated and returned to the people (government). Some economists have also used the argument of efficient taxation as applying to the fisheries rent. On the possible inefficiency of such a tax see Johnson (1995).

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