

THE EFFECTS OF INTRODUCING TRANSFERABLE PROPERTY RIGHTS ON FLEET CAPACITY AND OWNERSHIP OF HARVESTING RIGHTS IN ICELAND'S FISHERIES

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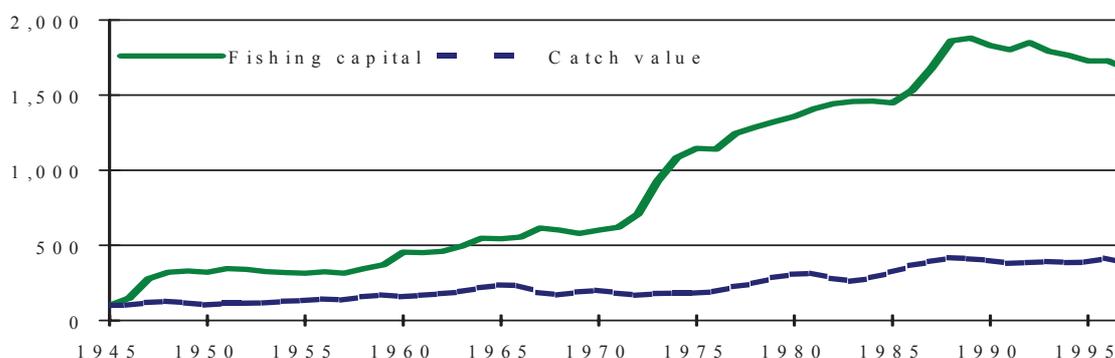
1. INTRODUCTION

1.1 Background

Until the extension of the fisheries jurisdiction to 200 nautical miles in 1976, the Icelandic fisheries were, for all intents and purposes, international and open-access 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 nautical miles all but eliminated foreign participation in the traditional Icelandic fisheries. Since then international fishing for deep-sea redfish and blue ling outside the 200 nautical miles has developed. However, the initial management measures taken in the demersal fisheries, following the extension of the fisheries jurisdiction in 1976, were inadequate and did not alter the common-property nature of these fisheries as far as domestic fishers were concerned. They were still forced to compete for a share of 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 investment of fishing capital and fishing effort, compared to the reproductive capacity of the fish stocks. The post-war development of fishing capital and catch values since 1945 is illustrated in Figure 1.

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

Figure 1
Fishing capital and catch values 1945-1997 (index 1945=100).



Source: National Economic Institute.

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 nautical miles, was limited. With the *de facto* recognition of the exclusive 200-mile zone in 1976, the situation changed dramatically: the Icelandic fisheries gradually came under increased management, culminating in a uniform system of individual transferable quotas (ITQs) in practically all fisheries since 1991.

1.2 The pelagic fisheries

Due to an alarming decline in the Icelandic herring stocks, an overall quota (total allowable catch, TAC) was imposed on this fishery in 1969. These stocks were fished almost exclusively by Icelanders. Since this did

not halt the decline in the stocks, a complete moratorium on herring 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 for a single season at a time. The quotas were, therefore, not permanent, but determined annually by dividing the TAC by the total number of eligible vessels applying to participate in the fishery. In 1979, spokesmen for the industry requested fairly unrestricted transfers of quotas between vessels. The Ministry of Fisheries permitted transfers, as it had observed that there were various methods for bypassing the non-transferability of the vessel quotas (Arnason 1996a). The *Fisheries Management Act 1990* made the vessel quota system in the herring fishery part of the general ITQ system.

The capelin fishery, which became a major fishery 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 in favour of this policy were the same as in the herring fishery discussed above, except in this case the industry asked for regulation. 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 quota to each licensed vessel. Only 52 vessels received a licence, but there had been 68 vessels engaged in the capelin fishery during the preceding year.

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 1990*.

1.3 Demersal fisheries

In connection with the extension of Iceland's exclusive fishing zone to 200 nautical miles in 1976, the major demersal fisheries were subjected to overall catch quotas. These quotas, recommended by the marine biologists, soon proved quite restrictive, and difficult to enforce. As a result, individual effort restrictions, taking the form of limited allowed-fishing-days for each vessel, were introduced in 1977. However, as new entries remained possible, the demersal fleet continued to grow, and the allowable-fishing-days had to be reduced from year to year. In 1977, deep-sea trawlers were allowed to fish for cod for 323 days a year, but in 1981 they were only allowed 215 days of fishing a year. It gradually became obvious to all concerned that this system was economically wasteful.

In 1984, following a sharp drop in the demersal stock and catch levels, a system of individual vessel quotas was introduced. The Fisheries Association of Iceland, an association of vessel owners, processing-plant owners and of fishermen, held its annual meeting on December 2 and 3, 1983. At the end of that meeting, after some heated discussion, it was agreed on to ask the Ministry of Fisheries to institute a system of ITQs in the demersal fisheries for one trial year: 1984. On December 22, 1983, the Parliament passed an amendment to the *Fisheries Act 1976*, basically giving the Minister of Fisheries discretionary power to put a vessel quota system in place. In the upper chamber, the amendment received only the minimum support necessary: 11 out of 20 MPs.

Because of generally favourable results of the system, the quota management system was extended for 1985 and 1986-1987. However, to ensure sufficient political support for the system, an important provision was included in 1985: vessels were allowed to opt for effort-restrictions instead of catch-quotas. On 8 January 1988 the Icelandic Parliament enacted general vessel-quota legislation that applied to all Icelandic demersal fisheries, which became effective between 1988 and 1990. This legislation retained the effort-quota option but made it somewhat less attractive.

In 1990 comprehensive ITQ legislation (individual transferable share quota), 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 ten GRT (vessels under six GRT continued to be exempt from the ITQ system). The legislation required licensing of all commercial fishing vessels and a moratorium on the issue of new licences. It also extended the ITQ system indefinitely. Since then, the system has continued to be modified and the Act has been amended on several occasions since 1990.

1.4 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 from the outset have been subject to detailed management, primarily using limited local-entry and overall quotas. An overall TAC was set in the lobster fishery in 1973, with restrictions on the size of vessels that could prosecute the fishery and, subsequently, licensing and vessel quotas in 1984. Legislation regulating the processing and fishing of inshore shrimp and

scallop was passed in 1975. This legislation gave the Ministry authority to issue quotas for these fisheries to the fish processors. There are seven inshore shrimp areas, each having specific regulations. In general, the Ministry would set a TAC for each area and allocate shares to each shrimp processing-plant in the area. The Ministry would also decide on the total number of vessels that could catch shrimp in each area and would licence vessels for that fishery. In determining the total number of licences the Ministry would also specify the maximum daily-catch and maximum weekly-catch for each vessel. In addition, the Ministry decided on the allowable size of vessels and the permissible gear. The processing plants would then allocate quotas to vessels that would catch their share of the overall shrimp quota. In 1988, the deep-sea shrimp fishery was also subject to vessel quotas. The management of shrimp and scallop fisheries became part of the general ITQ system with the enactment of the *Fisheries Management Act* in 1990.

1.5 Evolutionary process, not design

As may be inferred from this description in Section 1, 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 derives not from rational arguments, but rather from the desire to protect traditional values and vested interests. From a socio-political view, Iceland probably had 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 crucial for the eventual acceptance of a more efficient ITQ system.

It should be noted, however, 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 biomass 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 a 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. Rule-changes in fisheries are frequently a response to crises, *i.e.* lower income for fishermen (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 and ITQs already existed in the herring and capelin fisheries at this time. As early as 1981, the favourable experience with quotas in these fisheries had convinced many vessel-owners that nothing short of an ITQ system was needed. And, despite an increased catch of demersal species, the fishing industry was running with heavy losses in the period from 1981 to 1983.

The passing of the comprehensive ITQ fisheries-management legislation in 1990 constituted a break in this pattern. For the first time, the fishing industry agreed to a significant overhaul 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, which were now becoming apparent to most of the participants in the fisheries. The modifications of the ITQ system since then have been relatively minor and reflect, on the one hand, the desire of the fishing industry in general to improve the efficiency of the system and, on the other hand, the efforts of special interests (small boats, and regions) to protect their position.

2. THE NATURE OF THE HARVESTING-RIGHT

2.1 Licences

The current harvesting-right in Icelandic fisheries consists of two parts: a general fishing licence and a catch quota. To carry out any commercial fishing a general licence is needed. To fish species subject to a TAC both a fishing licence and a quota for the particular species are required.

In December 1983 legislation was passed that gave the Minister of Fisheries the power to put a licensing scheme into place for all fisheries as well as those managed using ITQs. The Ministry could now licence vessels in particular fisheries that used particular gear, or vessel sizes, or groups based on gear/vessel-size combinations. The Ministry issued a new regulation in February 1984 that required the licensing of all vessels over ten GRT intending to fish in the Icelandic EEZ. Vessels already in the fishery (for the period November 1982 to October 1983) were issued licences. New vessels could only receive a licence if they had been commissioned before the end of 1983. Other vessels could receive a licence if a comparable ship already in the fishery was

decommissioned *i.e.* withdrawn from the fishery. These rules were in effect, with only minor changes, until 1990.

From 1991 regulations on licensing have been issued each year, with small changes or clarification on the definition of a "comparable" vessel. During the first 8 months of 1991 a new vessel could be up to 60% larger than the vessel it replaced, if the older vessel was at least 12 year old. For younger vessels the new replacement had to be comparable in size. From September 1991 to August 1992 this exemption for older vessels was revoked. From 1992 to 1996, up to 3 vessels could be decommissioned for a single new vessel. The size-limit for the new vessel was the sum of the 3 vessels it replaced, with the additional requirement that the largest of the replaced vessels had to be at least 70% of the size of the new vessel. From 1996 to 1997 this 70% threshold was abolished, and any number of vessels could be decommissioned for a new vessel comparable in size to the sum of the replaced vessels. From 1997 to January 1999 a new vessel could be up to 60% larger than the replaced vessel, if the replaced vessel had been within the ITQ system for at least 7 years.

From 1986 there were also regulations on modifying vessels already licensed. Vessels in the fishery before 1986 have had the freedom to be increased in size without limits, although replacing them has mostly been subject to the same rules as for other vessels. Vessels that came into the fishery in 1986 or later, have not been allowed to be increased in size unless other vessels were decommissioned at the same time (such that the now larger-size vessel is really replacing the decommissioned vessel).

The first regulation on the import of small vessels came into effect in 1986. This regulation was not enforced. New legislation, the *Fisheries Management Act* for 1988-1990, required the licensing of all vessels over six GRT, and of gill-net vessels under six GRT. From 1988 a new vessel over six GRT could only receive a licence if a comparable vessel was retired. The *Fisheries Management Act 1990* required all vessels to be licenced. Since 1991, therefore, a new vessel of any size, could only receive a licence if a comparable vessel (or vessels) were decommissioned.

In December 1998 the Supreme-Court reached a decision on a case concerning an application by an individual for a commercial fishing licence and fish quota. The Ministry of Fisheries had declined the application and a lower Court had upheld the Ministry's decision on the basis of the *Fisheries Management Act 1990*. Article 5 of the legislation stated that only vessels already in the fishery at the time of the legislation could receive licences. The Supreme-Court found the article unconstitutional on the grounds that it amounted to unequal treatment of citizens. The Court did not, however, decide on the second issue, the application by the individual for catch quota.

In response to the Supreme-Court decision in January 1999 the Parliament passed legislation to modify the *Fisheries Management Act*. All registered vessels could now apply for commercial fishing licences: access is therefore not restricted any more. Receiving a commercial fishing licence is only one step needed, to fish as harvesting TAC-species also requires a quota. The legislation abolished the restrictions on licensing of new vessels and therefore new vessels can receive a licence without any other (older) vessel being decommissioned. All restrictions on enlarging a vessel have also been abolished.

As of May 1999 17 new licences had been issued to vessels larger than six GRT, and 21 new licences to vessels smaller than six GRT. The 17 larger vessels could participate in the fishery immediately, but had to lease or buy quota to do so. The latter 21 smaller vessels have had to wait until September 2000 to begin fishing, and then they must either lease or buy quota (in a new small-vessel ITQ-system) or be granted a very limited number of fishing-days.

2.2 The ITQ system

Although the ITQ system was instituted at different times and in somewhat different forms in the various fisheries, its application was made uniform through the *Fisheries Management Act 1990*. The fisheries-management system is based on individual transferable share quotas 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, with minor restrictions, transferable. They are issued subject to a small annual charge to cover enforcement costs. The ITQ system is fairly uniform across the various fisheries, although slight differences between the fisheries exist, mostly for historical reasons.

It should be noted that the ITQ system was superimposed on an earlier management system designed mainly for the protection of juvenile fish. That system involved restrictions on: certain gears, areas and fish-size, and is still largely in place. The ITQ system has not replaced these components of the more general fisheries-management system.

The Ministry of Fisheries determines the TAC for each species in the fisheries. This decision is made on the basis of recommendations from the Marine Research Institute (MRI). The MRI uses its own vessels to study the state of the fish stocks, but also relies heavily on sampling of catch-landings and operational information from the fishers. In more recent years the Ministry of Fisheries has followed the recommendations of the MRI quite closely. The fishery for cod plays a substantial role in the economy and therefore, not surprisingly, successive governments have been reluctant to curtail the cod TAC in accordance with the recommendations of the MRI. Only in the 1990s has the Ministry, with the general support of the vessel-owners, followed this advice closely, despite some political pressure to the contrary. In 1995 a TAC-rule, which sets the TAC for cod at 25% of the fishable stock, was established.

Currently 19 species are subject to TACs and consequently to ITQs. They include eleven demersal species: cod, haddock, saithe, redfish, Greenland halibut, plaice, wolf-fish, dab, long rough dab, witch and lemon sole; plus two pelagic species: the Icelandic herring and capelin; as well as deep-sea and inshore shrimp, lobster and scallops. Together all these species account for over 95% of the landed value. In addition, Icelandic vessels fishing the deep-sea redfish fishery, the shrimp fishery on the Flemish Cap and the Atlanto-Scandian herring fishery are subject to ITQs¹. Several species (on which fishing pressure is regarded as slight) are not currently subject to TACs. This means that the corresponding fisheries can be pursued freely, but they are in most cases commercially negligible. Permanent shares are issued for every species for which there is a TAC. These permanent quota shares may be referred to as TAC shares.

The size of each vessel's annual catch entitlement (ACE) in a specific fishery is a simple multiple of the TAC for that fishery and the vessel's TAC share. While the TAC share is a percentage, annual catch entitlements are denominated in terms of volume *i.e.* tonnes.

The Icelandic demersal fishery is a mixed-stock fishery and vessels catch other species than those that they particularly target. The ITQs system permits some leeway in counting catches of one species against the quota of another (5% for demersal species, except cod).

2.3 Transferability

TAC shares are transferable without any restrictions. Any fraction of a given quota may at any time be transferred to another vessel, subject only to registration with the Ministry of Fisheries. The particulars of the exchange, including price, are not registered. Table 1 shows the development of TAC share transfers in the period 1991-1998. As may be seen in the Table, trade has increased during this period, presumably resulting in a more efficient fishery.

Table 1
Transfer of TAC-shares 1991-1998. *Percentage of TAC-shares in each year*

	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99
Cod	10.6	13.0	6.7	18.1	18.7	11.8	31.3	12.8
Haddock	11.0	16.6	7.2	18.3	18.1	11.2	27.9	12.2
Saithe	10.3	14.2	9.2	12.8	17.9	10.0	28.8	11.5
Redfish	8.3	12.6	9.7	8.1	16.0	5.9	30.6	4.4
Greenland halibut	3.1	10.3	4.2	9.9	15.4	8.1	34.7	3.5
Plaice	10.7	18.1	10.3	17.1	11.6	11.5	24.8	14.1
Herring	12.0	16.6	12.0	25.0	43.2	16.7	28.8	17.7
Capelin	2.9	6.7	9.4	2.7	11.2	3.8	21.0	18.0
Lobster	22.1	14.1	7.5	30.7	17.2	20.9	19.2	12.1
Deep-sea shrimp	14.7	15.2	13.3	22.6	24.9	20.2	44.4	28.1

Source: Fisheries Directorate.

Transfers of ACEs are subject to some restrictions. First, the Ministry of Fisheries must agree to a transfer of ACE between geographical regions. The rationale for this stipulation is to stabilise local employment in the short-term and to hinder speculation in quotas. In practice, however, it appears that few inter-regional transfers are actually blocked. Second, only up to 50% of ACE are freely transferable between vessels under different ownership. However, exchanges of quotas for different species of equal value are not subject to any such restrictions. Further, as vessel-owners are not allowed to have the crew share in the costs of quota transfers, all

¹ In addition Iceland receives shares of the cod TAC in the Norwegian EEZ and the Russian EEZ. These were allocated to Icelandic vessels as ITQs in 1999.

ACE transfers as of 1998/99 have to take place through a public body: the Quota Trade Authority. Table 2 shows the transfers of ACE over 1992/93 – 1998/99.

2.4 Exemptions from the ITQ system

There is one minor exemption from the current ITQ system. Under the 1996 amendment to the *Fisheries Management Act*, hook-and-line vessels under six GRT, not already in the ITQ system, must choose between a cod share-quota system and a cod effort-restriction system (maximum number of allowable-fishing-days). As a group, they receive a 13.75% share of the general TAC for cod.

Table 2
Transfers of quota between vessels 1992-1998. *As percentage of total ACE*¹

Transfer ²	92/93	93/94	94/95	95/96	96/97	97/98	98/99
Type A	33.0	26.3	41.3	32.5	31.3	38.6	26.7
Type B	20.2	23.9	13.6	18.3	19.4	15.4	-
Type C	12.6	11.3	12.0	7.2	10.1	9.0	8.1
Type D	34.3	38.5	33.1	42.1	39.2	37.0	11.5
Total	66.2	63.7	78.1	71.2	68.1	69.3	46.3

¹ These quotas are measured in cod equivalents and represent temporary annual quota (gross) transfers only.

²Type A: Transfers between vessels with the same owner.

Type B: Transfers between vessels with different owners operated from the same port.

Type B and Type D are grouped together as of 98/99

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.

Source: Fisheries Directorate.

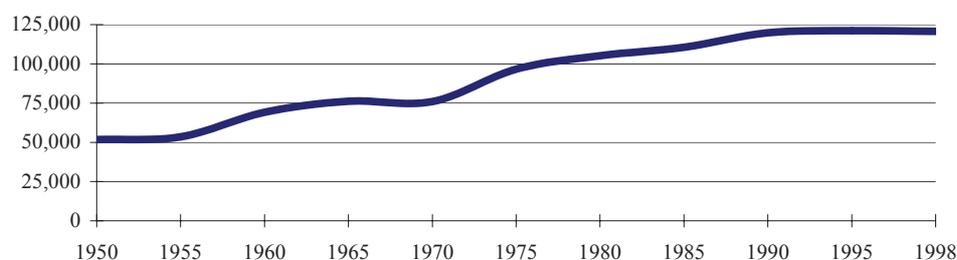
3. FLEET CAPACITY

3.1 Size

In 1975 the overall fishing fleet was about 97 000 gross registered tonnes (GRT) but had increased to about 111 000 GRT at the introduction of the ITQ system in 1984 (the average vessel age was 18 years). All of the increase in GRT from 1975 to 1984 can be explained by two factors. First, the switch from the herring fishery to the new capelin fishery required larger vessels, and second, a change in fishing technology with the introduction of deep-sea stern-trawlers into the Icelandic fisheries. After the collapse and subsequent moratorium in the herring fishery in 1970, the government encouraged and provided financial incentives for investment in the deep-sea fishery and the capelin fishery (increasing the holding capacity of former herring vessels).

From 1984 to 1998 the increase in the size of the fleet was mainly explained by three factors: (a) the increased number of small vessels, (b) increased size of factory vessels and (c), the increased size of replacement vessels during profitable periods in the fishery since 1984. At the end of 1998 the fishing fleet consisted of 795 decked vessels, and measured about 121 000 GRT,² valued at close to US\$1 billion. The average age of the fishing fleet is rather high, or about 21 years. The development of the fleet in terms of size and number of vessels is shown in Figures 2 and 3.

Figure 2
Development of the capacity of the Icelandic fishing fleet, in GRT

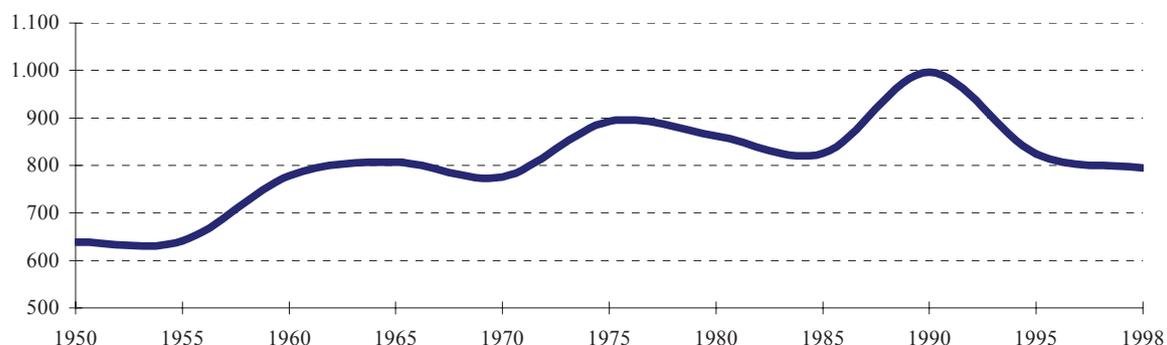


Source: Fisheries Association.

² A fleet-capacity equivalent to about 10 000 GRT was no longer active in the Icelandic fisheries in 1999 (they did not have quota and/or licences).

Table 3 shows the number of vessels in the fishing fleet in recent years. Note the increase in the number of small vessels (<ten GRT) from 1984 to 1990. The number of vessels larger than ten GRT has decreased since 1985.

Figure 3
Development of the Icelandic fishing fleet, number of decked vessels



Source: Fisheries Association.

Table 3
Number of vessels in the Icelandic fishing fleet

Year	Vessels <10 GRT	Vessels >10 GRT	Trawlers	Total
1984	1060	573	103	1736
1985	1338	572	106	2016
1986	1357	566	107	2030
1987	1560	551	107	2218
1988	1770	546	108	2424
1989	1894	556	115	2565
1990	2045	542	115	2702
1991	2046	522	112	2680
1992	2001	478	108	2587
1993	1966	437	109	2512
1994	1856	425	109	2390
1995	1721	379	114	2214
1996	1538	360	121	2019
1997	1471	345	115	1931

Source: Fisheries Association.

3.2 Composition of the fleet

3.2.1 Fleet composition

The fleet consists of several vessel-types, and although a particular vessel may actually belong in more than one category it is in some ways convenient to divide the fleet into the following categories: deep-sea trawlers, factory vessels, pelagic-fishery vessels, multi-purpose vessels, and small vessels.

3.2.2 Deep-sea trawlers

The first Icelandic deep-sea stern-trawler started operation in 1970, the numbers increased to 53 in 1975, 106 in 1985, 115 in 1990, 121 in 1996 (of which only 109 had licences), but in 1999 their number was down to 102. They are relatively large vessels usually of between 400 and 1400 GRT (the average size has increased from 490 GRT in 1980 to 615 GRT in 1998) and 130 and 250 feet (40-75 m) in length. There are currently 102 vessels in this group totaling 62 000 GRT, and the average age is 20 years. They are engaged in the demersal fisheries employing bottom- and, occasionally, mid-water trawls. Some are also used in the deep-sea shrimp fisheries. A few also, for a part of the year, catch herring and capelin. 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 those in international waters. Each trip on the domestic fishing grounds usually lasts about 5-15 days.

3.2.3 Factory vessels

In the 1980s some of these vessels (mostly deep-sea trawlers, but also some long-liners) were converted so that fish-processing could take place on-board. Often the renovations also involved increasing the size of the vessel. The first factory vessel began operation in 1982: since then there has been a steady increase in their number, and in 1997 there were 54 processor-vessels in operation. In addition a few vessels have freezing and filleting equipment on-board. In the 90s, after the restrictions on ship renewals were relaxed, several new processor-vessels have been built. The fishing trip of a typical freezer-trawler is about 20-30 days, and longer if they go to distant waters (this also resulted in the vessels becoming larger, as crew quarters were made more attractive and comfortable). Currently there are 54 processor-vessels.

3.2.4 Pelagic-fishery vessels

Another vessel-type is the specialised purse-seiner. These vessels - 300 GRT and larger - are primarily engaged in the capelin fishery. These specialised purse-seiners usually follow the capelin schools over great distances and land their catches where it is most convenient. There are 38 vessels in this group (down from 52 in 1980) with a total fleet capacity of 20 000 GRT. The average age is over 27 years. The vessels are renovated periodically and their carrying capacity has usually been enlarged during this process. Most of the purse-seiners participate also in other fisheries, particularly the herring fisheries and, some, in the deep-sea shrimp fishery.

Various other large and small multi-purpose vessels are capable of participating in the pelagic fisheries using purse-seines or pelagic trawls. In recent years between 40 and 60 vessels have participated in such fisheries. There has actually been a steady decrease in the number of vessels fishing the capelin and the Icelandic herring. On the other hand, with the opening of the Atlanto-Scandian herring fishery, other vessels were encouraged to establish a fishing history before the fishery became subject to ITQs in 1997. The same phenomenon is now taking place in the blue whiting fishery.

3.2.5 Multi-purpose vessels

The fourth category comprises the multi-purpose vessels. They cover a wide range in size, from 12 GRT to over 200 GRT. There are 327 vessels in this group (down from 460 in 1980) with a total capacity of 35 000 GRT. The average size being just over 105 GRT, and the average age just over 27 years. The multi-purpose fleet is, for the most part, not specialised with respect to either fishing gear or fishery. Most have been designed as gill-netters or long-liners, although technically capable of employing trawl and purse-seine as well. The geographical range of the smaller multi-purpose vessels is limited and they are normally confined to fishing trips of one to three days, exploiting grounds relatively close to their home port. The fishing trips of the larger vessels can last up to two weeks. A few multi-purpose boats are processing-vessels.

3.2.6 Small vessels

Finally, there is a class of fishing vessels that covers numerous vessels of sizes up to 12 GRT, although most are under ten GRT. There were in 1997 1196 licenced fishing vessels under 12 GRT. Of these, 313 vessels were decked (up from 264 in 1980) with a total of 2500 GRT, and the average vessel age was 12 years. The other 883 are open-decked and the fleet has a combined total of 4400 GRT. These vessels are typically owner-operated on a seasonal basis, employing hand-lines, gill-nets and long-lines. Depending on the gear and fishery, the crew size is one to three persons.

In 1984 all vessels above ten GRT became subject to ITQ restrictions. This restriction led, predictably, to a dramatic increase in the number of vessels smaller than this. In 1984 a total of 978 small vessels were active but by 1990 their number had increased to 1599, an increase of about 63%. By 1991 restrictions on further increases in the number of small vessels had been introduced, and in effect entry into the fisheries became restricted for all vessels. The rule-change required that for every new vessel an older one had to be decommissioned. Furthermore in 1991 all vessels over six GRT were included in the ITQ system. This, along with some change in the fisheries legislation in 1994-96, has resulted in a decrease in the number of small vessels under ten GRT, being down to 1114 in 1997.

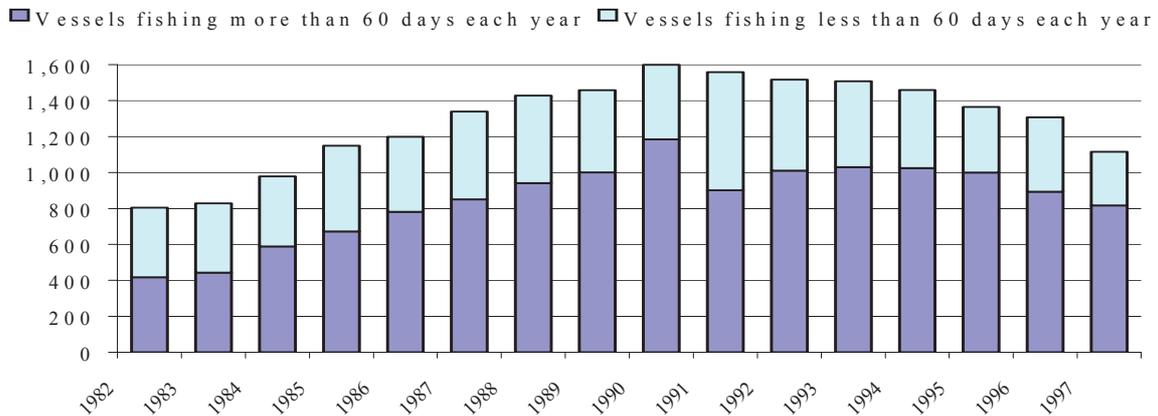
3.3 Investment

Investment in new fishing vessels and fishing equipment reached a maximum in 1973-1974. As previously mentioned, the 1980s were a period of renewal of the deep-sea fleet, and 1973-74 was the peak period of investment. The period 1986-90 showed an increased investment in small vessels. Over 1985-89 there was a great deal of investment in factory vessels, mainly through the conversion of older vessels, but also some new vessels in 1988-89. The years 1992 and 1994 saw some replacement of deep-sea trawlers.

3.4 Other measures of fishing-capacity

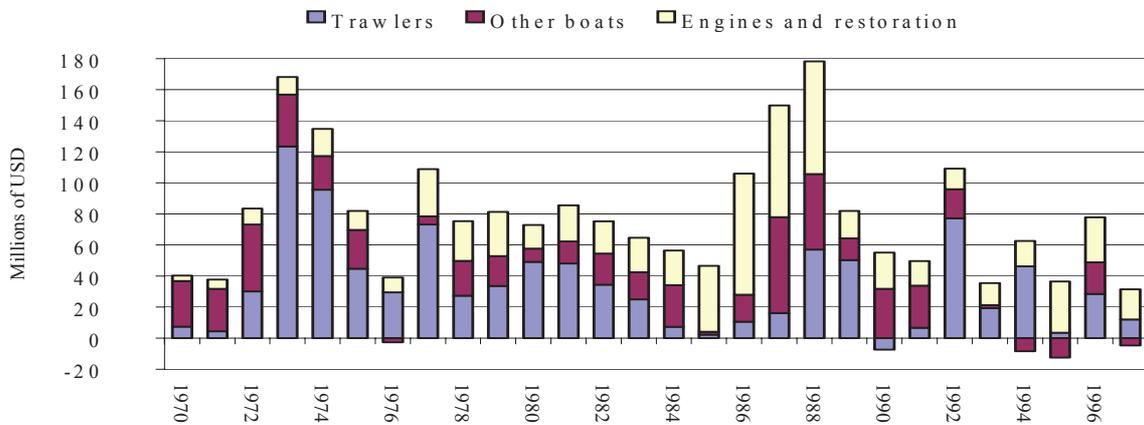
There is no common method in accessing capacity in fisheries. Capacity is not simply a multiple of vessel number and vessel size. In Iceland, for example, it is common that new ships are larger in size due to the demand for more spacious living quarters on board. Improvement in the handling and storing of the catch on board also effects size, and so do requirements for on-board processing.

Figure 4
Number of small vessels (< 10 GRT) fishing each year



Source: Fisheries Association.

Figure 5
Investment in fishing vessels



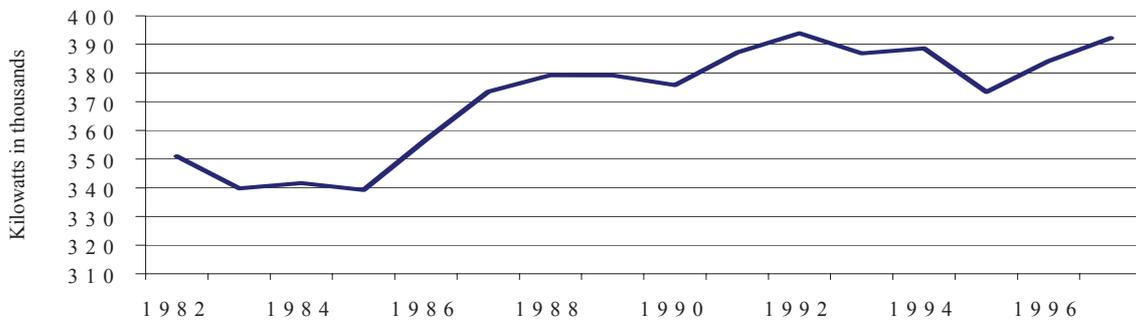
Source: National Economic Institute.

Several other factors therefore effect capacity: vessel age, engine-power, technical equipment, even the skipper's and crew's influence the fishing power of a vessel. Engine power is sometimes used as an indicator of capacity. Figure 6 shows the evolution in recent years of engine-power (in kilowatts) of all vessels larger than ten GRT. It had begun a decrease after 1992, along with the decrease in the number of vessels, but in 1996 and 1997 several powerful deep-sea trawlers were bought for the sole purpose of fishing in international waters. This increased the total engine-power of the fleet again.

3.5 Number of vessels with fishing licences

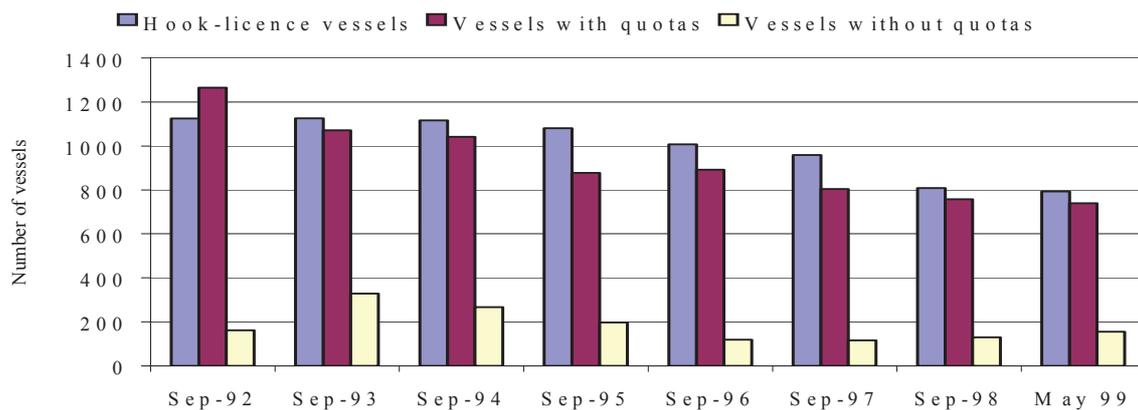
The number of vessels with commercial permits was 2560 in January 1991; 1433 vessels were in the ITQ system and 1127 had hook-and-line licences. In May 1999 the number of vessels with commercial fishing permits was down to 1688 (1671 if new licences are excluded). Only 740 vessels had TAC shares and 793 vessels under six GRT were active under the small-vessel arrangement. In addition there are 155 vessels with a commercial fishing permit, but no quota. Thus, there has been a total reduction of about 900 vessels since the introduction of the comprehensive ITQ system in 1991.

Figure 6
Engine power for all vessels over 10 GRT



Source: Fisheries Association.

Figure 7
Number of vessels with commercial fishing permits 1992-1999



Source: Fisheries Directorate.

A reduction in the number of vessels engaged in the inshore shrimp fisheries (from 50 to 44), the scallop fishery (from 21 to 15), and the lobster fishery (from 57 in 1992 to 42 in 1998) is included in the numbers above.

4. OWNERSHIP

4.1 Concentration of ownership

Table 4 shows the development of the quota holdings of the ten largest harvesting-companies. In 1998 these ten largest firms, in terms of demersal quotas (for cod, haddock, saithe, redfish and Greenland halibut), held about 37% of all quotas for these species. However in 1991 the ten largest firms had held only about 25% of these quotas. One reason for this recent increase in quota-holdings by the ten largest is the wave of mergers in the fisheries industry. The largest firm in 1991 (Grandi Ltd.) resulted from the merger of three large harvesting-companies in the late 1980s. Their combined share actually decreased from 5.6% of the total in 1984, to 4.8% in 1998. Samherji Ltd., the second largest in 1998, merged with several large and small firms in 1996-97. Haraldur Bodvarsson Ltd., the fourth largest in 1998, merged with three large harvesting firms in the 1990s. Thormodur rammi-Saeborg Ltd., the fifth largest in 1998, merged with three large firms in the 90s. Skagfirthingur Ltd., sixth largest firm in 1998, bought the stock of another large company and they merged. Vinnslustodin Ltd. is the result of the merger of several firms. Snaefell Ltd. is also a combination of several companies, and the same applies for Thorbjorn Ltd and Basafell Ltd. Only UA Ltd. and Skagstrendingur have been exempt from the wave of mergers, having grown instead by increasing their quota directly³.

Table 4

The evolution of quota-holdings among the largest harvesting-firms in the demersal fisheries*
Percentage of total quota shares

Harvesting firm	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99
UA Ltd. (NE)	4.0 (2)	4.6 (2)	4.6 (2)	5.0 (2)	5.4 (2)	5.4 (2)	5.0 (2)	5.5 (1)
Samherji Ltd. (NE)	3.2 (3)	3.4 (3)	3.4 (3)	3.5 (3)	3.6 (3)	4.2 (3)	5.6 (1)	5.5 (2)
Grandi Ltd. (SW)	4.3 (1)	4.9 (1)	4.9 (1)	5.1 (1)	6.1 (1)	5.7 (1)	4.9 (3)	4.8 (3)
Haraldur Bodvarsson Ltd (W)	2.2 (6)	2.3 (5)	2.3 (6)	2.3 (5)	2.6 (5)	3.3 (5)	4.5 (4)	4.3 (4)
Thormodur Rammi Ltd (NW)							4.0 (6)	3.8 (5)
Vinnslustodin Ltd. (S)	2.5 (4)	2.0 (6)	2.9 (4)	2.5 (4)	2.2 (7)	2.0 (8)	4.3 (5)	3.3 (6)
Skagfirthingur Ltd. (NW)	1.5 (9)	1.5 (10)	1.7 (8)	2.2 (7)	2.9 (4)	3.3 (4)	2.8 (8)	3.2 (7)
Snaefell Ltd. (NE)								2.6 (8)
Thorbjorn Ltd. (SW)							2.5 (7)	2.3 (9)
Basafell Ltd. (Wfj)							2.3 (9)	2.3 (10)
Total, ten largest each year	24.9	25.9	27.0	28.2	30.7	31.8	38.1	37.6

*Shares of total cod equivalent values for each year. Quota-holdings in: cod, haddock, saithe, redfish, greenland halibut and plaice as percentage of total allotments of cod, haddock, saithe and redfish

Source: Runolfsson (1999b).

Another reason for the increase and/or decrease in quota-holdings of most harvesting-firms is found in the change in the cod-equivalent values for the various species. The cod-equivalent value for haddock has gone from 0.85 in 1984 to 1.05 in 1998, for saithe from 0.55 to 0.65, for redfish from 0.55 to 0.7 and for Greenland halibut from 0.85 to 2.15. These changes in weighting of the different species may have moved firms up or down the list. Related to this are the changes in the TACs for the various species: the TAC for redfish was 110 000t in 1984 and 65 000t in 1998/9, for saithe from 70 000t to 30 000t, for haddock from 60 000t to 35 000t, for cod from 200 000t to 250 000t, and for Greenland halibut from 30 000t to 15 000t respectively.

³ An analysis of mergers since 1995 shows a slight decrease in concentration in total quota-holdings of the ten largest (see Runolfsson 1999b). It should also be noted that the total sum of ACE has usually been only 75-83% of the combined TAC (in terms of cod-equivalents). The ten largest therefore only hold about 26.7% of the TAC.

Table 5
Percentage distribution of stock in the ten largest demersal harvesting-firms in December 1998

Harvesting firm	Year 1998/99 %	Number of stock-holders	Institutional investors* %	Corporate ** %	Other %	Biggest stockholders			
						One %	Three %	Five %	Ten %
UA Ltd.	5.5	1 720	35	49	16	20	50	64	76
Samherji Ltd.	5.5	3 864	9	1	89	21	62	76	80
Grandi Ltd.	4.8	1 080	18	21	61	26	47	57	71
Haraldur Bodvarsson Ltd.	4.3	1 227	19	37	44	10	24	37	59
Thormodur Rammi Ltd.	3.8	580	18	23	59	19	35	42	61
Vinnslustodin Ltd.	3.3	762	17	35	48	18	38	48	67
Fisk. Skagfirdingur Ltd.	3.2	197	22	8	70	56	74	87	94
Snæfell Ltd.	2.6	119	3	96	1	92	96	98	99
Thorbjorn Ltd.	2.3	368	6	11	83	11	34	51	71
Basafell Ltd.	2.3	332	18	27	55	24	39	48	64
Total	37.6	10 049							

* Stock owned by municipalities, cooperatives, pension funds, stock funds, etc.

** Corporations and cooperatives listed on the Icelandic stock exchange.

Source: Runolfsson (1999b).

Another view of the issue of concentration is given by the number of share-holders that hold stock in these harvesting firms, since they should really be regarded as the owners of the harvesting-rights. The number of stockholders in these corporations was well over 10 000 in 1998; up from less than 2800 in 1990. Institutional investors, such as retirement funds and investment funds, who represent a majority of the population, are major stock-holders in several of these companies.

Samherji Ltd. is an interesting example of the increased number of share-holders. This firm, although founded in 1972, came under current ownership only in 1983 when its only asset was one (old and rusty) deep-sea trawler. Samherji Ltd. is today the largest quota-holder in Iceland, in terms of overall quotas. The firm has also invested in other firms, domestic and foreign. Samherji Ltd and its subsidiaries operate 20 vessels from five countries. In addition they operate two processing-plants for shrimp, two reduction-plants, one freezing-plant and one marketing firm in England (this is not an exhaustive list of all their investments). Samherji Ltd. became a public company in 1997 and the number of stock-holders in 1998 reached almost 3900.

4.2 Effectiveness of regulations governing ownership rights

There are only three restrictions on ITQ ownership of any significance: (a) ITQs must be attached to a fishing vessel, (b) foreigners cannot own harvesting-companies and therefore cannot own ITQs, and (c) the total ITQ holdings by a single firm may not exceed a certain upper limit.

The first restriction is primarily for bureaucratic convenience and as such it is perfectly adhered to. However, ITQs attached to a given vessel may actually be owned by someone else. The vessel-owner is the registered owner of the TAC share, but through another contract (e.g. an option to purchase) the TAC share may actually be owned by someone else.

The second restriction is apparently also well adhered to. However, it is clear that foreign companies can actually be *de facto* owners of fishing-companies and therefore of quotas through a chain of Icelandic companies or by financing and/or catch purchase contracts. So far, however, there have been few signs of this happening.

The third restriction is a recent (1998) addition to the fisheries legislation. No company is actually close to the upper bounds set on ITQ ownership (10% for demersal and 20% for pelagic species). So there has been no reason to thwart these restrictions, although clearly this could be relatively easy by simply forming groups of formally independent companies.

So far cheating in the use of quotas seems to have been relatively limited. Discarding-at-sea appears to be moderate (under 5% for the most discarded species: cod). Landings in excess of quota also appear to be limited,

apparently due to relatively few landing places (under 70) and a good system of dockside-monitoring inherited from the previous fisheries management system.

5. RESULTS OF THE ITQ SYSTEM

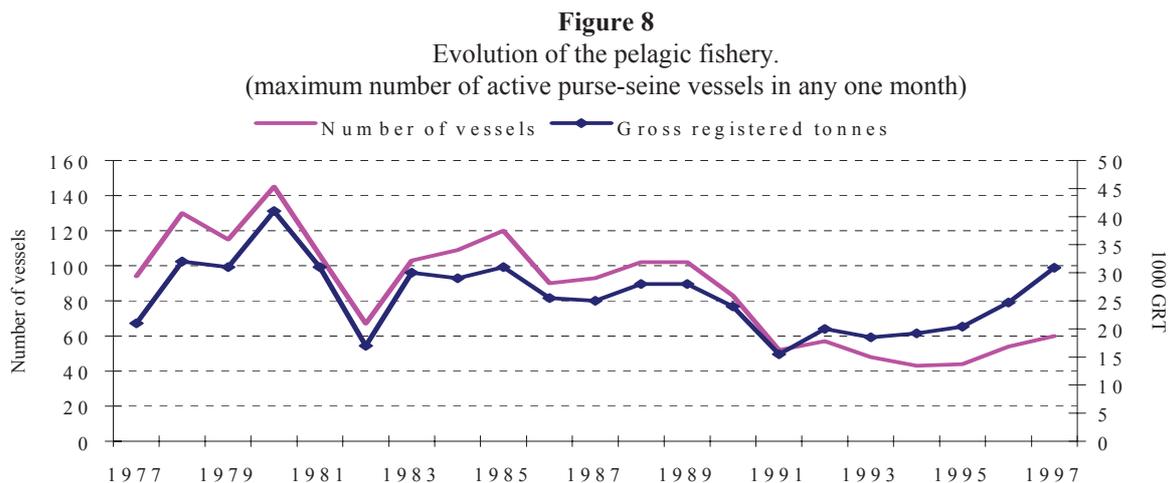
The ITQ system in the herring fishery has been very successful. Since 1975 herring catches have increased almost ten-fold. Fishing effort, on the other hand, has not increased: in fact it has declined substantially. The number of vessels in the fishery has decreased from about 65 in 1975, to 30-40 in recent years (their numbers had actually increased up to 145 in 1980)⁴. Catch-per-unit-effort in the herring fishery is now roughly ten times higher than it was at the outset of the vessel-quota system over 20 years ago (Arnason 1996b). The herring-stock biomass is now greater than at any time since the 1950s.

The capelin is a short-lived species and the fishery can be very volatile. Part of the capelin stock migrates seasonally into the jurisdiction of Greenland and Norway. The capelin is therefore a shared stock, but, through an agreement with these two countries, Iceland determines the annual TAC to be shared between the three countries. Iceland's share is 81% of the TAC. In winter, the capelin is fished exclusively in Icelandic waters. The yearly catch of capelin averaged less than 700 000t over 1980-95, but the catch in 1996-98 averaged 1 070 000t. The capelin fleet, on the other hand, has been reduced: the number of specialised purse-seine vessels declined from 68 in 1979 to 38 in 1995 (yet 44 vessels participated in the capelin and Icelandic herring fisheries). The total fleet tonnage (GRT) was reduced by over 25%, and the total days-at-sea for the fleet fell by almost 25%. Thus, there are strong indications that the efficiency of the capelin fishery has increased substantially since the introduction of the vessel-quota system.

In the summer of 1994 the Atlanto-Scandian herring fishery resumed. This herring stock migrates between the waters of Norway, Faroe Islands, and Iceland. ITQs were issued for this fishery in 1998. Icelandic vessels caught 21 000t in 1994, but the catch had increased to 197 000t in 1998. The size of the capelin stock has also been growing and the TAC increasing as a result. This, along with the larger capelin catch, may have induced some vessel-owners to revert to pelagic fishing.

Many of the new, or renovated, large trawlers are multi-purpose vessels, capable of using deep-sea trawls (especially deep-sea shrimp trawls) or also special purse-seines and pelagic trawls for herring and capelin. These larger multi-purpose vessels are therefore not only capable of pursuing pelagic fisheries all year round (capelin in winter and late summer, Atlanto-Scandian herring in early summer, Icelandic herring in the autumn), but can also harvest shrimp (or other species) in between the herring and capelin seasons.

It is appropriate to look at the evolution of the pelagic (purse-seine) fisheries as one, rather than separate herring and capelin fisheries. The changes in the pelagic fishery, in terms of vessel number and size is illustrated in Figure 8.



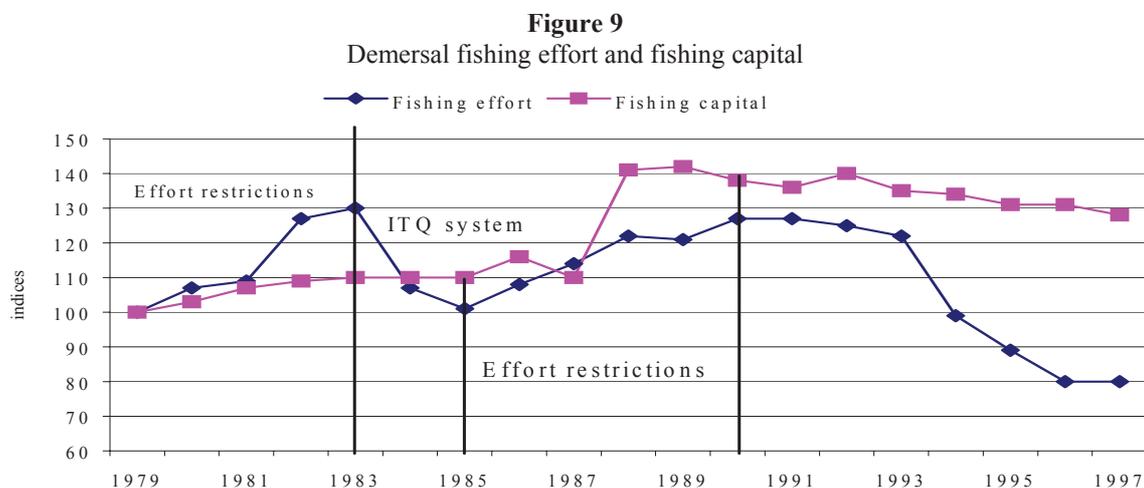
Source: Fisheries Association.

⁴ The vessel-quota systems in the Icelandic herring fishery only applied to purse-seine vessels. In addition there were another 95 vessels with licences for fishing herring with other gear, and they became subject to vessel quotas in 1985. In 1986 the vessel-quota systems in the herring fishery were abolished, and instead a common ITQ system was instituted.

The trend in the value of fishing capital, and of fishing effort (GRT/days-at-sea) in the demersal fisheries in recent years is illustrated in Figure 9. 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 between 1984 and 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, 1983 and 1984 were periods of heavy losses for the fishing industry. In 1986 investment in fishing capital resumed at a high rate, but this 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 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.

First, a good deal of the investment in fishing capital from 1986 onwards has consisted of the installation of freezing equipment and the corresponding modifications to several deep-sea trawlers. In 1983 there were three processor-vessels, in 1990 they were 26, and in 1997 they were 54. 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 shrimp 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 significant investment in vessels under ten GRT (that were not subject to the vessel-quota system). Their numbers increased from 1067 in 1983, to 2023 in 1990. Investment in small vessels accounted for almost 15% of total investment in the fishing fleet over 1984-92. Although the comprehensive *Fisheries Management Act 1990* closed many of the loopholes of the previous ITQ system(s), one loophole did remain: fishing vessels under six GRT were offered the option of remaining outside the ITQ system, provided that 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, but the *Fisheries Management Act* was amended in 1996 so that this group now receives a common share of the TAC for cod, set at 13.75% in 1998. In 1998 there were 807 vessels in this group, 480 of which chose cod-share quotas.



Source: Fisheries Association.

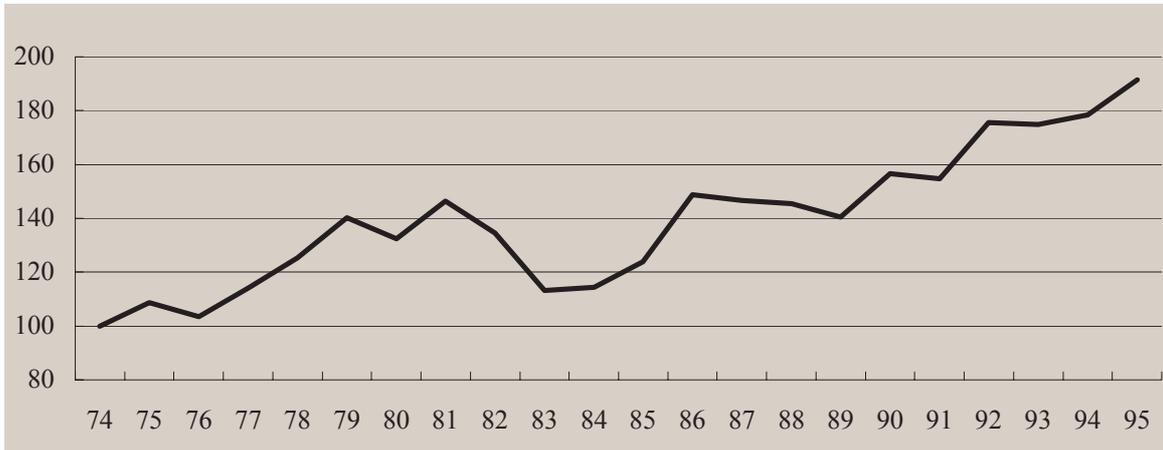
Last, but not least, the effort-quota option in the demersal fisheries, introduced in 1985, undermined the efficiency incentives of the ITQ system, thus inducing many vessel-owners to upgrade or replace their vessels. The effort-quota option was abolished at the end of 1990 and, in fact, a significant reduction in fishing-capital occurred subsequently.

The course of the demersal fishing-effort tells a similar story. As indicated in Figure 7, 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 was the decline in the demersal fish stocks without a commensurate

reduction in the TACs. Thus, more fishing-effort was required to fill the catch quotas. Since 1991 demersal fishing-effort has declined substantially.

Over the period 1974-95 as a whole the average annual productivity-growth in the Icelandic fisheries was 2.8%. The extension of the EEZ to 200 nautical miles in 1976 played an important part in the productivity-growth during the early part of this period. However, since 1984, after the introduction of the ITQ fisheries management system, productivity in the fishing industry has grown at an annual rate of well over 4%.

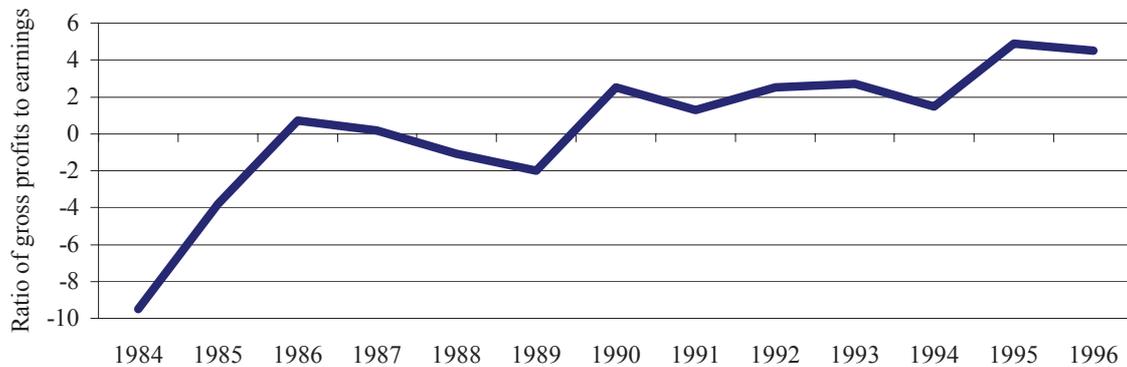
Figure 10
Total factor productivity (index) in the fisheries, at constant prices and adjusted for stock size



Source: *Institute of Economic Studies.*

The equity-ratio in the fisheries increased from 5.3% in 1988, to 15% in 1990, and to 26% in 1996. Profitability in the fisheries has also improved, as can be seen in Figure 11. The number of fishermen employed on the fishing vessels actually increased from about 6200 in 1983, to 6500 in 1990, but has since decreased to about 4600 in 1997.

Figure 11
Profitability in the fisheries



Source: *National Economic Institute.*

6. CONCLUSION

In Iceland over-capacity and over-capitalisation emerged as issues in the 1970s with the extension of the fisheries jurisdiction to 200 nautical miles and the expansion of the domestic fleet. Over the years, various measures were taken in an attempt to reverse this trend. Most of the early measures were in the form of restrictions on entry and effort, although some financial incentives were also provided to decommission vessels. The most important measure to counter the over-capacity or over-capitalisation problem in the Icelandic fisheries was the introduction of ITQs. Iceland has had vessel-quota systems for two decades now. Since 1991, all major fisheries within the economic exclusive zone have been subject to a uniform system of ITQs, with only minor exceptions. Iceland even subjects its vessels which fish stocks shared with other nations, or in international waters, to an ITQ management system. The evidence on the performance of this system is

generally favourable. The system has resulted in increased efficiency of the fishery, and a reduction, albeit a slow one, in the total capacity of the fleet.

In recent years the fishing fleet has decreased drastically in terms of vessel numbers, although in terms of total GRT it seems to have decreased only slightly. But the total GRT given in the official vessel-registry may mask an actual decrease in tonnage, because there are numerous vessels in the registry which cannot participate in the Icelandic fisheries. There has been a reduction of about 900 vessels, since the introduction of the comprehensive ITQ system in 1991, a decrease of close to 35%. The free transfer and trade of quotas has provided incentives for vessel-owners to economise on the number of vessels. Aggregate fishing-effort has decreased by more than 35% since 1992.

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