

03/06/99

Birgir Runolfsson*

**On the Management Measures to Reduce Overcapacity
in Icelandic fisheries**

**A short report for the
Ministry of Fisheries**

May 1999

* Associate Professor of Economics
University of Iceland

Introduction

There has been increasing concern world-wide about excess capacity in fishing fleets and its impact on fish stocks. In many countries, despite successive fleet reduction programmes, it appears that overcapacity continues to present a serious obstacle to the achievement of fishery management objectives, particularly the control of fishing effort. Excessive fishing capacity also threatens the world's fishery resources and their ability to provide sustainable catches and benefits to fishers and consumers (FAO 1999). The role of subsidies in encouraging overcapitalisation and overcapacity in fisheries is also receiving increased attention (see Hatcher and Robinson 1999, Milazzo 1998, and Arnason 1999). Many fishing industries receive subsidies in a variety of forms, including grants for vessel construction and modernisation as well as product price support measures. At the same time, subsidies are provided for the removal of fishing capacity.

Overcapacity and overcapitalisation emerged as an issue in Iceland in the 1970s with the extension of the fisheries jurisdiction to 200 miles. 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. With the *de facto* recognition of the exclusive 200-mile zone in 1976, the situation dramatically changed. The Icelandic fisheries gradually came under increased management, as it became apparent that there was a long-term decline in the economic performance of the Icelandic fisheries. In fact, over the years, various measures were taken in an attempt to reverse this trend. Most of the measures have been in the form of restricting entry and effort, although, at times, financial incentives have been provided both to commission and decommission vessels.

Excess capacity in the world fisheries is the result of various factors, including relatively open access conditions in many fisheries (FAO 1999). The most important measure to counter the overcapacity or overcapitalisation problem in the Icelandic fisheries was the introduction of individual transferable quotas (ITQs). Iceland was among the first countries to introduce individual vessel quotas and individual transferable quotas in major ocean fisheries. Vessel catch quotas were introduced in the Icelandic herring fishery in 1975, and in 1979 these quotas were made transferable. Individual vessel quotas and transferable quotas were introduced in to other Icelandic fisheries during the 1980s. Since 1991, all major fisheries within the economic exclusive zone have been subject to a uniform system of ITQs with only minor exceptions. Fisheries by Icelandic vessels outside the economic exclusive zone have also been subject to ITQs.

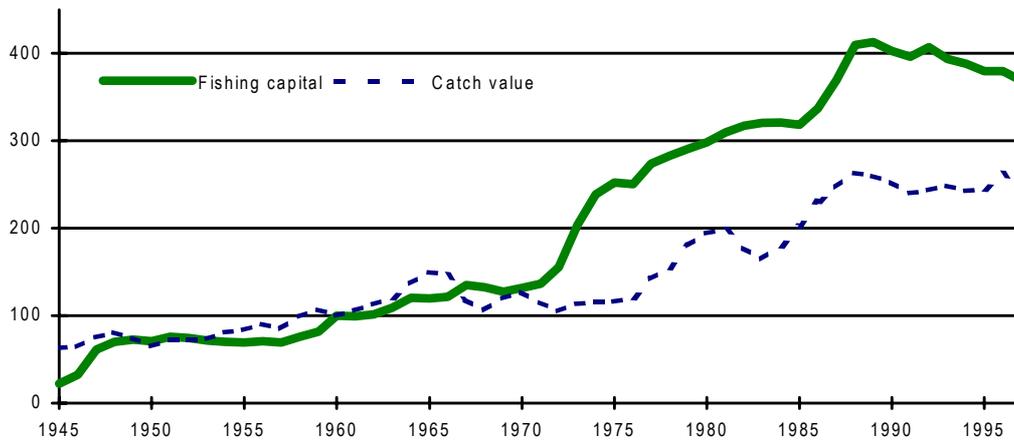
This paper will look at the issue of overcapacity in the Icelandic fisheries and the measures taken to counter that problem. Specifically, the paper will address the issue of whether Iceland has implemented "management measures to ensure that fishing effort is commensurable with the productive capacity of the fishery resources and their sustainable utilization", as Article 6.3 of the Code of Conduct for Responsible Fisheries recommends (FAO 1999).

Fisheries Management

Until the extension of the fisheries jurisdiction to 200 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 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 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, 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. The post-war development of fishing capital and catch values since 1945 is illustrated in Figure 1.

Figure 1. Fishing capital and catch values 1945-1997 (index 1960=100).
Source: National Economic Institute.



This long-term decline in the economic performance of the Icelandic fisheries did not go unnoticed. With the *de facto* recognition of the exclusive 200-mile zone in 1976, the situation dramatically changed. The Icelandic fisheries gradually came under increased management until, after 1990, there was a uniform system of individual transferable quotas in practically all fisheries.

The Pelagic Fisheries

Due to an alarming decline in the herring stocks, an overall quota (total allowable catch) 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 stock 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 suggested 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 1996). The *Fisheries Management Act* of 1990 made the vessel quota system in the herring fishery part of the general ITQ system.

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. The capelin fishery, which became big in the 1970s, was subjected to limited entry and individual vessel quotas for license 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, except this time the industry asked for regulations. 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 license but there had been 68 vessels engaged in the capelin fishery the preceding year. In 1986, 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 Iceland's 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 difficult to uphold. As a result, individual effort restrictions, taking the form of limited allowed fishing days for each vessel, were introduced in 1977. As new entry remained possible, however, and the demersal fleet continued to grow, the allowable fishing days had to be reduced from year to year. 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. It gradually became obvious to everyone 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 held its annual meeting 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. 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 restrict entry through licensing and 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.

Due to generally favourable results of the system, it was extended for 1985 and 1986-1987. 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. On January 8, 1988, the Icelandic parliament enacted general-vessel quota legislation that applied to all Icelandic demersal fisheries and was effective between 1988 and 1990. 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 (vessels under 6 GRT continued to be exempt from the ITQ system). The legislation required licensing for all commercial fishing vessels and a moratorium on issuing new licenses. It also extended the ITQ system indefinitely. Since then, however the system has continued to be modified, and the *Act* has been amended on several occasions since 1990.¹

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 extensive management, primarily limited local entry and overall quotas. An overall TAC was set in the lobster fishery in 1973, with restrictions on the size of vessels 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 processors. There are seven inshore shrimp areas, each having regulations specific to it; two areas already had individual vessel quotas in 1974. 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 ITSQ system with the *Fisheries Management Act* of 1990.

The Fisheries Management System

Although this system was instituted at different times and in somewhat different forms in the various fisheries, it was made uniform by the *Fisheries Management Act* of 1990. The fisheries management system is based on individual transferable 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 some restrictions, freely transferable; 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.

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, is still 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 has its own vessels to study the state of the fish stocks. The MRI also relies on information from the fishers, such as with an annual trawler-rally and a gill-net-rally. In addition to the government fisheries researchers, the Association of Vessel Owners employs its own researchers. In more recent years the Ministry of Fisheries has followed the recommendations of the Marine Research Institute quite closely. The cod fishery plays a

¹ The *Fisheries Management Act* of 1990 has been amended almost every year since it came into effect (in 1992, 1994, 1995, 1996, 1997, 1998 and 1999), see Runolfsson 1999.

very substantial role in the economy and therefore, not surprisingly, successive governments were reluctant to curtail the cod TAC in accordance with the recommendations of the MRI. Only in the 1990s has the Ministry followed this advice closely and even stood firm on that decision despite political pressure. In 1995 a TAC-rule, which sets the TAC for cod at 25% of the fishable stock, was established.

Currently 18 species are subject to TACs and consequently ITSQs. They include 10 demersal species: cod, haddock, saithe, redfish, Greenland halibut, plaice, wolffish, dab, long rough dab and witch, two pelagic species: the Icelandic herring and capelin; deep-sea and inshore shrimp, lobster and scallops. Together these species account for over 90 percent 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 ITQs. 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, in most cases, commercially negligible.

All licensed vessels received a permanent share in every species for which there was 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 volume terms.

The Icelandic demersal fishery is a mixed-stock fishery and vessels are bound to catch other species than aimed for. The ITQs (or TAC shares) are, therefore, also denominated in cod- equivalent terms, as the cod-fishery is the most important fishery in Iceland. This provides some flexibility for the vessels, as they can subtract by-catch of other species from their quota at fixed values.

Transferability

Both the TAC share and the ACE are fairly freely transferable and perfectly divisible. TAC shares are transferable without any restrictions whatsoever. Any fraction of a given quota may be transferred to another vessel. 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. 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, resulting in a more efficient fishery and fewer vessels catching the fish.

Table 1. Transfer of quota shares 1991-1998. Percentage of total quota shares in each year.

	91/92	92/93	93/94	94/95	95/96	96/97	97/98
Cod	10.6	13.0	6.7	18.1	18.7	11.8	31.3
Haddock	11.0	16.6	7.2	18.3	18.1	11.2	27.9
Saithe	10.3	14.2	9.2	12.8	17.9	10.0	28.8
Redfish	8.3	12.6	9.7	8.1	16.0	5.9	30.6
Greenland halibut	3.1	10.3	4.2	9.9	15.4	8.1	34.7
Plaice	10.7	18.	10.3	17.1	11.6	11.5	24.8
Herring	12.0	16.6	12.0	25.0	43.2	16.7	28.8
Capelin	2.9	6.7	9.4	2.7	11.2	3.8	21.0
Lobster	22.1	14.1	7.5	30.7	17.2	20.9	19.2
Deep-sea shrimp	14.7	15.2	13.3	22.6	24.9	20.2	44.4

Source: Fisheries Directorate

The Ministry of Fisheries must agree to transfer of ACE between geographical regions. The rationale for this stipulation is to stabilise local employment in the short run and hinder speculation in quotas. In practice, however, it appears that few inter-regional transfers are actually blocked. Transfer of ACE became subject to further restrictions in 1992 and 1994, when the parliament amended the *Fisheries Management Act* of 1990. These amendments were designed to discourage speculative quota holdings. They were, however, relatively insignificant. Further restrictions came in 1998; only up to 50% of ACE is

freely transferable between vessels under different ownership. Offsetting transfers of different species with equal value are not subject to any such restrictions. Further, as vessel owners are not allowed to have the crew share costs in quota transfers all ACE transfers, as of 1998/99 have to take place publicly, at the Quota Trade Authority (this has reduced trade of ACE and increased price). Table 2 shows transfers of ACE in 1992-1998.

Table 2. Transfers of quota between vessels 1992-1998. As percentage of total ACE¹

Transfer ²	92/93	93/94	94/95	95/96	96/97	97/98
Type A	33.0	26.3	41.3	32.5	31.3	38.6
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
Type D	34.3	38.5	33.1	42.1	39.2	37.0
Total	66.2	63.7	78.1	71.2	68.1	69.3

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

Source: Fisheries Directorate.

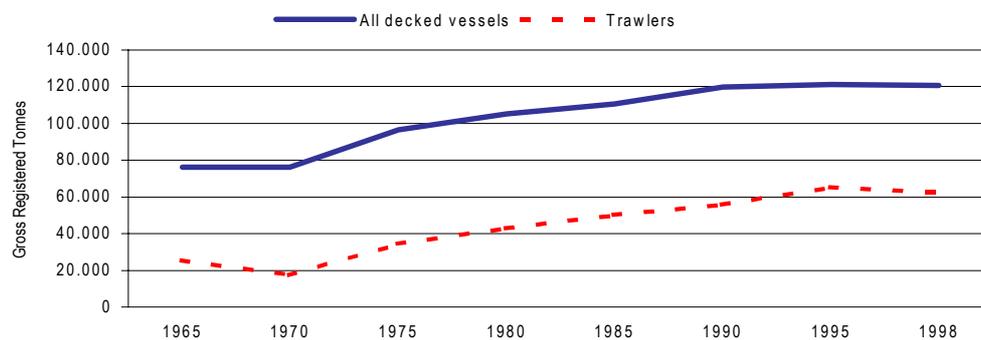
Exemptions from the ITQ System

There is one minor exemption from the current ITSQ system. In demersal fisheries, hook-and-line fisheries by vessels under 6 GRT were allowed exemption from quota restrictions, but are subject, instead, to limited fishing days and an overall TAC. Although this arrangement was to end in 1994, the exemption was extended, though the number fishing days was reduced. Under the 1996 amendment to the *Fisheries Management Act*, these vessels now 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.

The Icelandic Fishing Fleet

In 1975 the fleet was about 97 thousand gross registered tonnes (GRT) but had increased to about 111 thousand GRT at the introduction of the ITQ system in 1984 (the average age being 18 years).

Figure 2. Development of the Icelandic fishing fleet, size in GRT
Source: Útvegur 1983-1998



All of the increase in GRT from 1975 to 1984 is 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).

Table 3 shows the number of vessels in the fishing fleet in recent years. As may be seen, the number of small vessels increased dramatically in 1984-1990, but have decreased since then. Vessels larger than 10 GRT have decreased in number since 1989.

Table 3. Number of vessels in the Icelandic fishing fleet. *Source:* Fisheries Association

Year	Small vessels	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

At the end of 1998 the fishing fleet consisted of 795 decked vessels, measured about 121,000 GRT,² and was valued at close to US\$ 1 billion. The average age of the fishing fleet is rather high, or about 21 years.

The fleet consists of several vessel types, and it is in some ways convenient to decompose the fleet in the following categories (although a particular vessel may actually belong in more than one category).

Deep-sea trawlers

The first Icelandic deep-sea stern-trawler started operation in 1970. Their number had increased to 53 in 1975, 106 in 1985, 115 in 1990, 121 in 1996 (only 109 had licenses), but in 1999 they are down to 102. They are relatively large fishing vessels usually 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 102 vessels in this group with a total of 62,000 GRT, and the average vessel age is 20 years. They are engaged in the demersal fisheries employing bottom and, occasionally, mid-water trawl. Some are also used in the deep-sea shrimp fisheries. A few also 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 international waters. Each trip in domestic fishing grounds usually lasts for about 5-15 days.

Processors

In the 80s some of the vessels in the fleet were converted such that fish processing could take place on-board the vessels. With the renovation the vessels were made larger, in terms of GRT. Most of the converted ships were deep-sea trawlers. The first processor vessel began operation in 1982. Since, there has been a steady increase in their number and in 1997 there were 54 processors 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 processors have been built. The fishing trip of a typical freezer trawler is about 20-30 days, and longer if they go into distant waters (this also made the vessels larger, as crew quarters were made attractive and comfortable). Currently, there are 54 processor vessels.

Pelagic Fisheries Vessels

Another type is the specialised purse-seine vessel. These vessels - 270 GRT and larger - are primarily engaged in the capelin fishery. The 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 of 20,000 GRT, and the average vessel age is over 27 years. The

² A total of about 10,000 GRT are not active in the Icelandic fisheries (they do not have quota and/or licenses).

vessels are renovated periodically and carrying capacity usually enlarged. Most of the purse-seine vessels participate also in other fisheries, particularly the herring fisheries and, some, in the deep-sea shrimp fishery.

Various other large and small multipurpose vessels are capable of participating in the pelagic fisheries, using purse seine or pelagic trawl. In recent years between 40 and 60 vessels have participated in such fisheries. There has actually been a steady decrease in the number of vessel 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 is now taking place in the blue whiting fishery.

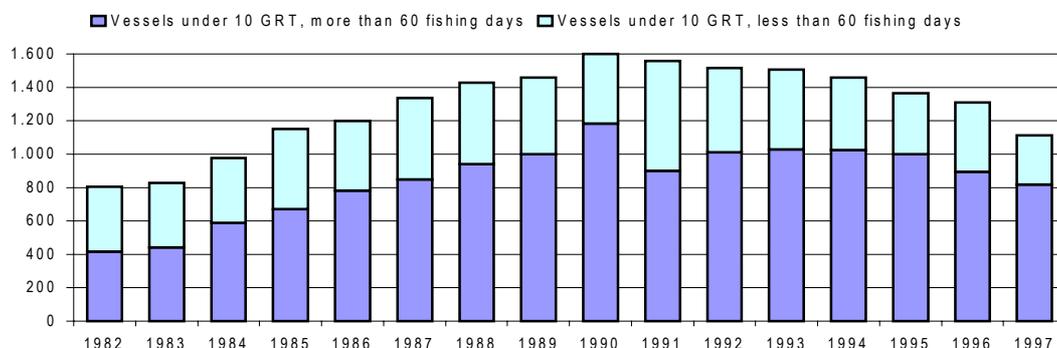
Multipurpose Vessels

The third type is the multipurpose vessel. They cover a wide size range, from 12 GRT to over 200 GRT. There are 327 vessels in this group (down from 460 in 1980) with a total of 35,000 GRT. The average size being just over 105 GRT, and the average vessel age is just over 27 years. 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 gill-netters 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 fishing trips of one to three days, exploiting grounds relatively close to their homeport. The fishing trips of the larger vessels can last up to two weeks. A few are processing vessels.

Small Vessels

Finally, there is a class of fishing vessels that covers numerous vessels of sizes up to 12 GRT although most are under 10 GRT. In total there were 1196 vessels under 12 GRT in 1997. Of these, 313 vessels are decked (up from 264 in 1980) with a total of 2,500 GRT, and the average vessel age is 12 years. The other 883 are open decked and a total of 4,400 GRT. These vessels are typically owner operated and employed on a seasonal basis. This fleet employs hand-line, gillnets and long-line. Depending on the gear and fishery, the crew size is one to three persons.

Figure 3. The number of small vessels fishing each year
Source: Fisheries Association



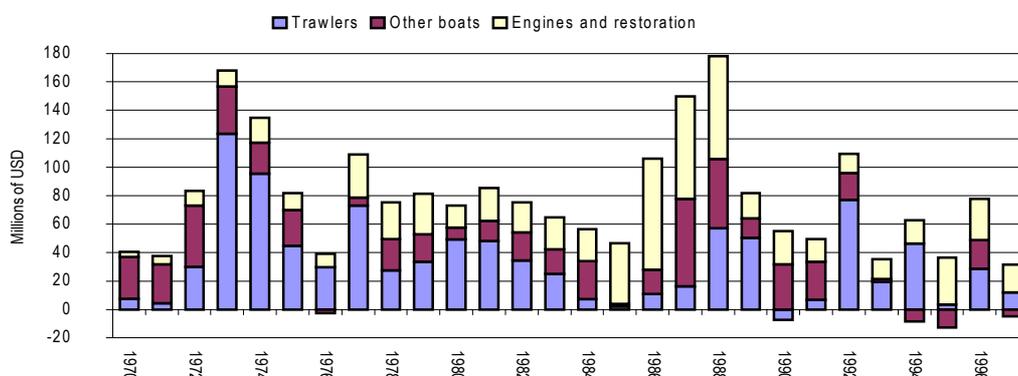
In 1984 access to the fisheries became restricted for all vessels in excess of 10 GRT. This restriction led, predictably, to a dramatic increase in the number of smaller vessels. In 1984 a total number of 978 small vessels were active but by 1990 their number had increased to 1599, an increase of about 63%. By 1991 restrictions had been put into effect on further increase in the number of small vessels, 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. Further, all vessels over 6 GRT were put under the ITQ system in 1991. This, along with some change in the fisheries legislation in 1994-96, has resulted in a decrease in the number of small vessels. In 1997 the number of small vessels, under 10 GRT, fishing was down to 1114.

Investment

Investment in new fishing vessels and fishing equipment reached a maximum in 1973-1974. As previously mentioned, the 80s were a period of renewal of the deep-sea fleet and 1973-74 was the height of the investment. The period 1986-1990 shows the increased investment in small vessels. From

1985-89 shows the investment in processor vessels, mainly through the conversion of older vessels but some new vessels in 1988-89. The years 1992 and 1994 had some renewal of deep-sea trawlers.

Figure 4. Investment in fishing vessels
Source: National Economic Institute

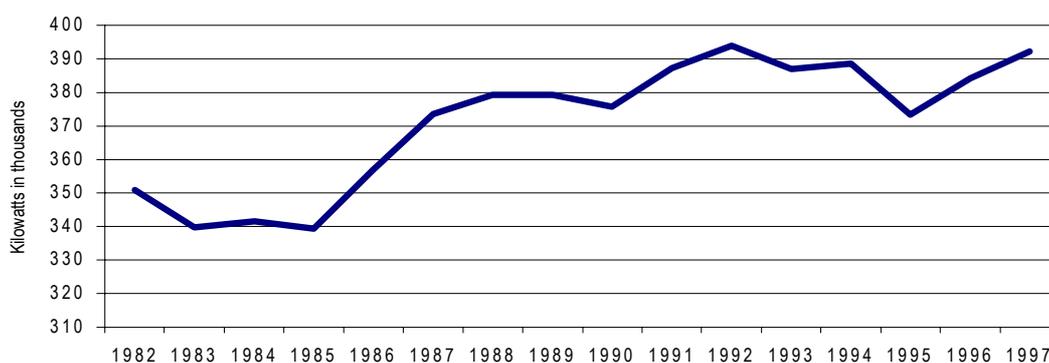


Other measures of capacity

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 demand for more spacious living quarters on board. Improvement in the handling and storing of the catch on board also effects size, and so does on-board processing.

Several other factors therefore effect capacity: Vessel age, engine power, technical equipment, and even the skipper and crew influence the capacity of a vessel. Engine power is sometimes used as an indicator of capacity. The following graph shows the development of engine power, in kilowatts, of all vessels larger than 10 GRT in recent years. Engine power had begun a decrease after 1992, along with decreasing number of vessels, but in 1996 and 1997 several large deep-sea trawlers were bought for the sole purpose of fishing in international waters.

Figure 5. Engine power for all vessels over 10 GRT
Source: Fisheries Association



Legislation and regulation on vessel renewal

After the extension of the fisheries limit (the EEZ) to 200 miles in 1975 it soon became apparent that the capacity of the Icelandic fishing fleet was excessive as compared to the state of the resource. From that time on there has been various legislation and regulation on vessel renewal in the fisheries, mainly to curtail fishing effort.

Indirect measures 1977-1983

New credit rules for the Fisheries fund came into effect in 1977. The rules put a maximum on credit for new vessels at 50% of the import price and, in addition, credit was only offered if another vessel, at least 8 year old, was decommissioned. In 1979 the regulation was changed such that permission from the Ministry of Fisheries was required to import a new vessel. The rule of a 50% maximum loan was retained, except that credit of up to 80% was allowed to import vessels that were to fish from new fish stocks or if the vessel was deemed necessary in light of the governments' regional policy. Despite these rules new vessels continued to be imported, both because private financing was becoming more available and because the Ministry did not block many imports. In 1981 a tariff was set on the import of trawlers, processors and other fishing vessels. The tariff basically banned the import of all larger fishing vessels, whether financed through the governments' Fisheries fund or privately. From 1981, import of larger fishing vessels required the special permission of the Ministry.

Licensing

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 ITQs). The Ministry could now license vessels in particular fisheries, using particular gear, or vessel size or groups. The Ministry issued a new regulation in February 1984 which required licensing for all vessels over 10 GRT to fish in the Icelandic EEZ. Vessels already in the fishery (in the period November 1982 to October 1983) were issued licenses. New vessels could only receive a license if they had been commissioned before the end of 1983. Other vessels could receive a license if a comparable ship already in the fishery was decommissioned (retired). These rules were in effect, with only minor changes, until 1990. In 1986 the Ministry made an exemption and issued licenses to three new vessels. These vessels had actually been commissioned in 1983, with government initiative to support the domestic shipbuilding industry.

From 1991 regulations on licensing have been issued each year, with small changes or clarification on the definition on 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 the 70% maximum was abolished and any number of vessels could be decommissioned for a new vessel comparable in size as 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 changing vessels already in the fishery. Vessels in the fishery before 1986 have had the freedom to increase in size without limits, although replacing them has mostly been subject to the same rules as other vessels. Vessels that came into the fishery in 1986 or later have not been allowed to increase 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 licensing for all vessel over 6 GRT and gillnet vessels under 6 GRT. From 1988 a new vessel over 6 GRT could only receive a license if a comparable vessel was retired. The fisheries management act of 1990 required licensing for all vessels. Since 1991, therefore, a new vessel, of any size, could only receive a license if a comparable vessel (or vessels) were decommissioned.

In December 1998 the supreme-court reached a decision on a case brought before it, concerning an application by an individual for a commercial fishing license and quota. The Ministry of Fisheries had declined the application and a lower court had decided the Ministry had grounds for the refusal on the basis of the *Fisheries Management Act* of 1990. Article 5 of the legislation stated that only vessels already in the fishery at the time of the legislation could receive licenses. The supreme-court found the article unconstitutional, on the grounds that it provided for unequal treatment of citizens. The court did not however decide on the second issue, the application by the individual for quota.

The parliament passed legislation in January 1999 to rectify the Fisheries Management Act. All registered vessels may now apply for commercial fishing licences. Access is therefore not restricted anymore.

Receiving a commercial fishing license is only one step though, to fish TAC-species also requires a quota. This legislation abolished the restrictions on licensing of new vessels and therefore new vessels can receive a license without any other (older) vessel being decommissioned. All restrictions on enlarging a vessel have also been abolished.

As of May 1999 17 new licenses have been issued to vessels larger than 6 GRT and 21 new licenses to vessels smaller than 6 GRT. The 17 larger vessels can participate in the fishery immediately, but have to lease or buy quota to do so. The latter 21 smaller vessels have to wait until September 2000 to begin fishing and then they may either lease or buy quota (in a new small vessel ITQ system) or receive a very limited number of fishing days.

Grants (subsidies) for decommissioning vessels

One of the aims of the fisheries management policy since 1976 has been to decrease the capacity of the fishing fleet. Despite various regulations on vessel renewal and entry of new vessels, the capacity of the fishing fleet continued to increase in 1977-1990. Only after the *Fisheries Management Act* of 1990 came into effect and licensing was required for all vessels has the capacity increase been halted.

The Ageing Vessel Fund

This Fund was founded in 1978. The purpose for the Fund was to provide grants such that older and uneconomical fishing vessels could be retired. The Fund would provide grants by buying the older vessels but the owner could use the grant to purchase a new vessel. All decked vessels larger than 12 GRT paid fees to the Fund and were all in return eligible to receive grants to retire their older vessels. The Fund was in effect based on intra-industry subsidies.

Fund for Obsolete Vessels

The Fund for Obsolete vessels was formed in 1980. It had a similar purpose as the Ageing Vessels Fund, to provide grants such that older and inefficient vessels could be decommissioned. The Fund received a portion of the export duty on fish products to fund the grants (intra-industry subsidy). The Fund provided grants to destroy vessels and to retire vessels permanently. Grants were not usable to renew vessels. There was no vessel size limit on grant eligibility.

The Rationalisation Fund

The Fisheries Rationalisation Fund replaced the Ageing Vessels Fund and the Fund for Obsolete Vessels in 1990. The objective with the Fund was to increase efficiency in the fisheries and to assist fishing villages that needed help in adjusting to changes in the fisheries. There was a maximum grant of 10% of the insurance value of each vessel. The Fund received fees from all vessels larger than 10 GRT (intra-industry subsidy). In 1992 the grant was increased to 30% of the insurance value of each vessel, with a maximum total amount. In total the Rationalisation Fund provided grants for the decommissioning of 41 vessels in 1991-1993, or a total of 2,496 GRT (another 6 vessels were decommissioned in this time period without receiving grants).

Development Fund

The Fisheries Development Fund was formed in 1994. The Development Fund replaced the Rationalisation Fund, but had a wider purpose. The basis for Development Fund was the high debt of the fisheries sector which could be traced partly to overcapitalisation and overcapacity in fishing and processing. The objective of the Fund was therefore to act to adjust capitalisation and capacity of the fisheries sector to suit the sustainable yield of the fisheries. The Development Fund inherited the assets of the Rationalisation Fund. In addition the Development Fund became responsible for collection and repayment of the fisheries sector debt to the governments Regional Development Institute. The Development Fund collects fees from all fishing vessels, based on vessel size. From 1996 the Fund also collects fees on vessel quotas. Land based fish processors also paid fees to the Fund, based on the value of the processing plant (discontinued in 1997). As with all the decommissioning funds, the Development Fund relies on intra-industry subsidies.

In 1997 the role of the Fund was changed. It now manages the fisheries sector debt and the fees it collect are now earmarked for the sole purpose of financing a new Marine Research Institute vessel. As of 1997 the Fund no longer provides grants to decommission or retire vessels.

The Development Fund provided grants to decommission and retire fishing vessels from 1994 to 1997. Receiving a grant did not require that the vessel be destroyed. Instead the vessel was removed from the official ship registry and its commercial fishing license was revoked. The vessel grant, in 1994 and early 1995, was set at the 45% of the insurance value, with a maximum of USD 1.3 million. From mid-1995 the grant was lowered to 20% of the insurance value. Small vessels received a higher grant in 1996, or 60% to 80% depending on the type of license. In total the Development Fund provided grants for the decommissioning of 459 vessels, or a total of 7,829 GRT (most in 1994-1995, or 6,861 GRT). Of these, 398 vessels were under 10 GRT and only 24 larger than 100 GRT. (Another 85 vessels were decommissioned in this period without receiving grants.) The total amount of grants was USD 40 million. The Fund also provided grants for the retirement of 20 processing plants, for a total amount of USD 6 million.

The performance of the ITQs in reducing excess capacity and effort

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 decreased from about 65 vessels in 1975 to 30-40 in recent years (their numbers had actually increased up to 145 in 1980).³ Catch per unit effort in the herring fishery is now roughly 10 times higher than it was at the outset of the vessel quota system in the fishery over 20 years ago (Arnason 1993). The herring stock biomass is now greater than at any time since the 1950s.

The capelin is a short-lived species and the fishery is very volatile. Part of the capelin stock migrates seasonally into the jurisdiction of Greenland and Norwegian fisheries. 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 percent of the TAC. In winter, the capelin is fished exclusively in Icelandic waters. The capelin catch averaged less than 700,000 MT in 1980-1995. The catch in 1996-1998 averaged 1,070,000 MT. 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 fleet total tonnage (GRT) was reduced by over 25 percent and total days at sea for the fleet had reduced by almost 25 percent. Thus, there are strong indications that the efficiency of the capelin fishery has increased substantially since the introduction of the vessel-quota system.

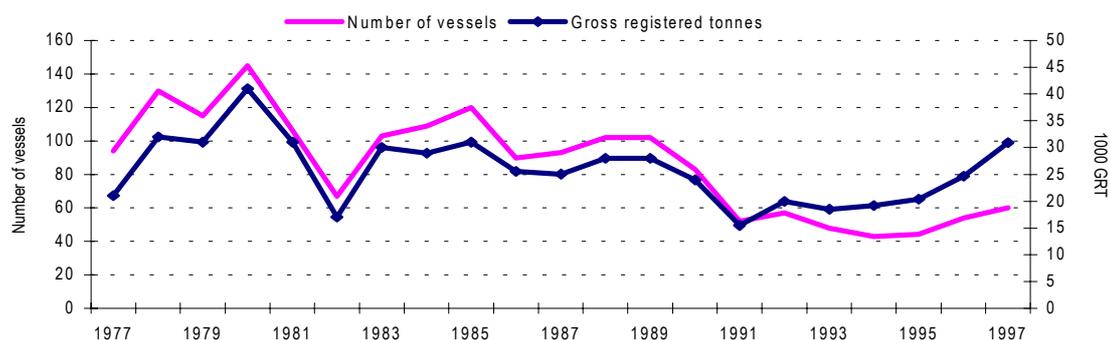
In the summer of 1994 the Atlanto-Scandian herring fishery resumed. This herring stock migrates between Norwegian, Faroe Islands, and Icelandic waters. ITQs were issued for this fishery in 1998. Icelandic vessel caught 21,000 MT in 1994, but the catch had increased to 197,000 in 1998. The size of the 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 multipurpose vessels, capable of using deep-sea trawls (especially deep-sea shrimp-trawl) and also special purse seine and pelagic trawl for herring and capelin. These larger multi-purpose vessels are therefore not only capable of pursuing pelagic fisheries year round (capelin in winter and late Summer, and Atlanto-Scandian herring in early Summer and Icelandic herring in the Autumn), but can also pursue shrimp (or other species) in between the herring and capelin seasons.

It is appropriate to look at the development of the pelagic (purse seine) fisheries as one, rather than separating the herring and capelin fisheries. The development of the pelagic fishery, in terms of vessel number and size is illustrated in figure 6.

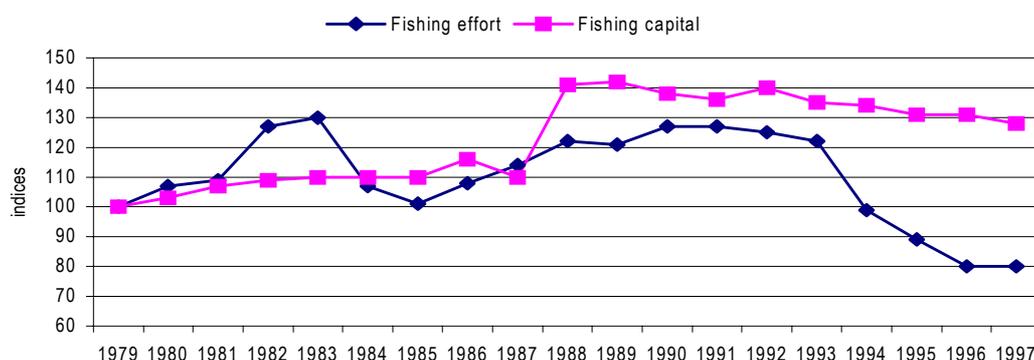
³ The vessel quota system in the Icelandic herring fishery only applied to purse-seine vessels. In addition there were another 95 vessels with licenses for fishing herring with other gear, and they became subject to vessel quotas in 1985. In 1986 the vessel quota systems in the herring fishery were abolished, and instead a common ITQ system instituted.

Figure 6. The Development of the Pelagic Fishery 1977-1997
 Max. no. of active purse seine vessels in any one month
 Source: Útvegur 1977-1997



The trend in the value of fishing capital and fishing effort (ton-days at sea) in the demersal fisheries in recent years is illustrated in figure 7. 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 six-percent. 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. 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 two percent annually while during the preceding 15 years this annual increase was over six percent. Moreover, most of the investment since 1986 can be explained by factors extraneous to the ITQ system.

Figure 7. Demersal fishing effort and capital 1979-1997
 Source: Útvegur 1979-1997



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 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.

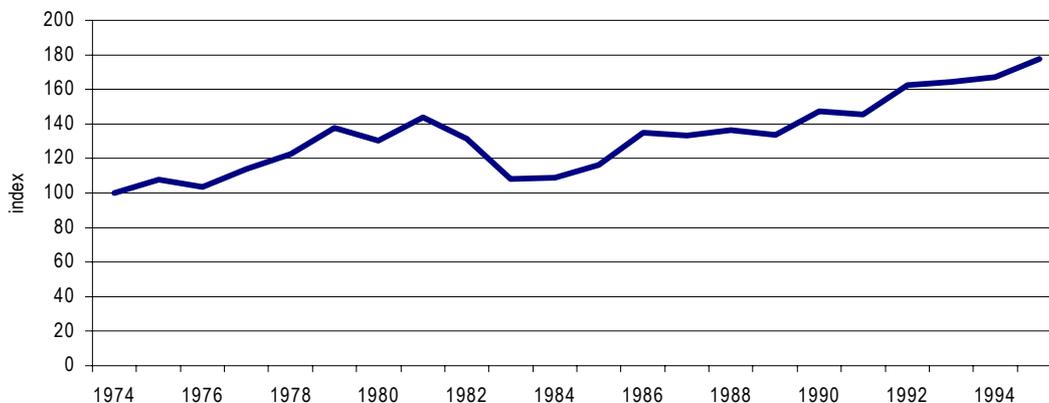
Fourth, during this period there was a very significant investment in vessels under 10 GRT that were not subject to the vessel quota system. Their numbers increased from 1,067 in 1983 to 2,023 in 1990. Investment in small vessels accounts for almost 15 percent of total investment in the fishing fleet from 1984-1992. Although the comprehensive *Fisheries Management Act* of 1990 closed many of the loopholes of the previous ITQ system(s), one loophole did remain. 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 license, 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 percent in 1998. In 1998 there were 807 vessels in this group, 480 of which chose cod share quotas.

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 at the end of 1990 and, in fact, we subsequently see a significant reduction in fishing capital.

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 percent in 1984, the first year of the vessel quota system, and by an additional six percent 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, more fishing effort was required to fill the catch quotas. From 1991 and onwards demersal fishing effort has declined substantially.

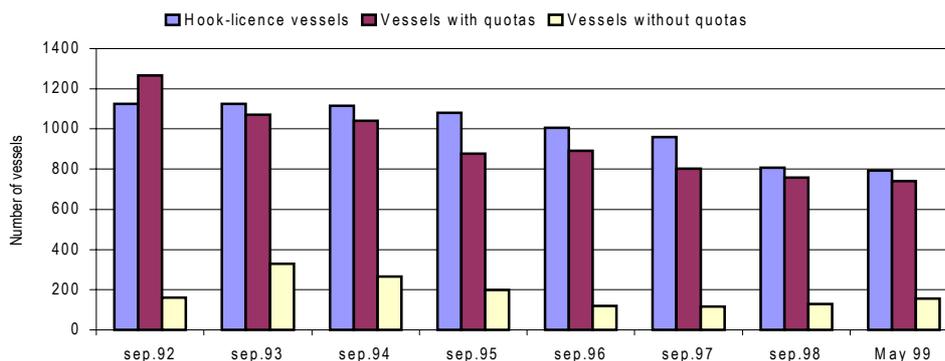
Productivity in the Icelandic fisheries has continued to increase after the ITQ system came in to effect, as may be seen in figure 8.

Figure 8. Total factor productivity in the fisheries, at constant prices and adjusted for stock size.
Source: Institute of Economics



The number of vessels with commercial permits was 2,560 in January 1991; 1,433 vessels were in the ITQ system and 1,127 had hook-licenses. At the start of the 1992/93 fishing season (see figure 9) 2,552 vessels had licenses. Of these, 1,265 vessels were larger than 6 GRT had TAC shares and 1,125 vessels under 6 GRT were engaged in hook and line fishing (the other 162 vessels had permits but no quotas). In May 1999 the number of vessels with commercial fishing permits was down to 1,688 (1,671 if new licenses are excluded). Only 740 vessels have TAC shares and 793 vessels under 6 GRT are active under the small vessel arrangement. In addition there are 155 vessels with a commercial fishing permit, but no quota. There has been a total reduction of about 900 vessels since the introduction of the comprehensive ITQ system in 1991. About 500 vessels have received grants for decommissioning, about 400 have not. Of the 500 vessels receiving grants, almost 400 were under 10 GRT in size. More than a third of the vessels were retired after the decommissioning grants were abolished in 1997.

Figure 9. Number of vessels with commercial fishing permits 1992-1999
Source: Fisheries Directorate



Included in the numbers above is 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).

Conclusion

Overcapacity and overcapitalisation emerged as an issue in Iceland in the 1970s with the extension of the fisheries jurisdiction to 200 miles. Over the years, various measures were taken in an attempt to reverse this trend. Most of the measures early on were in the form of restricting entry and effort, although some financial incentives were also provided to decommission vessels. The most important measure to counter the overcapacity or overcapitalisation problem was the introduction of ITQs in the Icelandic fisheries. Iceland has experimented with 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 fishing in stocks shared with other nations and in international waters to ITQs. The evidence on the performance of this system is generally favourable. The system has resulted in increased efficiency of the fishery and the evidence is becoming clearer.

The fishing fleet has decreased drastically in terms of vessel numbers in recent years, although in terms of total GRT it seems to have decreased only slightly. But the total GRT in official vessel registry may mask the actual decrease in tonnage, as there are numerous vessels in the registry that 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%. About 500 vessels have received grants for decommissioning, about 400 have not. Of the 500 vessels receiving grants, about 400 were under 10 GRT in size. More than a third of the vessels have been retired after the decommissioning grants were abolished in 1997, suggesting that the link between the grants and the decommissioning is rather weak. The free transfer and trade of quotas has provided incentives to vessel owners to economise on the number of vessels. Aggregate fishing effort has decreased by more than 35% since 1992.

In closing, the question of whether a special decommissioning scheme is really necessary should be raised. The Icelandic experience suggests that an ITQ-system will induce rational behaviour, resulting in the removal of excess capacity. In addition to the ITQs, Iceland adopted restrictive rules on vessel renewal (size restrictions), resulting in a market for redundant vessels. The decommissioning funds may simply have raised up the price for redundant capital.

Bibliography

- Arnason, Ragnar (1993). "The Icelandic Individual Transferable Quota System: A Descriptive Account." *Marine Resource Economics* 8, 201-208.
- Arnason, Ragnar (1995). *The Icelandic Fisheries: Evolution and management of a fishing industry*. Oxford: Fishing News Books.
- Arnason, Ragnar (1996). "On the ITSQ fisheries management system in Iceland." *Reviews in Fish Biology and Fisheries* 6, 63-90.
- Arnason, Ragnar (1999). "On the Environmental Impact of fisheries subsidies." A short report for the Ministry of Fisheries, Reykjavik, Iceland.

FAO (1999). "The Management of Fishing Capacity: A New But Crucial Issue for the Sustainable World Fisheries." Ministerial Meeting on the Implementation of the Code of Conduct for Responsible Fisheries, Rome, Italy, 10-11 March, 1999.

FAO Fisheries Department (1998). "The International Plan of Action for the Management of Fishing Capacity." (www.fao.org/WAICENT/FAOINFO/FISHERY/IPA/capace.htm)

Fisheries Association of Iceland. *Aegir*. Vols. 1977-1999.

Fisheries Association of Iceland. *Utvegur*. Vols. 1977-1997.

Hatcher, A. and K. Robinson (1999). *Overcapacity, Overcapitalisation and Subsidies in European Fisheries*. Proceedings of a workshop held in Portsmouth, UK, 28-30 October 1998. Centre for the Economics and Management of Aquatic Resources, University of Portsmouth.

Milazzo, M (1998). *Subsidies in World Fisheries: A Reexamination*. World Bank Technical Paper no. 406, Fisheries Series. World Bank, Washington DC.

Runolfsson, Birgir and Ragnar Arnason (1997). "Individual Transferable Quotas in Iceland", in Laura Jones, ed: *Fish or Cut Bait!* Fraser Institute

Runolfsson, Birgir (1999). *Sjávarútvegur Íslendinga: Þróun, staða og horfur*. A Report to the Minister of Fisheries (www.hag.hi.is/~bthru/skyrsla.htm).