ISSN 1011-8888

INSTITUTE OF ECONOMIC STUDIES

WORKING PAPER SERIES

W00:12 September 2000

Changing Rules for Regulation of Icelandic Fisheries

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Abstract

From the 1950s to the mid-seventies, Iceland's efforts in international diplomacy were largely devoted to convincing other nations that Icelanders should control and utilise the resources of the waters within 12, then 50 and finally 200 nautical miles around the island. During the last quarter of the twentieth century, Icelandic politicians have devoted considerable time and effort to the debate on how to organise the utilisation of these resources and in what way the revenues from this harvest should be distributed. This paper gives a short account of the development of regulatory reforms in four types of Icelandic fisheries.

None of these reformatory processes can be said to be a replica of any of the other processes. It seems apparent on the face of things that each reformatory process is unique and distinct from the others, except in its final outcome, the rule of the ITQs. However, this conclusion may be too short sighted. From the earliest history of regulatory reforms, it is evident that the ITQ system which eventually came into being was not the intended outcome. There is a common pattern for all the fisheries, however. First of all, serious attempts to reform management practices start when the fishery has collapsed or is close to collapse. Secondly, the first thing that stakeholders do is close the club that has access to the given fishery. Thirdly, a variety of rules are implemented to allocate participation rights when the club of participants has been closed. Fourthly, prior to the invention of the ITQ system, prices were used to manage fisheries in Iceland. It may be that management of fisheries by ITQs rather than through some form of taxes or fees has historical rather than logical roots.

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[1] This is a revised version of a paper presented at the IIFET 2000 conference of the International Institute of Fisheries Economics and Trade in Corvallis, Oregon, USA in July 2000. I am indebted to participants at that conference as well as Hjálmar Vilhjálmsson, Jakob Jakobsson, Unnur Skúladóttir, Ágúst Eingarsson, Benedikt Valsson, Markús Möller, Thorvaldur Gylfason and Thráinn Eggertsson for reading and commenting on this manuscript at various times. They have helped to reduce the number of errors but are of course not responsible in any way for the remaining ones.

1. Introduction

Iceland is surrounded by waters that have potential for producing valuable fish species in large quantities. From the 1950s to the mid-seventies, Iceland's efforts in international diplomacy were largely devoted to convincing other nations that Icelanders should control and utilise the resources of the waters within 12, then 50 and finally 200 nautical miles around the island. During the last quarter of the twentieth century, Icelandic politicians have devoted considerable time and effort to the debate on how to organise the utilisation of these resources and in what way the revenues from this harvest should be distributed. The following paper gives a short account of the development of regulatory reforms to the management of Icelandic fisheries.

2. Regulatory reforms to the management of important Icelandic fisheries

2.1 Fjord shrimp

Jónsson (1990) describes in detail how the catch of fjord shrimp started out with experimentation in Ísafjarðardjúp in the mid-twenties, when equipment and know-how were imported from Norway. These pioneering experiments were not successful. New equipment was bought for use in Ísafjarðardjúp in 1935. Shrimp processing was established in Ísafjorður in 1936, marking the beginning of the economic utilisation of Icelandic fjord-shrimp. The industry experienced a slow start. For most of the period from 1935 until the early 1950s, catch was conducted by between one and three vessels and processed by one plant. A second plant, utilising quick freezing of the peeled shrimp, was established in 1949. The introduction of quick freezing enabled more vessels to enter the fishery and sell their catch. The removal of the shell (peeling) was still done by hand, and was thus labour intensive. An automatic sheller was invented in Germany in

1958 and was introduced in a plant in Ísafjörður in 1959. This innovation reduced demand for labour: one source states that an automatic sheller and 10 girls were as efficient as 30 girls had been before. Hence, on-shore capacity was greatly expanded. Before the introduction of automatic shellers, the plants had discouraged catch of small (young) shrimp, which were extremely labour-intensive to process and hence expensive to produce; moreover the market price for small shrimp was low. The introduction of automatic shellers considerably reduced the cost of utilising small shrimp and shrimpers began to bring more juvenile shrimp ashore. This eventually resulted in more intensive use of the existing fishing areas and consequently, a drop in catch per unit of effort. In 1959, the shrimpers in Ísafjörðdur asked the Ministry of Fisheries for help with finding fresh fishing spots in order to expand the harvesting area. (See Hoonaard, 1977, p. 263.) The Ministry chose to interpret the plea for help as a request for regulation. (This seems to be the official view of the Ministry up to this day, cf. a speech by the then Permanent Secretary of the Ministry, Árni Kolbeinsson in October 1995. (See Kolbeinsson, 1995.) The shrimp fishery collapsed in 1962. Catch per unit of effort decreased by as much as 50% between the spring season in 1960 and the spring season in 1962. (See Hoonaard, 1992, p. 143). The fact that total catches of shrimp decreased clearly suggested that the known fishing spots were being over-fished.[2] The Ministry responded to the collapse of the fishery by introducing quotas. Vessels were restricted to bringing no more than 600 kg of shrimp on shore per day and the total catch for the whole fleet was not to exceed 400 tons. Hence, the shrimp fishery became the first fishery in Iceland to be regulated by a total allowable catch (TAC) quota.

Quantity of catch was not the only issue debated. The price of fresh shrimp was also a contentious issue. The shrimpers were rarely happy with prices they negotiated with the processors. The Official Fish Price Board (established by Parliament in 1961) announced an ex-vessel price of shrimp for the first time in 1965. The board consisted of

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[2] Shrimpers suggested that the decreased catches in 1962 could be explained by cod substituting shrimp for herring in its diet. The changes in the eating habits of cod were to have come about due to increased catches of herring. Marine biologists do not subscribe to this theory. (See Hoonaard, 1992, p. 117).

an equal number of representatives of "sellers" and "buyers" with a governmentally appointed chairman. Shrimpers felt that the ex-vessel price established by processors and/or the Official Fish Price Board shifted an unfair share of total profits to processors. This sentiment is probably the main reason why shrimpers got directly involved in processing in the early seventies. Active shrimpers both bought existing processing plants and built new ones. The shrimpers obviously believed that the ex-vessel price of shrimp was depressed due to monopsonic behaviour on the buyer side.

In 1964, the shrimp fishers in Isafjorður organised an association, Huginn, in order to be better able to express their views regarding the management of the fishery. The Ministry had the formal right to manage the fishery, but did consult both the Marine Resource Institute (MRI for short) and the shrimpers' association, Huginn. The right to enter the shrimp fishery was restricted by permits, and the shrimpers pushed for regulation that would restrict permits to members of Huginn. The Ministry was reluctant to do so, but experimented with the rule that a permit holder had to apply for membership in Huginn in order to keep his permit.[3] The Ministry tried, nonetheless, to uphold the guiding principle that permits should only be issued to local inhabitants. Hence, the pool of possible entrants into the fishery was relatively big and had vague boundaries. Consequently, the attempts to close the club of harvesters proved ineffectual and the number of participants in the fishery increased.

The system of daily quotas introduced in 1962 was not popular among shrimpers, who maintained that it was too restrictive vis-à-vis the most efficient fishers. A weekly quota system was introduced in 1967. The idea was to give the efficient fishers more scope to enjoy their comparative advantage and gain their "rightful" share of the total quota. As a result, the processors experienced huge landings early in the week and had to increase the speed of the peelers, resulting in increased waste. Hence, in 1970 a system of a three-day quota system was introduced with a maximum limit of catches for the first

[3]During the fall season in 1969 the Ministry only granted permits to vessel owners who were full members of Huginn. That policy was challenged by vessel owners who were non-members and the Ministry did not try to impose it again.

three days of the week and a maximum quota for the whole fleet through the week. (See Hoonaard, 1992.)

Legislation passed in 1975 empowered the Ministry to regulate the establishment of new capacity in the processing as well as in the fishing of shrimp. The act also empowered the Ministry to allocate quotas to individual vessels. The main concern of the Ministry was to develop rules to restrict entry of new firms into the onshore activity. Owners of shrimp vessels tried to safeguard their investments. Hence, in 1980, the owners of vessels in Ísafjörður initiated a system whereby the shrimp TAC was allotted per vessel. Vessels were divided into three categories based on size, and vessels in each category were allotted a quota of equal size. (Source: Kolbeinsson, 1995.) Vessels of less than 12 GRT were allotted a quota of 75 tons per season, vessels of 12-18 GRT were allotted 83 tons and bigger vessels were allotted 90 tons. Daily quotas were abandoned. (See Hoonaard, 1992.)

The joint effort of the Ministry, the vessel owners and other stakeholders to regulate the shrimp fishery predates most other attempts to regulate fisheries in Iceland. One would expect that the experience from this regulatory attempt would have figured prominently in the fishery management debate in Iceland in the 1980s and the 1990s. That was not the case.

Looking back, one may wonder why the shrimp fishery management design was not extended to demersal fisheries when fishery management experiments started for those fisheries in the mid-seventies to the mid-eighties. For example, the shrimp quota was partly tied to onshore facilities. Inhabitants of small towns dependent on onshore activities and owners of onshore facilities suggested numerous times that a similar rule should be invoked in the regulation of the demersal fisheries, i.e., that a cod quota should be allotted to processors. The proponents of this view hardly ever mentioned that a similar rule had been employed in the case of the shrimp fisheries. Furthermore, the shrimp-fishery rule of equal allotment of quotas to all vessels in a given category was not considered when the rudimentary ITQ system was initiated.[4]

[4] The spokespersons for the fish processors and the political leadership in fishing villages argued the case for “processor-plant quotas” quite strongly. In 1993, the so-called Two-

Why were the lessons from the shrimp fishery not brought to bear on the general debate later on? To my knowledge, this question has not been seriously addressed. One probable reason is that the structure of the shrimp fishery was in a state of considerable flux in the early 1980s when the ITQ system was in its infancy. New fishing grounds far off the coast had been discovered. The new grounds had to be harvested by bigger and better equipped vessels than those used in the fjord shrimp grounds. Hence, new capital and vessel owners and skippers and crews with "fresh" experience were entering the industry. It was obvious that old regulations would have to evolve in order to manage the changing industry. The sentiment may have been that management of the fjord shrimp was already obsolete and could not serve as a model for management systems in other fisheries.

A final comment on the fjord shrimp experience bears noting. The offshore shrimp fishery was developed in the 70s and took off in the 80s at the same time as the ITQ system was developed. It should have been obvious for any outside observer of the shrimp fishery that grandfathering the right to catch shrimp in Icelandic waters to those already in the industry would have been unfair and might have delayed the development of the shrimp fishery by several years. One would expect, with hindsight, that the argument just mentioned would have been extended to the demersal fishery and the development of the overall ITQ system; however, that did not happen.

2.2 Herring

The Icelandic herring fishery developed into a large-scale industry during the first half of the 20th century. The catches in Icelandic waters varied between 100,000 and 150,000 tons until 1958, when total catches in Icelandic waters grew to more than

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headed Committee (so-named because it had two chairmen) appointed by the two majority parties in Parliament with the mandate to evaluate the Fishery Management Act almost recommended a "processor-plant quota". The proposal was eliminated from the final draft of the committee's report. Reference to the shrimp-management experience was not made to my knowledge during the public debate after the release of the report.

200,000 tons. Catches increased every year after that to reach an all time peak of 625,000 tons in 1964 and 1965. Catch in 1966 was almost 500,000 tons, but declined to 100,000 tons in 1967. The catch in 1968 was only 30,000 tons, or less than 1/20 of its peak a few years earlier. The fishery had collapsed.

Fisheries biologists guessed as early as 1905 that the catches of herring in Iceland were based on at least two stocks. (See Jónsson, 1990, p. 79.) They were later able to identify two separate small local stocks (the spring spawning Icelandic herring and the summer spawning Icelandic herring) and one large stock (the Atlanto-Scandic herring) that spawns off the coast of Norway but feeds in the plankton-rich areas off the eastern coast of Iceland. The high-catch fishery of the 1950s and the 1960s was based on the feeding migration of the Atlanto-Scandic stock.

As catches from the Atlanto-Scandic stock increased during the 1960s, a growing concern emerged that the catches were at an unsustainable level. Hence, landings of small herring were banned in 1966. A partial moratorium was introduced in 1967 and a TAC on herring was introduced in 1969, followed by a full moratorium in 1972 for all gear except drift nets. Drift nets had not been in use in Iceland since 1960, so the 1972 regulation amounted to a full moratorium until vessels were equipped with the appropriate gear.

These regulatory measures by the Icelandic authorities were not effective. By and large, they only reduced fishing from the two local stocks. The large stock, the Atlanto-Scandic herring, migrated through international, Icelandic, Norwegian and Russian waters. Consequently, large-scale catches of juvenile herring were confined to Norwegian waters, where catches were half a million tons in 1967. The Atlanto-Scandic herring changed its migration behaviour after the collapse of the stock in 1968 and became a local stock to Norwegian waters. No effort was made to effectively manage the catches from the stock in Norway until 1971. Hence, the Icelandic moratorium (1972-1975) affected only the fishing from local Icelandic stocks.

The moratorium was, however, successful with respect to the Icelandic summer spawners. Fishing from the summer spawners resumed in 1975, as the estimated size of the stock had grown from virtually zero to 50,000 tons and has since increased to about 500,000 tons. The drift-netters were allotted some 30-40% of the TAC and fished from a

common quota. (See Jakobsson, 1980.)[5] When the Ministry for Fisheries decided in 1975 that "herring vessels" ("síldarbátar") had to apply for the right to participate in the herring fishery, they received 44 applications. The purse-seiners' quota was divided equally between vessels so that each vessel was allotted the right to catch 215 tons. (Source: E-mail exchange with Jakob Jakobsson in May, 2000.) Fishing with stationary nets was open and unrestricted for any vessel below a given size limit (50 GRT). From 1979, vessel owners were allowed to concatenate two purse-seiners' quotas. Some experimentation seems to have taken place in the year 1982 with respect to management of the catch of purse-seiners. Vessels that applied for a licence in 1982 had to have participated in the herring fishery in one of the years 1980 or 1981. The applicants were divided into two equal groups. One group was allowed to participate in 1982, and the rest were allowed to participate in 1983. Each vessel received a mixed value and volume quota. The value/volume of the catch was not to exceed 1.360.000 *krónur* or 515 tons. The reason for this complicated rule seems to have been that quotas were uneconomically small. Quotas were made partially transferable in 1983, when vessel owners were allowed to transfer 50% or 100% of an allotted quota to other quota-holding vessels. (Source: Útvegur 1982, 1983 and 1986.) The transition from a derby-fashion fishery for the drift-netters towards transferable quotas went as follows. Each drift-net vessel that was active in the fishery during 1983, 1984 or 1985 was allocated a fully transferable quota of 350 tons. Drift-netters that had caught more than 350 tons during the previous season were allotted cod-quotas at the favourable rate of 1 ton of cod for each 3 tons of herring. Many of the high-catch drift-netters that were allotted cod quotas due to this rule originated from Hornafjörður. (Source: Benedikt Valsson and Grétar Mar Jónsson of the Skippers and Mates Union of Iceland, telephone conversation April, 2000, Útvegur 1986.) Vessel owners holding a herring quota were allowed to permanently transfer their herring quota into demersal quotas. (Source: Útvegur, 1986.) Quotas in 1987 were

[5] It should be noted that the discussion in Arnason (1995) is not comprehensive when it comes to describing the rules of initial distribution of quotas in the herring fishery in Iceland.

allotted equally to 91 vessels. Vessels that had participated during the previous three years could transfer their quotas freely to other quota-holding vessels.

Herring became part of the general ITQ system along with all other regulated fisheries when The Fishery Management Act (Act 38/1990) came into effect in January, 1990. According to this act, each vessel was allotted a share in the permanent herring quota in accordance with its last allotted yearly share.

The relative success of quotas, and subsequently transferable quotas, in the herring fishery paved the way for use of quotas and transferable quotas in other types of fisheries.

2.3 Capelin

Large-scale utilization of capelin in Icelandic waters started in 1965. Initially, the fishery was based on the spawning stock migrating in coastal waters to the spawning grounds during late winter. The fishery was extended, first to the spawning migration in deep waters east of Iceland in winter in the early 1970s and to the feeding migration in the area between Iceland, Greenland and Jan Mayen in the mid-to-late 1970s.

With the advent of a summer/autumn fishery, catches increased rapidly and it became clear that regulatory measures would have to be taken in order to prevent over fishing. Since capelin are short-lived and their spawning mortality is extremely high, it is a prerequisite not to reduce the spawning biomass to such a degree that recruitment is impaired. For this reason, a regulation postulating a targeted spawning stock of 400,000 tons remaining after the annual catch was passed in 1980 and has been in force since then. At about the same time, attempts began to be made to predict fishable stock abundance six to nine months ahead and to set preliminary TACs for the summer/autumn season at certain levels of the predicted TAC. The TAC for the whole season starting in summer and ending in late winter of the following year was set on the basis of acoustic assessments of the fishable stock biomass, made in October and November and/or January and February during each season. In 1992, a new model was developed, which was more successful in predicting the fishable stock abundance than the somewhat cruder version used initially. While maintaining the precautionary approach just described, the

scientific advice further stipulated that no more than 2/3 of the predicted TAC should be allocated until the actual fishing stock abundance had been assessed in autumn and/or winter. All parties concerned accepted the advice and this "catch rule" has been in effect and adhered to ever since.

The migration between feeding grounds and winter locations brings the capelin outside of the Icelandic exclusive economic zone (EEZ) and into Jan Mayen (Norwegian) and Greenland waters. Iceland and Norway reached an agreement in 1980 that distributed available TAC between vessels from the two nations. Iceland gained 85% of the TAC, Norway the rest. The EEC, representing the interests of the Greenlanders, was not ready for managing the stock. Hence, Danish and Faeroese vessels could catch without limits on EEC licence. (Source: Vilhjálmsson, 1994.) The fishery collapsed suddenly in 1982/1983, but stock was quickly rebuilt. Norway, Iceland and Greenland reached an agreement on sharing of the TAC in June, 1989. The Icelandic share was 78% and the share of each of the other nations was 11% of the available TAC. Detailed rules governing crossover of vessels from one nation into another nation's EEZ were contained in the agreement. (Source: Vilhjálmsson, 1994.)

Icelandic capelin catches were small in the sixties until after the collapse of the herring fishery in 1967. The catch was 80,000 tons in 1968 and more than doubled in 1969. Catches increased dramatically in the first years of the seventies.

In the early seventies, the main season for capelin fishing was during mid-winter and usually lasted only a few weeks. Weather, distribution of catches relative to distribution of processor plants, transport capacity of vessels and processor plant storage capacity for fresh capelin were important parameters determining the overall catch during the season. The Official Icelandic Fish Price Board issued a uniform ex-vessel price. The price was differentiated according to intended use. Hence, price of fresh capelin intended for freezing was higher than price of fresh capelin intended for processing. It is noteworthy, however, that only a small fraction of the catch was frozen. The pricing rule gave skippers and vessel owners strong incentives to bring their catch to the closest harbour, thus minimising transport costs. The result, predictably, was that at each harvest season, fully loaded vessels waited in lines in harbours close to the area of harvest, while processing plants further away were idle. It was obvious, even to the most casual

observer, that the overall economy of the fishery could be improved by giving some of the waiting vessels incentives to take their catch to an idle plant.

The representatives of vessel owners and fishermen aired their concerns in a letter to the Ministry of Fisheries in April, 1972, which responded by appointing a committee to look into the matter. The committee's proposal for changes to existing legislation was adopted by Parliament, with minor modifications, as Act 102/1972. According to the Act, processing plants were forbidden to unload capelin vessels out-of-turn. A regulatory capelin committee was established to direct vessels away from over-supplied plants to under-supplied plants.

The Official Icelandic Fish Price Board announced the prices for fresh capelin at the end of January, 1973. The Board decided to levy a fee of 0.05 krónur per kilo of capelin, to be paid into the newly created Capelin Transport Fund. A few days later, the fee was raised to 0.15 krónur per kilo. The Transport Fund divided the harvesting area into seven sub-areas. The coast was divided into thirteen geographical locations, each containing one or more processing plants. The Transport Fund announced transport support rates based on the transport distance and supply situation at different plants for each period. In effect, the Transport Fund announced a 13x7 matrix of rates. A matrix could be effective for as long as ten days and as little as twenty-four hours. The Ministry and the Capelin Committee jointly engaged Professor Pall Jensson to write a computer simulation model of the capelin fishery. An account of the work by Jensson was published in the annual reports of the Capelin Committee for the years 1977 and 1978. The objective of Jensson's work was to find methods to maximise catch, given fleet, plants and the movement of the spawning stock along the coast. One of the underlying assumptions for Jensson's work was that capelin was an unlimited resource. However, that assumption did not hold, as became evident when the MRI recommended a reduction in the 1979-winter catches late in 1978. Hence, the main assumption for the computer modelling work so far proved false. The Capelin Transport Fund obviously took notice of the changed circumstances and withdrew transport support, which was given for the last time in 1978. (See Anon., 1980.)

The right to catch capelin was limited to fifty-two vessels by a Ministerial decree issued August 11, 1980, in the wake of the settlement with the Norwegian government

regarding catch in the EEZ of Jan Mayen. The vessels, as well as a provisory quota per vessel, were listed in the decree. Half of the provisional TAC was divided equally between the fifty-two vessels. The rest of the TAC was distributed according to the transport capacity of each of the fifty-two vessels. The vessel owners suggested in 1985 that the rule should be changed so that 2/3 of the TAC should be distributed equally and 1/3 according to transport capacity. The Ministry complied. (Sources: Jónsson, 1984; Vilhjálmsson, 1994; Stjórnartídindi B, 1980; Ágúst Einarsson, personal communication; Arnason, 1995; http://www.althingi.is/altext/125/s/1155.html.) Fishing for capelin was prohibited in 1982. The only exception was for vessels that had not fished up their 1981 quota and were allowed a quota identical to their remaining 1981 quota. The catch in 1982 was thus only 13,000 tons. Fishing for capelin resumed in 1983. The Ministry used the 1980 model for allocating quotas to fifty-one vessels. Act 97/1985 on Management of Fisheries in 1986-1987 opened up transferability of capelin quotas. (Source: Act 97/1985, Danielsson, 1997 and Arnason, 1993.) Management of the capelin fishery became a part of the general ITQ system in 1990.

2.4 Demersal fisheries

The Marine Research Institute issued a report in October, 1975 on the status of the cod stock. The report was quickly nicknamed "The Black Report". (See Jónsson, 1990 and Durrenberger, 1987.) This epithet reflects the message of the report, which predicted that the cod stock was about to collapse. The severity of the situation is reflected in the fact that the MRI recommended that total catch of cod in Icelandic territorial waters should not be in excess of 230,000 tons for 1976, whereas the annual aggregated Icelandic and foreign catches in those waters had been 400,000 tons in previous years. With the fate of the Atlanto-Scandic herring fresh in mind, most Icelanders at the time understood that new methods had to be introduced in order to manage the Icelandic cod fishery. The old methods of relying on making gear less effective or more selective by increasing mesh size and/or restricting use of the least selective gear did not do the job.

(Jónsson, 1984, p. 247.)[6] The 230,000 tons of catch recommended by the MRI were grossly exceeded. It was obvious that new types of restrictions had to come into place. The Ministry introduced a decree on July 14, 1977 aimed at restricting cod fishing efforts in particular. The basic measures were three: a) 30 codless days a year for trawlers, implying that trawlers were to keep clear of cod for the given length of time; b) the introduction of a codless week for all vessels; c) a ban on increasing the carrying capacity of the fleet. The catchable cod stock grew the following years, partly due to good conditions in the sea and due to strong year classes entering the fishable part of the stock. (See Fig. 2 in Danielsson, 1997.) The improved situation of the cod stock induced the politicians and the MRI to lower their guard. The consequence was that the effort capability of the fishing fleet continued to grow, in spite of the aim to keep catch-capability constant. Environmental conditions took a turn for the worse in the early 1980s. By 1983, it was evident that codless days and effort restrictions were not adequate measures for keeping the effort capability of the fleet in line with the yield capacity of the cod stock. The issue of enhanced management methods was discussed among participants in the fishery at the 1983 annual meeting of Fiskifélag Íslands.

Fiskifélag Íslands was inaugurated in 1911, for the purpose of working for the benefit of participants in the fishery trade. Since its inception, Fiskifélag Íslands has

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[6] Gear-limitations have a long history in Iceland. There are early records of resistance among fishermen to introduction of new types of fishing line in the late Middle Ages. Use of trawl was prohibited inside the 3-mile territorial limit as early as 1894. There were no trawlers owned by Icelanders at that time. In consequence, the ban was mainly aimed at reducing English, German and French catches in Icelandic waters. Icelanders were especially concerned about the Faxa Bay area, which is an important feeding ground for juvenile demersal species. Effective protection from trawling in that area did not emerge until the 1950s. (See Jónsson, 1990.) There was considerable activity in the 1960s towards regulating the use of gear, size of mesh and minimum size of catch. Act 40/1960 regulates the use of Danish seine. Acts 69/1967 and 4/1968 regulate the use of bottom trawl and pelagic trawl. Act 42/1977 allows the MRI to close juvenile rich grounds for short periods of time without further notice.

contributed in many areas: in collecting data, conducting scientific research, educating officers, building lighthouses, marketing fish products, negotiating better prices for inputs like bunkers, oil etc.. Fiskifélag is governed by a Board that is elected by Fiskiþing (the Fisheries Assembly). Members of the Fisheries Assembly represent local divisions of the Fiskifélag and trade unions, vessel owners and plant owners. (See Jónsson, 1990.) As early as 1978, resolutions brought forward by the local division of East-Iceland recommended management of demersal fisheries by quotas. The members of the local division of the Westfjords voiced opposition, and negative sentiment on this issue is clearly present in that region up until this day. Management of demersal fisheries was debated at every annual meeting until 1983. The MRI had recommended catch of 450,000 tons of cod in 1982, but the catches were only 388,000 tons. The MRI recommended a catch of 400,000 and then 350,000 tons in 1983; however, the fleet was only able to catch 300,000 tons. Thus, the MRI did not manage to reduce its recommendations fast enough to keep up with the reduction in actual catches! It was becoming obvious that the cod stock was in a serious state. Consequently, the MRI recommended a catch of 200,000 tons in 1984. (See Danielsson, 1997.) That was a 25-50% reduction as compared to recent experience and expectations a few years back. The system of effort restrictions that had been in place was by now widely viewed as useless. (See Jónsson, 1990.) Some form of quota system was considered to be the obvious alternative. The Fisheries Assembly of 1983 suggested that management of the demersal fishery in 1984 should operate as follows: every vessel of twelve gross register tons (GRT) or more should be given a quota based on its catch history the three previous years. Smaller vessels were to catch from a common pool. Transfer of quotas should be allowed to some extent. All vessels that conducted fishing should have a permit issued by the Ministry of Fishery. The new management system was to be introduced as a one-year experiment, to be revised at the end of the year. (See Jónsson, 1990.)

The Fisheries Assembly did not and still does not have constitutional powers to write the rules of fishery management. Hence, the Minister of Fisheries put a proposal for new legislation before Parliament on December 12, 1983. The new law was to take effect January 1, 1984. The proposed Act gave few details as to how the management was to be conducted and left much to be decided by Ministerial Decrees. Many MPs

disliked the idea, but in the end, the resulting Act 82/1983 and Decree 44/1984 were in the spirit of the resolutions from the Fisheries Assembly. The general rule established by the Act was that vessels of ten GRT or more were allotted a quota based on the catch history during a reference period. The reference period was defined as the previous three years. Special rules applied to vessels that entered the fleet during the reference period or to vessels that had been absent due to major repair. Special rules also applied if a vessel had changed hands or if the vessel owner had hired a new skipper during the reference period. Owners of vessels with an abnormal catch history or a new captain could choose a) a quota equal to the average quota for the vessel category of the vessel in question or b) an effort quota with maximum catch limit. The catch limit was 115% of the average quota for the given vessel category.

In 1985, the provisory system established by the 1983 Act was extended for one more year, but liberalised the conditions under which vessel owners could choose the effort quota with maximum catch limit. The quota system was extended for two years by Act 97/1985. Effort quotas were made more attractive and conversion of effort-quota based catch history into catch quotas was made possible. Vessel owners were also allowed to forward unused quotas to the next year.

The hybrid effort-and-catch-quota system was prolonged for the 1988-1989 period by Act 3/1988. The only noticeable change in the text of the Act was inclusion of the following in §1 of the Act: "The fish stocks around Iceland are the property of the Icelandic people."

The last substantial contribution of Parliament came with Act 38/1990, the Fishery Management Act. The domain of quota management was extended to cover pelagic species and crustaceans in addition to the demersal species. Quotas were made permanent and admission for owners of vessels over six GRT to choose effort quotas was eliminated. Quotas were made fully transferable, temporarily as well as permanently, with the restriction that a vessel was required to fish at least 50% of its permanent quota every other year. The quota system was furthermore extended to cover all vessels six GRT or bigger. Owners of vessels smaller than six GRT were allotted a TAC of cod that was a given percentage of the overall TAC for cod and each vessel was allotted a given number of sea-days. If the small-vessel TAC was over-fished, the number of sea-days

was to be reduced accordingly in subsequent years. This rule represented a loophole that many small-scale fishers were quick to utilise.

3. Rules for change of management of a commons

The evolution of the management regime in Icelandic fisheries from a free access system (granted by code of law as far back as the 12th century) to a restricted access system is monumental from every possible perspective. A lot of questions are raised. How did the process get started? Why did it start at different points in time in different fisheries? What characterises the process? Was the process similar from fishery to fishery or was every fishery unique in some sense?

It is not easy to find answers to these questions. In the language of Ostrom, (1994), we are asking how the rules of a game are formulated. Ostrom et al. point out that rules apply to multiple levels of governance. At the lowest level, the operational level, day-to-day operations are governed. In an ITQ system, a skipper is prohibited from taking a vessel without a quota to a fishing spot. An intermediate level, the level of collective choice, governs how a particular vessel can acquire a quota. The highest level, the level of constitutional choice, governs methods for changing "the fishery constitution"; i.e., at the constitutional choice level, rules are laid out for how a new "fishery-constitution" is to be established. Ostrom et al. identify seven types of rules that play a role at each level of governance. The following paragraphs relate the changes of fishery management in Iceland to those rules.

3.1 Position rules

Ostrom et al. explain position rules as "rules [that] specify a set of *positions* and how many participants are to hold each position." Hoonaard (1992, page 97), reminds us of "…the all pervasive cultural value in Iceland that the sea's rawproducts belong to <u>all</u> Icelanders.' This value was stressed particularly in the last major 'cod war' with England

(1972-1973). The nation as a whole was deemed to be 'entitled' to its own resources."[7] Hoonaard then observes that this "cultural value" implies that free fishing should be the guiding principle for fishery management in Iceland. That does not imply that position rules are simple or absent in the case of free fishing. Formally, free fishing means that anyone willing and able can participate in a free fishing fishery. Ostrom et al. and others have shown that norms and rules can evolve and take the form of position rules in a free fishing environment. Those norms and rules restrict access to a valuable resource and can even prevent over-utilisation. Ostrom et al. (pp. 80-81) describe examples of how a fisherman or the crew of a fishing vessel gain the right to position a net or a trap at a given fishing spot for a specific period of time.

The Official Icelandic Fish Price Board did have an influential position in the pre-quota management the Icelandic fishery management system. This is very obvious in the case of capelin fisheries, where the crude price-setting rules of the Official Icelandic Fish Price Board were modified in order to maximise the volume of processed capelin. The capelin fishery example clearly shows that the Official Fish Price Board realised how influential its decisions could be. In the case of demersal fisheries, the object of the Price Board was to determine a price path that did not undermine macro-economic stability and did not cause too much discontent among fishers. It has been argued forcefully that the policy of successive governments was to keep fish prices low and the real exchange rate high. The Official Icelandic Fish Price Board was obviously important for anyone who wished to implement such a policy. This policy of low real fish prices was a factor in discouraging investment in new fishing capacity, which may not have been the intended consequence of the overall policy, but was probably an important side effect, illustrating that indirect management by prices has been utilised in Icelandic fisheries with some success. (See Helgason, 1990 and Matthiasson, 1997.)

The evolution of the fishery management system in Iceland has involved a change of position rules in several stages. Fjord-shrimp fishers were required to hold a licence.

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[7] One of the crown arguments of Icelandic politicians during the cod wars was that good governance of coastal resources required that coastal nations have unrestricted control over those resources.

Herring fishing in Icelandic waters was free until banned by the moratorium of 1972. When the moratorium was lifted, fishing was only open to vessels with a licence from the Ministry of Fisheries. Capelin fishing in Icelandic waters was practically free until 1972, when the day-to-day operation of capelin fishing was directed by the Capelin Committee. This situation lasted until 1980, when capelin fishing was restricted to vessels listed in a particular document signed by the Minister of Fisheries. Demersal fishing was restricted to vessels that had participated during the reference period. The evolution of the management effort from free fishing to limited access also involved the creation of new positions. The size and distribution of catch by species needed to be confirmed by a trusted observer. An official record keeper was required. Lastly, an institution with the authority to restrict, arrest and punish an erratic fisher had to be established. It may be confusing that persons performing most of those duties were active before access to fishing was restricted. But those persons performed their collection of data as part of a different *position* prior to restriction of access to the fishing grounds. The record-keeper formerly kept records partly so that skippers knew who was the *catch-king* of the year. This was useful, as skippers gained reputation in accordance with higher catch figures. A skipper of reputation enjoys a good supply of able crewmembers. (For details, see Pálsson, 1991.) With restricted access, a high figure in the record keeper's book could hurt the skipper economically. Hence, skippers might have had an interest in inflating catch figures before the quota system was in place, but this changed with the invention of the quota system in such a way that the skipper might be more interested in deflating the catch figures!

Noteworthy is the changed position of the fisheries biologist. Under a free fishing regime, a fisheries biologist has a role much like that of a commentator writing on the stock market for the business pages of a newspaper. The stock market analysts collect data and explain the behaviour of the market and the reasons why it has moved up or down. Similarly, under free access to the fishery, the role of the fisheries biologist is to measure the size of the stocks, explain the development of stock size and develop theories about the behaviour of the prey. With the advent of TACs, the fisheries biologist is forced to assume a role that is much more like that of a pension fund manager. The latter must develop an investment strategy and convince the board that the proposed

strategy is sound. As the success of a fund manager is measured by the growth of his portfolio, so too is the success of the fisheries biologist. He has to forecast the development of a given statistic, give advice on the size of the TAC and convince politicians and other stakeholders that his methods are sound and his measurements adequate. The success of the fisheries biologist is measured against the development of the size of stocks and the size of sustainable landings.

Hoonaard (1977) gives a good account of the conflict-ridden expectations surrounding the role of the fisheries biologist in the case of fjord shrimping. Shrimpers expect the fisheries biologist to supply information about unutilised fishing spots. The Ministry expects the fisheries biologist to come up with stock estimates, suggestions for safe exploitation levels and good management methods. To complicate matters further the Ministry can ignore and has ignored the advice given by the fisheries biologist. Ignorance of the expert advice was particularly striking in the early years of TAC management. The same pattern can be found in other fisheries. The Ministry overrides the recommendations of the MRI time and again in the case of demersal fisheries, as Danielsson (1997) documents. Fishing for summer spawning herring is a notable exception. The Ministry and the vessel owners were keen to follow advice given by Jakob Jakobsson (Ágúst Einarsson, personal communication). The fisheries biologists and the MRI have made gains in terms of recognition, reputation and funds through the years.

It was noted above that vessel owners and other stakeholders in the Westfjord area have been hostile towards the introduction of the ITQ system in the demersal fisheries. It was also noted that stakeholders with ties to the Eastern region in Iceland took a different view. Introduction of any kind of a quota system implies that older, informal position rules are replaced by new, formal rules. The Westfjords are close to some of the very best fishing grounds. The stakeholders from that region may have reasoned that formal rules would be less favourable for them than the informal rules that they believed were effective. Hence, one can speculate that the long standing negative sentiment towards the ITQ system in the Westfjords may have to do with the “damage” that the introduction of the ITQ system did to the informal position system that was perceived to have been in place in pre-ITQ times.

3.2 Boundary rules

Ostrom et al. define boundary rules as rules that "…specify how *participants* enter or leave […] positions." The formal boundary rules in free fishing are simple, as already alluded to. The informal rules may be complicated. With the advent of limited access, all previous boundary rules, whether formal or informal, are removed. In the case of fjord-shrimp fishing, a participant had to have a permanent address in a given municipality and in addition he had to fulfil several other conditions[8]. Access to the herring fishery was based on an application for a "herring" permit to the Ministry of Fisheries. Consequently, it seems that the ministry had discretionary power with regard to boundary rules in the case of the herring fishery. Access to the capelin fishery was governed by the listing of a vessel in a Ministerial Decree. Thus, boundary rules in the case of capelin fisheries were a ministerial affair. The boundary rules in the case of demersal fisheries are complicated and ever evolving. Any vessel owner that had participated in the fishery during the reference period was allotted a quota. If he was not satisfied with his lot in terms of quotas, he could try to increase his lot by selecting the effort option. However, there was a backdoor into the fishery that was open for most of the time and has only recently been closed. Small vessel owners could enter the fishery and fish from "next-year's" small-vessel quota, so to speak. They over-fished their quota

[8] The Ministry of Fisheries played and still plays a key role in defining who can fish for shrimp in fjords inside the twelve-mile economic zone. This is due to the fact that trawling was and still is forbidden in that area. Shrimp trawling is permitted by exemption from the law. It is in the hands of the Ministry to grant the exemption. The shrimpers that were members of Huginn in Ísafjör›ur tried to control access to shrimping by establishing the rule that every shrimper in the Ísafjar›ardjúp area had to be a member of that association. The Ministry was reluctant to establish such a rule. The Ministry maintained during the 1960s and early 1970s that fishing should be free. Exemptions from that rule had to be based on principles that had a more general flavour to them than suggested by the shrimpers association, Huginn.

almost every year to such a degree that the politicians and the Ministry did not dare to reduce catches to the degree called for by the formally accepted rules!

3.3 Authority rules

According to Ostrom et al., authority rules specify which type of actions are assigned to each position and in which situations a given action is applicable. Authority rules of many of the players in Icelandic fisheries have changed dramatically. Fiskifélag, that had fulfilled a central function in the collection and analysis of data, in addition to being a forum for policy debate lost many of those functions and the functions were transferred to governmental or semi-governmental bodies like Statistics Iceland. This stands to reason. Changes in management imply that the nature of data collection changes significantly from being informative to becoming an integral part of the fishery management system.

When the authority rules of the fishery management systems used in Iceland are considered, it is hard not to notice the vast discretionary powers invested in the Ministry of Fisheries and various committees. Committees were usually composed of members from the Ministry, unions and vessel owners. Meetings as well as minutes from the meetings were usually closed to the public.

3.4 Aggregation rules

Aggregation rules specify how an action is mapped into intermediate or final outcomes. In the case of the Icelandic fishery management system, one should note that the system could not evolve unless the Icelandic Parliament adjusted the code of law appropriately. The formal resolutions agreed on by the Fisheries Assembly in 1983 were worthless as rules of fishery management until Parliament had passed them as legislation.

The implication of the fact that the ground rules of fishery management are useless unless written into the legal code of the country may not have been fully understood by vessel owners and policy makers. The Fishery Management Act is only word on paper until Parliament determines how much money and effort it is going to devote to enforcing the Act. That decision is a tricky one. Devoting resources to force fishers to comply with the rules and regulations of the Fishery Management Act implies that resources are

diverted from some other worthy causes. Politicians will presumably take into account how the well-being and the tax bill of their voters are affected by a given set of actions. A model is given in Matthiasson (1995).

3.5 Scope rules

Scope rules define the set of outcomes that may be affected. The scope of the early reforms was restricted to one or two years at a time. There has been considerable confusion as to the permanency of some of the rights given to vessel owners. Some claim that harvesting cannot be taken from vessel owners without compensation. Others claim that the statement in §1 of the Fishery Management Act reduces the scope of the harvesting rights. The Supreme Court seems to subscribe to the latter conclusion in the Supreme Court Ruling 12/2000, the so-called Vatneyrar-Ruling. The majority ruling of the court states that §1 of the Fishery Management Act implies that an Act of Law is needed if the distribution of quota rights is altered or if other substantial changes to fishery management are contemplated. The Court maintains in its ruling that such changes, if invoked by an Act of Law, will not precipitate rights to compensation by the present holders of ITQs.

3.6 Information rules

Information rules specify which information is available at each position. Management of fisheries by a TAC requires a huge amount of information and adequate modelling. Modelling and interpretation of data is in the hands of the fisheries biologists. (Fishers unhappy with their allotments sometimes maintain that expertise in this context should have “fishy” rather than “fisheries” in front of it). Fishers must be informed of allowable catch, fishers must provide information on transactions of quotas, enforcement officers must be informed of possible violators. Managing fisheries by an ITQ system requires that the accuracy of information be verified. Verification is especially important when it comes to the flow of information from vessel owners about the size of catch. Hence,

information rules change dramatically when fisheries are managed by a TAC and quotas as compared to free access.

One of the unproven assumptions of modern fishery economics is that "prices" (landing fees, for example) are inferior to "quantities" (quotas) as instruments for management. The view is shared by many stakeholders in the industry. Weitzman (2000) finds this peculiar and argues the opposite view, pointing out that this conclusion counters conventional wisdom in the economic literature at large. Why have fishery economists come to different conclusions from economists working in other fields? I think that the historical development in Iceland casts some light on this question. ITQs were not developed "from scratch", but rather they were an evolutionary step that followed when the club of eligible stakeholders in the fishery had been closed.

Assume that a fishery that previously was one of free access is closed due to over-fishing. Assume furthermore that the number of vessel owners that are allowed to participate is fixed somehow. The typical situation is that the catch capacity of the fishing fleet is two or three times that of allowed catches. Hence, concatenating quotas of two or more vessels reduces costs, as less gear and fewer crews are needed. Consequently, it will be economical for vessel owners to send out fewer vessels and share the savings in one way or another. The implication is that a rudimentary ITQ system will emerge quite naturally, given the assumptions presented above. One should note, however, that the fact that a given system is the result of "natural evolution" does not imply that it is the best of all possible systems.

3.7 Payoff rules

Payoff rules specify how costs and benefits are required, permitted or forbidden in relation with outcomes. Discussions regarding payoff rules have been hard to bring to conclusion in the Icelandic debate. Should a holder of harvest rights be allowed to sell or rent-out that right? Ódinsson (1997) documents how small-scale fishermen and other inhabitants in remote fishery villages dislike the idea that uncaught fish can be sold in advance. But even if people agree that harvesting rights can be bought, sold and rented, the question remains to whom the rent should accrue. Should some kind of a

grandfathering rule be used? If so, what kind? Or should the rent accrue to the public at large? How should "the public at large" be defined? Icelanders have debated these matters intensively since the early 1980s. (See Matthiasson, 1992 and Matthíasson, 1999.) The polls have shown that a large majority of the people (70-80%) voice discontent with the fishery management system in its present form. There is a large body of evidence in support of the proposition that the discontent has to do with payoff rules.

The Central Bank of Iceland and the National Economic Institute have recently drawn attention to the fact that the market value of fishing firms traded on the Icelandic Stock Market is considerably lower than the net value of the assets, including fishing rights, of these firms. Table 1 shows that the net value of physical assets and fishing rights are 2.5 times higher than the value of the firms on the stock market. This fact begs the question: why have professional corporate raiders not taken the opportunity for easy money? There are no established answers. But it is quite obvious that buyers and sellers of stocks on the stock market indirectly value fishing rights at a much lower rate than do the buyers and sellers of fishing rights on the quota market.

In a perfect world, the discrepancy between the two measures of quota values should disappear. A skilled investor would buy quotas in one market and sell in the other market. It is noteworthy how constant the difference is. The difference in how the fishing right is valued in the two markets is not because some investor has made a mistake in one trade, but rather reflects a permanent difference. Any Icelander can buy stocks on the stock market, whereas to buy quotas, you have to own a vessel. However, this restriction on the trade in quotas cannot possibly explain the discrepancy. Nonetheless, the buyers and sellers of stocks and the buyers and sellers of quotas are different persons. The bulk of stocks is owned and bought by professional investors like pension funds. The quotas are bought and sold by small-scale fishers, owners of family firms specialising in fishing and professional managers of big fishing firms. It is possible that the sentiment about payoff rules to be advanced in the future is different between these two groups of people.

4. Conclusion

Above, I have given an account of the regulatory activity in four distinct types of fisheries in Iceland. It should be obvious by the evidence presented that none of the reformatory processes can be said to be a replica of any of the other processes. The shrimp fishery in Ísafjarðardjúp is very limited in terms of geographical area. The herring and the capelin fisheries are characterised by a short season and fishing in a rather limited geographical area at each point in time. The demersal fishery is an all-year fishery involving a large number of stakeholders and large sums of money.

It seems evident on the face of things that each reformatory process is unique and distinct from the others except in its final outcome, the rule of the ITQs. However, that may prove to be too short-sighted a conclusion. It should be evident from the earliest history of regulatory reforms that the ITQ system that eventually came into being was not the intended outcome. I will be the first to admit that people representing the Ministry of Fisheries and self-proclaimed spokespersons of the vessel-owners association have not been eager to stress this part of the story. Nevertheless, it is necessary to pose and answer the questions: how and why did the ITQ system come into being in the Icelandic fisheries? If answers to these questions are not provided, others trying to modernise regulatory regimes of fisheries will encounter avoidable problems.

There is a common pattern for all the fisheries. First of all, serious attempts to reform the management practice begins when the fishery has collapsed or is close to a collapse. Ostrom et al. (p. 47) point out that changing rules is a public good that is costly to supply. The proponents of a changed fishery management system must argue their case and they must convince stakeholders and policymakers that a new rule of conduct is productive. Assume now that a fishery is about to collapse due to lack of management. Vessel owners, plant owners, fishers and others have sunk costs that they are unlikely to recover if free fishing is to be continued. The probability that sunk costs are recoverable is much higher if the fishery is managed. Hence, the collapse of a fishery may well bring about the right incentive for stakeholders to supply the effort needed for providing the public good of rule renewal.

Secondly, the first thing that stakeholders seem to get done is to close the club that has access to the given fishery. The shrimpers in Ísafjörður tried time and again to

restrict who can obtain a permit. The capelin case is rather clear cut: the club was closed by a Decree from the Ministry. The valuable multi-stakeholder demersal fishery is much harder to close. It has taken 15 years or more to do so.

When a fishery has been closed, the stakeholders can speculate, without having to take outside opinion into account, on how best to organise the fishery with respect to the economy of fishing firms and the sustainability of fish stocks. It is at this stage that the ITQs are an obvious choice.

Thirdly, a variety of rules was used to allocate participation rights when the club of participants had been closed. Note in particular that the rules used in the shrimp, the herring and the capelin cases are egalitarian towards the members of the club.

Fourthly, prices were used to manage fisheries in Iceland prior to the invention of the ITQ system. The rulings of the Fish Price Board regarding ex-vessel prices of fish and the discretionary decisions of the Government and the Central Bank of Iceland concerning the exchange rate of the króna had vast implications for decisions taken by vessel owners. This mechanism was used, in a very round-about and clumsy way, to transfer fishery rent from the fishery to the people at large. (See Matthíasson, 1999 and Helgason, 1990.) Experiments of the Capelin Committee show that it would cost considerable tinkering to make the use of the price mechanism effective as a management device. But those experiments also showed that the price mechanism works! That last conclusion was not emphasised in the public debate.

Lastly, management of fisheries by ITQs rather than some form of taxes or fees may well have historical rather than logical roots. The historical development that led up to ITQs should be the subject of further research. Fishing industry leaders did not like the idea of ITQs when it was first presented. Now, their pipe is playing a different tune. Understanding this transformation of attitude can be helpful when one is to design management systems that have other aims than just securing the financial health of the fishing sector.

Table 1: Market value of Icelandic fishing firms listed on the Icelandic Stock Market and value of physical assets and fishing rights net of debt

Month	(A) Stock market value of listed fishing firms	(B) Value of physical assets and fishing rights net of debt	(C) =(B)/(A)
Jan.99	*58.903.000 kr*	147.887.452 kr	251%
Feb.99	*59.462.000 kr*	148.233.823 kr	249%
Mar.99	*60.410.000 kr*	147.541.082 kr	244%
Apr.99	*58.910.000 kr*	147.714.267 kr	251%
May.99	*58.890.000 kr*	147.021.526 kr	250%
Jun.99	*58.791.000 kr*	148.753.379 kr	253%
Jul.99	*61.823.000 kr*	157.066.274 kr	254%
Aug.99	*61.960.000 kr*	161.915.463 kr	261%
Sep.99	*63.792.000 kr*	146.501.970 kr	230%
Oct.99	*65.138.000 kr*	147.367.896 kr	226%
Nov.99	*65.023.000 kr*	161.395.907 kr	248%
Dec.99	*66.759.000 kr*	164.340.057 kr	246%

Source: Calculation prescribed by the author. Information from the Icelandic Stock Exchange and individual fishing firms.

Table 2: Shrimp catches in Ísafjardardjúp

Season	Year	Effort, hours	Catch, tons	Tons per hour	Season	Year	Effort, hours	Catch, tons	Tons per hour
Fall	1959	2242	448,5	200,0	Fall	1979	4819	1202,8	249,6
Spring	1960	3806	545,5	143,3	Spring	1980	8854	1631,6	184,3
		6.048	**994,0**	**164,4**			**13.673**	**2834,4**	**207,3**
Fall	1960	4242	593,9	140,0	Fall	1980	4918	1097,8	223,2
Spring	1961	5680	606,1	106,7	Spring	1981	8204	1652,2	201,4
		9.922	**1200,0**	**120,9**			**13.122**	**2750,0**	**209,6**
Fall	1961	5452	472,7	86,7	Fall	1981	1625	748	460,3
Spring	1962	2447	181,8	74,3	Spring	1982	8359	2372	283,8
		7.899	**654,5**	**82,9**			**9.984**	**3120,0**	**312,5**
Fall	1962	2616	194,4	74,3	Fall	1982	1945	731	375,8
Spring	1963	3202	204	63,7	Spring	1983	6987	1702	243,6
		5.818	**398,4**	**68,5**			**8.932**	**2433,0**	**272,4**
Fall	1963	3901	302,7	77,6	Fall	1983	1819	638	350,7
Spring	1964	1425	93	65,3	Spring	1984	9626	1939,7	201,5
		5.326	**395,7**	**74,3**			**11.445**	**2577,7**	**225,2**
Fall	1964	2564	354,2	138,1	Fall	1984	959	347,8	362,7
Spring	1965	1917	247,9	129,3	Spring	1985	4981	1252,2	251,4
		4.481	**602,1**	**134,4**			**5.940**	**1600,0**	**269,4**
Fall	1965	2171	435,5	200,6	Fall	1985	1955	368,1	188,3
Spring	1966	6337	749	118,2	Spring	1986	7509	961,9	128,1
		8.508	**1184,5**	**139,2**			**9.464**	**1330,0**	**140,5**
Fall	1966	5025	510,1	101,5	Fall	1986	1617	254,8	157,6
Spring	1967	5900	564,7	95,7	Spring	1987	5664	788,4	139,2
		10.925	**1074,8**	**98,4**			**7.281**	**1043,2**	**143,3**
Fall	1967	3050	328,5	107,7	Fall	1987	4800	752,7	156,8
Spring	1968	5074	909,2	179,2	Spring	1988	7699	1347,3	175,0
		8.124	**1237,7**	**152,4**			**12.499**	**2100,0**	**168,0**
Fall	1968	5956	669,5	112,4	Fall	1988	2014	299,8	148,9
Spring	1969	6894	1140,1	165,4	Spring	1989	4722	800,2	169,5
		12.850	**1809,6**	**140,8**			**6.736**	**1100,0**	**163,3**
Fall	1969	4963	618	124,5	Fall	1989	3582	1050,6	293,3
Spring	1970	7092	1524,8	215,0	Spring	1990	2965	886,9	299,1

		12.055	**2142,8**	**177,8**			**6.547**	**1937,5**	**295,9**
Fall	1970	7609	935	122,9	Fall	1990	3961	1317,2	332,5
Spring	1971	16243	2135,9	131,5	Spring	1991	6178	1796,5	290,8
		23.852	**3070,9**	**128,7**			**10.139**	**3113,7**	**307,1**
Fall	1971	8867	779,4	87,9	Fall	1991	4031	989,8	245,5
Spring	1972	16672	1400,455	84,0	Spring	1992	5263	1564,8	297,3
		25.539	**2179,9**	**85,4**			**9.294**	**2554,6**	**274,9**
Fall	1972	8720	715	82,0	Fall	1992	3616	906,8	250,8
Spring	1973	12816	1211,4	94,5	Spring	1993	7511	1594,3	212,3
		21.536	**1926,4**	**89,5**			**11.127**	**2501,1**	**224,8**
Fall	1973	12697	1290	101,6	Fall	1993	5036	915,858	181,9
Spring	1974	14092	1220,4	86,6	Spring	1994	9536	1594,978	167,3
		26.789	**2510,4**	**93,7**			**14.572**	**2510,8**	**172,3**
Fall	1974	8672	1221,3	140,8	Fall	1994	4192	775,9	185,1
Spring	1975	10614	1119	105,4	Spring	1995	8465	1178,7	139,2
		19.286	**2340,3**	**121,3**			**12.657**	**1954,6**	**154,4**
Fall	1975	3898	585,3	150,2	Fall	1995	3028	738,2	243,8
Spring	1976	11274	1678,7	148,9	Spring	1996	7995	2018,1	252,4
		15.172	**2264,0**	**149,2**			**11.023**	**2756,3**	**250,0**
Fall	1976	6887	998,1	144,9	Fall	1996	2556	997,4	390,2
Spring	1977	9482	1529,5	161,3	Spring	1997	5395	1267,2	234,9
		16.369	**2527,6**	**154,4**			**7.951**	**2264,6**	**284,8**
Fall	1977	6139	1033,5	168,3	Fall	1997	2461	585,4	237,8
Spring	1978	8284	1644,3	198,5	Spring	1998	4452	839,8	188,6
		14.423	**2677,8**	**185,7**			**6.913**	**1425,3**	**206,2**
Fall	1978	0			Fall	1998	1680	359,8	214,2
Spring	1979	7222	1653,4	228,9	Spring	1999	2527	665,5	263,3
		7.222	**1653,4**	**228,9**			**4.207**	**1025,2**	**243,7**
					Fall	1999	1998	498,9	249,7
					Spring	2000	4953	1171,9	236,6
							6.951	**1670,8**	**240,4**

Source: Marine Resource Institute.

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