

INITIAL ALLOCATION OF TRANSFERABLE FISHING QUOTAS IN CANADA'S PACIFIC MARINE FISHERIES

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1. INTRODUCTION

Quota management has been introduced in a number of commercial fisheries on the Pacific coast of Canada. The purpose of this document is to examine how individual allocations were initially established in these fisheries. The commercial fisheries to be discussed are: halibut, sablefish, geoduck clam, herring spawn-on-kelp, roe herring, groundfish trawl, red and green sea urchin, and sea cucumber.

For each fishery, a brief description of the events leading up to quota-based management is given. A discussion of the nature of resource access both before and after the allocation follows. The method of allocation chosen is then detailed, as well as any computational processes or data required. The process of appeal of any individual harvesting allocation assigned, if applicable, is described and the administrative requirements of the allocation process outlined. The discussion concludes with an evaluation of the initial allocation process.

Each of the eight fisheries is examined separately. Given the diverse nature of these fisheries, information on each aspect is not always available, however, the presentation attempts to include the points outlined above, wherever possible.

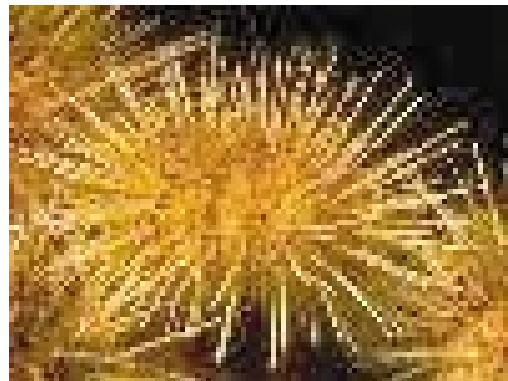
It is important to recognize that, in Canada, fishing privileges are granted, and fisheries resources are allocated, at the discretion of the Minister of Fisheries and Oceans. Under Section 7 of the *Fisheries Act*, the Minister of Fisheries and Oceans has absolute discretion in the issuance of licences. Therefore, when considering rights-based fisheries management in Canada, it should be noted that resource access is a privilege granted by the Minister, not a property right. Quota-based management has been introduced within the context of using existing fishery regulations and legislation. The Department of Fisheries and Oceans also recognized that by removing the need to race for the fish, commercial fishers could concentrate on product quality and maximizing the value of their catch.

In regard to the documentation of the success in achieving the initial policy objectives of the quota allocation process, little information is readily available. Nor, does any analyses appear to have been done as to the satisfaction of licence holders with the initial allocation process. This is also the case for review of the views of community groups in respect to their reaction to the manner of quota allocation. Thus, not surprisingly, much may yet be done to determine, in hindsight, how well this process was undertaken and the views of the respective stakeholders.

2. CANADA'S PACIFIC COAST HALIBUT FISHERY

2.1 Introduction

The Pacific commercial halibut fishery started in the late 1880s. As the halibut fleet grew and overfishing became apparent, the industry asked the Canadian and United States governments for international management of the halibut resource. Under a Convention signed in 1924 the Canadian and United States governments formed the International Fisheries Commission (IFC) to manage the Pacific halibut resource. In 1953 the Convention was modified and the IFC became the International Pacific Halibut Commission (IPHC). Today the IPHC performs assessments and basic research on the Pacific halibut stocks,



Green sea urchin

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sets total allowable catches (TACs) by fishing area, and determines regulatory measures almost exclusively related to conservation issues (Casey *et al.* 1995).

As discussed in Gislason (2000), halibut catches in both Canadian and US waters declined in the 1960s and the early 1970s due to a combination of factors, including poor recruitment and increased halibut bycatch by trawlers. Many Canadian halibut longline vessels were retrofitted to participate in the BC salmon fishery using seine gear. By 1974 the combined Canada-US catch had declined to less than one-third of the average catches in the early 1960s.

In 1977 both Canada and the US extended their coastal jurisdiction to 200 nautical miles. As a result, in 1979 the 1953 Halibut Convention was modified to prevent Canadian halibut vessels from fishing in US waters and US vessels from fishing in Canadian waters. The 1979 Convention modification also empowered the individual governments to impose fishing regulations on their own halibut fleets. In the same year Canada imposed limited-entry on the halibut fleet and 435 vessels qualified to receive a commercial halibut (or Category "L") licence.

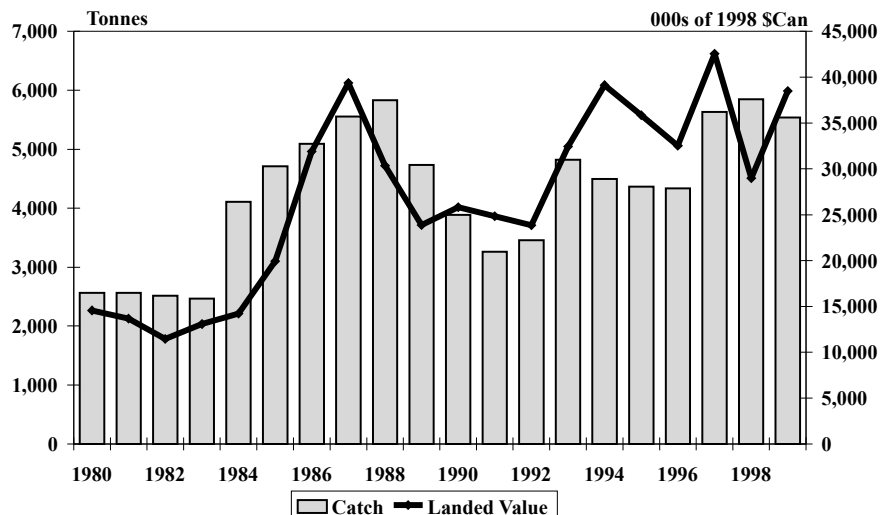
Over the next decade the catching power of the fleet increased remarkably. For example, in 1980, the commercial fleet took 65 days to catch 5.7 million pounds of halibut. Technological advances such as snap-on gear and automatic baiting machines improved the efficiency of the fleet enormously. Subsequently, in 1990, it took only a six-day fishing season for the fleet to catch 8.5 million pounds of halibut. Admittedly, halibut were more abundant in the early 1990s; however, the fleet took only one-tenth the time to catch almost 50% more halibut than it had a decade earlier (DFO 1999a). Even as the amount of catch rose, the time needed to catch the fish declined dramatically.

In the past the management of the British Columbia halibut fishery was based on three main elements: (a) limited entry, (b) a total allowable catch (TAC) set for each year and, (c) a fishery closure when the TAC was reached. This management regime proved ineffective at controlling fishing effort. The TAC was often exceeded and the ensuing race for the fish resulted in short fishing seasons, unsafe harvesting conditions, large quantities of bycatch being wasted, poor product quality, gluts in supply and low landed-prices. The halibut fleet was experiencing all the problems normally observed in a fishery under traditional common-pool resource management.

Between 1980 and 1991 the number of active halibut vessels ranged from 300 to 435 and averaged about 365 per year. In the years prior to 1991, approximately 1600 people were employed in the harvesting of halibut each year. Figure 1 displays the catch in tonnes (dressed, head-off) and the real, inflation-adjusted landed value over the past two decades.

In 1989 a small group of halibut licence-holders approached Fisheries and Oceans Canada for assistance in developing an individual quota (IQ) programme. As a result, an Individual Vessel Quota (IVQ) system was implemented in the halibut fishery in 1991 on a two-year trial basis with extensive input from industry participants. During the trial period the IVQ system proved successful at meeting conservation objectives and improving the economic viability of the fleet. The IVQ programme remains in place today.

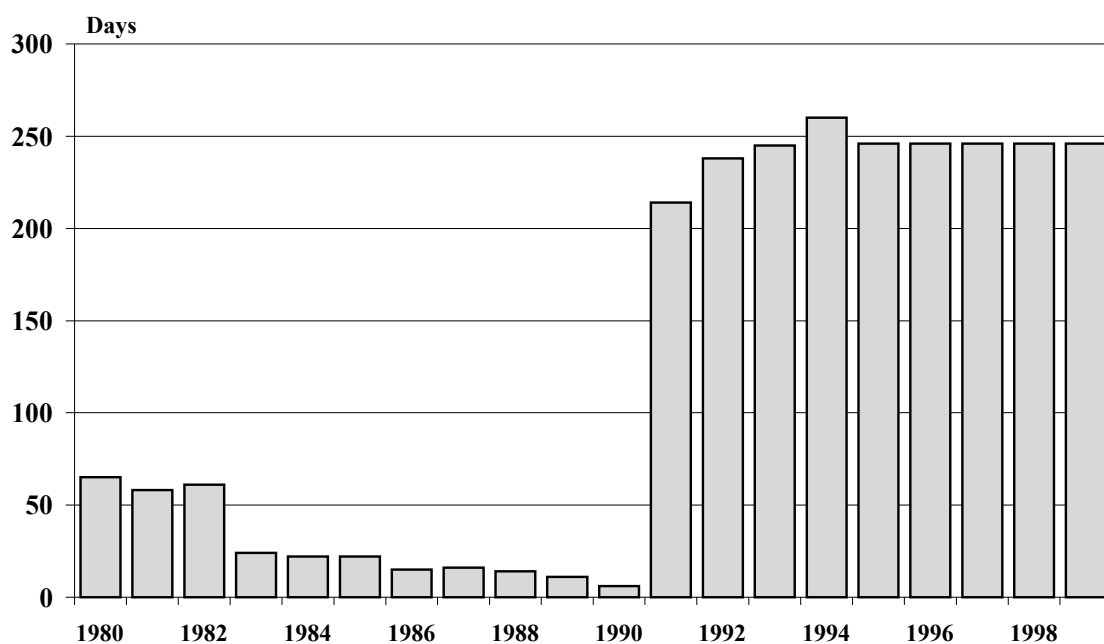
Figure 1
Halibut annual catch vs. landed value (1980 – 1999)



IVQ management has significantly increased the accuracy of the reported halibut catch. Commercial fishers complete logbooks that document location and catch, as well as pay for an independent dockside monitoring programme to count and weigh all halibut landed. Commercial halibut landings are only permitted at designated landing ports. Between 1979 and 1990 the halibut fleet exceeded the TAC in every season except 1980. Since IVQs were introduced in 1991 the commercial catch has been below the TAC in each year except 1999 when the fleet exceeded its target by 0.9%.

The economic performance of the halibut fishery improved dramatically after the introduction of IVQs. As illustrated in Figure 2, the halibut season is now open for nine months as compared to just six days in 1990. Net revenues have increased as commercial fishers have altered their fishing patterns to meet market demand, land a better quality product and reduce operating costs. Further, the number of active vessels has decreased, reducing fleet crew payments and fixed costs.

Figure 2
Halibut fishery season length
1980 - 1999



Reductions in employment have occurred as crew size has declined slightly and the number of active vessels has decreased through “quota stacking,” *i.e.* fishing more than one IVQ from a single vessel. Figure 3 shows fleet size over the past 20 years. Approximately 950 people are now employed in the harvesting of halibut.

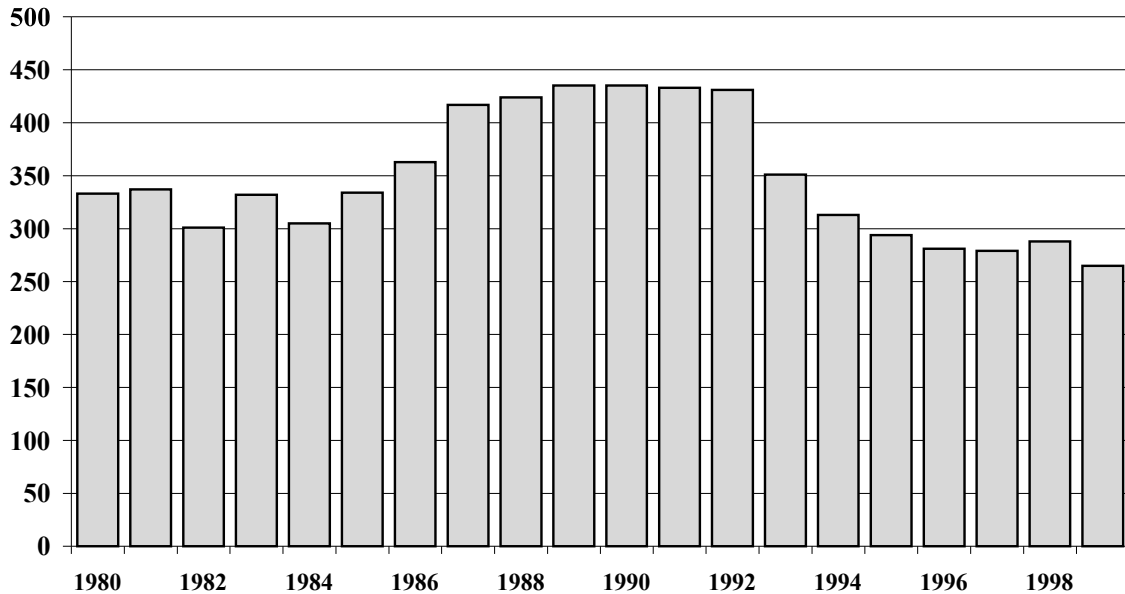
The level of enforcement has increased under IVQ management as quota-holders pay for a dockside-monitoring programme and for fishery officers specifically assigned to the halibut fishery. This contribution provides for enforcement above previous levels. While the DFO has experienced an increase in departmental costs as a result of the IVQ programme, halibut quota-holders are required to pay all the incremental costs associated with management, monitoring, and enforcement of the IVQ programme. This includes contracted services, salaries, benefits, overtime, travel, computer programming, vehicle leases, fishery officer relocations, and other operations, and equipment purchases.

The money is collected as fee paid in advance during licence issuance; a \$Can250 administration fee and a variable fee per pound of quota. The net effect has been no additional costs to the federal government.

Prior to IVQ management it has been estimated that approximately \$Can50 000 was spent on managing the halibut fishery and revenues from halibut licence fees were a mere \$Can4350 annually. Today the halibut fleet pays almost \$Can2.3 million annually to Fisheries and Oceans Canada; \$Can1.0 million to cover the direct costs of managing the fishery and another \$Can1.3 million in licence fees for the privilege of accessing

the halibut resource. IVQ management has provided an excellent opportunity to capture some of the resource rents as well as pay for management costs.

Figure 3
Number of active halibut vessels
1980 - 1999



2.2 The nature of the harvesting right

Commercial halibut licences (Category “L”) are vessel-based; the owner of the vessel controls the licence. Fisheries and Oceans Canada issues the licences on an annual basis. The halibut fishery is managed under a limited-entry licensing regime. Prior to 1991, a halibut licence could not be separated from any other commercial fishing licences attached to the vessel. All licences attached to a single vessel were considered “married” and had to be transferred together.

During the trial period of the halibut IVQ programme no changes were made to the transferability rules for licences and quotas were not transferable. For 1993, after extensive consultation with industry, each initial halibut quota was split into two equal shares and the temporary transfer of quota shares and/or licences was permitted. To prevent consolidation of quotas in a few hands, a maximum of four quota shares could be held or fished by a licensed halibut vessel.

In 1994 the above quota transferability rules were kept, but provisions were made to allow halibut licences to be separated from any combination of “married” licences and permanently or temporarily transferred to another licensed vessel of any shorter length, or even one upto 10 feet longer. These regulations remained in effect from 1994 to 1998.

In 1999, both permanent and temporary quota transfers were permitted. Licences could be transferred to another licensed vessel of a shorter length, or up to 25 feet longer. Quota shares were dropped and IVQ could be traded on a per pound basis to another licensed halibut vessel. Quota that had already been caught could not be transferred. No one vessel could hold more than 1% of the TAC (unless it had fished greater than this amount from 1993 to 1998). Further, each “L” licensed vessel was required to hold a minimum amount of permanent IVQ (0.01149% of the TAC in 1999). This minimum could be temporarily transferred during the year (Gislason 2000).

2.3 The method of allocation

2.3.1 Policy objectives

There were no specific Fisheries and Oceans Canada policy objectives for the initial allocation formula. Generally, the government’s objectives focused more on issues related to resource conservation and sound fisheries management. The move to IVQ management in the halibut fishery was largely an industry initiative.

While industry advisors established four important guidelines to help them design the halibut IVQ programme, only one of these guidelines touched on the issue of the initial allocation of quota. Specifically, industry advisors felt that “the programme should not, if possible, disenfranchise participants historically active in the halibut fishery.” (DFO 1995). Industry advisors went on to express concern about the distribution of income under IVQ management.

The initial allocation formula of an individual quota programme has the potential to affect individual commercial fishers if it results in a redistribution of wealth among the fleet. An initial allocation formula that results in a major change in the relative economic position of individual operators could “disenfranchise participants historically active in the halibut fishery”. Given this stated objective it is of little surprise that the halibut industry eventually chose an initial allocation formula heavily weighted toward historical landings in the fishery.

2.3.2 Process used in determining initial allocations

After two industry meetings in 1989, a survey was distributed to halibut licence-holders. Eighty-two percent of the 435 licence-holders responded and 77% stated they supported the IQ concept. Fisheries and Oceans Canada firmly believed that, if the halibut IQ initiative was to move forward, it would be necessary to establish a formal advisory board comprised of licence-holders, processors, First Nations and union representatives. The Halibut Advisory Board (HAB) was established using a selection process suggested by industry.

In January 1990, the first HAB meeting was held and lasted four days. The focus of the meeting was the initial allocation of quotas. At one point 17 different proposals were on the table. Proposals included equal shares, pounds per foot of vessel length, auctions, historical performance and shares based on the number of crew. By the fourth day HAB members had negotiated down to two basic allocation formulas and eventually agreed on an initial allocation formula. Only one of the 18 licence-holder representatives opposed the compromise position.

2.3.3 Initial allocation formula chosen

Under the initial allocation formula, each halibut vessel received a percentage of the annual TAC. Seventy percent of the initial allocation was based on the vessel's historical catch between 1986 and 1989. Thirty percent of the vessel's initial allocation was based on the vessel's overall length.

The catch history used was based on the one best catch year, adjusted for variations in the annual total catch, during 1986 to 1989. The catch had to be attributable to the current owner of the halibut licence regardless of what vessel fished the licence during that period. If the current vessel owner acquired the licence after the start of the 1989 halibut fishery, then the historical allocation was based on the previous owner's catch history during the 1986-1989 period. The catch history share was determined by dividing a commercial fisher's best adjusted-catch year by the total of the best adjusted-catches for the entire fleet. The resulting percentage was then multiplied by 70% of the annual TAC.

To determine the length-factor in the initial allocation formula, the vessel's overall length was divided by the total length of all vessels with halibut licences. This percentage was then multiplied by 30% of the annual TAC.

2.4 Data requirements and computational process

The information required to develop an allocation formula was readily available from Fisheries and Oceans Canada databases. DFO sales-slip data were used to determine the catch history portion of the initial allocation formula. Vessel length had been previously collected as part of the DFO licensing requirements and, at that time, had been determined by a certified marine surveyor.

Fisheries and Oceans Canada provided each halibut fisher with the catch history on file for their licence and the necessary information about their vessel. Licence-holders were also provided with the initial IVQ for their vessel for the upcoming season. In the event of a disagreement with the data presented, fishermen were encouraged to contact the DFO. Halibut fishers were required to provide documentation proving an error had been made. In such cases, the error was corrected. In cases where there was some question as to the validity of the error, or if there was an objection to the process used, an appeal process was established.

2.5 Appeals process

The Pacific Region Halibut Quota Review Board (PRHQRB) was established in February 1991 to hear appeals by halibut licence-holders regarding the IVQ share allocated to their licence. The Board was directed to consider individual circumstances, assess to the best of their ability whether or not an individual halibut licence-holder had been unfairly treated by the implementation of the halibut IVQ programme, and recommend to the Minister of Fisheries and Oceans whether or not the quota should be increased, and, if so, by how much. The

terms of reference of the PRHQRB did not include considering changes to the halibut IVQ initial allocation formula or the halibut IVQ proposal.

In 1991, the Board held hearings for six weeks from the beginning of March to the middle of April. Licence-holders were required to submit, in writing, the important points of their appeals as well as copies of all supporting documentation. Licence-holders could appear in person, make a written submission or have someone represent them to the Board. The Board would hear the appeal and then make a recommendation to the Minister of Fisheries and Oceans. The decision of the Minister would be final.

Out of 435 halibut licences, there were sixty-three appeals for increases in the individual vessel quota assigned to a halibut licence. Based on the recommendations of the review board, the Minister of Fisheries and Oceans accepted thirty appeals and changed the IVQ allocations of all licences. There was an opportunity for halibut fishers to request a second appeal if they had new information to be considered. Only two halibut fishers considered this option and both were unsuccessful.

Despite this appeal process, a small group of nine halibut licence-holders felt they had been disenfranchised by the initial IVQ formula and, in 1996, challenged the decision in the courts (*Carpenter Fishing Corporation et al. v. Her Majesty the Queen et al.*). These fishermen were successful in the initial case against Fisheries and Oceans Canada. However, an appeal court overturned the decision stating that, under the law, the Minister of Fisheries has absolute discretion in the allocation of Canada's fisheries resources (Federal Court of Appeal 1996).

2.6 Administration of the allocation process

2.6.1 Staff requirements

The majority of the work to determine the initial allocation formula was performed by industry advisors on the Halibut Advisory Board. DFO staff helped provide the forum and process for industry to discuss IVQs and the initial allocation formula. Departmental staff also assisted with technical advice when required.

With respect to the appeals process, the Pacific Region Halibut Quota Review Board was comprised of five members from the private sector. All members were respected individuals known in the commercial fishing industry. All had experience in halibut and other fisheries. None of the members had a direct involvement in the halibut fishery at the time of the appeal process. There was a sixth *ex-officio* member of the review board from Fisheries and Oceans Canada. This individual served as technical advisor and liaison to the Board, but did not participate in the decision-making process.

2.6.2 Additional programme funding requirements

The quota review process required additional funds above and beyond those available to the Pacific Region Groundfish Management Unit. Existing funds in the Pacific Region budget of Fisheries and Oceans Canada were allocated to establish and administer the process. However, any incremental costs of operating the IVQ programme are borne by the halibut licence-holders.

2.7 Evaluation of the initial allocation process

2.7.1 Success in achieving initial policy objectives

While Fisheries and Oceans Canada had no explicit policy objectives outside resource conservation and management, it appears the initial allocation formula was successful at meeting the stated industry objective of not disenfranchising participants historically active in the halibut fishery. Only 14.5% of the halibut licence-holders appealed the initial allocation formula, indicating that the majority of the fleet did not feel they were unfairly treated.

2.7.2 Satisfaction of quota-holders with the process

There is no specific documentation available that records rights holders' satisfaction with the allocation process. However in December 1992, halibut licence-holders were asked to vote on whether to continue the Pacific halibut IVQ programme. Ninety-one percent of those responding voted in favour of continuing with the programme. This overwhelmingly favourable response, combined with the fact only a few appeals of the allocation formula were requested at the outset, seems to indicate licence-holders were satisfied with the process and the outcome.

2.7.3 Views of other community groups

There is no specific documentation available relating to the views of other stakeholder groups on the initial allocation process of halibut IVQs. However, a common criticism of individual quotas is that it concentrates fishing privileges in the hands of a few individuals. Many groups feel individual quotas "privatize" the resource and restrict broad access to a publicly owned resource. Many coastal communities

would like to see fish allocated as community development quota, or CDQ, and used to improve regional economic opportunities (Turriss 2000).

Individual quota management has also been criticized for the detrimental effects it has on employment levels in a fishery. IQs generally lead to a smaller fishing fleet and, therefore, reduced employment levels in the fishery. Admittedly, there are fewer people employed in the harvesting of halibut; however, crew members still employed in the fishery are generally working a longer season and earning higher incomes.

Another common criticism of halibut IQ management is the “windfall profits” that accrue to quota holders as increased profitability in the fishery translates into higher market values for quotas. However, this criticism can also be directed at some non-IQ, limited-entry fisheries. A limited-entry, commercial fishing licence has market value based on the expected earnings from the fishery. The greater these expected earnings, the more valuable the fishing privilege. Regardless of the management regime employed, it can be difficult for new entrants to enter a fishery if the costs of fishing privileges are prohibitive.

2.7.4 Hind-sight assessment

The initial allocation formula for IVQs in the halibut fleet was accomplished through negotiations among industry representatives at the first HAB meeting. The process lacked transparency, which was of particular concern to those licence-holders not in the room. A closed-door process can be attacked as being potentially based on vested interests rather than clear principles (Kaufmann and Geen 1998). In the case of halibut, this concern resulted in a counter-productive court case that pitted commercial fishers against one another as well as commercial fishers against the Department of Fish and Ocean. In retrospect it may have been more beneficial to use an independent arbitrator to determine initial allocations in the halibut IVQ programme. The process would thus have been seen to be more impartial and would have been less open to criticism.

Quota allocation is always a contentious issue. Independent advisors/arbitrators can provide advice to the Minister on the most appropriate allocation system within a defined fishery, or between defined fisheries (intersectoral allocation). These individuals are simply advisory; the Minister still makes the final decision in relation to allocation. Where necessary, advisors/arbitrators can obtain advice or input from relevant legal, economic or statistical experts.

Since quotas were introduced in the halibut fishery in 1991, Fisheries and Oceans Canada has started to use independent advice on allocations of fishing resources on the Pacific coast. For example, the Canadian government used an independent arbitrator to recommend allocation arrangements between the groundfish trawl, and the hook-and-line fleets. At the same time the arbitrator provided advice on the initial allocation formula for the groundfish trawl IVQ programme.

2.8 Discussion

The IVQ programme has successfully involved vessel owners more closely in the management of the resource from which they derive their livelihood and a co-operative approach has evolved in the commercial halibut fishery. Halibut licence-holders have recently formed the Pacific Halibut Management Association of B.C. (PHMA) through which halibut fishers would like to enter formal co-management arrangements with Fisheries and Oceans Canada, and assume greater responsibility for the day-to-day operations of the fishery.

3. CANADA'S PACIFIC COAST GEODUCK CLAM FISHERY

3.1 Introduction

Heizer (2000) provides an excellent history and description of the commercial geoduck (*Panopea abrupta*) fishery in British Columbia. Geoduck clams can be found on the west coast of North America from Alaska to the Gulf of California. They are found from the intertidal zone to depths of at least 110 m, buried up to one metre deep in soft substrates ranging from mud to pea gravel. Once dug in, they remain in the same spot for the duration of their lifespan, which is well over 100 years.

Recruitment to the fishery begins at age four and by age 12 geoducks are fully available for harvest. Juveniles can be harvested at any age but are not marketable. Geoducks are harvested commercially by divers using high pressure water delivered through a nozzle (known as a “stinger”) which loosens the substrate around the clam and allows the diver to lift the clams out alive (DFO 2000).

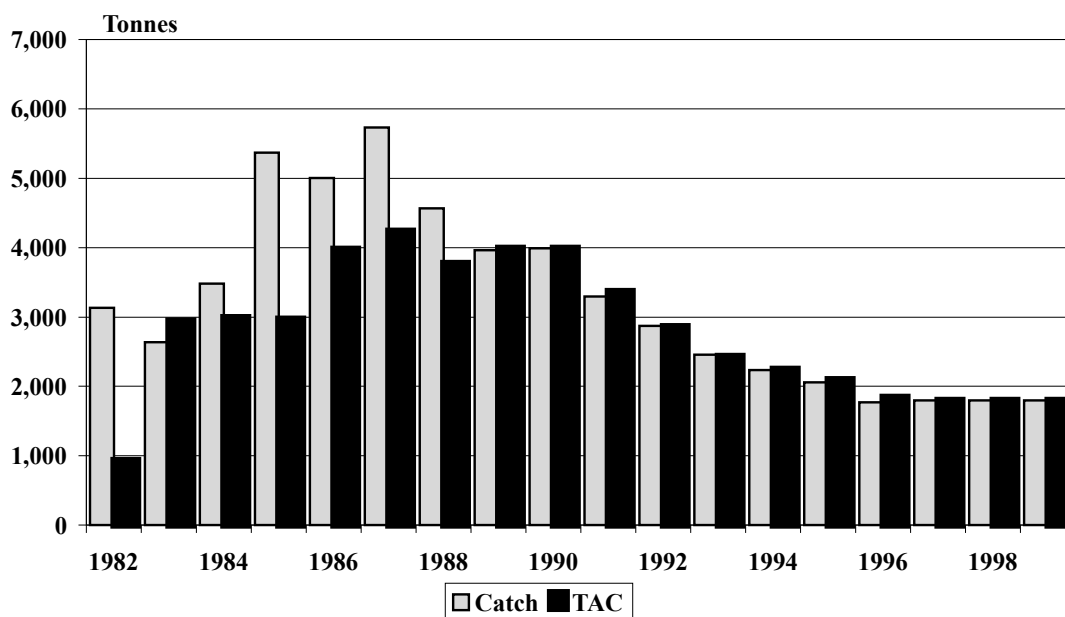
Canada's Pacific geoduck fishery began in 1976. In 1983 the fishery came under a limited-entry licensing programme. Following several licence appeals, 55 geoduck (Category “G”) licences were issued. Between

1976 and 1987 the average landed price for geoduck rose and the number of active vessels increased. By the late 1980s all 55 "G" licences were active.

The management system of limited-entry with area and season restrictions had led to an unsafe and costly fishery. The derby-style fishery made it difficult for fishers to land a quality product, and, as a result, geoduck prices were depressed. The management system put increasing pressure on the geoduck resource and conflicted with Fisheries and Ocean Canada's conservation objectives; area quotas were consistently exceeded. Figure 4 compares coastwide geoduck landings and allowable catches.

At the request of the industry, IVQ management, combined with area licensing was introduced into the geoduck fishery for 1989 and 1990 on a trial basis. The coast was divided into three licence areas, the North Coast, the West Coast of Vancouver Island, and waters inside Vancouver Island.

Figure 4
Geoduck annual catch vs. TAC
1982 - 1999

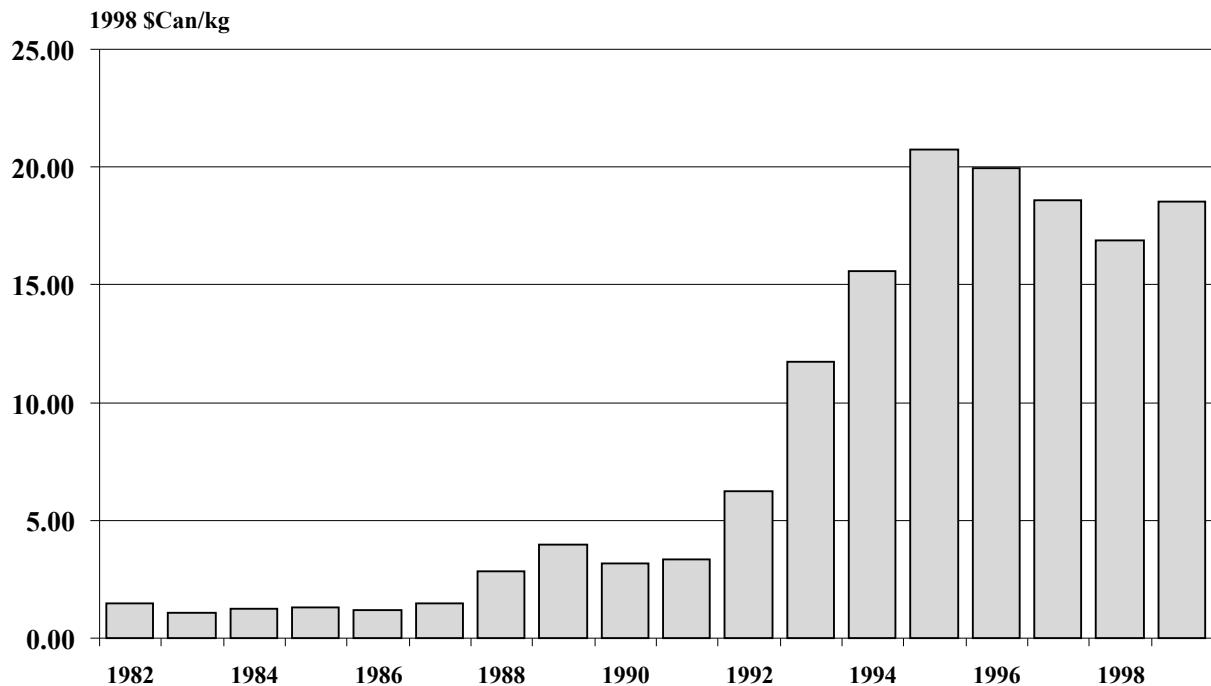


The commercial licence year is now from January 1 to December 31. The location of the fishery and schedule of openings and closings varies from year to year. The season runs year round until all quotas are taken with sub-areas opening at different times. Commercial fishery openings are scheduled to allow for a year-round supply of geoducks to the market (DFO 2000). Prior to 1989 landings tended to be concentrated in May and June, but since 1989 geoducks have been landed throughout the year; however, peak landings occur between March and July.

Landed prices for commercially caught geoducks have increased as a result of the introduction of the IVQ programme. Commercial fishers have concentrated on better servicing the market as well as developing new markets. The increases were primarily due to premium prices paid for live geoducks in the port of Hong Kong and the Peoples Republic of China. Traditionally, only 40% of all geoducks sold in the wholesale market had been as live product. Prior to IVQ management most of the product was frozen. IVQ management has allowed for slower, more even production and the development of live markets. More than 80% of all geoduck are now sold into live markets. The effect on landed price, in inflation-adjusted terms, is shown in Figure 5.

Geoducks have the highest commercial value among Pacific Region shellfish fisheries with a total annual value of approximately \$Can33 million in 1999. Recently the landed value has dropped for two reasons: prices for most fish and shellfish exported to Asia have declined; and the continuing market presence of large quantities of product

Figure 5
Geoduck landed prices
1982 - 1999



from Washington State has affected the market value for BC geoducks (DFO 2000). Figure 6 shows Canada's geoduck catch in tonnes and the real, inflation-adjusted landed value over time.

Some rationalization of the geoduck fleet has occurred under IVQ management. For example, 45 licensed vessels were active in 1990 while 46 licensed vessels were active in 1992. In 1994 there had been a reduction as 44 vessels reported geoduck landings. By 1997 the geoduck fleet was made up of 42 active vessels. The reduction in fleet size has led to an associated decrease in the number of crew jobs. There were approximately 200 people employed in the harvesting of geoduck clams before IVQ management was introduced in 1989. In 1997 approximately 120 people were employed in the geoduck fishery.

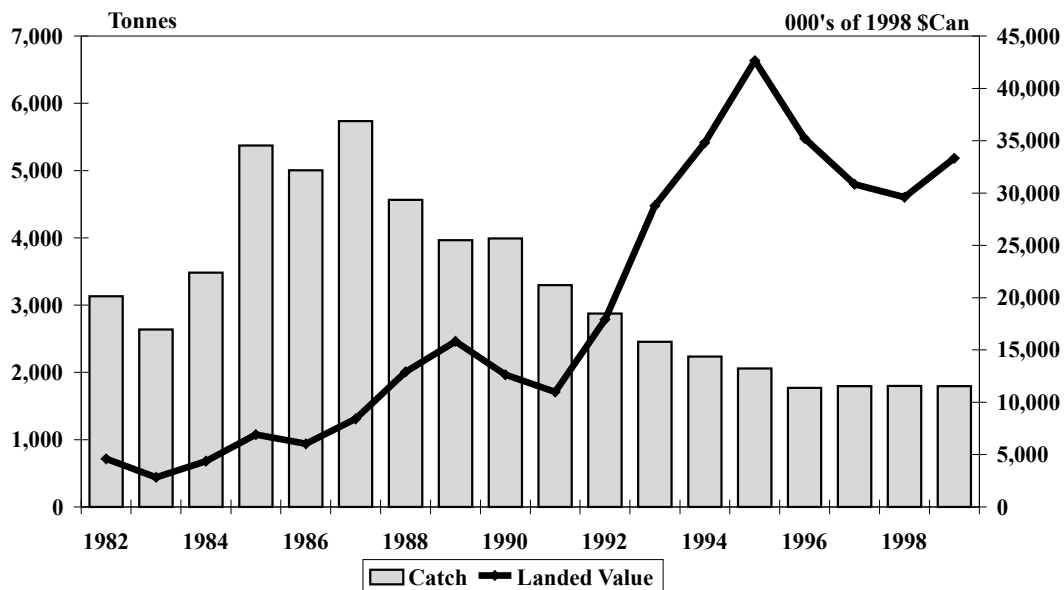
Today, control and monitoring of the commercial fishery is achieved largely through the catch monitoring and validation programme. Commercial fishers contract with a third party to validate all landings of geoduck at the first point of landing. Vessels are required to notify the validation company prior to engaging in fishing, and prior to landing clams. Each vessel must also carry and fill out a Validation and Harvest Logbook with details of harvest activity (DFO 2000). The industry has also chartered a patrol vessel to act as an on-grounds monitor in the more remote North Coast area.



Geoduck clam, *Panopea abrupta*

There has been a significant increase in stakeholder involvement in the geoduck fishery under IVQ management. All geoduck licence-holders are members of the Underwater Harvesters' Association (UHA). The UHA takes an active role in the management of the geoduck fishery. In addition to the monitoring and validation programme, industry members fund research, water quality testing, and bed seeding programmes. For example, the UHA has embarked on a geoduck "enhancement" programme, which involves seeding several sites along the coast of British Columbia. Industry also offsets the salary of one full-time management biologist for Fisheries and Oceans Canada (FOC).

Figure 6
Geoduck annual catch vs. landed value
1982 - 1999



The aggregate value of these management expenditures was approximately \$Can1.2 million in 1999 (DFO 2000). The UHA funds these programmes through fees to association members and a collaborative agreement with FOC.

3.2 The nature of the harvesting right

Commercial geoduck licences (Category “G”) are vessel-based; the owner of the vessel controls the licence. FOC issues the licences on an annual basis. The geoduck fishery is managed under a limited-entry licensing regime. Prior to 1989, geoduck licences could be transferred to another commercially licenced fishing vessel. However, the licence could not be separated from any other commercial fishing licences attached to the original vessel. All licences attached to a single vessel were considered “married” and had to be transferred together.

All geoduck licences had a maximum vessel-length established in 1989. If the replacement vessel is unlicensed, then it may not exceed the maximum vessel-length recorded on the licence. Licences can be transferred, and more than one category “G” licence, up to a maximum of three, can be fished by a single vessel. Thus, licences may be stacked and fewer than 55 vessels can be active in the fishery.

In 1991 a survey of licence-holders indicated that more than half of the respondents felt that quota transferability should be more flexible. Frequent comments included: “allow transfer of partial quota”. Current regulations do not allow for transfers of shares of quotas. Licences, and the associated IVQ, cannot be divided and transferred in smaller quantities.

3.3 The method of allocation

3.3.1 Policy objectives

There were no explicit policy objectives for the initial allocation of geoduck quotas. However Fisheries and Oceans Canada was becoming increasingly concerned about conservation objectives as area quotas, and therefore the TAC, were being consistently exceeded. Industry felt that IQ management had the potential to reduce operating costs, increase revenues, reduce risk and improve safety in the fishery.

3.3.2 Process used in determining initial allocations

As with many of Canada’s Pacific IQ programmes, the move to quota management in the geoduck fishery was largely an industry initiative. In the spring of 1988 industry representatives presented the DFO with a proposal recommending Individual Transferable Quotas (ITQs) for the geoduck fishery. Several meetings were held among Fisheries and Oceans Canada, industry participants and the Geoduck Sectoral Committee to discuss

the proposal. The Geoduck Sectoral Committee is the advisory body that the DFO works with to design management and fishing plans for the commercial fishery.

Due to enforcement concerns, Fisheries and Oceans Canada suggested combining the proposed ITQ programme with area licensing. The initial proposal was modified. Approximately 80% of geoduck licence-holders supported the new management approach. An IVQ programme was introduced into the geoduck fishery for 1989 and 1990 on a trial basis. Due to enforcement concerns and the costs for Fisheries and Oceans Canada to move to IVQs, the industry was required to develop and fund the catch-monitoring and validation programme that is still in place today.

3.3.3 Initial allocation formula chosen

Each geoduck licence ("G" licence) is granted an equal share or 1/55 of the coastwide TAC. The TAC is divided over three areas: North Coast, West Coast, and the Gulf. Each year, prior to the fishing season, licence-holders must choose the area they wish to fish in, and may only select one area. The number of licences fishing each area may change annually according to the proportion of the total quota assigned to each area.

3.4 Data requirements and computational process

Little or no data were used in the allocation procedures. The majority of industry agreed to equal sharing of the TAC as the best way to allocate quota. These equal sharing arrangements removed the need to gather data and perform any calculations.

3.5 Appeals process

No appeal process was established to deal with geoduck licence-holders who disagreed with the allocation formula or felt they were affected by extenuating circumstances.

3.6 Administration of the allocation process

3.6.1 Staff requirements

The move to IVQ management was largely an initiative taken on by the licence-holders themselves. Fisheries and Oceans Canada provided the forum for discussion and made staff available to provide technical advice and help in programme design.

3.6.2 Additional programme funding requirements

While the process to move to IVQ management and determine an initial allocation formula may have resulted in some additional expenses for the Department, existing budget sources covered these costs. Further, most incremental FOC costs resulting from the operation of the geoduck IVQ programme are borne by the licence-holders.

3.7 Evaluation of the initial allocation process

3.7.1 Success in achieving initial policy objectives

Fisheries and Oceans Canada saw individual quota management as a possible way of better controlling geoduck harvests. Since quotas were introduced, catches in excess of the TAC have been trivial, usually far less than 1%. Industry participants have achieved many of their objectives as the fishery is now more orderly and safer, and the revenues generated from geoduck harvesting have increased.

3.7.2 Satisfaction of quota-holders with the process

There is little information readily available about licence-holders' satisfaction with the initial allocation process. However, 80% of the licence-holders voted for IVQ management in 1989; this would indicate a high degree of support for many aspects of the programme. Further, the programme has continued beyond the trial period indicating ongoing licence-holder support for the pilot IVQ regime and allocation formula currently in place.

3.7.3 Views of other community groups

There is no documentation readily available on the views of other community groups with respect to the initial allocation of geoduck IVQ. However, given that the number of active vessels has declined under IVQ management, there are less divers employed in the geoduck fishery. These displaced individuals may feel disenfranchised by the IVQ programme.

3.7.4 Hind-sight assessment

There is little information or data readily available to provide a basis for comment on the initial allocation process. However, further consideration may have been given to the issue of quota transferability.

Current regulations do not allow licences, and the associated IVQ, to be divided and transferred in smaller quantities. Therefore, individuals wishing to enter the fishery must acquire a geoduck licence and a full IVQ. Such an acquisition can be quite costly and serve as a barrier to entry into the fishery. Alternatively if new entrants could acquire a geoduck licence with a smaller IVQ attached they could enter the fishery for a lower initial expense and then build up their quota holdings over time. Admittedly such a transferability option may not be feasible given the area licensing and other management requirements of the geoduck fishery.

3.8 Discussion

Since 1989 the geoduck TAC has been reduced. Under IVQ management, a more conservative management approach has been taken in the geoduck fishery. Both government and industry are now working together to better manage the geoduck resource. The industry is involved in science and research projects and works closely with government officials to manage the fishery on a co-operative basis.

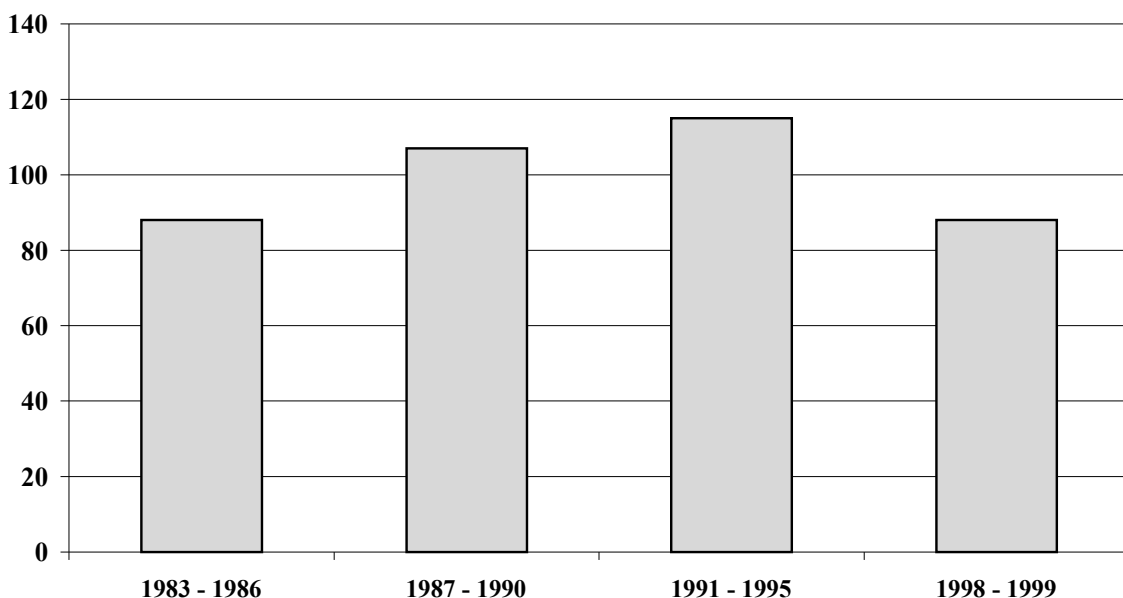
4. CANADA'S PACIFIC COAST GROUND FISH TRAWL FISHERY

4.1 Introduction

Turris (2000) provides an excellent chronology of changes in the management of the groundfish trawl fishery. The groundfish trawl fishery has operated off the Pacific coast of Canada for over 50 years. Much of the catch and effort was from foreign fishing vessels prior to extended jurisdiction in 1977. In 1976, limited entry was introduced and 142 Canadian fishing vessels received a commercial groundfish trawl (or Category "T") licence.

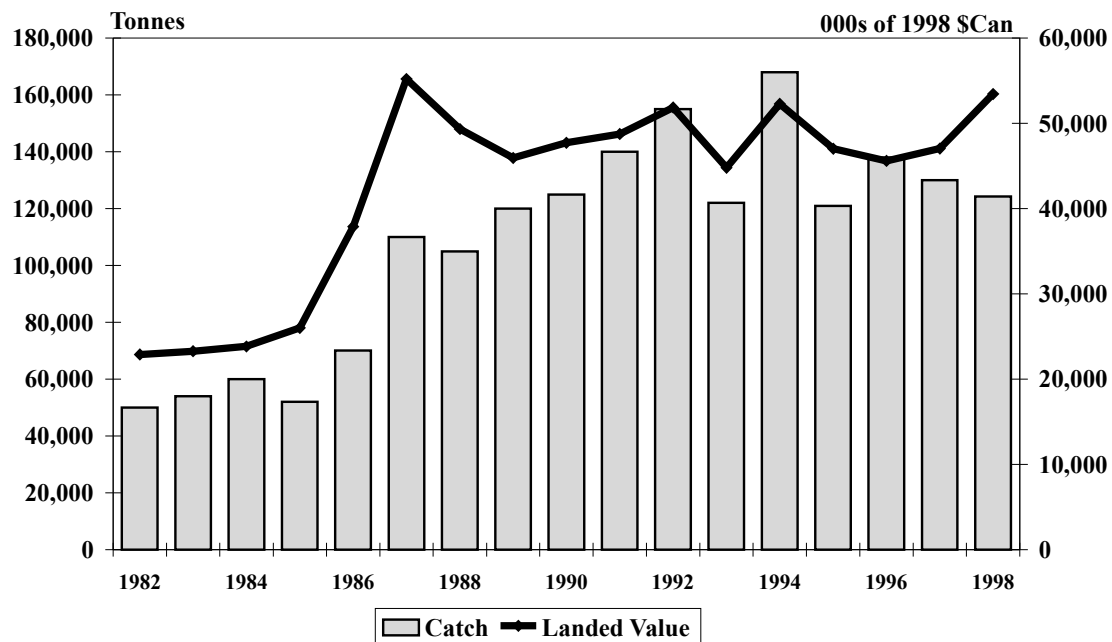
The newly-licenced Canadian trawl fleet was made up of vessels ranging from 35 to 150 feet in length, however, less than half the vessels were active in the late 1970s. Figure 7 shows the average active vessels over the past 15 years. Approximately 110 vessels were active in the groundfish trawl fishery in 1996 (Gislason 1998). The average crew size in the groundfish trawl fleet, including the skipper, is approximately 3.5 persons per vessel.

Figure 7
Average active groundfish trawl vessels
1983 - 1999



Prior to 1980 fishing effort in the trawl fishery was fairly unrestricted and few groundfish species were under any form of catch limit. In 1980 Fisheries and Oceans Canada (FOC) introduced a groundfish trawl fishery management plan that identified some mesh-size restrictions and set total allowable catches (TACs) for a limited number of species (Turris 2000). Figure 8 shows landings and the inflation-adjusted landed value for the trawl fleet since 1982.

Figure 8
Groundfish trawl annual catch vs. landed value
1982 – 1998



As in other limited-entry fisheries, effort began to increase as vessel owners invested heavily in their fishing operations to stay competitive in the race for the fish. Catching capacity increased as vessels used more engine-power, effective gear, new fish-finding electronics, improved hydrographic charts and stern trawls instead of side trawls (Turriss 2000). As a result of the increased catching capacity the TACs for many species were reached before the end of the year.

Increasingly complex management plans were designed in an effort to keep the fishery open year round. Trip limits and monthly limits were implemented in an attempt to distribute effort and catch throughout the year. Despite these measures, fishing effort continued to increase. Trip limits were reduced and at-sea discarding and misreporting of catch worsened (Turriss 2000). The situation was exacerbated as the Department of Fisheries and Oceans began to place catch-limits on previously unrestricted species. By 1995 the catching capacity of the fleet had increased so dramatically that it was becoming very difficult to stay within annual TACs.

Although unprecedented, the groundfish trawl fishery closed for the first time in September 1995 due to significant catches in excess of the TAC. The fishery re-opened in 1996 with numerous new regulations, including 100% at-sea observer coverage for all bottom trawl trips, 100% dockside monitoring of landed catches and new species- and stock-specific catch-limits (Turriss 2000). These new regulations imposed significant costs on the industry while the fishery was already struggling financially because of low landed prices and shrinking markets.

The existing management structure left industry with little flexibility to improve returns from the fishery. The groundfish trawl industry recognized that significant change had to occur if their fishery was to survive economically in the future. In early 1996, the DFO and industry began to discuss changes to the management of the groundfish trawl fishery (Turriss 2000). The consultative process was initiated with the distribution of a discussion paper that gave background information on the fishery and listed six long-term management options under consideration.

In July 1996 four public meetings were held to solicit advice from interested stakeholders. Written submissions were also accepted. A survey was widely distributed to industry stakeholders, environmental organizations and coastal community representatives to encourage input on the issue. Individuals were also encouraged to express their views to a Groundfish Trawl Advisory Committee (GTAC) representative. GTAC is the advisory body that the DFO works with to design management and fishing plans for the groundfish trawl fishery.

Individual vessel quotas (IVQs) were considered for the groundfish trawl industry. A subcommittee of GTAC, the Groundfish Special Industry Committee (GSIC), was formed to negotiate IVQ programme details such as transferability, species-caps and holdings-caps. After 14 months of consultation and difficult negotiations, IVQs were introduced into the groundfish trawl fishery.

Turris (2000) provides a complete overview of the groundfish trawl IVQ programme. The fishery is now open from 1 April through 31 March. While fishers are free to fish at any time during the open season, trawl vessels are subject to various restrictions. For all bottom trawl trips, all vessels must carry an at-sea observer to estimate location, towing time, catch, discards and collect biological samples. All trawl landings are weighed and validated at the dock by an independent contractor certified by Fisheries and Oceans Canada. Vessels are also subject to quota and species-caps to limit quota concentration and fleet rationalization. If a vessel exceeds a species IVQ by more than the permitted amount, the vessel is restricted to mid-water trawling in that area for the remainder of the year. Alternatively, the vessel can acquire additional quota for that species and continue fishing.

The groundfish trawl IVQ programme is by far the most complex of all individual quota fisheries on Canada's Pacific Coast. There are over 55 groundfish species under quota and various transferability and fishing rules exist. Despite these complexities, the groundfish trawl IVQ programme has proven very successful. Catch limits are not being exceeded, the industry is becoming profitable and the programme's social benefit objectives are, for the most part, being realized.

4.2 The nature of the harvesting right

Commercial groundfish trawl licences (Category "T") are vessel-based; the owner of the vessel controls the licence. The groundfish trawl fishery is managed under a limited-entry licensing regime. Fisheries and Oceans Canada issues the licences on an annual basis. Prior to the 1999/2000 fishing season, a groundfish trawl licence could not be separated from any other commercial fishing licences attached to the vessel. All vessel licences had to be transferred together to a vessel of equal or less length.

Beginning in 1999/2000, vessels licensed only for the groundfish trawl fishery were permitted to move their single "T" licence (the vessel does not have any other commercial fishing licences attached to it). The licence can be moved to a vessel of equal or less length. It is important to note that this new rule does not apply to any vessel holding multiple vessel-based licences.

Groundfish trawl IVQ can only be transferred between Category "T" licensed vessels. All quota transfers must be registered and approved by FOC. Unlimited transfers of quota are permitted subject to species- and holdings-caps designed to prevent excessive quota concentration. There are no temporary quota transfers; FOC considers all groundfish trawl IVQ transfers permanent. However, lease arrangements between licence-holders do result in short-term or annual transfers.

The minimum quantity of IVQ that can be transferred is one pound, measured as a percentage of the TAC (DFO 1997).

4.3 The method of allocation

4.3.1 Policy objectives

When the groundfish trawl IVQ programme was being designed, explicit conservation, economic and social objectives were determined. The allocation formula for the groundfish trawl IVQ programme contained specific social objectives with respect to the distribution of benefits arising from the new management regime. The specific objectives were to: (a) maintain existing processing capability; (b) stabilize groundfish industry employment; (c) encourage economic development in coastal communities; (d) allow fair treatment of crews (earnings and working conditions); (e) allow for a controlled rationalization to an economically viable fleet level (in the range of 60 – 80 active vessels); and (f) avoid the pitfalls associated with leasing and quota concentration.

As a result of these objectives, the initial allocation of IVQ in the groundfish trawl fishery was designed to influence the way in which any economic benefits arising from the management change were divided. The initial allocation was also designed to control the pace of the change that could result from such a radical shift in the management of the fishery.

4.3.2 Process used in determining initial allocations

The determination of the initial allocation formula for the groundfish trawl fishery was turned over to an independent arbitrator, a retired Supreme Court justice. This arbitrator received hundreds of recommendations through the mail, as well as from numerous industry and public meetings held throughout the province between

January and December 1996. His recommendations were submitted to the Minister of Fisheries and Oceans in January 1997, were accepted and incorporated into the groundfish trawl IVQ programme.

4.3.3 Initial allocation formula chosen

As outlined in Turriss (2000), the groundfish trawl commercial TAC is allocated to three different quotas: vessel owner IVQs (80%), Groundfish Development Quota (10%), and Code of Conduct Quota (10%).

Each year, 80% of the TAC is allocated to the groundfish trawl fleet and each licenced vessel's initial quota was based on 1986 to 1989 catch history (70%) and vessel length (30%). The Minister allocates the remaining 10% Groundfish Development Quota (GDQ) and the 10% Code of Conduct Quota (CCQ) based on advice received from the Groundfish Development Authority (GDA).

The GDA was established solely to provide advice on groundfish trawl allocations. The GDA has seven voting members and a number of non-voting, *ex-officio* participants to provide background information and expertise necessary for the GDA process. The purpose of the GDA is to aid regional development, attain market and employment objectives, support sustainable fishing practices and ensure fair treatment of crews and safe vessel operation.

GDQ proposals are submitted jointly to the GDA by a group of vessel owners and a processor. Proposals are evaluated and ranked based on the extent to which the proposal contributes to the achievement of GDA objectives, the total IVQ commitment of proponents, the processing history of the applicant and evidence of adherence to previously submitted plans (Turriss 2000). The rating assigned determines the amount of GDQ the proposal receives and the allocation is added to the IVQ of the licenced vessels that made the proposal. GDQ cannot be transferred.

CCQ are used to provide an incentive to help ensure that crew members are treated fairly and equitably under the IVQ programme. The 10% CCQ is allocated to each vessel in proportion to the vessel's IVQ holdings (Turriss 2000). Any complaints of poor treatment of crew are made to the GDA. The GDA reviews all available information and make recommendations to the Minister on whether or not to hold back some, or all, of the CCQ of the vessel involved in the claim. CCQ is subject to the same transferability rules as IVQ.

4.4 Data requirements and computational process

Data was required to calculate the 80% portion of the TAC allocated to each groundfish trawl licenced vessel. Catch history (70%) and vessel length (30%) data were required. The information required was readily available from databases held by Fisheries and Oceans Canada. DFO sales slip data were used to determine the catch history portion of the initial allocation formula. Vessel length had been previously collected as part of DFO licensing requirements and, at that time, had been determined by a certified marine surveyor.

4.5 Appeals process

An appeals process was established for groundfish trawl licence-holders that were in disagreement with the catch history, vessel length information or IVQ allocated to the vessel's trawl licence. A special panel of the DFO's Pacific Region Licence Appeal Board (PRLAB) heard the groundfish trawl IVQ appeals¹. The Groundfish Panel of PRLAB was established in July 1997 to hear the appeals generated by the trawl IVQ programme.

If an appellant claimed additional landings during the years used under the allocation formula, these landings had to be substantiated by way of fish slips or log records, hail records, dock tallies, affidavits from buyers or income tax records. If an appellant was claiming extenuating circumstances during the years used under the initial allocation formula, these conditions or events must have directly affected their ability to fish groundfish or hake in the relevant years (such as health problems, vessel breakdown, personal hardship, licence transfers).

Forty-five licence-holders appealed for an increased groundfish trawl IVQ allocation. The Panel recommended the Minister approve seventeen of the appeals. The additional information generated from these seventeen successful appeals was incorporated into the initial allocation methodology and new IVQ allocations were determined. To accommodate these increases, initial allocations were slightly reduced across the fleet.

¹ The Minister of Fisheries and Oceans established the PRLAB in 1979 to be the last administrative level of appeal for fishers dissatisfied with DFO licensing decisions pertaining to West Coast fisheries. The PRLAB does not make decisions on licence policy or fisheries programs. PRLAB is strictly an advisory body to the Minister regarding exceptions to established policies and programs.

4.6 Administration of the allocation process

4.6.1 Staff requirements

An independent arbitrator determined the initial allocation formula. A consultant was hired to assist the arbitrator with meetings and help provide background information. Staff of Fisheries and Oceans Canada prepared discussion papers, assisted with the industry and public meetings and provided technical advice when requested.

4.6.2 Additional programme funding requirements

Additional funding above the budget of the groundfish trawl programme was required to pay for the independent arbitrator, plus industry and stakeholder meetings. These funds came from the existing FOC – Pacific Region Fisheries Management Branch budget.

4.7 Evaluation of the initial allocation process

4.7.1 Success in achieving initial policy objectives

As outlined above, specific objectives were set when IVQ management was considered for the groundfish trawl fishery. Through the allocation of the TAC, the groundfish trawl IVQ programme attempts to meet these objectives by influencing the way in which economic and other benefits derived from the fishery are divided. The decisions and activities of quota holders can directly impact crews, shoreworkers and coastal communities (Groundfish Special Industry Committee 1999).

A 1999 evaluation of the groundfish trawl IVQ programme indicated that many of the social objectives are being met. Specifically, the programme appears to have led to increased stability in the processing sector. Further, more groundfish is being landed in coastal communities, although evidence regarding final processing location is inconclusive.

The GDA gives influence to non-vessel/quota-owning interests as it creates the potential for vessels to lose 10% of their individual allocation and, therefore, encourages vessel owners to treat their crews fairly. However, as discussed in the 1999 evaluation of the trawl IVQ programme, the incentives of the CCQ are inherently flawed. The successful filing of a claim with the GDA will ultimately result in less IVQ for the crewman's vessel and this may inhibit the filing of complaints (Groundfish Special Industry Committee 1999).

While the GDA encourages more broad distribution of the benefits derived from the fishery, the holdings-caps permit some rationalization of the fleet but place a limit on quota concentration. While there are technically no temporary transfers of groundfish trawl IVQ due to the current transferability provisions, quota-leasing has occurred and resulted in short-term or annual transfers (Turriss 2000). However, this is not beyond what was deemed acceptable when the programme was initially designed (Groundfish Special Industry Committee 1999).

4.7.2 Satisfaction of quotas-holders with the process

While there is a general consensus in the industry that the IVQ programme moved the groundfish trawl fishery in the right directions, some vessel owners feel disenfranchised by the allocation process. For example, vessel owners who entered the fishery after the period used to determine the catch history portion of IVQ allocations (1986 to 1989) were unhappy with the years chosen. Owners of small vessels felt the allocation formula favored the larger boats and did not recognize that some operators deliver small amounts of fish to focus on quality rather than quantity (Turriss 2000). According to Turriss (2000), many licence-holders are unhappy about the GDQ programme and believe that processing companies and communities use it to lever additional IVQ from independent operators. These licence-holders feel that the GDQ programme restricts healthy competition and results in lower prices.

4.7.3 Views of other community groups

Even though individual quotas are not legally considered property in Canada, many groups feel they privatize the resource and restrict broad access and utilization to a publicly owned resource. Many coastal communities would like to see fish allocated as community development quota and used to improve local economic opportunities (Turriss 2000). In the groundfish trawl IVQ programme, crews, shore-workers and coastal communities have a say in the allocation of the resource through the GDA.

4.7.4 Hind-sight assessment

By 1996, when discussions on IVQ management for the trawl fishery began, Fisheries and Oceans Canada had already implemented a number of individual quota programmes on Canada's Pacific coast. A number of lessons had been learned and the valuable experience gained was used in the design of the

groundfish trawl IVQ programme. For example, the government used an independent arbitrator to increase the transparency of the often contentious initial allocation process. Further, the external groups (non-vessel owning interests), that could be affected by a change in the management of the groundfish trawl fishery, had a much greater role in the programme design and the initial allocation processes. While there is still criticism directed at the groundfish trawl IVQ programme, FOC has mitigated many of the more serious concerns normally associated with IVQ management on Canada's West Coast by making the process of change more inclusive.

4.8 Discussion

IVQ management may help improve the health of many groundfish stocks. According to Turriss (2000) IVQ management has focused the attention of licence-holders on sustaining groundfish stocks. Industry has established the Canadian Groundfish Research and Conservation Society (CGRCS) to deal with the lack of research and assessment resources dedicated to the fishery. The CGRCS provides financial and human resources to improve groundfish stock assessments. The Society also conducts surveys and research, collects biological information and employs technicians, researchers and scientists to work co-operatively with FOC staff.

5. CANADA'S PACIFIC COAST SABLEFISH FISHERY

5.1 Introduction

Prior to 1977, when Canada extended its coastal jurisdiction to 200 nautical miles, the Japanese distant water fleet targeted Pacific sablefish (*Anoplopoma fimbria*) off Canada's west coast. In the late 1970s several Canadian fishermen started a directed sablefish fishery to pursue markets in Japan (Turriss 2000). A limited-entry sablefish fishery was established in 1981 as a means of controlling and limiting the increased fishing effort directed towards the sablefish resource. Forty-eight vessels received commercial sablefish (or Category "K") licences and were restricted to either longline or trap fishing gear.



Sablefish (*Anoplopoma fimbria*)

Between 1981 and 1989 the number of active sablefish vessels ranged from 22 to 48, although almost all licences were active by the end of the period. In 1988 approximately 550 people were employed in the harvesting of sablefish. Figure 9 displays the catch in tonnes and the inflation-adjusted landed value over the past two decades.

The fishery was managed by season length. Fisheries and Oceans Canada (FOC) would close the fishery when it was estimated the Total Allowable Catch (TAC) had been taken. As illustrated in Figure 10, there was a steady decline in the number of fishing days as effort increased and the race for the fish began.

As early as 1984, it was apparent that there were problems in the sablefish fishery. Various new management concepts were discussed in great length with the Sablefish Advisory Committee (SAC), a DFO industry board that provided (and still provides) advice on management of the sablefish fishery. Due to differences in ideologies, vessel size and investments in gear, the fleet would not support the use of individual quotas (IQs) in the fishery.

The fishing power of the fleet increased as sablefish fishers invested heavily in their operations to enable them to catch the fish as quickly as possible. The impacts of this were numerous, yet predictable:

- i. commercial fishers received lower landed-prices due to poor fish-quality
- ii. vessel owners were unable to service the lucrative Japanese markets during the most opportune period due to the shortness and timing of the fishery openings

- iii. fishing costs continued to increase as fishermen tried to maintain their share of the catch with on-going gear and vessel improvements
- iv. commercial fishers, under pressure to fish in bad weather and to overload their vessels with gear and crew, often compromised safety and
- v. slight miscalculations in the efficiency of the fleet by fisheries managers lead to catches in excess of the TAC in every year from 1981 to 1989.

Figure 9
Sablefish annual catch vs. landed value
1981 - 1999

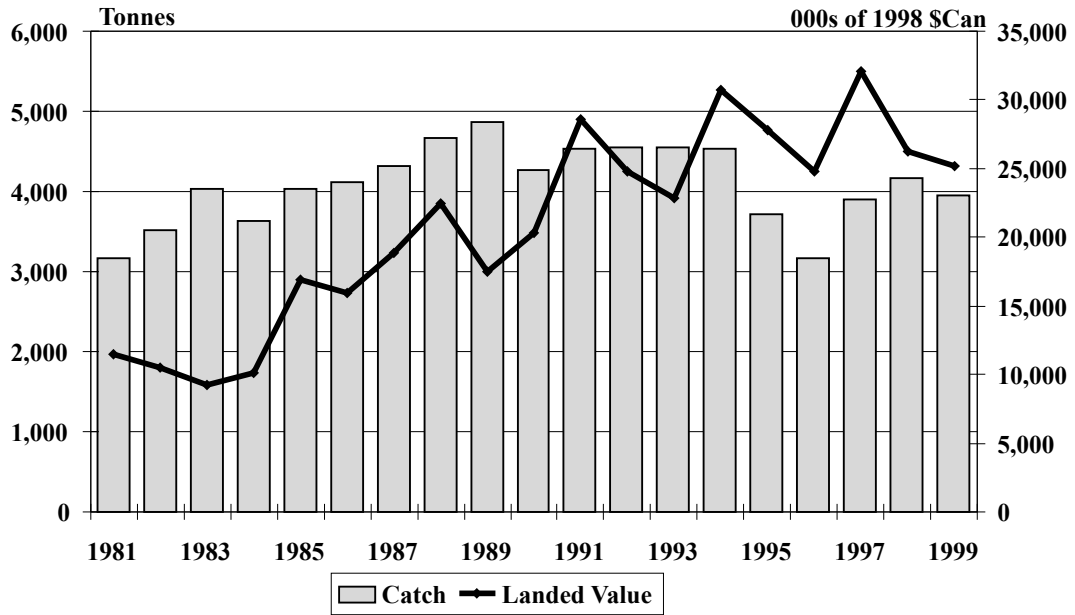
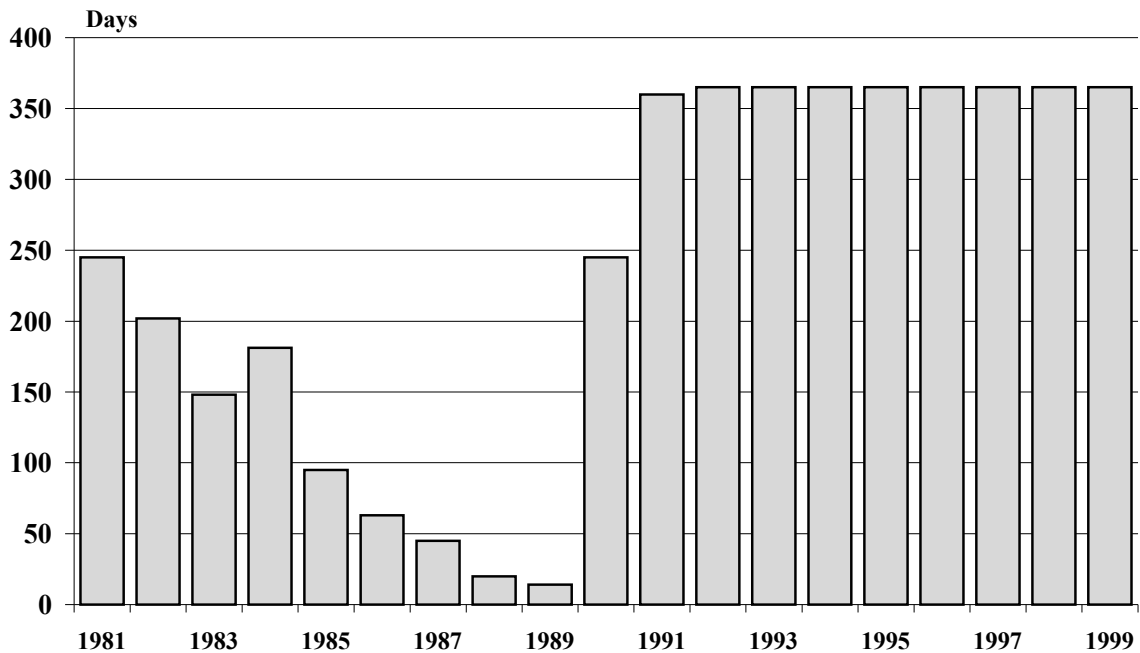


Figure 10
Sablefish fishery season length
1981 - 1999



The Department of Fisheries and Oceans was also concerned about monitoring and enforcement of the sablefish fishery. There were rumours of operators fishing outside of the season and other commercial users (groundfish trawlers and longliners) illegally landing sablefish throughout the year (Turriss 2000). Due to the cost of monitoring and enforcement, budget cuts and departmental priorities, the Department of Fisheries and Oceans lacked the resources to effectively monitor sablefish landings.

When the sablefish fishery was projected to be open for no more than eight days in 1990, the Pacific Blackcod Fishermen's Association (an organization of sablefish licence-holders) approached the Department of Fisheries and Oceans in October 1989, recommending that an IQ programme be developed for the sablefish fishery for 1990. An Individual Vessel Quota (IVQ) programme was implemented in the sablefish fishery in 1990 for a two-year trial period.

The trial IVQ programme proved very successful. The programme was extended and continues today. Since the introduction of IVQs, catches have been within 0.5% of TAC, and in some years the fleet has landed less than the allowable catch. All landings are verified through an independent dockside-monitoring programme paid for by the sablefish fishers. Catches are also monitored through mandatory logbooks, sales-slip information and restricted offloading locations.

The sablefish fishery is now open from 1 January to 31 December and licenced vessels are permitted to fish at any time but must "hail-out" prior to proceedings to the fishing grounds and "hail-in" prior to landing (Turriss 2000). Prior to IVQ management, most landings of sablefish occurred between March and September. Since 1990 landings have occurred year round, but a significant proportion occur between September and March to take advantage of greater market demand.

The number of active sablefish vessels has declined since IVQs were introduced. In 1998, 24 Category "K" licenced vessels reported sablefish landings. The reduction in fleet size has obviously led to a decline in the number of crew jobs. However, total earnings for crews increased from \$Can6.4 million in 1988 to \$Can7.4 million in 1991 and \$Can7.0 million in 1994. The average earnings per crew member increased from about \$Can12 000 before IVQs to \$Can33 000 in 1991, and \$Can46 500 in 1994.

The biggest change in sablefish fishery regulations arose from the port-offloading validation and quota-monitoring programme, operated independently of the DFO by a third-party contractor. To further increase enforcement, one additional fishery officer person-year has been dedicated to the sablefish fishery. Licence-holders pay for both these initiatives. In fact, as in the halibut fishery, sablefish licence-holders are required to pay all the incremental costs associated with management, monitoring, and enforcement of the IVQ programme. The net effect has been no additional costs to the Department of Fisheries and Oceans.

Stakeholder involvement has increased significantly under IVQ management. Through the Pacific Blackcod Fishermen's Association, licence-holders are taking an active role in the management of their fishery and the sablefish resource. The Association works closely with the Department of Fisheries and Oceans staff on the development of management plans and has hired scientific staff to work with government biologists on stock assessments and other research.

5.2 The nature of the harvesting right

Commercial sablefish licences (Category "K") are vessel-based; the owner of the vessel controls the licence. Fisheries and Oceans Canada issues the licences on an annual basis. The sablefish fishery is managed under a limited-entry licensing regime.

Prior to 1989, a sablefish licence could not be separated from any other commercial fishing licences attached to the vessel. All licences attached to the vessel had to be transferred together. Today a sablefish licence can be permanently or temporarily separated, and be transferred from any combination of licences on a vessel as long as it is placed on another commercially licenced fishing vessel (of any length) that does not already have a Category "K" licence.

Since 1989, only temporary (annual) transfers of quotas have been permitted between "K" licensed vessels. Initially, each sablefish licence was assigned a "quota block", determined by the initial allocation formula, and vessel owners were permitted to trade quota blocks. Once a quota block had landings against it, it could not be transferred. In 1993 each quota block was broken into smaller quota shares that could be transferred. Once a quota share had landings against it, the remainder of that share could not be transferred. In 1995, quota shares were dropped and sablefish IVQ could be traded on a per pound basis. This practice remains in place today.

5.3 The method of allocation

5.3.1 Policy objectives

There were no explicit policy objectives for the initial allocation of quota. Fisheries and Oceans Canada, in general, wanted an alternative management strategy for the sablefish fishery to be able to better control harvests and meet conservation objectives.

5.3.2 Process used in determining initial allocations

As stated above, the Pacific Coast Blackcod Fishermen's Association made a recommendation to move to IQ management. Fisheries and Oceans Canada then consulted with the Sablefish Advisory Committee (SAC), an industry advisory body made up of eight licence-holders and a processing company representative. After several meetings to develop the initial allocation formula and design the IVQ system, the DFO distributed a discussion paper outlining the concept of IQs, each sablefish vessel owner's IVQ allocation, and the details of a two-year trial programme.

Sablefish fishers were asked to vote on the proposed IVQ programme (Turriss 2000). More than 95% supported the proposal. Individual quotas were introduced in the sablefish fishery a mere nine months after the initial request from industry.

5.3.3 Initial allocation formula chosen

Each vessel in the sablefish fleet was allocated an individual quota using a set formula. The formula calculates 70% of the quota based on historical catch and 30% of the quota on the licensed vessel's overall length. Historic catch was determined by taking each licence's best catch in either 1988 or 1989. This number was then divided by the total of all sablefish vessel highest landings in either 1988 or 1989, and then multiplied by 70% of the 1990 TAC. Overall length was determined for each individual vessel by a certified marine surveyor and then divided by the total length for the fleet. This number was then multiplied by 30% of the 1990 TAC.

5.4 Data requirements and computational process

The information required was readily available from Fisheries and Oceans Canada databases. DFO sales-slip data was used to determine the catch history portion of the initial allocation formula. Vessel length had been previously collected as part of DFO licensing requirements and, at that time, had been determined by a certified marine surveyor.

In the discussion paper sent to vessel owners, Fisheries and Oceans Canada provided each sablefish fisher with the catch history on file for their licence and the necessary information about their vessel. Licence-holders were also provided with the initial IVQ for their vessel for the upcoming season. In the event of a disagreement with the data presented, fishermen were encouraged to contact Fisheries and Oceans Canada. Fishers were required to provide documentation proving an error had been made.

5.5 Appeals process

No appeal process was established to deal with sablefish fishers who disagreed with the allocation formula or felt they were affected by extenuating circumstances. The Department only considered the discrepancies between sales-slip records or overall vessel-length measurements.

5.6 Administration of the allocation process

5.6.1 Staff requirements

The move to IVQ management in the sablefish fishery was largely an industry initiative. Fisheries and Oceans Canada provided the forum for discussion and made staff available to provide technical advice, aid in programme design and calculate initial allocations based on the formula derived by SAC.

5.6.2 Additional programme funding requirements

While the process to move to IVQ management and determine an initial allocation formula may have resulted in some additional expenses for the Department, existing budget sources covered these costs. Any incremental costs resulting from the operation of the sablefish IVQ programme were borne by the licence-holders.

5.7 Evaluation of the initial allocation process

5.7.1 Success in achieving initial policy objectives

While there were no explicit policies for the initial allocation process, Fisheries and Oceans Canada saw individual quota management as a possible way to achieve an orderly harvest of the sablefish resource.

Catches have been within 0.5% of TAC since the introduction of IVQ. In some years the fleet has landed less than their total allowable catch.

5.7.2 Satisfaction of quota-holders with the process

There is little information readily available about licence-holders' satisfaction with the initial allocation process. The fact that an overwhelming majority of licence-holders voted in favor of the proposed initial IVQ allocation formula in 1989 would suggest licence-holders were not displeased with the process. Today the majority of the remaining industry participants are satisfied with the move to IVQs in the sablefish fishery (Turriss 2000).

5.7.3 Views of other community groups

There is no information readily available on crew opinions on the initial allocation process. Turriss (2000) discusses the views of crew members with respect to the move to IVQ management. As the number of active sablefish vessels has declined under IVQ management, there has also been a corresponding decline in crew employment. However, those crew members remaining have more stable employment and are better paid. Crew members are often unhappy about having to absorb the costs of quota leasing through reduced crew shares. In some instances, crew members are paid a daily rate rather than a share.

5.7.4 Hind-sight assessment

With respect to the initial allocation process, a more independent and transparent process may have been preferable. However, given the overwhelming support the IVQ proposal received, this criticism is moot. As illustrated by Turriss (2000), more thought could have been given to the issues of temporary *versus* permanent transferability of quotas. Only temporary (annual) quota transfers are permitted in the sablefish fishery. Fisheries and Oceans Canada was only willing to allow temporary transfers when the programme was first introduced. This led to a considerable amount of leasing between licence-holders, and this practice has become entrenched in the industry. If transferability had been more thoroughly analyzed prior to programme implementation, some of the criticisms regarding "armchair" fishing, leasing costs being passed onto crews, and high lease rates, etc. may have been mitigated (Turriss 2000).

5.8 Discussion

There is greater industry involvement in the research, assessment, monitoring and administration of the sablefish fishery as a direct result of the IVQ programme (Turriss 2000). The Pacific Blackcod Fishermen's Association, which represents sablefish fishers, funds all management costs of the Department of Fisheries and Oceans through cost-recovery mechanisms and employs independent researchers, scientists and fishery managers to help manage the resource.

6. CANADA'S PACIFIC COAST ROE HERRING FISHERY

6.1 Introduction

The fishery for roe herring (*Clupea pallasii*) is by far the largest user of the herring resource: on average it uses approximately 80% of the harvestable surplus each year. Prior to 1998 the roe herring fishery by both seine and gillnet vessels, was an intensely competitive, frantic race, timed precisely to catch female herring just before they spawn when their roe yield is highest.

Canada's Pacific roe herring fishery began in 1972 when herring stocks had recovered from a collapse in the 1960s and the lucrative Japanese market for roe became accessible to Canadian producers. A new commercial fishery was started to harvest herring for its roe. Figure 11 shows the catches and inflation-adjusted landed values for the roe herring fishery. The history and evolution of roe herring management are described below.

Limited entry: In 1974 steps were taken to control the rapid expansion of the roe herring fleet by restricting future access to the fishery to those who obtained licences that year. Fisheries and Oceans Canada now issues 252 seine licences and 1301 gillnet licences annually.

Effort controls: Since the fishery began, the fishing effort of the roe herring fleet has been controlled through a variety of input controls such as numerous restrictions on gear (*e.g.* net length) and effort (*e.g.* time and area openings and closures).

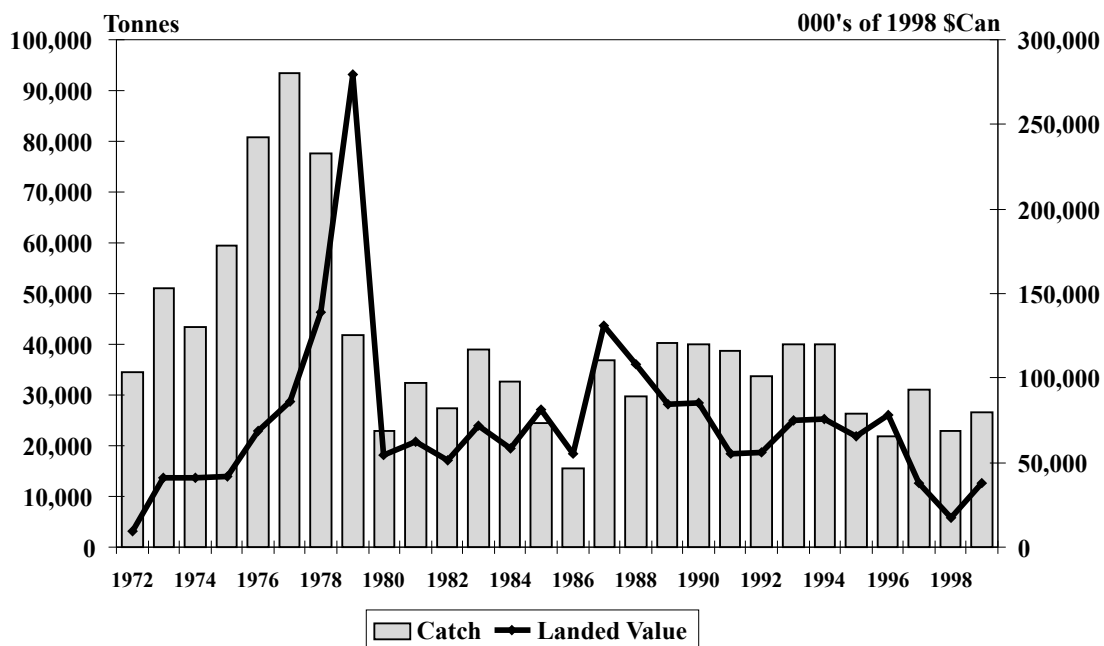
Area licensing: In 1981 area-licensing was introduced to restrict excessive participation in each roe herring opening. Prior to 1981 a roe herring licence entitled the holder to participate in all openings on the coast of British Columbia. The majority of the herring fleet would move from opening to opening, and fisheries

managers faced increasing difficulty restricting the catch. Under area licensing, the coast is divided into five geographic areas and each licence is eligible to fish in only one area. This significantly reduces the number of vessels participating in each opening.

Multiple area licensing: Given the timing of the fishery in each area, it is possible for a vessel to fish more than one area in a single season provided that the vessel is able to obtain a separate licence for each area. This practice of a vessel fishing more than one area, referred to as multiple licensing, reduced the number of active vessels participating in the fishery. As the number of active vessels declined, so did employment in the fishery.

Double or triple licensing: In some instances the Department of Fisheries and Oceans has required that a vessel have at least two roe herring licences to be eligible to fish in a specific area. The objective of this double-licence requirement was to give managers better control over a fishery, by reducing the size of the fleet. This practice started in 1985 and was used increasingly over time. In 1997 double-licensing was required for all areas except the Central Coast gillnet fishery. This also reduced employment levels in the fishery.

Figure 11
Roe herring annual catch vs. landed value
1972 - 1999



Thus, as noted above, management of the Pacific roe herring fishery evolved steadily over the past 25 years with considerable input from participants in the fishery. Unfortunately, the fishing power of the fleet grew and these measures proved incapable of controlling the harvest. Area target-catches were often exceeded, particularly by the seine fleet.

By 1997 due to multiple area and double/triple licensing requirements, the fleet had been reduced to approximately 105 active seine vessels and 415 active gillnet vessels. The average crew for a seine vessel was six people including the skipper. Gillnet vessels had an average crew of four persons, including the skipper (Gislason 1998).

Two significant events occurred in 1997 that led to major change in the roe herring fishery. First, roe herring prices collapsed. The weakness of the Japanese economy and changing tastes in that country hurt market returns. Landed prices dropped by more than one third. Second, the seine fleet exceeded its target catch by over 100% in one management area and by more than 70% in another. The Minister of Fisheries and Oceans declared this unacceptable and announced that change must occur in the roe herring fishery.

The Department of Fisheries and Oceans announced that, by the 1998 roe herring season, the government intended to have the necessary measures in place that would ensure area target-catches were not exceeded. Strict management measures, unprecedented in the fishery's history, were announced for 1998. The DFO recognized

that such measures could have profound impacts on roe herring fishery participants, and industry was given the opportunity to develop an acceptable alternative management strategy for the future.

After extensive industry and stakeholder consultation, a trial 'pool' fishery plan was tested in all seine fisheries and in three small gillnet fisheries in 1998. Under the new pool fishery plan, vessels were grouped together or "pooled". Each licence was granted an equal share of the target-catch in the fishing area chosen for 1998. Each group of fishers or "pool" could catch the total amount of herring designated to the licences in the pool.

Any catch estimated to be in excess of an individual vessel's authorized amount was transferred, in order of priority, to other vessels within the pool, to other pools in the management area, and, where total catch exceeded the target, to test fishing vessels, or the excess catch was allocated to an industry-run society, sold and the funds used for research purposes. Catch weights were validated at the point of landing and this weight was measured against the licence catch share. Vessel pooling continued in the 1999 and 2000 roe herring fisheries.

6.2 The nature of the harvesting right

Roe herring licences are issued to the person, rather than to the vessel. Initially roe herring licences were non-transferable. However, since some roe herring licences were issued to companies and selling the company could effectively transfer control over the licence. Also, in the 1970s, the non-transferability rule was relaxed when the Minister began to approve the transfer of roe herring licences to deceased licensee's spouses or next of kin.

Once the holder/operator restriction was dropped in 1979, other ways of legally circumventing the non-transferability rule were found, *e.g.* leases and trust holdings. Leasing became a common practice and licences were changing hands, though at some inconvenience and cost. In 1990, after consultation with the Herring Industry Advisory Board (HIAB), transferability was recognized as roe herring licencees were able to relinquish their licence eligibility and nominate another individual for that eligibility. HIAB is the advisory body that the Department of Fisheries and Oceans works with to design management and fishing plans for the commercial herring fisheries.

After vessel-pooling was introduced, an allocation of herring was attached to each licence. While the licence can still be transferred, the entire allocation moves with the licence and cannot be separated or split into shares. Under vessel-pooling a maximum of two licences can be placed on a single vessel. Prior to vessel-pooling there was no limit on the number of licences that could be placed on a vessel. In fact, the former multiple area and double/triple licensing requirements often forced vessels to hold more than one licence for the season.

6.3 The method of allocation

6.3.1 Policy objectives

A number of objectives and guiding principles were listed in a discussion paper that focused on alternative management strategies for the roe herring fishery. However there were no explicit objectives, from either government or industry that dealt specifically with the individual allocation of the herring resource. The industry outlined the importance of meeting the overall gear catch shares (55% to the seine fleet and 45% to the gillnet fleet), but there were no explicit objectives related the issue of individual allocations.

When vessel-pooling was introduced, the industry recommended that a maximum of two licences be permitted to be "stacked" on a single vessel for the fishing season. This was done to protect employment in the fishery and avoid concentration of fishing opportunity. Industry also introduced the limitation in an attempt to control the demand for roe herring licence leases and keep leasing costs low.

6.3.2 Process used in determining initial allocations

After the DFO announced the need for changes to the roe herring fishery, a small government-industry working group was established to discuss the feasibility of different management options. Meetings were held in May and June 1997. In August a discussion paper based on the outcome of the working group meetings was sent to all roe herring licence-holders on record, Aboriginal bands and other interested stakeholders. Objectives and guiding principles were outlined and a number of alternative management options were considered.

Broad consultation was then undertaken through three industry meetings open to the public during September. Written submissions were also accepted. The Department hired an independent facilitator to chair the industry meetings and report on the results and written submissions. The advice received from the public process was carried to the HIAB meeting in October for review and to provide guidance for the development of management options for the 1998 roe herring fishery. At the meeting, the Department re-iterated its position on catches in excess of targets and re-stated management requirements for future roe herring fisheries.

The HIAB caucus met and industry members emerged with recommendations for the 1998 roe herring season. While support was not unanimous, the majority of HIAB members felt their organizations could accept the recommendations. Specifically, “pool” fisheries were recommended for the seine fleet on a coastwide basis. Gillnet representatives indicated they wanted to try some form of pool fishery on a pilot programme basis. The HIAB representatives recommended target catches be allocated on an equal basis among the licences in an area.

6.3.3 Initial allocation formula chosen

The Minister of Fisheries and Oceans accepted the HIAB recommendation for equal allocations of the herring target-catches, which are divided equally among the licences eligible to fish in each management area. Licences and the associated quota cannot be divided and transferred in smaller quantities.

6.4 Data requirements and computational process

As part of the annual stock assessment, Fisheries and Oceans Canada determines target-catches by management area. Once the target-catches are announced, roe herring licence-holders are given a deadline in which they must designate a management area for their licence(s) for the upcoming season. Roe herring fishers can change management areas if an area is over-subscribed. Once the deadline passes the target-catch is divided by the number of licences designated to the area and allocations are determined for the season.

The practice of choosing management areas was in place for many years prior to the introduction of pooling. The only change resulting from vessel-pooling is that an allocation is now granted to each licence. The Department of Fisheries and Oceans had to develop a new computer programme to document the catch on the fishing grounds to ensure pool allocations were being complied with, and that area target-catches were not being exceeded.

6.5 Appeals process

To date there has been no appeals process. A group of roe herring seine licence-holders has expressed dissatisfaction with the allocation formula and have requested an appeals process. The Department of Fisheries and Oceans is currently considering the request of this group.

6.6 Administration of the allocation process

6.6.1 Staff requirements

To date, there has been no separate allocation process for the roe herring fishery. The process described in this paper was undertaken to discuss management change in the roe herring fishery. The DFO staff conducted the working group meetings, prepared the discussion paper, which was sent to all stakeholders and provided technical advice. An independent facilitator was hired to chair the stakeholder meetings, review written briefs and prepare a report summarizing the advice received.

6.6.2 Additional programme funding requirements

Additional funding above the budget of the herring programme was required to pay for the independent facilitator and the three stakeholder meetings held in September. These funds came from the existing Department of Fisheries and Oceans – Pacific Region Fisheries Management Branch budget.

6.7 Evaluation of the initial allocation process

6.7.1 Success in achieving initial policy objectives

As stated above, there were no explicit objectives that dealt with the allocation of the herring resource. The main objective was to design a management regime that would ensure the gillnet and seine roe herring fleets harvests adhered to area target-catches. As a result of this management change in 1998 and 1999, catches in the seine fisheries were 5% over the target, as compared to a long-term average catch overage of 20%. The gillnet fleet was below its target-catch for 1998. Roe herring fisheries managers believe that vessel-pooling gives them greater control over the fleet and, therefore, increases their ability to manage to the target-catches.

6.7.2 Satisfaction of rights-holders with the process

While this does not directly focus on the allocation process, after the 1998 season, the Department of Fisheries and Oceans held a review of the roe herring fishery and vessel-pooling. A survey was sent to all roe herring licence-holders as well as to First Nations and other interested stakeholders. An independent consultant was hired to review the 1998 roe herring season and compile the survey results. Of the surveys received, 85% of the gillnet responses and 88% of the seine responses indicated that the pool experiment was a success and should be continued in 1999.

However, a group of seine licence-holders has expressed dissatisfaction with the process of allocation. These licence-holders feel strongly that they have been unfairly treated by the equal allocation formula in the roe herring seine fishery, as it fails to take into account historic participation and investment in the fishery. They would like the Department of Fisheries and Oceans to appoint an independent arbitrator to rule on the allocation formula.

6.7.3 Views of other community groups

No information is readily available on the views of other community groups on the initial allocation process. Officials of the Department of Fisheries and Oceans indicate that many First Nations, recreational fishing groups and environmental organizations have expressed some support for the vessel-pooling management regime as it affords fisheries managers greater control over the roe herring fleet.

6.7.4 Hind-sight assessment

A change in the management regime can have different impacts on individual operators in a commercial fishery. A group of seine licence-holders feels they have been disenfranchised by the management change in the roe herring fishery, specifically by the initial allocation formula. They feel the equal sharing arrangement does not take into account their past participation in the fishery or the significant investments they made in vessels and gear.

When regulatory bodies consider changes to the management of a fishery, they should carefully consider how the options being discussed could affect relative economic positions within the fleet. More importantly, this sentiment should be explicitly documented as an objective of the process. Specifically, efforts should be made to minimize a redistribution of wealth within the fleet due to a change in the management of the fishery.

6.8 Discussion

Results from the review of the 1998 season indicate that there are other economic benefits to vessel-pooling. Specifically, many roe herring fishers cited lower operating costs under pool fishery management. As they no longer had to race for the fish, licence-holders could concentrate on quality and keeping costs low to improve profits. Roe herring processors also noticed a reduction in operating costs after vessel-pooling was introduced, specifically from reduced tendering (the vessels that take the catch to processors' facilities) and packing expenses. Many of these cost savings can be attributed to a more orderly harvest and delivery of fish.

Most importantly, safety has improved under vessel-pooling. Historically, the roe herring fishery has been a frantic race for the fish. There have been cases of vessels sinking from collisions or overloading of the vessel. Lives have been lost. According to survey results the majority of the roe herring fleet believes that the fishery is safer under pool fishery management.

7. CANADA'S PACIFIC COAST HERRING SPAWN-ON-KELP FISHERY

7.1 Introduction

Pacific herring (*Clupea pallasii*) are the most abundant fish species on Canada's west coast. Herring are short-lived (usually less than age 8) and, as a result, individual year-classes contribute to the fishable population for only a few years. Herring populations can fluctuate markedly from one year to the next depending on the number of fish entering the spawning population. Pacific herring spawn during March and April in coastal areas.

Herring are harvested in a number of different fisheries. The focus of this paper is the herring spawn-on-kelp fishery. Natives living along the B.C. coast have traditionally harvested herring spawn deposited on marine plants and hemlock boughs that grew near the low tide mark. This Native food-product was adapted to the Japanese market. Japan began importing spawn-on-kelp (SOK) from Alaska in the early 1960s. Japan is essentially the only market for spawn-on-kelp.

In 1971 the Canadian Department of Fisheries and Oceans (DFO) issued an experimental permit to produce SOK in the Queen Charlotte Islands off the northern part of Canada's Pacific coast. A second permit followed in 1974. The commercial herring SOK fishery started in 1975 with the issuance of 13 Category "J" licences and has expanded in stages over the years. There are currently 46 "J" licences issued each year.

The SOK fishery has operated under an individual quota (IQ) system since its inception. From the start of the fishery, each licence-holder was authorized to produce a set (and equal) amount of SOK product. It is important to distinguish between the harvestable resource (herring) and the market product (SOK). In the SOK fishery, the IQ is based on the quantity of SOK produced, not the amount of herring used.

Therefore, the total quota for the SOK fishery is determined by the number of licences issued each year. Since 1978, each licence-holder has had an individual quota of 7257.6kg of product, with the exception of 1986 when only 5443.2kg could be produced (due to concerns over herring stocks).

There are two basic methods of producing spawn-on-kelp product; closed ponding and open ponding. Closed ponding requires the temporary capture and impoundment of herring. It is the most common method used in the SOK fishery and produces the highest quality product. Log frames are constructed to suspend harvested kelp and placed in the impoundment or pond site. Most operators use the same log frames year to year, beaching them near the area of operation between seasons. Herring are seined close to the impoundment, slowly brought to the pond and released into it. After herring deposit a sufficient amount of roe on the suspended kelp they are released and the product, both the spawn and the kelp, is harvested (ARA Consulting Group Inc. 1993).

Methods of open ponding are identical to those for closed ponding, except that the herring are not captured and impounded, rather the log frame containing the suspended kelp is moved close to an area of natural spawning (ARA Consulting Group Inc. 1993).

Figure 12 shows SOK landings in tonnes and landed values in inflation-adjusted terms. The herring SOK has traditionally been one of the more lucrative commercial fisheries on the Pacific coast of Canada. However, over the past two years there has been a significant decline in the landed value of the fishery. Much of this decline can be attributed to the downturn of the Japanese economy and a major shift in the marketing of spawn-on-kelp in Japan. Spawn-on-kelp has traditionally been sold as a luxury product in sushi-bars. When economic conditions in Japan are depressed, the high-priced end of the market is quickly saturated. Industry sources indicate that the Japanese are now trying to sell spawn-on-kelp as a consumer item at a lower price for home consumption.

Increased supply may also have negatively affected SOK prices in recent years. The DFO issued four new SOK permits in 1997 and an additional three new SOK permits in 1998. It is likely the increased supply put additional downward pressure on landed prices. The combined result has been lower landed prices paid to Canadian SOK operators. A time series of inflation-adjusted landed prices is shown in Figure 13.

In most years, all SOK licences are actively fished. Each spawn-on-kelp operation can employ between five and twelve people, although the average crew size per operation is six. There are designated landing sites and port validation of landed product in this fishery. Licence-holders began to pay for on-ground and plant monitoring programs to increase enforcement and improve compliance in the fishery in 1996.

SOK licence-holders take an active role in the management of their fishery. The Spawn-on-Kelp Owners Association (SOKOA) represents licence-holders in advisory sessions with the DFO. In addition, one spawn-on-kelp licence-holder sits on the Herring Industry Advisory Board (HIAB). HIAB is the advisory body that the DFO works with to design management and fishing plans for the commercial herring fisheries.

7.2 The nature of the harvesting right

SOK (or Category "J") licences are personal licences and are not vessel-based. They are issued to an individual or Aboriginal band and the licence and associated quota are not transferable. IQ cannot be separated from a SOK licence and transferred. When "J" licences were first issued, they were made non-transferable with the intent that the licence would revert back to DFO when the licence-holder decided to retire from the commercial fishery. At this point DFO could decide whether or not to re-issue the licence, and to whom.

In the SOK fishery there have been since 1975 four transfers by Ministerial appeal due to the death of the licence-holder. Some SOK licence-holders want to leave the fishery. They would like the DFO to implement policy changes that would allow them to somehow "transfer" their licences legitimately instead of having them revert back to the DFO. There is evidence to suggest that licence lease agreements are starting to occur in this commercial fishery as SOK operator attempt to "transfer" their fishing privilege.

7.3 The method of allocation

7.3.1 Policy objectives

In many cases the SOK fishery has been used to promote economic development opportunities within Aboriginal communities. Of the 46 SOK licences issued each year, 24 are held by Aboriginal Bands, 13 are held by Native individuals, and nine are held by non-Native individuals.

Figure 12
SOK annual catch vs. landed value
1975 - 1999

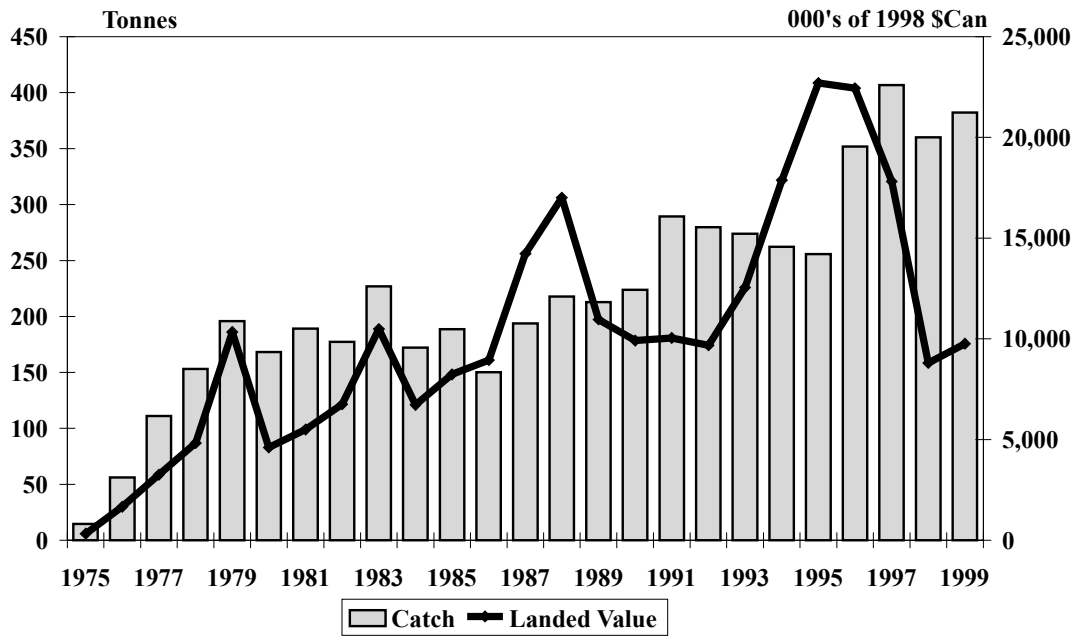
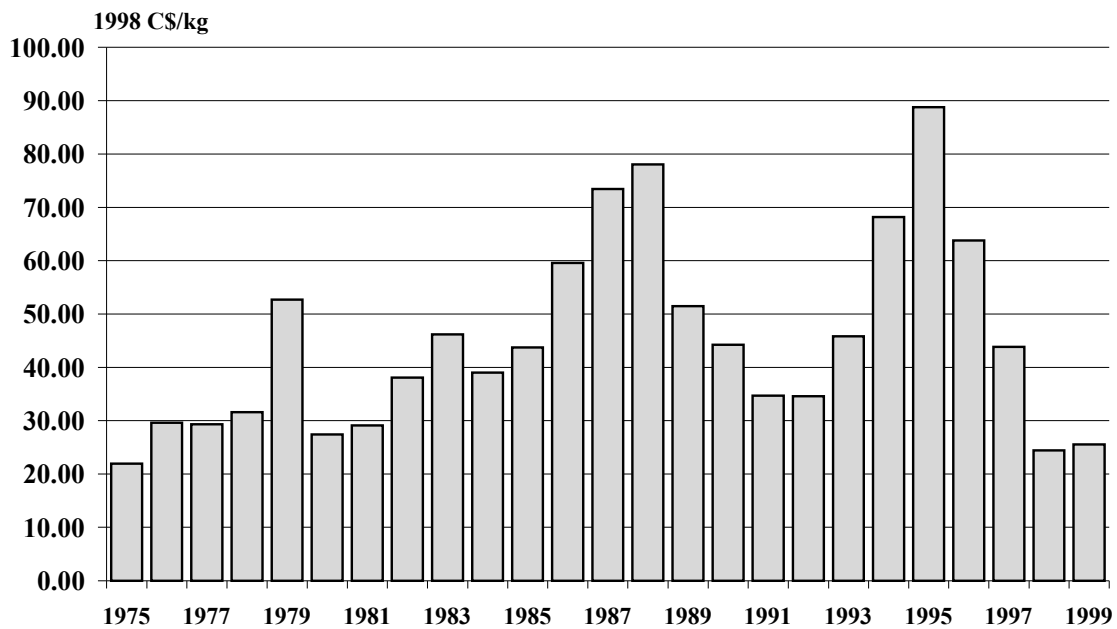


Figure 13
SOK landed prices
1975 - 1999



7.3.2 Process used in determining initial allocations

The selection process for the initial allocation of SOK licences considered factors such as previous experience in the handling and ponding of herring. Preference was given to fishers and natives living in remote areas of the coast. Readers are reminded that the SOK fishery is sometimes used to promote economic development in Aboriginal communities.

Those individuals that qualified for a Category “J” SOK permit had to surrender a roe herring seine licence. In later years, Aboriginal Bands receiving new SOK licences were required to surrender either one roe herring seine licence or six roe herring gillnet licences. This was done to avoid putting additional harvesting pressure on the herring resource and to compensate roe herring fishers for the re-allocation of herring to a new user group.

7.3.3 Initial allocation formula chosen

Each licence is permitted to land 7257.6kg of SOK product in a given year.

7.4 Data requirements and computational process

In order to attach an initial IQ of SOK production to each licence, the Department of Fisheries and Oceans had to determine the impacts of a SOK operation on the herring resource. After accounting for herring mortalities in the ponding operation and the impacts on the biomass as a result of the removal of the spawn, the amount of herring required to produce 7257.6kg of SOK product was calculated. Commercial fishers were required to surrender a roe herring seine licence to receive their SOK permit to ensure no additional pressure was put on the already fully subscribed herring resource.

7.5 Appeals process

There was no appeals process as the SOK fishery has always been managed as an IQ fishery.

7.6 Administration of the allocation process

7.6.1 Staff requirements

Fisheries and Oceans science staff were required to determine how much herring had to be attributed to a SOK operation to ensure the new SOK fishery did not negatively impact the resource.

7.6.2 Additional programme funding requirements

Funding of the management costs of the commercial SOK fishery is covered by the budget of the regional DFO fisheries management branch. Monitoring costs paid for by industry vary between \$Can150 000 and \$Can200 000 each year.

7.7 Evaluation of the initial allocation process

7.7.1 Success in achieving initial policy objectives

The Department of Fisheries and Oceans has used the SOK fishery to create economic development opportunities for some Aboriginal bands. Generally speaking, the fishery has historically generated positive employment and income benefits for the Bands involved in the fishery. However, some Bands have not been as successful as others in the SOK fishery.

7.7.2 Satisfaction of quota-holders with the process

There is little information readily available about operators' satisfaction with the allocation of licences in the SOK fishery. Some existing licence-holders are critical of the Department of Fisheries and Oceans for continuing to issue new permits and increasing the supply of SOK. They feel this depresses SOK prices and, therefore, has a negative impact on their revenues. These licence-holders would rather the DFO purchase existing SOK licences and then transfer these fishing privileges to Native Bands. They feel this practice would create less of a disruption in the SOK market.

7.7.3 Views of other community groups

There is little information readily available on the views of other community groups. However, FOC officials indicate that those Aboriginal Bands that did not receive a SOK licence are dissatisfied with the allocation process for licences (and, therefore, quota).

7.7.4 Hind sight assessment

As stated earlier there are two methods of producing spawn-on-kelp product; closed ponding and open ponding. For closed pond operations, 90.7t of herring must be allocated to account for herring mortality and removal from the biomass. However, as open pond techniques result in less herring mortality only 31.8 tonnes of herring must be allocated to the operation. Despite this substantial difference in the use of herring both open and closed pond operations receive the same IQ of SOK product. In retrospect, it may have been preferable to link SOK IQs to the amount of herring actually used in production. This may encourage SOK operators to adopt harvesting methods that have the least impact on the herring resource.

8. CANADA'S PACIFIC COAST SEA CUCUMBER FISHERY

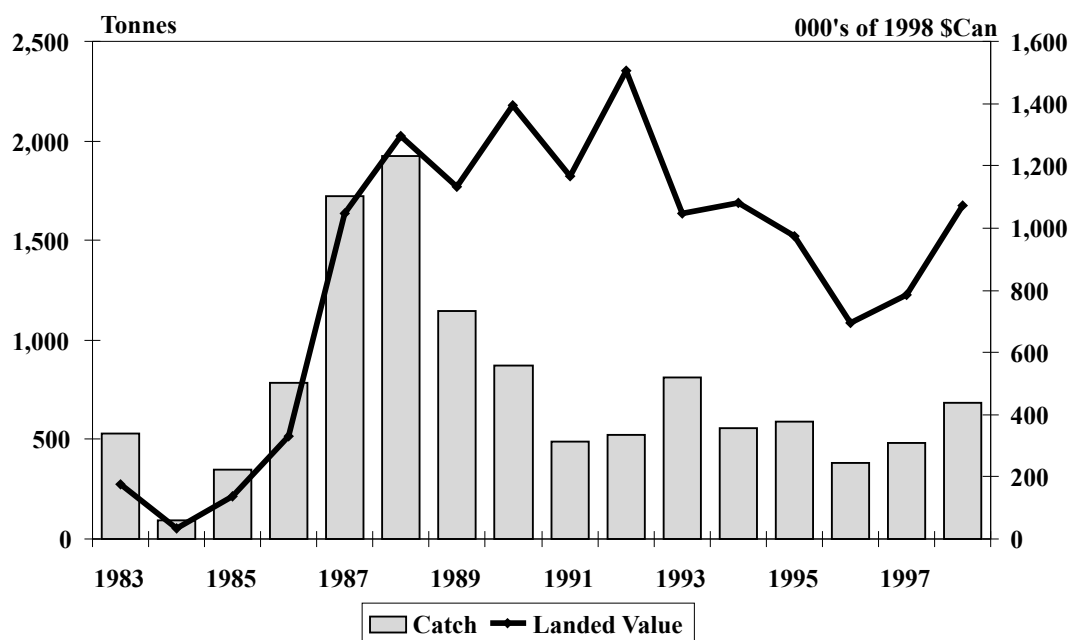
8.1 Introduction

This section is based on information from Fisheries and Oceans Canada's Sea Cucumber Management Plan (1999/2000) and Stock Status Report C6-10 (1999).

Canada's Pacific coast giant red sea cucumber (*Parastichopus californicus*) fishery is managed under a precautionary regime as little is known of the biology and abundance of the species. There are no size limits for sea cucumbers. Divers harvest sea cucumbers by hand in the commercial fishery. Marketable products include frozen muscle strips and dried skins. These products are exported to the port of Hong Kong, the Taiwan province of China, the mainland of the Peoples' Republic of China, and to the Republic of Korea, as well as to Canada and the U.S.

The fishery is relatively small. There are eight buyers and registered processors involved in the commercial sea cucumber industry. Under the current management regime, the fishery generally lasts three weeks and occurs during October when product quality is higher and weather conditions are still favorable. Figure 14 gives sea cucumber landings (in round weight) and the inflation-adjusted landed value. Little information on employment is currently available; however, for 1999, there were 39 active vessels employing 69 divers.

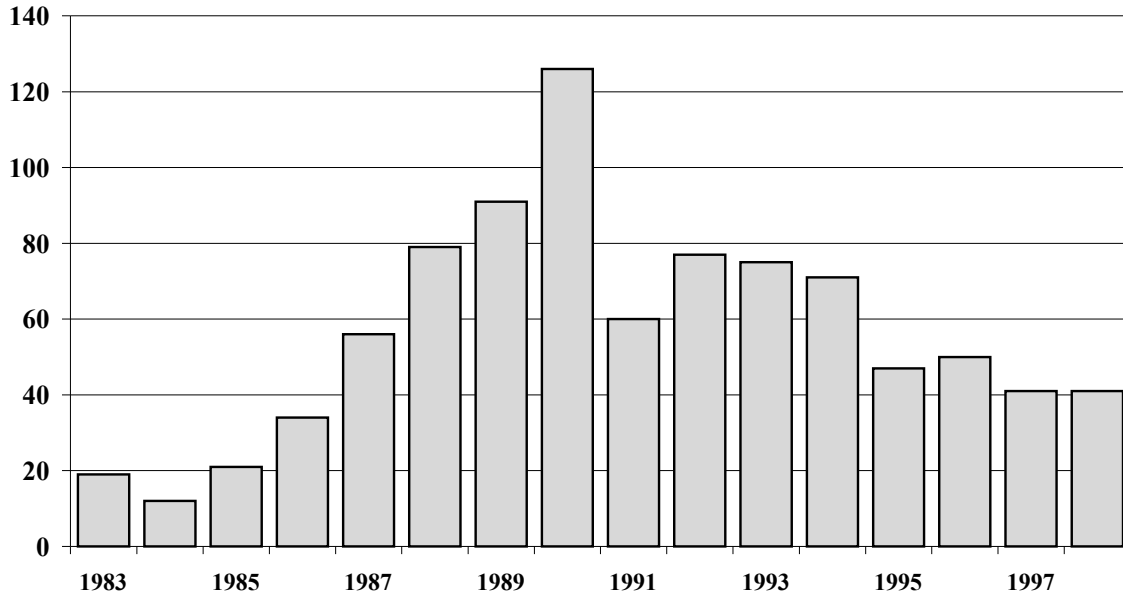
Figure 14
Sea cucumber annual catch vs. landed value
1983 - 1998



Sea cucumbers were first harvested commercially in Canada in 1971. A scientific fishery then occurred in southern waters during the early 1980s. During this time markets were established for the product. There was a rapid escalation in effort during the 1980s that led to conservation concerns. In an attempt to control effort and alleviate conservation concerns, fishing times were reduced and a precautionary total allowable catch (TAC) was introduced. Increasing effort was still a concern for the Department of Fisheries and Oceans and in 1991 limited

entry licensing was introduced into the sea cucumber fishery. A total of 85 Category “Z-D” licences were issued. Figure 15 shows the number of active vessels in the sea cucumber fishery from 1980 to 1998.

Figure 15
Number of active sea cucumber vessels
1983 - 1998



Despite these measures, it was becoming increasingly difficult to comply with area quotas and the TAC was often exceeded. The short duration of the fishery enticed some commercial fishers to “stock pile” sea cucumbers underwater prior to the fishery opening and then land them once the season began. The pace of the fishery was also creating dangerous fishing conditions. In 1995, FOC implemented an individual quota (IQ) programme for the sea cucumber fishery as a two-year pilot. The sea cucumber programme is modeled after the geoduck clam IVQ management regime.

Currently the fishery is administered under an adaptive management plan that sets a precautionary TAC and leaves part of the coast closed to harvesting. Five licence areas have been designated for the sea cucumber fishery. Licence-holders are required to select one licence area in which to fish. For over-subscribed areas, a process of voluntary area selection and lottery draw is used to determine the final licence area selection. Prior to fishing, licence-holders may jointly exchange licence areas. The Pacific Sea Cucumber Harvesters Association (PSCHA), an industry organization representing sea cucumber licence-holders, is responsible for ensuring that the area selection process is completed prior to the fishery opening.

The PSCHA has contracted a service bureau to weigh and validate the catch at the first point of landing. Fishermen are required to report to the service bureau before they begin fishing operations and prior to landing harvested sea cucumbers. This catch-monitoring and validation programme was a requirement of IVQ management in the sea cucumber fishery.

8.2 The nature of the harvesting right

The sea cucumber fishery is managed under a limited-entry licensing regime. A Category “ZD” licence is required to harvest sea cucumbers. The licences are issued to individuals and are not vessel-based, however, they must be designated to a commercial fishing vessel each season.

Prior to quota management, sea cucumber licences were not transferable. Under IVQ management, licences were made transferable and vessel length restrictions do not apply. A maximum of three active “Z-D” licences may be designated to any one vessel. Current regulations do not allow licences, and the associated IVQ, to be divided and transferred in smaller quantities.

8.3 The method of allocation

8.3.1 Policy objectives

There do not appear to have been any explicit policy objectives for the initial allocation of quota in the sea cucumber fishery. While there is little information available on this aspect of programme implementation, it appears that the Department of Fisheries and Oceans believed moving to IQ management would help acquire a better understanding of the resource and enable the Department to better meet conservation objectives. Industry had expressed a willingness to spend their own time and money to improve knowledge and management of the resource. Further, based on comments in the management plan for the fishery, the move to individual quota management appears to have been in response to conservation concerns and to move the fishery away from a "race for the fish".

8.3.2 Process used in determining initial allocations

There is little information available on this aspect of programme implementation. The move to IVQ management was mainly an industry-driven process and was discussed internally prior to approaching the Department of Fisheries and Oceans.

8.3.3 Initial allocation formula chosen

The Department of Fisheries and Oceans approved individual quota management for the green sea urchin, red sea urchin and sea cucumber fisheries at the same time. At that time the Minister of Fisheries and Oceans directed that 2% of the total allowable catch (TAC) in each fishery would be reserved for First Nations while the remaining 98% would be split equally among the licences in the commercial fishery.

The annual TAC is set based on surveys and assessments. In 1999, the TAC was divided over four of the five licence areas. Each sea cucumber ("Z-D" licence) is granted an equal share or 1/85th of the annual commercial TAC. Prior to each fishing season, licence-holders must choose the area they wish to fish. The number of licences fishing each area may change annually according to the proportion of the total quota assigned to each area.

8.4 Data requirements and computational process

Little or no fishery data were required for the allocation procedures. The equal-sharing arrangements removed the need to gather data and perform any calculations.

8.5 Appeals process

No appeals process was established to deal with sea cucumber licence-holders who disagreed with the allocation formula or felt they were affected by extenuating circumstances.

8.6 Evaluation of the initial allocation process

There is little information available on the success in achieving initial policy objectives or about licence-holders' satisfaction with the initial allocation process. And, there is no data readily available on the views of other community groups with respect to the initial allocation of sea cucumber quotas or hind-sight assessment information or data to enable an evaluation on the initial allocation process.

8.7 Discussion

Under IQ management, industry is taking a more active role in the management of the resource. The Department holds a collaborative agreement with the Pacific Sea Cucumber Harvesters Association (PSCHA) for catch validation and biological sampling. The PSCHA also funds research and management programs through fees to association members. This includes stock assessment surveys, biological research surveys, a catch validation programme and a biologist hired to co-ordinate research with the Department. Association fees in 1998 were \$Can825 per licence.

9. CANADA'S PACIFIC COAST RED SEA URCHIN FISHERY

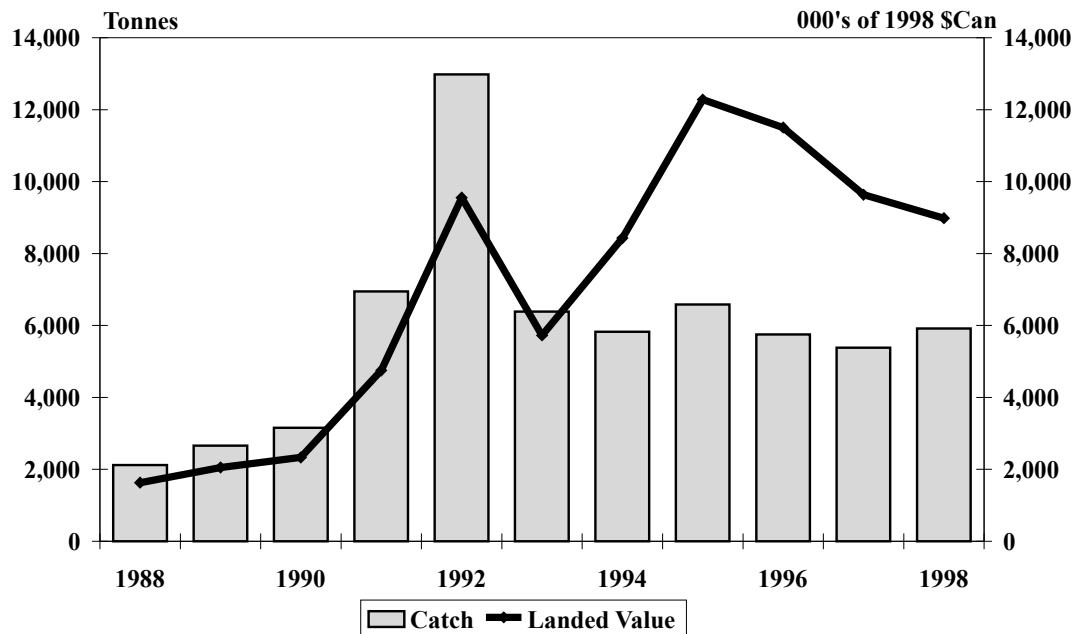
9.1 Introduction

This section is based on information from the Department of Fisheries and Oceans Red Sea Urchin Management Plan (DFO 1999/2000) and Stock Status Report C6-09 (DFO 1999).

The red sea urchin (*Strongylocentrotus franciscanus*) is one of three sea urchin species historically fished in British Columbia waters. Red sea urchins are harvested for their roe. The roe is extracted and processed in shore-based plants. The red sea urchin roe is marketed almost exclusively in Japan, where it is sold as 'uni'; however, a smaller market is developing in other Asian countries and in North America.

To ensure a quality product and a steady supply to markets, fishing times are determined by the Department of Fisheries and Oceans in consultation with sea urchin processors and the Pacific Urchin Harvesters Association (PUHA), an organization of red sea urchin licence-holders. Figure 16 shows commercial landings and the inflation-adjusted landed value for the commercial red sea urchin fishery. Information on employment is currently unavailable.

Figure 16
Red sea urchin annual catch vs. landed value
1988 - 1998



The commercial dive fishery for red sea urchins began in the late 1970s. It has grown rapidly since 1982. The red sea urchin “Z-C” licence category was established in 1983. The number of licences peaked at 240 in 1989, although only 109 were actively fished. Licence-limitation was introduced in 1991 in an attempt to control fishing effort and 102 Category “Z-C” limited-entry licences were issued. By 1994, licence appeals had increased the number of licences to 110, although only 89 vessels were active that year.

In 1994 the PUHA implemented a voluntary individual quota (IQ) programme that the industry had developed. The Department of Fisheries and Oceans adjusted the management plan to facilitate the voluntary programme. The programme was modeled after the geoduck IVQ management regime and included area licensing. The coast was divided into two licence areas, the North Coast and the South Coast. Dockside monitoring was introduced and the PUHA contracted an independent company to perform catch validations to ensure compliance with the individual quotas. Industry continued to run and manage their fishery under a voluntary individual quota system for two years while the DFO considered such a change in the fishery.

Mr M. Featherstone (pers. comm., Pacific Urchin Harvesters Association) reported that in the first season in 1994, there was one opening in January which lasted only a few days. Prices started out “ok” but as soon as the second day’s harvest arrived at the plants the price dropped, the market was flooded and the plants could not process all the product. The industry had set up to fish 1 million pounds per month on the North Coast, but it was all landed in the first few days, then everyone had to sit till the start of the next month. There was a very poor price paid as well! It looked as if the same thing would happen on the second opening but the fishermen decided not to go out until a better plan was reached – all the fishermen “just tied up and booked a meeting room at the Moby Dick Hotel in Prince Rupert”. At the meeting a quota system was proposed and while there was a lot of debate and some people thought it would not work, after three days, the details were hammered out and phone calls were made to all the licence-holders who were not represented in order to figure out the split of the catch, validation of the system, costs, etc.

Mr Featherstone has recalled that it was amazing that it all came together. Management fees were collected by D&D Pacific, a company hired to monitor and validate landings of red sea urchins by the

commercial fishers through an industry-funded program. It was a totally grass-roots endeavour by the fishermen and independent of DFO. Further, everyone played by the rules, as there would have been no legal recourse if someone decided to just keep fishing. There was unanimous acceptance, although by some grudgingly. The participants in this fishery had an advantage in that many of the participants were involved, or associated with the geoduck fishery (see Heizer 2000) and knew the basics of such management systems. The Association had also organized a workshop to discuss options for the management of the fishery in the fall of 1993. Mr David Smith (Ministry of Fisheries, Province of British Columbia) helped with the funding and getting it together. Quotas were discussed at length at the workshop, so the idea of IQs was not all that foreign to the different fishermen.

In 1996 DFO sanctioned the programme as a two-year pilot initiative. Under the DFO pilot IQ programme, red sea urchin licences are assigned to either the South Coast area or the North Coast area. Two percent of the harvest was reserved for Section 35² - Aboriginal food, social and ceremonial requirements, and other quota put aside for industry-funded surveys, etc., all of which became part of the pilot programme. The PUHA remains responsible for developing and implementing the third-party catch monitoring and validation programme to ensure that area quotas and IQs are not exceeded. Industry also contracts an on-grounds monitor to assist in the management of the fishery for areas above the mid-point of the coast of British Columbia.

Annual changes to the TAC are made based on surveys and updated assessments. There is a minimum size limit for red sea urchins. All commercial fishing vessels harvesting red sea urchins must be in possession of a logbook approved by the Department of Fisheries and Oceans. Prior to fishing, the vessel master must confirm the remaining vessel quota from the catch validation logbook.

9.2 The nature of the harvesting right

The red sea urchin fishery is managed under a limited-entry licensing regime. A Category "ZC" licence is required to harvest red sea urchins. The licences are issued to individuals and are not vessel-based, however, they must be designated to a commercial fishing vessel each season.

Prior to quota management red sea urchin licences were not transferable. Under IVQ management, licences were made transferable and vessel length restrictions did not apply. A maximum of three active "Z-C" licences may be designated to any one vessel. Current regulations do not allow licences, and the associated IVQ, to be divided and transferred in smaller quantities.

9.3 The method of allocation

9.3.1 Policy objectives

There do not appear to have been any explicit policy objectives for the initial allocation of quota in the red sea urchin fishery. While there is little information available on this aspect of programme implementation,

² Section 35 of the Canadian *Constitution Act 1982* recognizes Native Rights. The Courts have interpreted this Section to mean that Native Bands that have traditionally relied on fishing hold a collective right to fish for "food, social, and ceremonial purposes and the aboriginal right to fish must be accorded first priority after conservation needs are met". This interpretation is based on a decision taken in May 1990 in which the Supreme Court of Canada ruled in the Sparrow Decision. The Section is worded as follows:

Section 35. RIGHTS OF THE ABORIGINAL PEOPLES OF CANADA

- (1) The existing aboriginal and treaty rights of the aboriginal peoples of Canada are hereby recognized and affirmed.
- (2) In this Act, "aboriginal peoples of Canada" includes the Indian, Inuit and Métis peoples of Canada.
- (3) For greater certainty, in subsection (1) "treaty rights" includes rights that now exist by way of land claims agreements or may be so acquired. Aboriginal and treaty rights are guaranteed equally to both sexes
- (4) Notwithstanding any other provision of this Act, the aboriginal and treaty rights referred to in subsection (1) are guaranteed equally to male and female persons. Commitment to participation in constitutional conference 35.1 The government of Canada and the provincial governments are committed to the principle that, before any amendment is made to Class 24 of section 91 of the "Constitution Act, 1867", to section 25 of this Act or to this Part, (a) a constitutional conference that includes in its agenda an item relating to the proposed amendment, composed of the Prime Minister of Canada and the first ministers of the provinces, will be convened by the Prime Minister of Canada; and (b) the Prime Minister of Canada will invite representatives of the aboriginal peoples of Canada to participate in the discussions on that item.

it appears the Department of Fisheries and Oceans believed that moving to IQ management would help acquire a better understanding of the resource and enable the Department to better meet conservation objectives. The industry members themselves had expressed a willingness to spend their own time and money to improve knowledge and management of the resource.

9.3.2 Process used in determining initial allocations

Little information appears available on how the programme was implemented. The Department of Fisheries and Oceans sanctioned individual quotas in the red sea urchin fishery two years after industry introduced their voluntary programme. Mr Featherstone (Pacific Urchin Harvesters Association) reports that the quota's were split equally "just to keep it simple". The North and South Areas were selected and the quotas divided between licences by area. Under the Voluntary IQ the North and South Coasts had different harvest amounts.

9.3.3 Initial allocation formula chosen

Fisheries and Oceans Canada approved individual quota management for the green sea urchin, red sea urchin and sea cucumber fisheries at the same time. At that time the Minister directed that 2% of the total allowable catch (TAC) in each fishery would be reserved for First Nations while the remaining 98% would be split equally among the licences in the commercial fishery.

Each red sea urchin ("Z-C" licence) is granted an equal share or 1/110th of the annual commercial TAC. The TAC is divided over two areas: North Coast and South Coast. Each year, prior to the fishing season, licence-holders must choose the area they wish to fish. The number of licences fishing each area may change annually according to the proportion of the total quota assigned to each area. Licence area selection is facilitated by the PUHA.

9.4 Data requirements and computational process

Little or no data was used in the allocation procedures. Industry agreed an equal sharing of the TAC was the best way to allocate quota under the voluntary plan. Under the direction of the Minister, Fisheries and Oceans Canada adopted this allocation formula when it officially sanctioned individual quota management in the red sea urchin fishery. The equal sharing arrangements removed the need to gather data and perform any calculations for the allocation process.

9.5 Appeals process

Red sea urchin licence-holders voluntarily implemented an equal allocation individual quota programme. Therefore, when the Ministry officially sanctioned the programme, there was little need for an appeals process. Therefore, no appeal process was established to deal with red sea urchin licence-holders who disagreed with the allocation formula or felt they were affected by extenuating circumstances. The IVQ programme was modeled after the geoduck fishery that had demonstrated considerable success with individual quota management.

9.6 Administration of the allocation process

The move to IVQ management in the red sea urchin fishery was a decision by the industry. Licence-holders determined the allocation formula through internal discussions and with Fisheries and Oceans Canada officials. Thus there were few demands on the Department.

As the licence-holders voluntarily introduced IQ management into their fishery and designed the sharing arrangement, it is unlikely that significant Departmental was required in the allocation process.

9.7 Evaluation of the initial allocation process

There is little information readily available on the success in achieving initial policy objectives regarding this aspect of programme implementation. Nor is information available about licence-holders' satisfaction with the initial allocation process. However, given the industry's voluntarily agreed to accept IQ management and equal allocations, it is likely most licence-holders feel the process to formally institutionalize individual quotas was adequate.

There is no data readily available on the views of other community groups with respect to the initial allocation of red sea urchin quotas.

It is noteworthy that immediately after the start of the programme, the price for urchins started to climb and \$Can1.00/lb became the norm; this gave the programme a lot of positive reinforcement (pers. comm., M. Featherstone, Pacific Urchin Harvesters Association).

9.8 Discussion

The fishery is currently managed on a precautionary basis. Scientific research and joint industry, First Nations, and Fisheries and Oceans Canada stock assessment surveys are underway to move the red sea urchin fishery to a more biologically sustainable harvest level.

Fisheries and Oceans Canada holds a collaborative agreement with the PUHA for catch validation and biological sampling. The PUHA funds research and management activities by collecting fees from its members. This includes stock assessment surveys, biological research surveys and a catch validation programme. Further, the PUHA also pays for a biologist to co-ordinate research with Fisheries and Oceans Canada as well as a charter patrolman to monitor and guide the harvest in the North Coast region for eight months of the year. Association fees in 1999/2000 were approximately \$Can5320 per licence. But of particular note is that the fishermen are satisfied to have implemented this quota system, that they believe it is working well and that it is improving with each year.

It is of interest that initially, it has been reported, that the DFO would not support the programme after the first year, and it was not until later in the second year that DFO decided to adopt it. It has also been noted that one possible concern was that the system would potentially make licences more valuable. This would provide windfall profits to fishermen and could cost the Department more money in the future, because it was planning a buy-back of quota for redistribution to Native groups.

10. CANADA'S PACIFIC COAST GREEN SEA URCHIN FISHERY

10.1 Introduction

This section is based on information from the Department of Fisheries and Oceans' Green Sea Urchin Management Plan (June 1/99 to May 31/99) (DFO 1999b) and Stock Status Report C6-11 (DFO 1999c).

Green sea urchins (*Strongylocentrotus droebachiensis*) occur in the Atlantic and Pacific Oceans. They are generally found in intertidal zones at depths of more than 140m. Divers harvest the green sea urchins live for their roe and the product is shipped whole and alive to Japan. The fishery generally occurs in winter, when roe quality and quantity are the highest and market prices are the best. Due to better roe quality and proximity to processing plants, the majority of landings have come from southern B.C. waters.

The fishery is relatively small. Since 1996 the green sea urchin commercial fishery has been restricted to areas with a known catch history. In 1998/99, total landings were 156t with a landed value of almost \$Can1.0 million. Figure 17 shows total landings and inflation-adjusted landed value from 1988 to 1998. Information on employment is currently unavailable.

The fishery began in 1987. The green sea urchin fishery was managed by a minimum size limit of 55mm and by time- and area-openings. Effort began to increase steadily and in 1991 the Department of Fisheries and Oceans limited entry to the fishery in an attempt to control effort. Forty-nine green sea urchin licences were issued. Despite licence-limitation effort remained high. Landings peaked in 1992 when 49 vessels reported 1042t for a landed value of \$Can4.4 million. Figure 18 shows the inflation-adjusted landed prices for the green sea urchin fishery.

Beginning in 1995, a two-year pilot programme of individual quotas (IQ's) and area licensing were implemented in the green sea urchin fishery. The programme was modeled after the geoduck IVQ system. Under the pilot programme, an industry funded catch validation and monitoring programme was put in place to ensure monitoring of quotas and recovery of accurate catch data. Today, the management system consists of precautionary area quotas and closures, a minimum size limit and individual vessel quotas.

Under the IVQ programme, vessel masters are required to notify an industry-funded contractor at least 24 hours prior to harvesting, changing fishing areas and landing green sea urchins. All catches must be landed at a designated landing port. Industry-funded dock side validators weigh and validate all catches and perform biological sampling of green sea urchins landed from each vessel off-load. Catches are also recorded in mandatory logbooks maintained by the vessel master.

10.2 The nature of the harvesting right

The green sea urchin fishery is managed under a limited-entry licensing regime. Green sea urchin (Category "Z-A") licences are issued to individuals and are not vessel-based, however, they must be designated to a commercial fishing vessel each season.

Figure 17
Green sea urchin annual catch vs. landed value
1988 - 1998

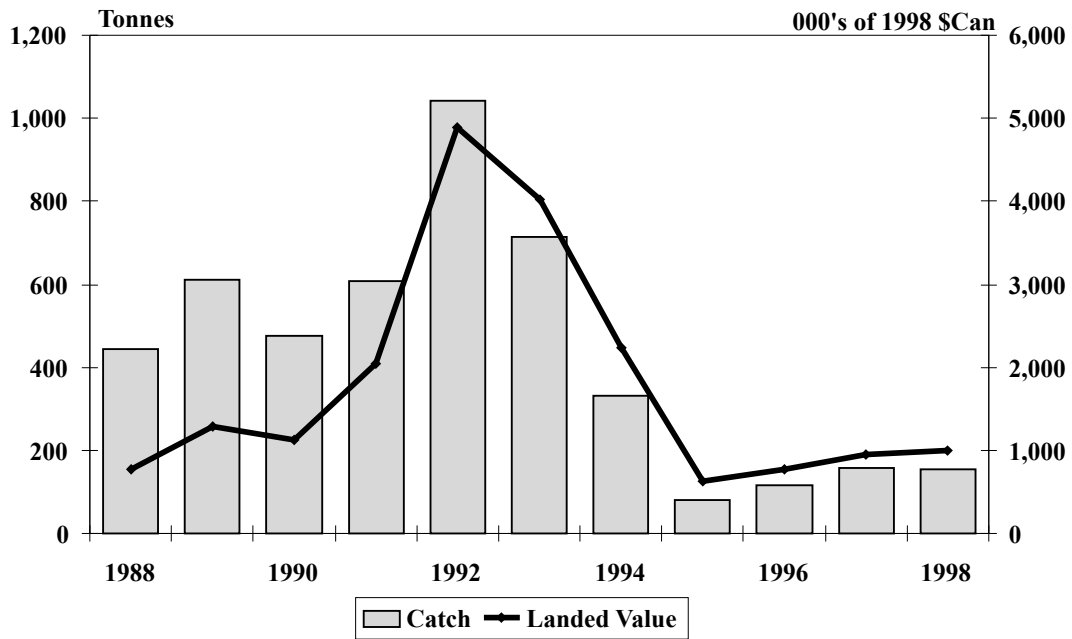
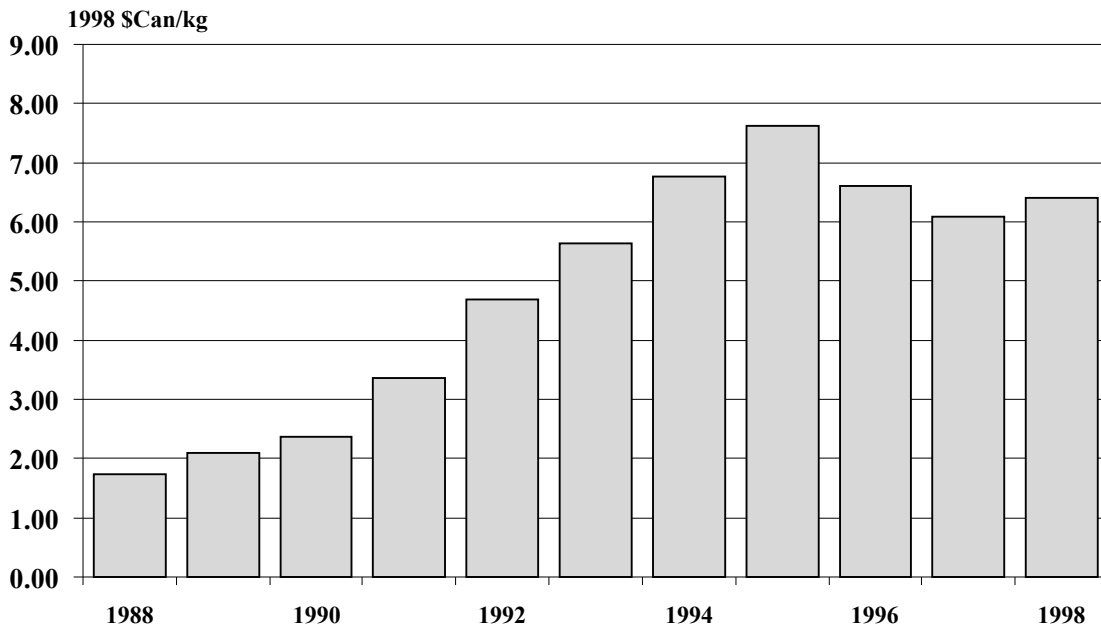


Figure 18
Green sea urchin landed prices
1988 - 1998



Prior to quota management green sea urchin licences were not transferable. Licence transferability was not permitted during the first two years of the pilot quota programme. Vessel length restrictions did not apply. In 1999, licences were made transferable. A maximum of three active "Z-A" licences may be designated to any one vessel at one time. Current regulations do not allow licences, and the associated IVQ, to be divided and transferred in smaller quantities.

10.3 The method of allocation

10.3.1 Policy objectives

There do not appear to have been any explicit policy objectives for the initial allocation of quota in the green sea urchin fishery. While there is little information available on this aspect of programme implementation, it appears Fisheries and Oceans Canada believed moving to IQ management would help acquire a better understanding of the resource and enable the Department to better meet conservation objectives. Industry had expressed a willingness to spend their own time and money to improve knowledge and management of the resource.

10.3.2 Process used in determining initial allocations

There is little information available on this aspect of programme implementation. For the green sea urchin fishery, it appears that the move to IVQ management was largely an industry-driven process. An industry organization approached FOC with a proposal for quota management in the fishery and supported equal allocations. The industry association had discussed the idea internally and the proposal had the support of the industry. Green seas urchin licence-holders had noted the success of the geoduck IVQ programme and modeled their proposal after that system. After some deliberation, Fisheries and Oceans Canada implemented IVQ management in the green sea urchin fishery.

10.3.3 Initial allocation formula chosen

Fisheries and Oceans Canada approved individual quota management for the green sea urchin, red sea urchin and sea cucumber fisheries at the same time. At that time the Minister of Fisheries and Oceans directed that 2% of the total allowable catch (TAC) in each fishery would be reserved for First Nations while the remaining 98% would be split equally among the licences in the commercial fishery.

Each green sea urchin ("Z-A" licence) is granted an equal share or 1/49th of the annual coastwide TAC. The TAC is divided over two areas: North Coast, South Coast. Each year, prior to the fishing season, licence-holders must choose the area they wish to fish. The number of licences fishing each area may change annually according to the proportion of the total quota assigned to each area.

Currently the TAC is allocated in South Coast areas. Opportunities to harvest in other areas of the coast are available under scientific harvest protocols. After careful review, additional TAC may be determined through this process.

10.4 Data requirements and computational process

Little or no data were used in the allocation procedures. The majority of industry agreed equal-sharing of the TAC was the best way to allocate quota. These equal-sharing arrangements removed the need to gather data on past fishing activity or perform any calculations.

10.5 Appeals process

No appeal process was established to deal with green sea urchin licence-holders who disagreed with the allocation formula or felt they were affected by extenuating circumstances.

10.6 Administration of the allocation process

10.6.1 Staff requirements

The move to IVQ management was largely an initiative taken up by the green sea urchin licence-holders. Aside from the industry proposal, it does not appear that there was a formal process to discuss the implementation of IVQ management in this fishery. The directive from the Minister of Fisheries and Oceans Canada was discussed at the Green Sea Urchin Sectoral Committee. However, there is little information readily available on this aspect of programme implementation.

10.7 Discussion

Industry and government are working together to encourage the development of this fishery in a scientifically based manner. DFO, in consultation with the West Coast Green Sea Urchin Association, have developed an exploratory fishing protocol to allow expanded commercial harvest while collecting data to

improve the understanding of the resource. Industry also contributes to the management of the fishery by funding stock surveys and the catch validation and monitoring programme.

IVQ management of this fishery has resulted in a better managed, more rational and safer fishery that achieves the conservation objectives set by Fisheries and Oceans Canada.

11. LITERATURE CITED

- ARA Consulting Group Inc. 1993. The 1991 Expansion of the Herring Spawn-on-Kelp Fishery: An Evaluation, Fisheries and Oceans Canada Vancouver, B.C., August 1993.
- Casey, K.E., C.M. Dewees, B.R. Turris and J.E. Wilen 1995. The effects of Individual Vessel Quotas in the British Columbia Halibut Fishery, *Marine Resource Economics*, Volume 10, pp. 211-230.
- Carpenter Fishing Corporation *et al. v. Her Majesty the Queen et al.* (Court No.: T-554-91)
- DFO Department of Fisheries and Oceans, Canada 1995. Individual Quota Management: Canada's Experience Featuring the Pacific Halibut Fishery, Ottawa, Canada.
- DFO Canada, Pacific Region Groundfish Trawl Fishery Management Plan: 1997.
- DFO Canada, Pacific Region Integrated Fisheries Management Plan: Halibut 1999a.
- DFO Canada, Pacific Region Integrated Fisheries Management Plan: Green Sea Urchins 1999b.
- DFO Canada, Stock Status Report C6-11, Nanaimo, Canada, July 1999c.
- DFO Canada, Pacific Region Integrated Fisheries Management Plan: Red Sea Urchins 1999d.
- DFO Canada, Stock Status Report C6-09, Nanaimo, Canada, July 1999e.
- DFO Canada, Pacific Region Integrated Fisheries Management Plan: Sea Cucumbers 1999f.
- DFO Canada, Stock Status Report C6-10, Nanaimo, Canada, July 1999g.
- DFO Canada, Pacific Region Integrated Fisheries Management Plan: Geoduck 2000.
- Federal Court of Appeal, Carpenter Fishing Corporation *et al. v. Her Majesty the Queen et al.*, and Titan Fishing Ltd. *v. Her Majesty the Queen et al.*, Docket A-941-96.
- Fisheries Economics, Research & Management Specialists (FERM) 1997. Re-allocation of Fishing Concessions Where Management Arrangement Have Changed. Background Paper Prepared for the Australian Fisheries Management Authority, June 1997.
- Fisheries and Oceans Canada – Commercial Licence Unit, Pacific Coast Commercial Licensing Handbook 1994, Vancouver, Canada, April 1994.
- Gislason, G.S. 1998. B.C. Commercial Fisheries Profile and Outlook, Fisheries and Oceans Canada, Vancouver, B.C., March 1998.
- Gislason, G.S. 2000. Stronger Rights, Higher Fees, Greater Say: Linkages for the Pacific Halibut Fishery in Canada. *In: Shotton, R. (Ed.) Use of property rights in fisheries management. Proceedings of the FishRights99 Conference, Freemantle, Australia, 11–19 November 1999, Workshop Presentations. FAO Fish. Tech. Pap. 404/2 pp383-389.*
- Groundfish Special Industry Committee 1999. Review of the Groundfish Trawl Individual Vessel Quota/Groundfish Development Authority Plan, Fisheries and Oceans Canada, Vancouver, B.C., September 29 1999.
- Heizer, S. 2000. The Commercial Geoduck (*Panopea abrupta*) Fishery In British Columbia, Canada – An Operational Perspective Of A Limited Entry Fishery With Individual Quotas. *In: Shotton, R. (Ed.) Use of property rights in fisheries management, Proceedings of the FishRights99 Conference, Freemantle, Australia, 11–19 November 1999, Workshop presentations. FAO Fish. Tech. Pap. 404/2 pp226-233.*
- Kaufmann, B. and G. Geen 1998. Quota allocation and litigation: An economic perspective. *Marine Resource Economics*, vol. 13, no. 2, pp143-157.
- Turris, B.R. 2000. A Comparison of British Columbia's ITQ Fisheries for Groundfish Trawl and Sablefish: Similar Results from Programs with Differing Objectives, Designs, and Processes. *In: Shotton, R. (Ed.) Use of property rights in fisheries management, Proceedings of the FishRights99 Conference, Freemantle, Australia, 11-19 November 1999, Workshop presentations. FAO Fish. Tech. Pap. 404/1 pp254-261.*