Development Potential of the Maine Scallop Industry

submitted to:

Department of Marine Resources

submitted by:

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CONTENTS

SUMMARY

1. THE SCALLOP MARKET

The Northeast market for scallops is highly developed, with several well-defined segments paying differentiated prices based on particular product characteristics. The market clearly prefers sea scallops over other scallop species (imports). The market pays a premium for fresh scallops over frozen, with upwards of half the total sea scallop supply sold in fresh form. It pays a premium for dry scallops over wet (soaked). Prices vary directly with size, with differences as much as $2.00/lb between the largest (under 10s) and smallest (over 50s) sizes.

The market is confined essentially to scallop meats (the adductor muscle), though a demand for whole scallops is emerging. These are marketed mainly through restaurants, but are also available from specialty seafood shops.

Sea scallop supplies in the U.S. Northeast market dropped to historically low levels in the mid- and late-1990s. Against a backdrop of strong demand in an expanding economy and rising incomes, ex-vessel scallop prices rose to decade-high levels of $6.50/lb. This changed in 1999. U.S. landings increased sharply, contributing to a softening of prices that started in 1998. The ex-vessel price dropped to the $5.50-6.00/lb range in 1999, and dropped to the $5.00/lb range in late 2000 as landings continued to increase and as markets began to soften in response to a slowdown in the economy.

Prices can be expected to soften further over the next year or two, dropping to the $5.00 range in 2001, and possibly below this in 2002. Expected shifts in both demand and supply account for this. Any slowing of the U.S. economy can be expected to put downward pressure on demand. Supply is expected to increase in response to changes in scallop management in areas under the jurisdiction of the NEFMC. Canadian landings are also expected to increase in the near term, contributing to U.S. supply and to the weakness in prices.

Sea scallop prices are sensitive to changes in supply and demand, and demand itself is sensitive to changes in price. Quantitative estimates of the relationships show that a 1% increase (decrease) in supply would result in a 0.4% decrease (increase) in price, while a 1% increase (decrease) in price would lead to a 2.3% decrease (increase) in quantity demanded.

2. MAINE SCALLOP PRODUCTION AND DISTRIBUTION

Maine scallop landings have been in steady decline over the past decade, dropping from just over 1,500 tons in the early 1990s to about 300 tons in 2000. Unsustainable levels of fishing effort combined with poor recruitment to the fishery are the primary causes of declines in scallop stocks. Maine landings account for just 2.5% of U.S. landings, and less than 2.0% of total sea scallop supply in the Northeast market.

The Maine scallop fishery is based almost exclusively on the sea scallop. It is harvested from wild stocks, with the fishery concentrated in a handful of the State's larger bays. Access to the fishery is by license, but there is no limit on the number of licenses. An accurate count of the number of active vessels is not available, but DMR officials believe it is substantially below the number of licensed vessels. Limited participation is a function of declining stocks.

The scallop season in Maine's coastal waters (within three miles) is from December 1 to April 15. Because it is a valuable species and because there are no constraints on effort, about half the landings are taken in the first few days of December. This fishery accounts for about 25% of total supply in the Northeast market during December.

The Maine scallop fishery occurs during a time of seasonal supply scarcity and relatively high market prices. This is good for harvesters. The high concentration of landings in early December is reported to exert some downward pressure on prices, but the effect is small and lasts no more than a few days.

Of arguably greater negative impact on ex-vessel prices than the concentration of the catch is the small average size of the scallops. Average size is reported to have declined over the past decade as fishing effort has increased.

3. OPTIONS AND RECOMMENDATIONS

Maine scallop producers have several options for enhancing their revenues. The options fall into two broad categories – production and marketing. The challenges of implementing each option vary considerably, as do the size of the pay-off and the likelihood of success.

The options related to production are in some ways the more challenging. Yet, they are of the highest priority because they deal with the very basis of the fishery and production generally, and also because they are fundamental to the success of any of the marketing options. The main options and recommendations are set out below in order of priority.

PRODUCTION

Management measures in the scallop fishery

The Maine inshore scallop fishery represents a classic open access problem. Fisheries with no controls on access result inevitably in wasteful investment in capital, low returns to labor, and unsustainable pressure on stocks. DMR lacks the regulatory tools to address the root of problem. The existing legislation limits what can be done. All the incentives in the fishery drive participants to poverty and the resource to depletion. But the measures needed to blunt these incentives (input controls), or change them altogether (output controls), seem to be unacceptable to most participants. Thus, harvesters find themselves in the paradoxical position of wanting the symptoms of the problem solved, but not wishing to compromise the very freedoms that lie at its root.

Recommendation 1: Measures should be introduced to limit fishing effort and rebuild scallop stocks in Maine waters. The measures should be developed through consultations with the fishing industry and coastal communities.

Stock enhancement initiatives

The objective is to augment natural processes to increase production. Experience indicates that enhancement initiatives can be successful, though considerable scientific work is necessary to identify spat collection techniques and locations, and to identify optimal grow-out sites. Stock enhancement requires a management framework providing producers with some form of access rights to seeded areas. Without such a framework, it is unlikely that prospective producers would risk the time and money needed to conduct enhancement projects.

Recommendation 2: A supportive policy environment should be developed to nurture scallop enhancement projects. This policy environment should address scientific and investment risks associated with enhancement projects. Policies should be developed through extensive consultation with coastal communities.

Scallop aquaculture

Aquaculture technology and methods have been successfully adapted to the sea scallop in northwest Atlantic waters. Several aquaculturalists in Canada and some in the U.S. are producing on a commercial basis. But there is considerable resistance to aquaculture in Maine. Opposition is based on concerns over loss of access to public waters (eg, lobster fishermen), and also to aesthetic concerns (cottage owners). These concerns tend to be unfounded, but nonetheless persist. Experience shows that without public support, aquaculture as a development opportunity stands little or no chance of success.

Recommendation 3: The Maine DMR should consider implementing a scallop aquaculture development program. It would consist of several phased initiatives including public consultation, public awareness, aquaculture promotion at the community level and small-scale demonstration projects.

MARKETING

Niche markets for specialty scallop products

A niche market for whole scallops exists in the U.S. Northeast. Producers in Massachusetts, Nova Scotia and Newfoundland currently supply this market. It represents a possible opportunity for prospective aquaculture producers because the demand can be met with 2-year old scallops (rather than a minimum of 3-4 years old if sold for the meat only). But the need for PSP testing and short shelf life of the product can present significant obstacles. Because of these factors and because the market is small and growing slowly, prospective suppliers should study it carefully before committing resources to any projects.

Recommendation 4: Prospective aquaculturalists interested in supplying the whole scallop market should assess competitive conditions (demand and competing sources of supply) and regulatory requirements (related to selling whole scallops) before investing.

Labeling or branding "Maine Scallops"

Experience shows that labeling or branding products to increase market recognition (and unit value) can work, but it requires development of quality standards that set the product apart from substitutes. If the object is to extract a price premium from the market, then it is necessary to develop a reliable marketing chain that promotes the label and adheres to these standards. Establishing a label requires considerable time, effort and resources. A successful labeling campaign would be based on consistent, year-round supply of product. In the case of Maine scallops, it may not be possible to overcome the hurdle presented by the short season. Also, since a successful campaign would require involvement of all segments of the distribution chain, it is not clear whether any market price differential would trickle down to producers in the form of higher ex-vessel prices.

Recommendation 5: A careful analysis of the practicability, costs, benefits and net returns to producers should be conducted before any attempt is made to develop a "Maine Scallop" label.

Direct marketing

Some harvesters market directly on a small-scale basis to local restaurants and retailers. Most sell to buyers at the wharf because it is the most straightforward (least troublesome) means of disposing of the catch. Successful direct marketing to restaurants and retailers in large urban centers could work under certain circumstances, but is likely to be more trouble than it is worth for both harvesters and customers. The current distribution system works well because it is flexible and spreads risk across many buyers and sellers. Direct marketing would concentrate all the buyer/distributor functions as well as the risks in the harvester's hands. From the final seller's standpoint, there is little to be gained from direct marketing, but much to be lost. The ability to one-stop shop for a full range of seafood products is not available, and nor is the flexibility to easily adjust quantities purchased. And given the short Maine season, final sellers would in any event have to rely on distributors for product at times when supplies from Maine were not available.

Recommendation 6: Producers should not be encouraged to look for direct marketing opportunities, except possibly in areas where buyer competition is not strong. In any event, producers should be made aware of the difficulties and risks of attempting to market directly.

I.

INTRODUCTION

1. CONTEXT

The Maine scallop harvest declined steadily during the 1990s, falling to about 350 tons in 1999, less than half the 1990 catch. This steady decline is a matter of considerable concern to those involved in the scallop industry, and also to State officials responsible for scallop science and fishery management. The loss of production represents a loss of economic opportunity measured in millions of dollars of foregone personal and business income for harvesters, processors and distributors, and also to suppliers of goods and services to the industry.

The growing concern about the declining harvest is generating interest among industry participants in taking action to address the underlying issues leading to this trend. There is also growing interest in examining options to increase scallop supply through stock enhancement and aquaculture.

Various organizations along the Maine coast are working to assess the issues and explore options. Among these are the Cobscook Bay Resource Center, sponsor of the Cobscook Fisheries Forum (an annual discussion among stakeholders concerned with sustainable use of the Bay's resources), and the Stonington Fisheries Alliance, a community-based organization dedicated to improving the scallop fishery through better management. These organizations are receiving support from the Maine Department of Marine Resources (DMR), and also from the Beals Island Regional Shellfish Hatchery, and the University of Maine Sea Grant/Cooperative Extension Program.

On the scallop research agenda are several matters:

- Biology and population dynamics
- Fisheries management and gear issues
- Stock enhancement and aquaculture
- Markets and marketing

This study is directed towards scallop markets and the development potential of the Maine scallop industry. Key questions concern the potential demand for Maine scallops, scallop substitutes, what steps need to be taken to increase supply and the impact of increased supply on prices, the impact of changes in seasonal landings on prices, and the market potential of niche products such as whole scallops.

2. ISSUES AND OBJECTIVES

Taking steps to increase scallop production raises several issues related to market conditions and marketing. Producers and prospective producers who must finance substantial investments in harvesting or enhancement equipment and operations want to know whether the steps they are taking to increase supply are worth taking from a financial perspective. This is also a question of some importance to lenders.

This question divides into two parts: whether the steps will actually result in increased production, and if so, what impact this increase will have on markets and prices. This study is directed towards the second question.

The possible impact of management and enhancement on scallop production is a complex matter which has received (and continues to receive) substantial treatment in the scientific and management literature. And though the scientific aspects lie outside the scope of this report, examples of management and enhancement initiatives elsewhere are addressed, with a brief discussion of results.

The main objective of this report, then, is to:

- Provide producers, entrepreneurs, scientists and those interested in community development, with a basis for making informed decisions about investments to enhance sea scallop supply.

By investments, we do not simply mean actual cash outlay for materials and equipment in the expectation of future profits. Investment can take many forms including time spent developing and protecting habitat for scallop enhancement, foregoing current landings of wild stocks in favor of future stock abundance, and improving future landings of large scallops by setting increased size limits.

The specific issues addressed in this report in order to meet the study objective include:

- Identifying scallop production trends that would influence the value of Maine scallops
- Analyzing and projecting scallop supply and demand and the effects on price
- Identifying optimal markets and distribution channels for Maine scallops
- Recommending strategies for Maine scallop producers.

3. METHODOLOGY AND REPORT OUTLINE

The analysis and conclusions in this report rely on primary and secondary data drawn from a variety of sources:

- Statistics compiled by the Maine DMR, the U.S. National Marine Fisheries Service, and other national and international fisheries agencies;
- Interviews with scallop producers, processors, distributors, scientists and fishery managers in Maine, Massachusetts and Canada.
- Documents and reports published by the Maine DMR, the U.S. National Marine Fisheries Service, and the Canada Department of Fisheries and Oceans, as well as various trade publications.

The Report is divided into five sections. Following this Introduction, Section II provides a description of scallop supply and market characteristics in the U.S. Northeast, the dominant market for sea scallops. Section III contains an overview of the Maine scallop industry, with a review of production patterns, management, and markets and distribution system. Potential opportunities for industry growth in Maine are outlined in Section IV, with an assessment of various measures to enhance revenues and case studies of experience elsewhere. The Report closes in Section V with conclusions and recommendations.

II.

SCALLOP SUPPLY AND MARKET CHARACTERISTICS

1. THE COMPETITION

Sea Scallops and Substitutes

Maine's scallop fishery is based on the sea scallop (Placopecten magellanicus). This species occurs naturally only in the waters of the northwest Atlantic, as far north as Labrador, and as far south as Virginia. Within this range, scallops are concentrated in geographically discrete beds, many of which support commercial fisheries.

The sea scallop is one of several scallop species produced in commercial quantities in the world. The main species are the yesso (similar to the bay scallop at smaller sizes), produced mainly through aquaculture in China and Japan, and the sea scallop, produced almost exclusively through the capture fishery. Table 1 shows the main commercial species in order of importance (by weight), and producing countries. What is noteworthy is the substantial share of production accounted for by aquaculture, particularly the yesso in China.

Table 1
Scallop Species by Production Level and Origin, 1998
(tonnes live weight)

Species	Capture	Aquaculture	Total
Yesso (China, Japan)	294,200	856,217	1,150,417
Sea (Canada, USA)	98,487	n.a.	98,487
Calico (Peru, Argentina)	26,276	17,498	43,774
Great Atlantic (France, U.K.)	35,588	363	35,951
Icelandic (Iceland)	10,103	n.a.	10,103
Queen (U.K., Faeroe Is.)	14,560	147	14,707
Weathervane (USA)	3,228	n.a.	3,228
Other/not specified	33,187	n.a.	33,187
Total	515,680	874,225	1,389,905

Source: FAO Yearbook, Fishery Statistics, Capture Production, Table B-55, Vol. 86/1, 1998
FAO Yearbook, Fishery Statistics, Aquaculture Production, Table B-55, Vol. 86/2, 1998

Market Segments

The U.S. market is the focus of this study because it is an important market for scallops generally, and because it is the largest and most valuable market for sea scallops in particular. From a scallop perspective, the U.S. market may be sub-divided geographically into two parts: the Northeast and all the rest. The Northeast region is the dominant seafood market, particularly for fresh product.

From a product (or species) standpoint, the Northeast market may be divided into two segments: sea scallop and all other species. Due to declining stocks, the market share of sea scallops declined through much of the 1990s, dropping from about 80% to just over 40% in 1998. With increased domestic landings in 1999 (and declining imports), this trend reversed sharply, with sea scallops rising to a 60% market share.

Maine producers compete in the sea scallop segment. This is the high end of the market, with scallops reaching consumers through better restaurants, seafood retailers and niche stores specializing in high quality fresh and organic produce.

The other scallops species listed in Table 1 provide competition, but as weak or imperfect substitutes. The one exception is the farmed yesso scallop from Japan, which (by virtue of size) can be a close substitute when fresh. The smaller scallops enter the market mainly in frozen form and are sold through supermarkets, mid-range restaurants and the food service sector.

2. PRODUCT CHARACTERISTICS

Product characteristics such as size, form (ie, fresh, frozen), and condition (dry or wet), determine market position and value. Almost all product is sold as scallop meat (the adductor muscle), though there is a growing market for whole scallops (as the name implies, these are sold live much like oysters and served raw or steamed on the half-shell).

Size

Size is a primary determinant of value. By size, scallops may be divided into two broad categories, large and small. Three species fall into the large category (common shell height: ± 10-15 cm): sea, yesso and weathervane. The others fall into the small category (common shell height: ± 5-8 cm). Sea and yesso scallops can be close substitutes by virtue of size, and this is reflected in fairly close relative prices for fresh product. Both species come in a range of sizes (meats per pound), with price varying directly with size. Weathervane scallops (native to Alaska), once abundant, are now available in only very limited quantities due to harvesting restrictions.

Fresh and Frozen

Fresh scallops tend to be more highly valued than frozen. Statistics on the size of the fresh market are not kept. The proportion of production entering the market in fresh form varies from day to day depending on demand and supply, with the relative prices of fresh and frozen product the signal to processors to adjust product form. Estimates from processors and wholesalers contacted as part of this study indicate the proportion sold fresh ranges from 40-60%, with some seasonal variation outside this range. But they also caution that estimates tend to be unreliable because scallops sold wholesale as frozen are often thawed by retailers and sold as fresh.

Some indication of the minimum size of the market for fresh scallops may be determined from Canadian scallop imports. Since 1993, Canadian scallop processors have shipped 65-75% of their product in fresh form. The amount peaked in 1994 at just over 14 million pounds, then dropped to the 10 million-pound range annually until 1997. If at least half the U.S. production entered the market in fresh form in these years (as suggested by processors and distributors), then at a minimum, total demand for fresh scallops would be in the 16 million-pound range. Imports of fresh Canadian scallops dropped to the 7 million-pound range in 1999, suggesting that the increase in U.S. landings crowded out some of the imported product.

Dry vs. Wet

The highest quality scallops are dry, ie, shucked and washed, but not otherwise processed or treated in any way. They command prices as much as $2.00/lb higher than the equivalent wet sizes (See Table 3, below). Scallops referred to as "wet" are shucked, washed and treated with STP – sodium tripolyphosphate – ostensibly to increase shelf life. But STP also allows the scallop to retain moisture when soaked in fresh water, so it serves a second purpose – to increase weight and add value.

The market discounts the value of wet scallops, so it is not clear who is benefiting from the practice (though it seems clear that consumers are the real losers). Treating and soaking sea scallops is sufficiently common that separate prices for dry and wet are quoted on major wholesale markets (See Table 3). Those interviewed for this study suggest that the practice of soaking is more common with imported product. Imported frozen scallops are thawed, soaked in a solution of STP and water, and then re-frozen for sale.

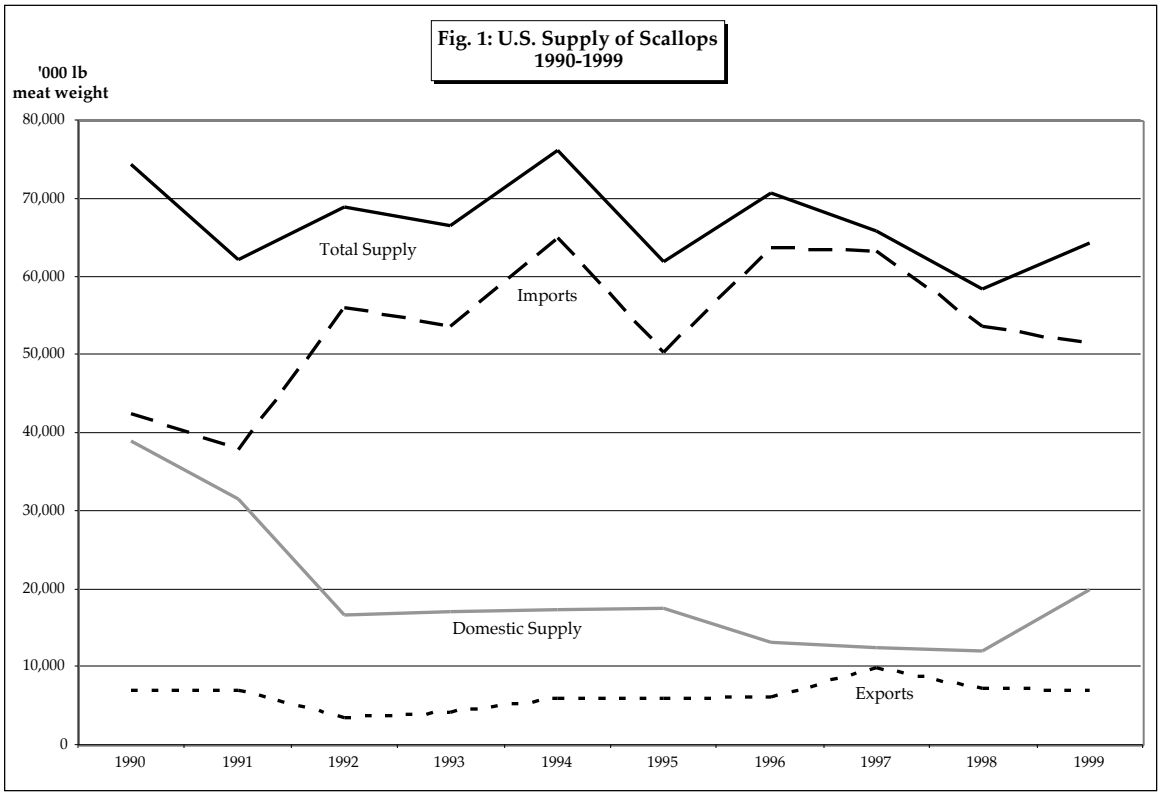
Chemically treating and soaking scallops are permitted under law, provided the product is clearly labeled and moisture content does not exceed 84%. Usual moisture content is in the 74-79% range. The problem is that the law is poorly enforced, so contravention is believed to be widespread. Scrupulous restaurants and stores with reputations to protect are prepared to pay a premium for dry scallops. These retailers are aware of the practices, and deal only with reliable processors and distributors.

3. HISTORIC SUPPLY LEVELS

Domestic Supplies and Imports

The U.S. typically consumes 60-70 million pounds of scallops annually, with consumption reaching 75 million pounds in some years. During the 1980s and into the early 1990s, domestic landings typically accounted for over 50% of supply.

With declining stocks and area closures in the mid-1990s, domestic landings dropped to less than half their historic levels by the late 1990s (Fig. 1). Imports (including Canadian sea scallops) rose to make up much of the difference, and in the late 1990s accounted for 90% of total U.S. supply. This changed in 1999. Domestic scallop landings increased sharply with the opening of Closed Area II on Georges Bank. Also, imports declined due mainly to a reduction in Chinese production. The relative share of imports dropped to just over 65% of total supply.



Source: Fishery Statistics of the United States, U.S. Department of Commerce.

In understanding the market and competitive conditions for Maine scallops, it is important to focus on the U.S. Northeast. This market dominates as the primary source of demand for scallops. Consequently, it is to this region that the bulk of U.S. supply is destined (typically in the 70% range). As such, it is this region that plays the dominant role in setting scallop prices. This is particularly the case for sea scallops, but also for imported scallops.

Several things are noteworthy about supply trends in the Northeast market over the past 20 years. *Of key importance is the role of imports in maintaining a balance between demand and domestic supply.* In other words, imports increase and decrease in response to the availability of sea scallops, thus balancing demand and supply in the 60-70 million pound range (Fig 1).

1980s

- **Total supply** rose, particularly in the U.S. Northeast. Rising domestic landings (mainly sea scallops) accounted for much of the increase. By 1990, total US supply was in the 75 million-pound range (meat weight).

- **Imports from Canada** rose, as Canadian landings increased. As a supplier to the U.S. Northeast market, Canada may be viewed more as an extension of domestic U.S. supply than an importer. Within limits, landings and supply trend tend to parallel the U.S. experience. This is because Canada is close to and highly dependent on the U.S. market, and also because it harvests the same species (sea scallop) from adjacent fishing grounds (Georges Bank and the southern Scotian Shelf).

- **Imports** from other countries fell off as domestic landings and imports from Canada rose. This reflects the imperfect substitutability of the imported product. The U.S. Northeast market, though large, is limited and expresses a clear preference for sea scallops over other species (with the possible exception of larger sizes of the yesso scallop from Japan).

1990s

- **Domestic landings** declined sharply in the early 1990s. Scallop stocks had declined after years of excessive harvesting pressure, and also, some of the most productive scallop areas were closed to allow groundfish stocks to recover. Landings stabilized during the late 1990s at early 1980s levels. This changed in 1999, when Closed Area II was opened to scalloping. Domestic production almost doubled, increasing from 12 to just over 20 million pounds.

- **Canadian imports** increased moderately during the early 1990s, as conservative management measures taken in the mid-1980s began to show results in terms of stock abundance, quotas and landings. Poor year classes led to lower landings in the late 1990s, resulting in reduced scallop imports into the U.S. With the management approach taken in Canada (a combination of conservative allowable catches, meat size restrictions and individual quotas), catches and hence import levels to the U.S., can be expected to be resource-driven. This means imports from Canada are unlikely to change substantially from year to year. This said, in the event of a particularly strong or weak year class, supply could change abruptly.

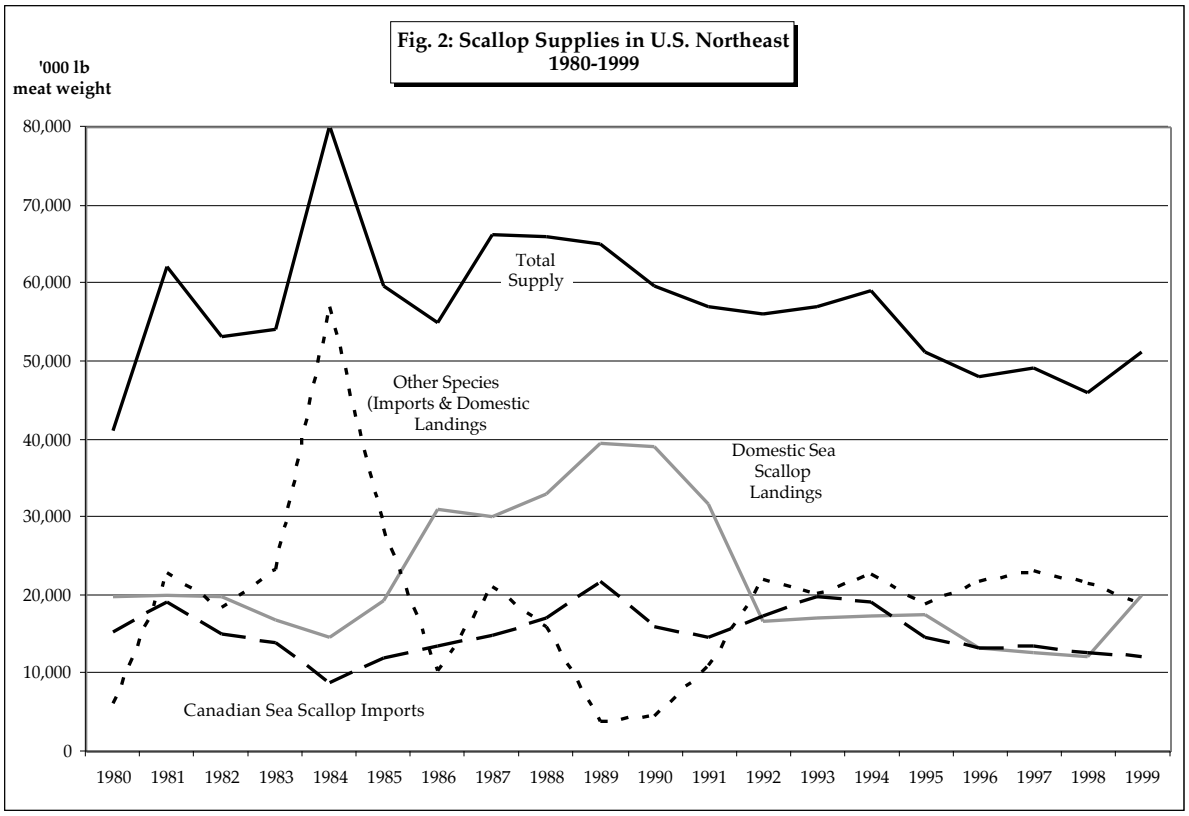
- **Imports from countries** other than Canada increased sharply in the early 1990s as domestic landings declined. But the increase was not enough to offset the decline in landings and the decline in Canadian imports. China, Argentina and Japan are the major exporters, taking over from Iceland, the major exporter in the 1980s. Scallop imports by country, 1990-1999, are given in Table 2. It is worth noting the substantial extent to which aquaculture contributes to global supply, and also how much production can grow and fluctuate over time.

Table 2
U.S. Scallop Imports by Country ('000s lbs, meat weight)

	1990	1993	1996	1999
Argentina	187	49	3,927	6,841
Canada	16,052	15,479	13,146	12,183
China	10,247	16,031	29,680	10,976
Iceland	1,023	2,606	397	1,047
Japan	3,885	5,863	3,564	5,755
Mexico	7,533	258	4,088	553
Philippines	0	4	348	1,859
Russia	0	1,771	1,385	2,373
Other	751	9,971	2,322	2,986
Total	40,025	52,073	58,858	44,609

Source: NMFS: HTTP://www.st.nmfs.gov

- **Scallop supplies** in the Northeast market steadily decreased between 1989 and 1998. Imports of other species did not fully offset the decline in availability of sea scallops and domestic landings of other species (U.S. bay and calico scallop landings peaked at about 43 million pounds in 1984 and declined sharply thereafter). This is because imports are not perfect substitutes (due to size, quality and product form differences). Indeed, the time series data in Fig. 2 could suggest there is a ceiling on the capacity of the Northeast market to absorb scallop species *other* than sea scallops (Fig. 2 indicates a ceiling of 20-22 million pounds at prevailing prices).



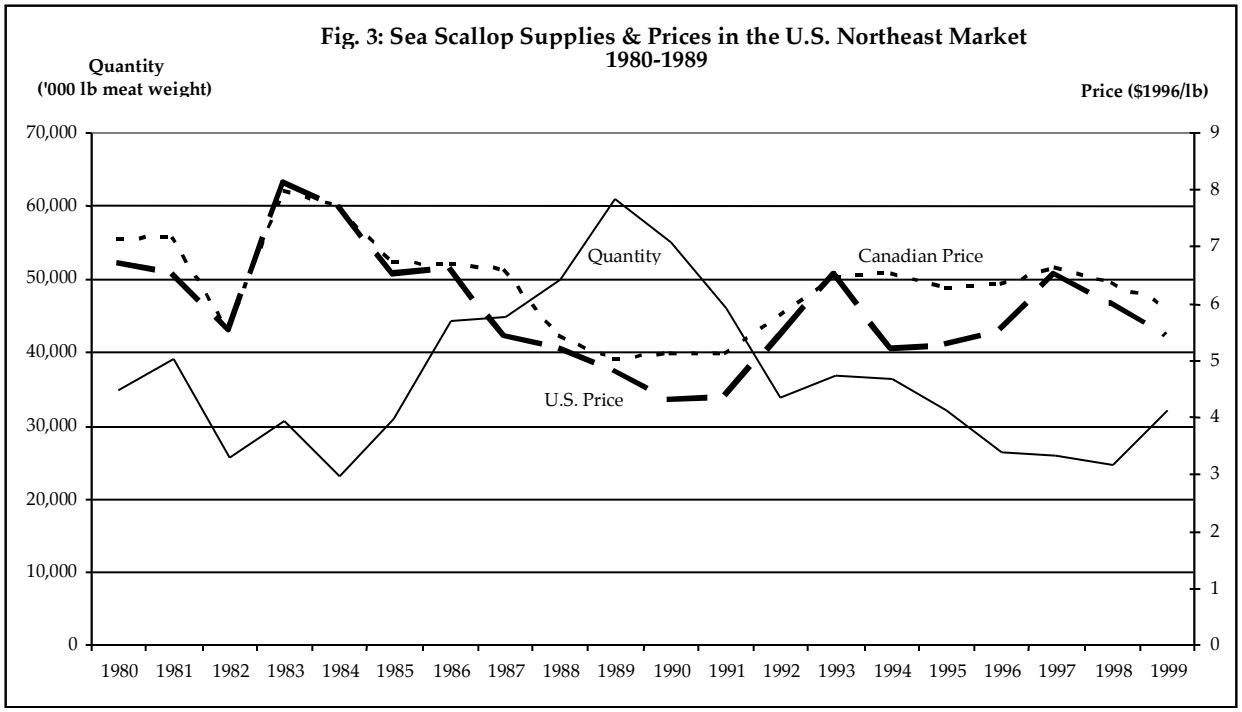
Source: NMFS.

- **Market share** between sea scallops and other species had shifted in favour of other species during the 1990s as domestic and Canadian sea scallop landings declined. Market share dropped from about 95% in 1990 to just over 50% in 1998. This trend reversed sharply in 1999 with the re-opening of Closed Area II. A combination of reduced imports and increased landings saw sea scallops rise to a 60% market share.

4. PRICES

Sea Scallop Prices

Prices vary inversely with supply, that is, other things equal, lower prices can be expected as supply increases. This is most clearly illustrated by the supply and price data in Fig. 3. It shows ex-vessel prices for domestic supply (and Canadian import prices) declining with rising supply during the late 1980s, and rising as supplies dropped in the early 1990s. Of course, demand also plays a role in price determination. This is most evident during the recession beginning in the late 1980s. Prices declined even as supplies dropped.



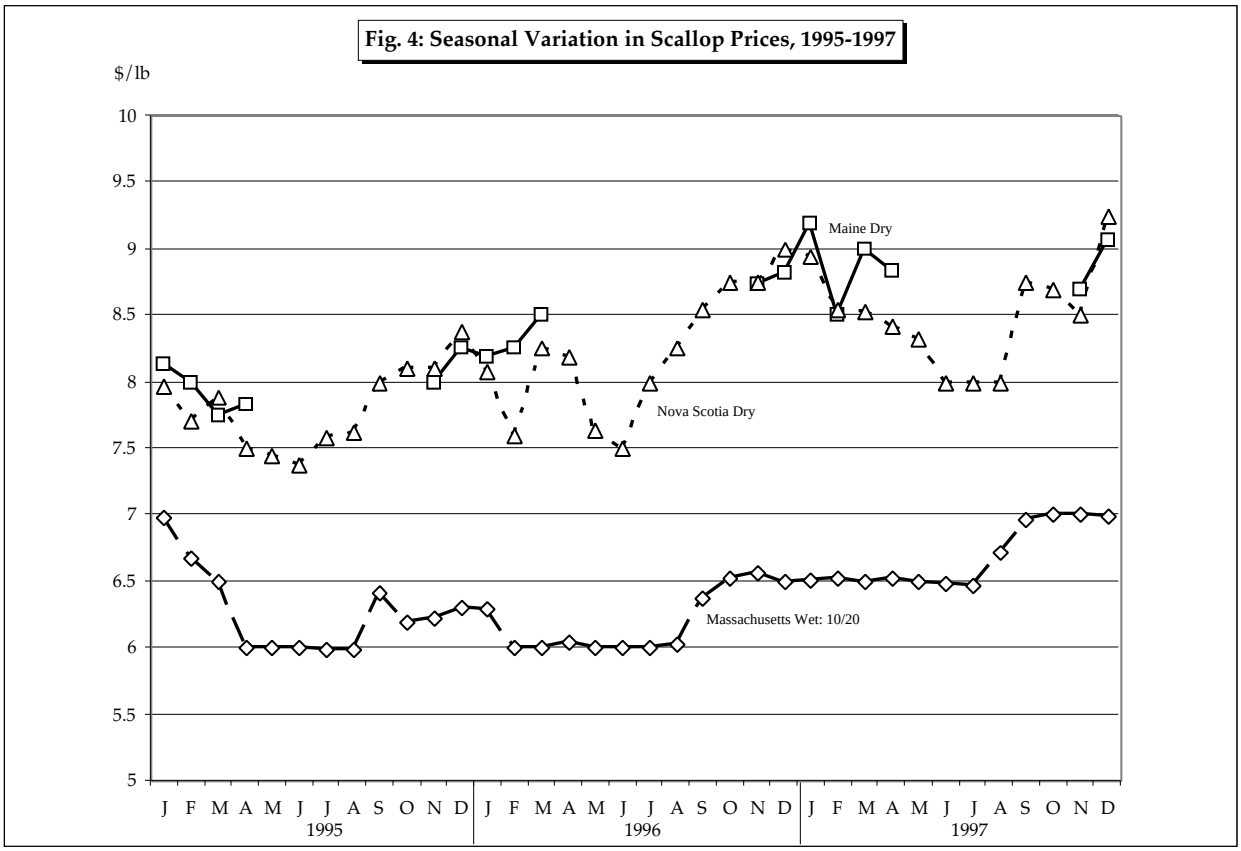
Source: 2000 Scallop Fishery Management Plan, SAFE Report.

Prices also vary seasonally, by scallop size, and also depending on whether they are dry or wet. The highest prices occur during winter, when supplies are relatively low, dropping during the summer months as supplies increase from offshore grounds (see Fig. 6). Larger, dry scallops command the highest prices regardless of time of year. An example (for 1999) of how prices can vary by size and form is set out in Table 3. Seasonal variation is also shown in Fig. 4 using wholesale prices (Fulton Market) for dry and wet scallops covering the 1995-1997 period.

Table 3
Monthly Wholesale Scallop Prices by Size and Product Form 1999

Month	Massachusetts				Maine				Japan
	10-20		20-30		10-20		20-30		10-20
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
January		6.28		5.80	9.25		9.25	5.00	
February	9.17	6.21	8.17	5.67	9.25		8.50		
March	9.50	6.25	8.50	5.70	9.25				
April		6.25		5.62		5.25		5.00	8.00
May		6.25	7.00	5.70		5.25		4.75	8.00
June	8.50	6.26		5.50		5.25		4.75	8.00
July		6.19	6.50	5.54		5.25		4.75	
August	7.50	6.15	7.25	5.58		5.50		4.63	
September	8.19	6.03	7.71	5.58		5.50			7.75
October	8.00	6.25	7.63	5.68					7.75
November	8.23	6.23	7.75	5.70					7.75
December	8.75	6.20	8.23	5.87	8.50	5.50	8.13	5.43	7.73

Source: New York Fulton Fish Market, NMFS, 1999.



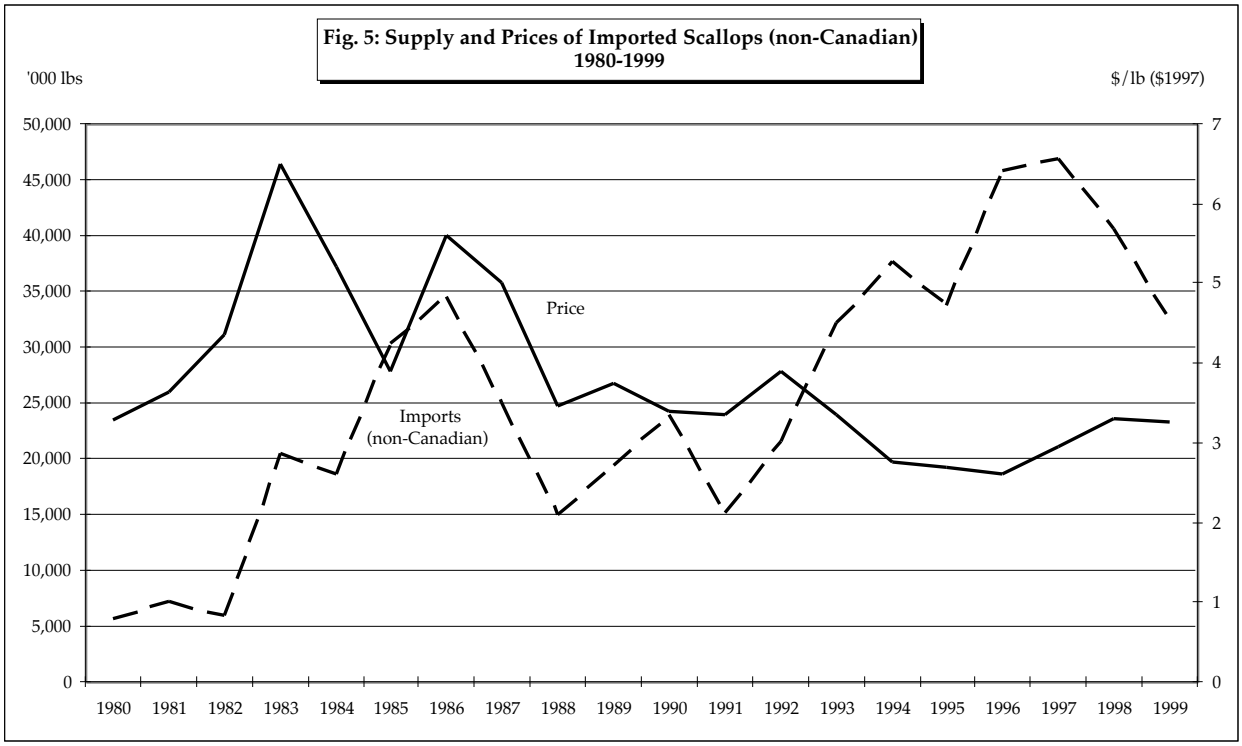
Source: New York Fulton Fish Market, NMFS, 1999.

Imported Scallop Prices

Prices in the Northeast reflect international market forces, not just conditions in the Northeast U.S. As frozen product, these scallops take on commodity characteristics, moving opportunistically to the highest valued markets (determined by relative prices and currency movements).

Fig. 5 shows supply into the Northeast dropping in the mid-1980s in response to declining prices as the market responded to the increasing availability of domestic supplies of sea scallops. Shippers responded to weakening prices by finding more attractive markets elsewhere.

Deteriorating domestic supply conditions seem to have had the opposite effect in the early 1990s; rising scallop prices in the U.S. (coupled with recession in the Far East) induced an increase in imports. Despite weakening prices in the U.S. Northeast thereafter, imports remained strong into the mid-1990s, arguably because of low relative prices in Far East markets arising from poor economic conditions. A combination of rising import prices (due to reduced Chinese supply, improved economic conditions in the Far East, and yen appreciation) and steady sea scallop supply after 1996, led to a decline in imports after 1997, a trend that continued through 1999.



Source: 2000 Scallop Fishery Management Plan, SAFE Report.

5. FUTURE SUPPLIES

Sea Scallops

It would appear that sea scallop supplies to the U.S market will be higher in the early 2000s than they were during the latter part of the 1990s. Under certain assumptions, supply (including Canadian imports) could approach 50 million pounds, a level last reached in the late 1980s.

Making an accurate prediction of future levels of sea scallop supply in the U.S. market is problematic because of biological uncertainty with respect to recruitment and stock abundance, and also to uncertainty with respect to how fisheries will be managed. These factors apply to both the U.S. (on the Georges Bank and Mid-Atlantic grounds) and Canada (on Georges Bank).

In the U.S., the major element of uncertainty in the short term (the next 2-3 years) arises from the management approach (see Table 4).

- If the Amendment 7 days at sea (DAS) schedule is implemented in 2001, then landings are expected to be in the 28 million pound range in 2001, dropping to the 25 million pound range by 2003. These levels are comparable to landings for 1999 and 2000. Under this scenario, ex-vessel prices are expected to rise from $6.18/lb in 2001, to $6.70/lb in 2003. This price increase reflects lower landings, as well as a larger average scallop size.

- Other possible management scenarios (with increased DAS) would see landings rise from current levels to 35 million pounds in 2001, and to as high as 45 million pounds in 2003. Under these scenarios, prices are expected to be lower in response to higher landings and slightly smaller average scallop size.

Table 4
Landings and Prices under Alternative Management Scenarios
Atlantic Sea Scallop FMP

	Status Quo		Proposed Management Adjustment	
	Scenario 1 Amendment 7	Scenario 2a Low Fishing Mortality	Scenario 2b High Fishing Mortality	Scenario 2c New Closed Areas
Days at sea	49	120	120	120
Landings (000 lb)				
2001	28,296	38,119	39,373	35,863
2002	27,273	41,215	43,630	37,971
2003	25,379	42,276	44,928	34,291
Meat Count (/lb)				
2001	22.8	24.7	23.8	25.2
2002	18.9	20.9	20.3	21.6
2003	17.9	19.0	18.5	19.6
Ex-vessel prices ($/lb 1997 prices)				
2001	6.18	5.48	5.44	5.56
2002	6.50	5.49	5.49	5.64
2003	6.70	5.54	5.54	5.99

Source: *2000 Scallop Fishery Management Plan SAFE Report*, Tables 188 and 189.

Which of these scenarios most accurately represents future conditions is not clear, since there continues to be considerable uncertainty within the NEFMC about the development of Amendment 10 (area rotation) and the objectives and scope of Framework Adjustment 14 (for 2001). But if the DAS recommended in the 2000 SAFE Report (120 days) is adopted, then regardless of which of Scenarios 2a, 2b or 2c most accurately reflects future conditions, we can expect higher landings, with prices in the $5.50-6.00 range over the next three years.

Canadian sea scallop imports also influence U.S. supply, and hence have a bearing on prices for domestic landings. Canadian landings (and exports to the U.S.) over the past five years were below the average for the previous decade, due largely to poor recruitment in the early 1990s. A strong year class in 1996 should contribute to higher quotas and catches in 2001 and possibly 2002, resulting in increased exports to the U.S. If so, this would cause downward pressure on prices. These anticipated changes in supply are not taken into consideration explicitly in the price model used in the 2000 SAFE Report (the price of Canadian imports is assumed to remain constant). Consequently, prices could turn out to be slightly lower than the prices set out in Table 4, above.

Imports of Other Species

Imports of other species also influence sea scallop prices, though in a more general way than changes in sea scallop supply. But with the wide swings in international scallop supply and the unpredictability of foreign markets, it is difficult to make reliable predictions on any price effects of imports on sea scallop prices.

In the 2000 SAFE Report, the influence of imports on domestic prices is incorporated in the price model. The level of scallop imports and import prices are assumed to be determined outside the U.S., ie, are independent of U.S. supply and market conditions. This does not mean that imports have no impact on domestic prices (they do – an increase in imports would cause some downward pressure on domestic prices), but that domestic prices are less important than market conditions elsewhere in determining the level of imports to the U.S.

III.

THE MAINE SCALLOP INDUSTRY

1. PRODUCTION

Scallop Fishery

The inshore fishery occurs within the 3-mile limit along much of Maine's coast. The many bays along the eastern part of the State provide the richest grounds, with Cobscook Bay the leading production area. Other areas of concentration include Machias Bay and the waters around Gouldsboro and Stonington.

Though some 900 commercial dragger licenses are issued, many are not fished. Participation fluctuates with prices and abundance, and is reported to have declined over the past several years. The exact number of active vessels along the coast is not systematically documented.

Cobscook Bay is one area where the Maine Department of Marine Resources conducts a count of active vessels. Effort has increased over the years, rising from just 25 vessels in 1990 to about 100 vessels in 1999. This jumped to 178 boats in 2000, a record high. Though several factors are at work to determine levels of effort in particular areas, this concentration in Cobscook Bay would suggest steps in addition to the December 1st coast-wide opening are needed to spread effort geographically and seasonally.

The fishery is highly seasonal. By law, it is open from December 1 to April 15th. In fact, the fishery is concentrated in December, with most of the effort in Cobscook Bay where much of the catch is taken. Boats from ports all along the coast are attracted to this fishery. Ordinarily, most of the catch is taken within a few days of the season opening, with catch rates falling off sharply after that. This means that after the first few days, the economics of fishing decline as the cost of effort drops below the revenue likely to be generated. Scallops are hard to find and, when found, tend to be smaller and less valuable.

Production

Landings of Maine scallops have fluctuated widely over the past 30 years. The data in Fig. 6 show that the shifts in landings are linked mainly to changes in stock abundance. Effort and landings are also linked to price, but as long as price is above the threshold where fishing is profitable, then stock abundance will be the main determinant of quantity landed.

- Landings increased from a low of 200,000 pounds in 1970, to a high of about 3.7 million pounds in 1980. While rising prices may have been a contributing factor, improved resource conditions were clearly key to the sharp improvement.

- Landings declined sharply in the early 1980s, bottoming out at about 700,000 pounds in 1986. Low stock abundance accounts for the steep slide, since prices were rising or stable over the period.

- The recovery to the 1.5 million-pound range in the late 1980s is attributable to improved stock conditions, as prices tumbled with the recession.

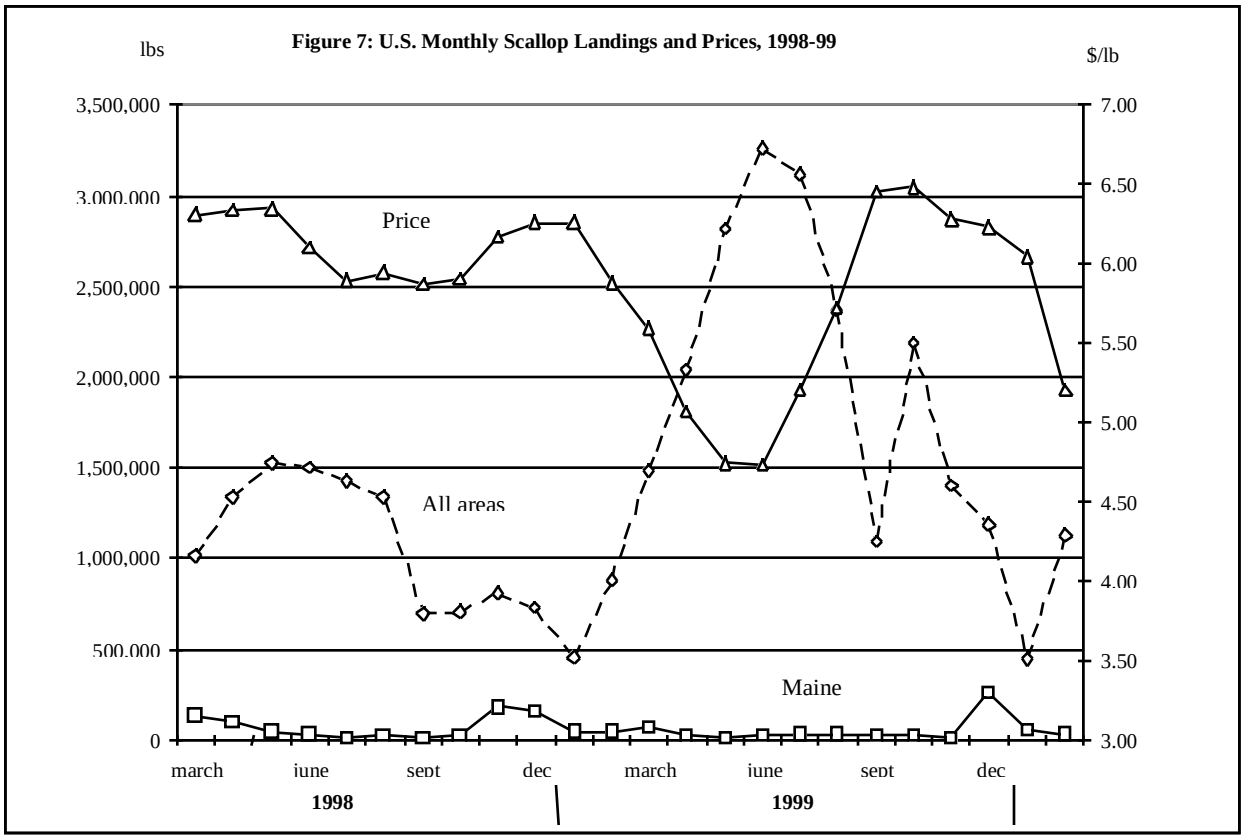
- Landings have declined fairly steadily since the early 1990s, despite rapidly rising prices. Low stock abundance (due to poor recruitment) combined with excessive harvesting pressure account for the steady drop.

Not only do the scallops in Cobscook Bay and elsewhere face heavy fishing pressure, but they tend to do so over short periods. The season is at best only four and a half months long. In 1998, about half the State catch was taken in November and December. The system of uniform December 1 openings introduced in 1999 resulted in a more even spread of effort along the coast, but led to an even greater concentration of effort and landings. About half the catch was taken in December alone. A similar pattern is expected in the December 2000 fishery. Landings by month are shown in Fig. 7.

Source: NMFS, 1999.

What is not obvious from the data in Fig. 7 is that not only have catches been declining, but the size of the scallops caught has also dropped. While size data are not collected systematically by DMR, anecdotal information obtained through interviews supports the point that smaller sizes are more common in the Maine inshore catch. Buyers report they are seeing fewer and fewer under 10 and 10-20 count scallops. The 20-30, 30-40 and even 40-50 count scallops are the predominant sizes.

The implication of smaller sizes is well known to harvesters – lower unit prices, and hence lower revenues per scallop caught. This is known as growth overfishing – harvesting before the scallop has reached its potential yield. An excellent example of what can occur if scallops are left to grow is the 1999 experience on Georges Bank. With the re-opening of the fishery after a five year moratorium, most of the catch was in the under 10 count category, fetching prices in the $7.00-7.50/lb range. This compares with prices in the $6.00/lb range for the December 1999 Cobscook Bay scallops.



Source: NMFS, 1999.

A second implication of smaller sizes is soaking the scallops in order to increase their weight. This practice is not confined to processors, but is also engaged in by some harvesters. There is every incentive to do so. Harvesters know that they can gain revenue, and they also know that if they do not soak the scallop, someone else is likely to do so.

Prices

Ex-vessel prices are closely linked to the seasonal pattern of landings in a manner that is generally favorable to the Maine fishery. Much of Maine's supply reaches the market in December when most other fisheries (eg, Georges Bank) are at a low point. As a consequence, ex-vessel prices tend to be stronger than they would be if the fishery were conducted in spring, summer or fall. Fig. 7 shows average ex-vessel prices (all areas) peaking during the winter months, and weakening during the spring and summer as supplies increase. Even though Maine supplies are at their seasonal highs, supplies generally are at seasonal lows.

But even though Maine production is at its annual peak in December, it accounts for no more than about 25% of total supply. This is enough to exert some influence on price, but not enough to *determine* price. Price is determined by overall supply in relation to

demand. Buyers, processors and distributors contacted as part of this study acknowledge there is a price effect when the Maine season opens, but contend that effect is small to negligible, and lasts no more than the few days landings are at their peak.

They also point out that if price does come under pressure, processors shift supply out of fresh and into frozen product in an effort to maintain prices. Processors report that a higher than usual proportion of the Maine catch went into frozen product in December 2000 because supplies from other areas (mainly Massachusetts) were higher than in the past few years. As a consequence, ex-vessel opening day prices in Cobscook Bay are reported to be weaker this year than last by at least $1.00/lb (ie, at or below $5.00/lb). Fig. 7 shows that a similar price drop occurred in early 2000 because overall landings exceeded demand.

Though Maine is a major supplier in December, it has no influence on the market and on prices during the rest of the year. For example, in 1999, the Maine fishery accounted for about 2.5% of U.S. scallop landings, and less than 2.0% of total supply in the Northeast market. These percentages are typical for Maine.

Management

Management of the scallop fishery is limited to two measures: seasonal closure and gear restriction. The scallop season in State waters is from December 1 to April 15. This season minimizes gear conflict, particularly with lobster fishery. It is also timed to coincide with the low point in the offshore scallop fishery, thereby providing good market conditions.

Gear restrictions cover ring size and dredge width. The ring size was increased in November 1999 to 3 1/4 inches, and will increase again in November 2001 to 3 1/2 inches. The move to larger rings contributes to both conservation and revenue objectives. By allowing smaller scallops to escape, stocks are protected from overfishing. By targeting larger scallops, higher unit prices are realized.

Access to the scallop resource is by license, though entry is unlimited. Two classes of commercial license are issued, for boats (draggers) and for hand fishing (diving). Dragging is the principal fishing method, with 889 licenses issued in 2000. Diving licenses numbered 390 in 2000. Licenses are available for the nominal sum of $89. In addition, 759 non-commercial scallop licenses were issued in 2000.

2. MARKET AND DISTRIBUTION

The Market for Maine Sea Scallops

The market for Maine scallops is national, though most of the product is consumed within the Northeast region. Boats are at sea for no more than 12 hours, so Maine scallops have a reputation for freshness. This allows them to be sold into the high end of the market.

Of course, not all scallops are actually sold in fresh form. The market is unable to absorb 200-300,000 pounds of fresh scallops within the space of several days in December, particularly when fresh supplies are available from other areas. Consequently, some of the Maine production is frozen. Estimates of fresh and frozen sales vary, but most indicate that 50-70% of production is sold fresh. The proportions vary from year to year, depending on overall supplies of fresh product in the market.

The processors and distributors contacted for this study indicate that the principal outlets for fresh Maine scallops are restaurants, followed by hotels and specialized retail stores. They indicate that the market preference is clearly for fresh *dry* scallops. The most popular sizes for restaurants are the 20-30s and 30-40s.

The Distribution System

Two characteristics about the Maine scallop distribution system stand out – it is well established with clearly defined roles and relationships, and it is efficient. The system has five main points of exchange:

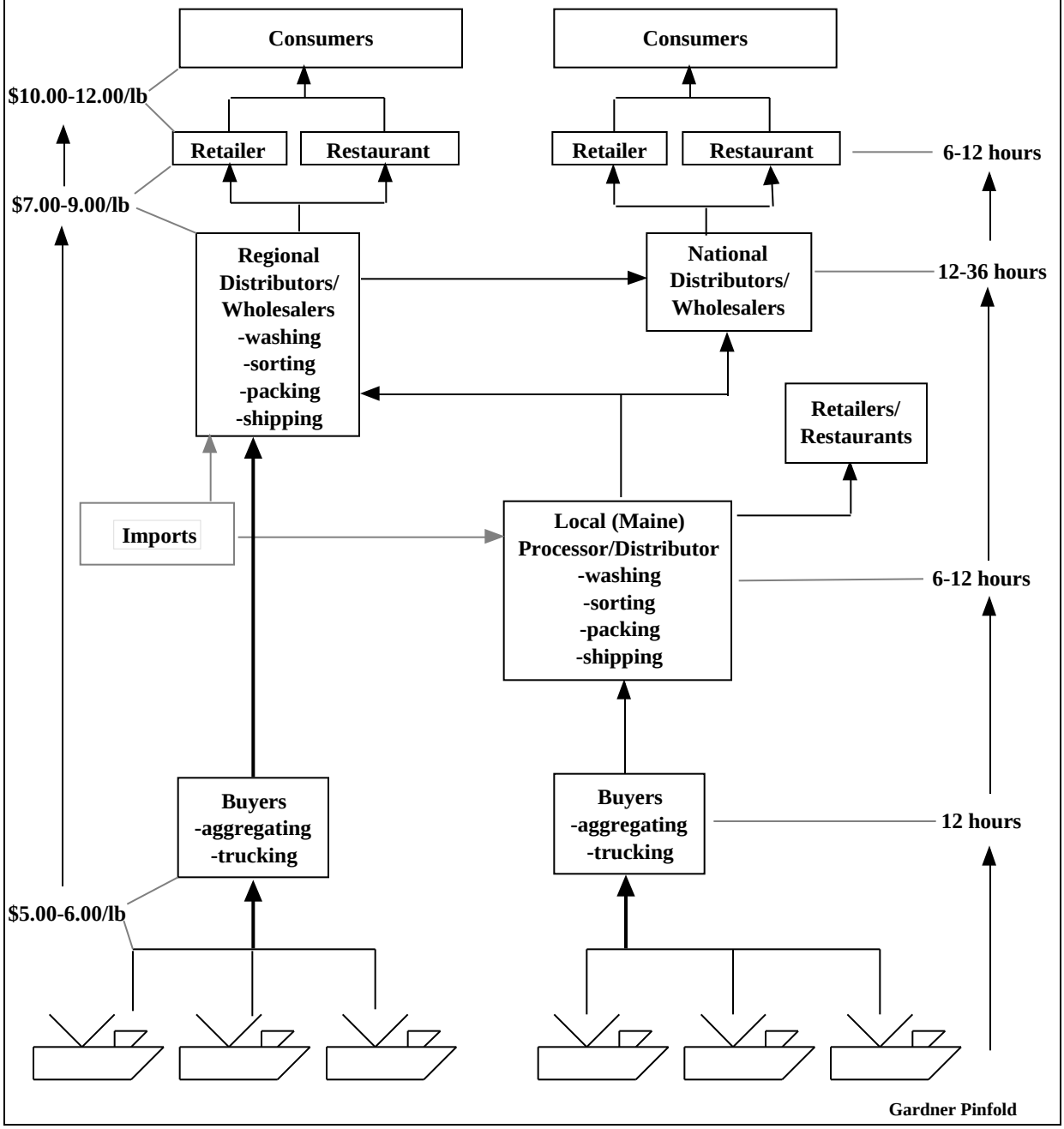
- boat to buyer;
- buyer to processor or buyer to distributor/wholesaler (the distinction between processors and distributors is blurred in the case of scallops with each engaged in both functions);
- processor to distributor/ wholesaler or processor direct to restaurant/retailer;
- distributor/wholesaler to restaurant/retailer; and
- restaurant/retailer to consumer.

These are identified in Fig. 8, together with typical times for the movement of scallops between points.

Fresh Maine scallops reach restaurants and retail outlets in national markets within 72 hours of harvest. Within the Northeast market, delivery is ordinarily within 36 to 48 hours. The steps in the distribution chain are:

- **Boats** are at sea for up to 12 hours. Upon landing, the shucked catch is sold to local buyers (also known as first receivers) who aggregate landings from 10-20 vessels. Scallops are stored on ice in 30-40 pound bags. Relationships between fishermen and buyers tend to be stable, provided the buyer is paying the going price. Payment is by cash or cheque, with a $0.25-0.50/lb surcharge if paying by cheque. Buyers pay an average price for the catch based on an estimate of the size mix. Scallops are not sorted at this stage. There are also private sales to individuals (particularly of under 10s), but this is not seen as a growth opportunity in part due to the limited number of under 10s in the catch, but also because of the need to maintain buyer relationships.

FIGURE 8: THE MAINE FRESH SCALLOP DISTRIBUTION CHAIN



- **Buyers** provide an aggregation and transportation function. They collect the scallops from the landing points at the end of the day. Some sell them to local processors, and some to regional distributors/wholesalers. Collecting and trucking take 6-12 hours, depending on distance from landing site. Buyers may be fishermen or their wives, local clam or lobster buyers, or small business people. They are independent, some with well-established relationships with particular processors and distributors (for which the latter are prepared to pay a small premium) to whom they sell all their supply. Others are more opportunistic, selling to the highest bidder. Depending on the buyer and the circumstances, this could range from direct selling to high-end restaurants to simply shopping product into the commodity trade. This group has to be nimble and prepared to change strategies at short notice as markets shift. Consequently, buyer margins vary widely, depending on their particular selling strategy. At a minimum, they would ordinarily earn $0.50-1.00/lb over the ex-vessel price.

- **Maine Processors** take delivery of the scallops at their plants. They wash and sort all scallops by size, with standing orders packed to customer specifications for shipment. Processing is ordinarily completed within a few hours of delivery to the plant, with fresh scallops generally shipped the same day. Delivery may take from 6 to 24 hours, depending on distance from the plant and mode of transport (truck or air). Processors sell to regional and national distributors and wholesalers, but many processors are also wholesalers in their own right, selling directly to local restaurants and retailers. Any scallops not committed to specific customers are held for a day or two then frozen if they cannot be sold fresh. Selling price is based on supply and demand.

- **Regional Distributors and wholesalers** (principally in Massachusetts) purchase directly from buyers along the Maine coast, and also from processors in Maine. The distribution and wholesale function involves filling orders for a range of seafood items, one of which may be scallops. The wholesaler is the one-stop shop that facilitates the buying task of restaurants, hotels and fish retailers. Orders at the distribution/wholesale stage are ordinarily filled within 6 to 12 hours. Wholesale selling prices on various markets are quoted, though actual trades may vary around these prices.

- **Restaurants, Hotels and Retailers** are the points of sale to consumers. They order from wholesalers on a daily or every other day basis as demand warrants. Once fresh scallops reach this stage they have a one to two day shelf life before they must be used or frozen.

Competition at each point of trade appears to be strong, as indicated by the number of buyers and sellers. Within Maine alone, over 200 vessels participate in the fishery, and over 100 companies advertise themselves as intermediaries (buyers and sellers) in the fresh scallop trade. Another 80-100 companies buy and sell fresh scallops in Massachusetts.

By the time the fresh dry scallops reach consumers in retail shops, the price has more or less doubled from its ex-vessel level. In the typical price build-up shown in Fig. 7, the aggregating and trucking service provided by the buyer adds a minimum of $0.50-1.00/lb to the ex-vessel price. Processing, distribution and wholesaling services add another $1.00-3.00/lb, bringing the wholesale price to the $7.00-10.00/lb range (depending on size). Another $2.00-3.00/lb is added at the retail stage. The gross margins at each stage cover fixed and variable costs, as well as profit.

IV.

OPPORTUNITIES FOR GROWTH

1. OVERVIEW

Producers in Maine have the potential to enhance their scallop revenues in several ways:

- ♦ Marketing directly to distributors, restaurants and retailers by by-passing local buyers and processors;
- ♦ Managing the capture fishery to produce more scallops and larger scallops;
- ♦ Improving scallop abundance through stock enhancement initiatives;
- ♦ Increasing production through scallop aquaculture;
- ♦ Developing niche markets for specialized scallop products; and
- ♦ Increasing unit value by labeling or branding "Maine Scallops"

These options are examined below by identifying the actions needed to meet the objective, and outlining the issues surrounding each of these actions. The options and issues are summarized in Table 5.

2. MEASURES TO ENHANCE REVENUES

FISHERIES MANAGEMENT

What it means

Management offers arguably one of the best long-term opportunities for securing enhanced revenues from the scallop fishery. The main objective of management is to control fishing effort so that what is taken from the stock does not impair the ability of the stock to sustain itself. Management measures fall into two broad categories: controlling *inputs* – essentially the level and scope (location and time) of effort harvesters put into the fishery, and controlling *outputs* – essentially the quantity and size of fish harvesters take out of the fishery.[1]

[1] Much is written about the role of management in achieving sustainability objectives for fisheries. For a detailed discussion, see *Management of Atlantic Sea Scallops in Maine Waters: Issues and Options*, by Chris Finlayson and Dan Schick. This paper is obtainable from the Maine Department of Marine Resources.

TABLE 5: MAINE SCALLOPS – OVERVIEW OF REVENUE ENHANCEMENT OPTIONS

	Direct Marketing	Fisheries Management	Stock Enhancement	Aquaculture	Niche Markets	Labeling/ Branding
Objective	♦ to gain larger share of final selling price	♦ to optimize yield from the resource	♦ to assist nature with production	♦ to culture scallops in Maine waters	♦ to extract higher value from scallop	♦ to occupy highest end of market
Approach	♦ deal directly with distributors	♦ adopt sustainable fishing practices	♦ transfer spat to good habitat	♦ use cage or net technology	♦ develop special products/markets	♦ product differentiation
Action required	♦ harvesters organize ♦ identify coordinator ♦ set terms/conditions with distributor ♦ aggregate/deliver ♦ monitor market ♦ obtain/distribute payment	♦ reduce fishing effort by controlling inputs: # vessels, time at sea, areas fished, gear & controlling output: quotas, size limits, trip limits.	♦ collect spat ♦ transfer to good growing areas ♦ close growing areas to fishing ♦ remove natural predators	♦ identify optimal sites ♦ experiment with technologies ♦ operators gain exclusive rights to sites ♦ rights are enforced	♦ conduct market analysis to identify specialty products ♦ assess interest/ capacity to supply niche products ♦ develop marketing plan	♦ assess interest in labeling campaign ♦ establish product (label) standards ♦ develop marketing channels ♦ supply consistent quality/quantity
Benefits	♦ could lead to higher ex vessel price ♦ improves harvesters' sense of the market ♦ provides incentive to produce high quality	♦ increases catches in long run ♦ increases average meat size ♦ reduces economic cost of fishing	♦ enhances potential for settlement and strong growth ♦ increases production and meat weight	♦ makes use of natural resource ♦ provides business opportunity ♦ generates income ♦ creates jobs	♦ scallop gains value from niche status ♦ closely linked to aquaculture ♦ increased income enters local area	♦ scallop gains value through product differentiation ♦ increased income enters local area
Costs	♦ time to organize during short season ♦ cuts into fishing time unless coordinator hired ♦ delivery costs must be paid by someone ♦ could increase risk (depends on point of sale – wharf vs. plant gate)	♦ excludes participants ♦ induces illegal fishing ♦ politically unpopular ♦ may impinge on other fisheries ♦ management becomes more complex	♦ closes areas to fishing for scallops and other species ♦ enforcement ♦ creation and maintenance ♦ monitoring fishing	♦ requires research and development ♦ investment in equipment/trainin g ♦ market development ♦ may be unpopular with established coastal interests	♦ conducting market analysis ♦ assessing capacity to supply ♦ on-going market development work ♦ requires change in law to allow whole scallops to be landed ♦ inspection needs	♦ producer campaign to establish standards ♦ market campaign to establish the label ♦ monitoring to ensure conformance with standards
Comments	♦ could work, though benefits and costs should be carefully weighed against current system ♦ system is fairly competitive, so may not be much money in a new approach	♦ sustainable fishing is possible only with strong management ♦ management requires industry support to be effective ♦ community-based approach needs State support	♦ experience shows this can work ♦ requires scientific study and testing ♦ requires much consultation and buy-in from stakeholders in fishery	♦ experience shows this can work ♦ requires scientific study and testing ♦ requires extensive consultations with fishing and cottage interests	♦ niche market for whole scallop exists, but is small and needs development ♦ inspection service is needed	♦ experience elsewhere shows label can be established ♦ can easily be abused at the retail/restaurant level

Input Control

Controlling input into a fishery is a means of limiting the capacity of fleets to remove fish from a stock. Inputs take many forms including the number of vessels, the fishing power of those vessels as measured by vessel and gear characteristics, and when and where fish may be caught. Input controls have biological objectives, but may also have economic objectives such as distributing fishing opportunity and income.

Among the forms of input control are:

- **Limited entry licensing**. Limiting the number of vessels permitted to fish is a necessary, but not sufficient, condition for controlling effort. Should be complemented with quotas.

- **Vessel size and power restrictions**. Generally not effective if implemented in the context of a competitive fishery. Experience shows that the ingenuity of fishermen in evading restrictions on effort tends to outstrip the ability of regulators to develop new measures.

- **Gear restrictions**. Measures aimed at supporting minimum size regulations are essential to protect stocks.

- **Days at Sea (DAS)**. This controls overall effort and also distributes effort across a fleet.

- **Close times**. Can be effective in protecting stocks during spawning or at other critical points in the life cycle. Also used to limit gear conflict and to optimize marketing.

- **Close areas**. Can be effective in protecting stocks at vulnerable points in the life cycle.

Output Control

Controlling output of a fishery is a means of limiting the amount and characteristics of fish removed from a stock. Output is ordinarily measured in terms of tonnage, but could also measured by number of fish. Specifying minimum fish size is also a means of controlling output. Among the forms of output control are:

- **Quotas**. These usually take the form of tonnage limits on particular stocks. A quota may be applied without qualification to be fished on a competitive basis, and may be sub-divided in some way by geographic area, time or fleet sector. Quotas may also be sub-divided into trip limits or individual quotas (whether transferable or not) in order to achieve socio-economic objectives.

- **Size limits**. Minimum size protects juveniles, contributing to the chances that they survive to maturity. Maximum size protects spawning stock. Specifying a minimum size may also contribute to economic objectives by ensuring that yield per recruit approaches an optimum size from a market perspective.

Factors to be considered

Designing and implementing a fisheries management regime is no easy task. Difficulties fall into two categories: factual – ensuring there is sufficient science to support controls aimed at achieving biological objectives; and social – ensuring there is sufficient stakeholder support for controls, whether aimed at achieving biological or socio-economic objectives.

Currently, the inshore scallop fishery in Maine can support far fewer than the 760 individuals holding dragger licenses. Harvesting capacity is far in excess of the ability of the resource to sustain it. Excessive pressure on the stock can be expected to continue indefinitely because as soon as stocks show any sign of recovery, additional capacity enters the fishery, driving stocks down to unsustainable levels.

Introducing management measures beyond seasonal closures, gear restrictions and minimum shell size, will generate long-term biological and economic benefits. Among these are increased stock abundance, reduced risk of recruitment failure, increased landings, larger average size and increased revenues and incomes. To achieve these benefits, costs will have to be incurred. The measures selected will determine the kinds of costs and on whom they fall. For harvesters there could be reduced participation with license limitation, reduced landings as conservation measures are introduced, loss of access with seasonal and area closures, and reduced competitive opportunity if trip limits and individual quotas are introduced. Science would face higher costs to develop and maintain the data needed to support quotas. Managers would face higher monitoring and surveillance costs to ensure compliance.

Observations

The Maine inshore scallop fishery represents a classic open access problem. Fisheries with no controls on access result inevitably in wasteful investment in capital, low returns to labor, and unsustainable pressure on stocks. DMR lacks the regulatory tools to address the root of problem. The existing legislation limits what can be done. All the incentives in the fishery drive participants to poverty and the resource to depletion. But the measures needed to blunt these incentives (input controls), or change them altogether (output controls), seem to be unacceptable to most participants. Thus, harvesters find themselves in the paradoxical position of wanting the symptoms of the problem solved, but not wishing to compromise the very freedoms that lie at its root.

What's at stake? Following several years of decline, the Maine inshore scallop fishery was worth about $3.5 million to harvesters in 1999 (Fig. 6). A return to the level of landings in the early 1990s would see revenues double. If increased landings were coupled with larger average size, landed revenue would more than double. So, for want of the management measures that could provide the basis for this long-term improvement, Maine harvesters and their communities seem to be prepared to forego at least $4 million annually.

ENHANCEMENT

What it means

Enhancement, as applied to scallops, is a technique aimed at assisting nature to increase production. It involves collecting spat (scallops at the early point in their life cycle where they have just developed beyond the larval stage) before it settles to the bottom, and using it to seed grounds considered to be good grow-out areas. The key steps in the process are to identify areas where spat are found in abundance (but which offer poor habitat for survival and growth), and collect spat from these areas. It is then a matter of transferring the spat to good habitat for grow-out, following an intermediate grow-out stage in pearl nets or some other holding facility.

Factors to be considered

Experience in Japan, and more recently in Atlantic Canada, shows this technique does work. The main challenges lie in identifying good grow-out areas, and establishing these as protected scallop grounds. Protection may involve removing or controlling the population of predators such as starfish and snails. The areas must also be closed to fishing while the scallop stock grows. This would ordinarily take a period of 4-5 years if the scallop is grown for its meat alone. If the whole scallop is to be marketed (at 2-3 years), then a smaller size would be acceptable.

The major stumbling block to stock enhancement lies in developing a management regime that makes it attractive for prospective producers to make the necessary investments. Not only does this mean closing or limiting access to seeded grounds during grow-out, but also to providing those making the investment with exclusive access to the scallops when they are ready to be harvested. The closure need not affect all fishing, but would exclude potentially destructive gears such as trawls, rakes and dredges.

Observations

This technique offers considerable potential, but requires widespread support from fishing interests if it is to succeed. It is ideally suited as a mechanism for community development, but must have the support of mobile fleet sectors used to unrestricted access to the resource. If the State of Maine wishes to pursue enhancement, it should expect extensive consultations on the matter.

AQUACULTURE

What it means

Scallop aquaculture is carried out using three methods: in lantern nets suspended in the water column, ear-hanging on suspended lines, and in cages placed on the bottom. These techniques facilitate the flow of water to provide food, while minimizing natural mortality due to predation. Most methods start with collected spat that is over-wintered (generally in pearl nets) and then transferred for grow-out using one the three techniques.

Scallop aquaculture and enhancement are widely practiced in Japan and China, with cultured production far exceeding that from the capture fishery. Scallop aquaculture is also proving a viable business in Nova Scotia, with one operator using lantern nets and two using cages (an experimental ear-hanging method failed to produce satisfactory results). Whole scallops for export to the U.S. and Far East are produced at the lantern net operation and at one of the cage operations. The second cage operation produces meats for the local market.

Factors to be considered

The coastal waters of Northwest Atlantic would seem to offer almost limitless opportunity for scallop aquaculture. The scallop is a hardy animal, spat is plentiful, and the region's waters provide excellent conditions for growth. Yet, production is limited to just a few operations.

There are three main reasons for this. First, the process of developing and adapting appropriate techniques is slow, particularly since private individuals with limited public support are carrying out much of the work. Second, There is considerable opposition to the dedication of public ocean space for non-traditional (non-fishing, non-recreational) uses. Traditional users such as lobster fishermen and cottage-owners feel threatened by the loss of access to fishing grounds. This is the case in Maine as well as Nova Scotia. Third, marketing costs are high. Much of aquaculture production is aimed at the whole scallop market because it can take as little as two years to grow a scallop to marketable size. While this is clearly an advantage from a cash flow perspective, it does present challenges: short shelf life (4-5 days under ideal conditions) and cost of testing for paralytic shellfish poisoning (PSP).

Observations

Aquaculture can make a valuable contribution to community development, without adverse environmental consequences. Those in opposition to it tend to associate shellfish aquaculture with large-scale corporate salmon farming, with its various environmental (biophysical and esthetic) concerns. Shellfish aquaculture, particularly scallops, can be developed on a relatively small scale, occupying limited space. Culturing these species presents no environmental concerns.

If aquaculture is to develop, it seems clear that a program of public consultation at the local level must be initiated. Public education about scallop aquaculture techniques and their minimal impact on ocean space and the environment should form an important element of this consultation program. Developing one or more small-scale demonstration projects may be a useful starting point. Discussions with community organizations and prospective aquaculturalists in Maine make it clear that without a substantial effort aimed at promoting public understanding and acceptance, the industry will get nowhere.

NICHE MARKETS

What it means

Niche markets may be thought of as small corners of larger markets where consumers demand products with special or unique characteristics. Almost by definition, quantities sold into niche markets are relatively small, with consumers prepared to pay a premium for the novelty and its relative scarcity.

The sea scallop tends to be sold on a commodity basis. The product is almost exclusively the scallop meat, sold in fresh or frozen form. The only real differentiation is on the basis of size, with price increasing with unit weight. Sufficiently large quantities of product by form and size are sold, so it is unlikely that a niche market could be carved out with scallop products in these categories.

A niche market does exist in the Northeast region (and other parts of the US) for whole scallops – an in-shell product similar in concept to oysters (uncooked) or mussels (cooked). The whole animal is shipped, shucked and eaten on the half-shell. Supply is from wild stocks on Cape Cod and also from Georges Bank (via American and Canadian draggers), and from scallops cultured in Nova Scotia waters. The product finds its way to consumers mainly through high-end restaurants, generally ones specializing in seafood. Distributors indicate that the market (demand) is small but growing. The short shelf life (4-5 days under ideal conditions) limits the market. Few distributors carry the product because throughput does not justify the marketing and carrying costs.

Factors to be considered

The most obvious consideration in any attempt to enter the whole scallop market is the balance between demand and supply. For the prospective producer, the key question is whether there is room for additional supply, and if so, at what prices. Existing producers currently receive $0.20-0.25 each for two-year old whole scallops. This is equivalent in size to, but double the price for, shucked scallops in the 40-50 meats/lb range. Prices could not be sustained at this level if production were to increase faster than the growth in demand.

A second important issue for prospective whole scallop producers in Maine concerns source of supply. Maine law prohibits landing whole scallops, or even scallop meats with the mantle and roe attached. This arises out of concern for the possible contamination by toxins causing PSP. Toxins accumulate in the soft tissue of the scallop, but not in the muscle (the meat). There are tests for PSP, though rapid and relatively inexpensive ones have yet to be approved by the USFDA. Until they are, the whole scallop market would not appear to be a viable option for the Maine (coastal) scallop industry.

This leaves aquaculture as a potential source of supply, and for this niche market, aquaculture can be an ideal source. Under good growing conditions, scallops can be ready for the whole market in just over two years. This is important from a cash flow perspective since culture requires a substantial investment in site selection, development, equipment and time. Testing for PSP and short shelf life present constraints. The experience of Canadian producers shows these can be manageable under the right circumstances.

The chief barrier to entry, and the major issue for prospective scallop aquaculturalists, is access to suitable grow-out sites in the many bays and inlets along the Maine coast. For the reasons cited above, there is considerable opposition from existing users of coastal waters to allowing any constraints on that use. The aquaculture industry is seen as a threat to open access.

Observations

Based on a preliminary assessment, it would appear that the whole scallop represents a niche market opportunity, but one that should be approached with caution. The market is small and growing slowly. It requires careful assessment before investments in production capacity are made. A careful assessment of supply intentions elsewhere is also necessary so that Maine producers are not undermined by imported product facing less stringent size or harvesting restrictions.

LABELING/BRANDING

What it means

Labeling or branding are methods of differentiating products that fall into the commodity category. They are attempts by producer organizations or individual producers to overcome the lack of any discernible differences between their product and that supplied by competitors in order to make theirs appear distinct and more desirable.

- **Labels** are developed by producer organizations to highlight generic differences among products. These differences may be attributable to such factors as production method (“organic”) or origin of supply (“Maine lobster”). Labeling benefits all producers of a particular product or all producers from a particular location, rather than any individual producer.

- **Brands** are developed by private companies in order to develop product identity and to build consumer loyalty. Brand development often centers on little more than packaging. Companies advertise to support the brand, with messages highlighting characteristics consumers are known to value for the kind of product in question.

Factors to be considered

The objective of any market development campaign would be to benefit Maine scallop producers in general, rather than individual producers. Accordingly, labeling rather than branding would be the appropriate approach. We see many examples of labeling at work. Among some familiar ones from the seafood sector are "Maine Lobster", "Maine Mussels" and "Digby Scallops".

Buyers and distributors consulted during this study offered mixed advice about the merits of a labeling campaign for Maine scallops.

- The success of any labeling campaign begins with a product that offers some potential for differentiation. In the case of Maine scallops, this could relate to location and quality based on short trips and cold, clean water. Opinion is divided on whether there is enough of a difference between Maine scallops and ones caught elsewhere to support such a claim and the price premium it would be expected to command. This is particularly the case at present, with Maine producing relatively small scallops.

- The success of labeling depends on the ability to deliver high quality. This means developing a set of product standards to which all suppliers operating under the label must adhere. Distributors point to the success producers have had in developing name recognition for the Massachusetts Bay Scallop. It sells for as much as $19.95/lb on the basis of quality characteristics (fresh, sweet) and name recognition. But in order to develop the market, producers would in all likelihood have to by-pass local buyers and sell to the 'next level' (regional distributors) or sell directly to final sellers. Meeting the quality and marketing conditions could be problematic for many Maine producers because they are widely dispersed, and could face difficulties shipping the scallops to major market points on a timely basis.

- The success of labeling also depends on the ability to meet consumer expectations on a year-round basis. If consumers are encouraged to look for Maine Scallops in the market or on the menu, then they expect to find them on a consistent basis. Not finding them for months at a time could undermine the name recognition campaign. But this said, it is worth considering the success wine producers from the Beaujolais region in France have had in creating a frenzied demand each year for that year's new wine – "Beaujolais Nouveau". As long as the Maine scallop fishery remains so highly concentrated in December, it may be possible to make virtue out of necessity, and try to capitalize on it as an event.

Observations

It is open to question whether a labeling campaign for Maine scallops would succeed in generating higher prices. The key to higher prices is consumer preference for Maine vs. other scallops. Consumers would have to be persuaded that the set of product characteristics exhibited by Maine scallops exceed those from other areas, that Maine scallops are worth demanding by name, and worth paying a premium for. It is doubtful whether under current supply and distribution circumstances, these conditions could be met. The season is short and the product, while fresh, generally consists of smaller meat sizes than supplies from Georges Bank. In short, a labeling campaign may have to wait until changes in fisheries management result in longer seasons, higher catches and larger scallop meats.

A second question is whether the campaign would necessarily work to the benefit of Maine producers, as distinct from distributors or final sellers. In other words, even if Maine scallops commanded a higher price at the consumer level, how much of that price difference would trickle down to harvesters? This is difficult to answer with any precision in the abstract, but the short answer is that competitive forces should cause an increase in the ex-vessel price as long as the campaign were successful at the retail end. If not, then producers would not see it as worthwhile to incur the extra expenses associated with meeting the quality criteria.

DIRECT MARKETING

What it means

Direct marketing means producers (harvesters or aquaculturalists) by-passing local buyers and dealing directly with processors/distributors or even final sellers (restaurants and retailers). This has a sound rationale, *if* the existing system is somehow inefficient or non-competitive, implying that it is possible for producers or producer organizations to earn a larger share of the final purchase price by taking on the buyer's function themselves.

Factors to be considered

Direct marketing work – examples include fishermen's organizations and co-operatives. It works best in cases where ports are isolated with limited competition among buyers. The real questions facing producers are whether existing competition among buyers is sufficiently strong to generate the highest prices, and if not, whether the revenue to be gained by taking the steps needed to set up and operate their own buying and selling organization outweigh the costs of doing so.

The first step producers should take in assessing whether it makes economic sense to try direct selling is to examine the competitive conditions under which they currently operate to determine whether the ex-vessel prices they receive are competitive. Among the key questions are:

- Is the number of buyers on the wharf sufficient to ensure competition? (Two or more operating independently are required to ensure a competitive environment.)
- Are prices comparable to those received in other areas?
- Do prices reflect changing market conditions?
- If landings were auctioned, would prices be any different?
- If vessels combined catches and sold to the highest bidder, would prices be any different?

Some of these questions are impossible to answer conclusively. But if there is any doubt that prices are competitively determined, then it may make sense for producers to organize and investigate options for dealing directly with processors, distributors and final sellers. This raises a whole new set of questions. Producers have to gather sufficient information to be able to translate these options to ex-vessel prices *net* of all their costs. These costs include setting up the organization, hiring a marketer, negotiating prices, aggregating and delivering scallops, monitoring the market, and securing and distributing payment.

Observations

Setting up and running a producer-run marketing organization is not a trivial task. Which may explain why so few exist. Most producers prefer to leave the job to others, while concentrating on what they do best – maximizing their share of the catch. Selling is seen as a necessary evil, a distraction from the main task of harvesting.

The whole rationale for by-passing intermediate buyers lies in the notion that the prices they pay are not competitive – that there is revenue to be gained for producers by selling directly. This is generally not the case, particularly for seafood that is sold fresh. In the case of scallops, there are many buyers, with changes in market conditions reflected fairly rapidly in shifts in ex-vessel prices. Also, information about market conditions is readily accessible from various sources making it increasingly difficult to take advantage of lack of knowledge.

Two other factors should be considered. First, the intermediate buying and selling function is not without costs and risks.

- The costs are those arising from aggregating the scallops from various vessels and ports, finding buyers for the product, and trucking them to these buyers.

- The risks are ones associated with market shifts between purchase and sale, spoilage, and delayed or non-payment. Whether the buyer or the producer sells the scallops, these costs and risks are incurred.

Second, while many of the comments above could be applied to producers in any fishery, there are some unique circumstances surrounding the scallop fishery that would make it difficult for producers to set up their own marketing organizations.

- The season is short, catches are relatively low with generally small meat sizes. This means that neither producers nor buyers (processors, distributors, final sellers) are likely to wish to spend much time and money in developing a new network when the existing one works well enough.

- The fishery is highly competitive. This means the producers' focus is entirely on harvesting, getting paid for the catch, getting back on the water, then moving on to the next area or the next fishery. A change in the management approach (eg, with individual quotas) could change the focus and allow for a more market-driven approach to fishing (choosing to fish when prices are high). But until this occurs, the perceived net gains from direct marketing are likely to be relatively small.

To conclude, of the face of it there would appear to be little for producers to gain from direct marketing, particularly as the fishery is currently conducted. Nonetheless, some direct marketing initiatives may warrant investigation if future changes in management lead to a more measured approach to fishing with more predictability of landings (both individual and total fishery), and larger average size scallops.

V.

CONCLUSIONS AND RECOMMENDATIONS

1. SUMMARY AND CONCLUSIONS

Northeast Market – Supply, Demand and Price

Sea scallop supplies in the U.S. Northeast market dropped to historically low levels in the mid- and late-1990s. Against a backdrop of strong demand in an expanding economy and rising incomes, ex-vessel scallop prices rose to decade-high levels of $6.50/lb. This changed in 1999. U.S. landings increased sharply, contributing to a softening of prices that started in 1998. The ex-vessel price dropped to the $5.50-6.00 range.

Prices can be expected to soften further over the next year or two, dropping to the $5.00 range in 2001, and possibly below this in 2002. Expected shifts in both demand and supply account for this. Any slowing of the U.S. economy can be expected to put downward pressure on demand. Supply is expected to increase in response to changes in scallop management in areas under the jurisdiction of the NEFMC. Canadian landings are also expected to increase in the near term, contributing to U.S. supply and to the weakness in prices.

Sea scallop prices are sensitive to changes in supply and demand, and demand itself is sensitive to changes in price. Quantitative estimates of the relationships show that a 1% increase (decrease) in supply would result in a 0.4% decrease (increase) in price, while a 1% increase (decrease) in price would lead to a 2.3% decrease (increase) in quantity demanded.

Predicting price changes beyond 2003 is problematic given the uncertainty surrounding factors on both the demand and supply side. The extent and duration of any slow-down of the U.S. economy is not clear. Moreover, the scope and effect on landings of NEFMC management action is also uncertain. Assuming the worst case, it seems unlikely that demand and supply shifts would be so extreme to cause ex-vessel scallop prices to dip below the 20-year (late 1980s) low of about $4.25/lb.

Northeast Market – Scallop Product Preferences

The Northeast market for scallops is highly developed, with several well-defined segments paying differentiated prices based on particular product characteristics. The market clearly prefers sea scallops over other scallop species (imports). The market pays a premium for fresh scallops over frozen, with upwards of half the total sea scallop supply sold in fresh form. It pays a premium for dry scallops over wet (soaked). Prices vary directly with size, with differences as much as $2.00/lb between the largest (under 10s) and smallest (over 50s) sizes.

The market is confined essentially to scallop meats (the adductor muscle), though a demand for whole scallops is slowly emerging. These are marketed mainly through restaurants, but are also available from specialty seafood shops.

Maine Scallop Production and Distribution

The Maine scallop fishery is based almost exclusively on the sea scallop. It is harvested from wild stocks, with the fishery concentrated in a handful of the State's larger bays. Access to the fishery is by license, but there is no limit on the number of licenses. An accurate count of the number of active vessels is not available, but DMR officials believe it is substantially below the number of licensed vessels. Limited participation is a function of declining stocks.

The scallop season in Maine's coastal waters (within three miles) is from December 1 to April 15. Because it is a valuable species and because there are no constraints on effort, about half the landings are taken in the first few days of December. This fishery accounts for about 25% of total supply in the Northeast market during December.

Maine scallop landings have been in steady decline over the past decade, dropping from just over 1,500 tons in the early 1990s to about 300 tons in 2000. Unsustainable levels of fishing effort combined with poor recruitment to the fishery are the primary causes of declines in scallop stocks. Maine landings account for just 2.5% of U.S. landings, and less than 2.0% of total sea scallop supply in the Northeast market.

The Maine scallop fishery occurs during a time of seasonal supply scarcity and relatively high market prices. This is good for harvesters. The high concentration of landings in early December is reported to exert some downward pressure on prices, but the effect is small and lasts no more than a few days.

Of arguably greater negative impact on ex-vessel prices than the concentration of the catch is the small average size of the scallops. Average size is reported to have declined over the past decade as fishing effort has increased.

2. OPTIONS AND RECOMMENDATIONS

Maine scallop producers have several options for enhancing their revenues. The options fall into two broad categories – production and marketing. The challenges of implementing each option vary considerably, as do the size of the pay-off and the likelihood of success.

The options related to production are in some ways the more challenging. Yet, they are of the highest priority because they deal with the very basis of the fishery and production generally, and also because they are fundamental to the success of any of the marketing options. The main options and recommendations are set out below in order of priority.

PRODUCTION

1. Management measures in the scallop fishery

The objective is stock conservation leading to the production of more and larger scallops. A broad range of input and output controls is possible. It is clear from the experience in the U.S. and in Canada, that until effective effort control is introduced, the landings, employment and income generated by the fishery will fall well short of their potential.

Recommendation 1: Measures should be introduced to limit fishing effort and rebuild scallop stocks in Maine waters. The measures should be developed through consultations with the fishing industry and coastal communities.

2. Stock enhancement initiatives

The objective is to augment natural processes to increase production. Experience indicates that enhancement initiatives can be successful, though considerable scientific work is necessary to identify spat collection techniques and locations, and to identify optimal grow-out sites. Stock enhancement requires a management framework providing producers with some form of access rights to seeded areas. Without such a framework, it is unlikely that prospective producers would risk the time and money needed to conduct enhancement projects.

Recommendation 2: A supportive policy environment should be developed to nurture scallop enhancement projects. This policy environment should address scientific and investment risks associated with enhancement projects. Policies should be developed through extensive consultation with coastal communities.

3. Scallop aquaculture

Aquaculture technology and methods have been successfully adapted to the sea scallop in northwest Atlantic waters. Several aquaculturalists in Canada and some in the U.S. are producing on a commercial basis. But there is considerable resistance to aquaculture in Maine. Opposition is based on concerns over loss of access to public waters (eg, lobster fishermen), and also to aesthetic concerns (cottage owners). These concerns tend to be unfounded, but nonetheless persist. Experience shows that without public support, aquaculture as a development opportunity stands little or no chance of success.

Recommendation 3: The Maine DMR should consider implementing a scallop aquaculture development program. It would consist of several phased initiatives including public consultation, public awareness, aquaculture promotion at the community level and small-scale demonstration projects.

MARKETING

4. Niche markets for specialty scallop products

A niche market for whole scallops exists in the U.S. Northeast. Producers in Massachusetts, Nova Scotia and Newfoundland currently supply this market. It represents a possible opportunity for prospective aquaculture producers because the demand can be met with 2-year old scallops (rather than a minimum of 3-4 years old if sold for the meat only). But the need for PSP testing and short shelf life of the product can present significant obstacles. Because of these factors and because the market is small and growing slowly, prospective suppliers should study it carefully before committing resources to any projects.

Recommendation 4: Prospective aquaculturalists interested in supplying the whole scallop market should assess competitive conditions (demand and competing sources of supply) and regulatory requirements (related to selling whole scallops) before investing.

5. Labeling or branding “Maine Scallops”

Experience shows that labeling or branding products to increase market recognition (and unit value) can work, but it requires development of quality standards that set the product apart from substitutes. If the object is to extract a price premium from the market, then it is necessary to develop a reliable marketing chain that promotes the label and adheres to these standards. Establishing a label requires considerable time, effort and resources. A successful labeling campaign would be based on consistent, year-round supply of product. In the case of Maine scallops, it may not be possible to overcome the hurdle presented by the short season. Also, since a successful campaign would require involvement of all segments of the distribution chain, it is not clear whether any market price differential would trickle down to producers in the form of higher ex-vessel prices.

Recommendation 5: A careful analysis of the practicability, costs, benefits and net returns to producers should be conducted before any attempt is made to develop a "Maine Scallop" label.

6. Direct Marketing

Some harvesters market directly on a small-scale basis to local restaurants and retailers. Most sell to buyers at the wharf because it is the most straightforward (least troublesome) means of disposing of the catch. Successful direct marketing to restaurants and retailers in large urban centers could work under certain circumstances, but is likely to be more trouble than it is worth for both harvesters and customers. The current distribution system works well because it is flexible and spreads risk across many buyers and sellers. Direct marketing would concentrate all the buyer/distributor functions as well as the risks in the harvester's hands. From the final seller's standpoint, there is little to be gained from direct marketing, but much to be lost. The ability to one-stop shop for a full range of seafood products is not available, and nor is the flexibility to easily adjust quantities purchased. And given the short Maine season, final sellers would in any event have to rely on distributors for product at times when supplies from Maine were not available.

Recommendation 6: Producers should not be encouraged to look for direct marketing opportunities, except possibly in areas where buyer competition is not strong. In any event, producers should be made aware of the difficulties and risks of attempting to market directly.

APPENDIX A

Scallop Development Experience Elsewhere

APPENDIX A

SCALLOP DEVELOPMENT EXPERIENCE ELSEWHERE

Overview

This section provides an overview of fisheries management and enhancement/aquaculture initiatives in areas outside Maine. The objective is to compare and contrast approaches, and to identify key lessons learned that may be applicable in the Maine context. The approach taken to fisheries management for sea scallops in Canada (Bay of Fundy and Georges Bank) is described and assessed. We also look at enhancement and aquaculture developments in Canada, Japan, Australia, New Zealand and the U.S.

Scallop Management in Canada

The Canadian scallop fishery has inshore and offshore components, each managed with a range of input and output controls.

- The inshore fishery in the Bay of Fundy bears some striking similarities to the Maine scallop fishery in terms of its recent performance. But after several years of decline, it is managed with more stringent controls than the Maine fishery.

- The offshore fishery is comparable to that in the U.S., targeting stocks on Georges Bank and the banks on the southern Scotian Shelf. The main difference between the Canadian and U.S. approaches to management is Canada's long-standing reliance on output controls.

Inshore (Bay of Fundy)

Over the long term, the objectives for this fishery are to:

- Protect small scallops (juveniles) from growth over fishing (harvesting at less than optimal size);
- Promote stock recovery and achieve a sustainable fishery.

The shorter-term management objectives include:

- Improve data quality on quantity landed through an industry-funded dockside monitoring program;
- Improve data quality on size distribution through an industry-funded port sampling program;
- Improve data quality on area of capture through industry-funded observer coverage;

- Continued development of the consultative process for this fishery both within DFO and at the level of the individual fleet sector Advisory Committees.

The Bay of Fundy scallop fishery is divided into several management units. Most are open year-round, while open times in others are as short as one month for biological reasons and to avoid gear conflict. The fishery developed strongly in the mid-1980s, following the closure of offshore grounds (mainly Georges Bank) to inshore vessels. In the absence of quotas, landings peaked at about 4,500 tonnes in 1989, but dropped sharply thereafter largely due to excessive fishing pressure. Landings fell to 1,754 tonnes in 1995. In the face of a complete collapse of the stocks, a quota was finally introduced in 1997. Stocks continued to decline, and by 1999, landings had dropped to about 785 tonnes against a quota of 760 tonnes.

The fishery involves three fleets with a total of 325 licence-holders, all operating vessels <65 feet. Entry to the fishery has been restricted since the late 1970s. Only about 190 vessels are active, due largely to weak stock conditions. The most productive fleet historically (Full Bay Fleet) numbers 55-60 active vessels down from 99 before the introduction of Individual Transferable Quotas (ITQs) in 1996. ITQs have proved to be a useful device for fleet rationalization. Many license-holders decided to sell their quotas in the late 1990s, given the weak stock conditions and poor prospects for the near future. When stocks recover, those remaining in the fishery will benefit from less competition and higher average landings.

The fishery is emerging from over a decade (1985-1995) of limited interest among harvesters in conservation and management. This began to change after 1995 with the collapse of stocks in historically important fishing grounds. The Department of Fisheries and Oceans (DFO) and licence-holders reached agreement on a conservation harvesting plan, with vessels also agreeing on some voluntary measures to promote conservation and stock recovery.

- 100% dockside monitoring of landings;
- 100% at-sea monitoring (black-box) or agreement to take at-sea observers;
- Port sampling regime to determine proportion of small meats in the catch (<11 grams); and,
- In-kind contributions for funding trawl surveys to better assess the resource.

The Bay of Fundy Scallop fishery is currently managed using an array of conservation measures:

- Limited entry (only a pre-determined number of licences are issued);
- Individual or fleet quotas.
- Open times by production area and licence category;
- Meat count (blended) – 45/500 grams;
- Shell height – 95 millimetres;
- Minimum scallop meat weight – 11 grams
- Mandatory participation in meat weight sampling program

- Maximum gear width – 5.5 metres
- Minimum ring size – 82 millimetres;

Management activities are enabled by a variety of legal arrangements including the Fisheries Act, Fishery (General) Regulations, the Atlantic Fishery Regulations and variation orders. Also, the limited entry licence is used a means of imposing management controls. These are referred to as licence conditions. These conditions restrict fishing operations, covering such matters as fishing area, individual quota, gear limitations, meat weight, hailing requirements and dockside monitoring. A breach of these conditions could cause cancellation of the licence.

Offshore Fishery

Canada's offshore scallop fishery is conducted mainly off the southwest coast of Nova Scotia on Georges Bank and to a lesser extent on several banks on the Scotian Shelf: Browns Bank, German Bank, Sable Bank and Western Bank.

Seven companies are active in the offshore scallop fishery, down from ten in 1984. They operate 25 vessels, one-third the number actually licensed to fish. Corporate consolidation and fleet rationalization are attributable to the change in management approach following the boundary delimitation in 1984. Among the main elements of the new management regime were an overall quota and individual company quotas called enterprise allocations. The latter eliminated competitive fishing and the incentive for companies to operate large fleets. The fleet rapidly adjusted to the size needed to harvest the available resource efficiently.

The offshore scallop fishery is managed subject to an annual plan specifying objectives, principles and management measures. The main objectives of the plan are to ensure conservation and protection of the stock and habitat. For Georges Bank the long-term objective is to regulate the fishery with the aim of optimizing yield or value. This objective is met by regulating the size of the scallops that may be harvested (30 meats/lb) and by controlling the overall effort of the fishery by quota and individual quota.

Enhancement and Aquaculture

There has been considerable progress on scallop enhancement and aquaculture techniques since the Japanese began experimenting in the mid-1930s. Today, over half the world's production is derived from aquaculture, most of it from China and Japan, but with significant strides being made in Argentina. These countries are demonstrating what is possible.

The state of today's scallop enhancement techniques can be traced to the experience gained by the Japanese between 1935 and 1965. During this time, they developed many of the technologies commonly used today throughout the world.

The main phases of scallop enhancement or culture include:

- Spat Collection: either from collectors in the wild or produced in hatcheries;
- Intermediate Culture: a period of growth using suspended technology (can be used as an intermediate or final stage);
- Sort and seeding: small spat (5-10mm) or intermediate spat (35mm or higher) are sorted and sown on the bottom or to cages.

Virtually all enhancement and culture programs worldwide are a variation on the Japanese techniques. Programs vary depending on the geographic location, biological characteristics of the species, and the objectives set for the program. The tabular summary in Table A-1 provides a status report of country-specific programs currently in progress.

Uptake in North America has been slow, in part because of limited government support during the long and costly development phase, and in part because of limited access to coastal waters. In spite of these constraints, some individuals in Canada and the U.S. are making headway with their enhancement and aquaculture projects. Some are emerging from the long development phase into commercial viability.

This global experience has much to teach those interested in pursuing similar initiatives in Maine. Several prospective proponents of scallop enhancement and culture development gained valuable insights into what is possible with a State of Maine-sponsored visit to Japan in 1998. Similar initiatives are under way in Canada, Australia and New Zealand, albeit on a much smaller scale. Among the main lessons learned are[1]:

> **Feasibility.** The enhancement of scallop production via culture methods is possible in traditional scallop producing areas. Appropriate technologies must be assessed and management practices adapted. Proponents can expect a five to ten year research and development phase.
>
> Enhancement of natural areas (no commercial fishing) has potential as well. Some projects in eastern North America appear to be close (for instance Magdalen Islands) to commercial status. It will take several years of operation to prove long-term commercial viability.

[1] In part taken from, *Final Report Phase I Scallop Enhancement project for Southwest Nova Scotia* by Shawn Robinson, Jay Parsons and Monica Bricelj. Supplemented by research completed for this project.

Recruitment Variability. Wild stocks exhibit significant variability in recruitment success from year to year. Success in the collection of wild spat follows the same pattern. This has the effect of de-stabilizing research projects as years of poor results impact on participating fishermen and funding agencies. Hatcheries have an advantage in this regard although most enhancement practitioners consider the costs of running hatchery-based programs prohibitive.

From Hunters to Gatherers. Changing the mindset of fishermen is a difficult task. Projects must pay considerable attention to building a cooperative attitude among all industry participants including, the research community, regulatory agencies, management agencies and most importantly the fishing community.

Intermediate Culture. Programs that are the closest to achieving commercial success are those that incorporate intermediate culture activities to their overall plan. This is an expensive step, but appears to make the largest difference in ultimate survival and capture rates.

Enforcement. Poaching problems are minimized when fishermen share in the responsibility for enforcement. In Japan all participants share in profit, the same is true in New Zealand where quota cheaters lose their allocation for the season.

Role of Government and other Funding Sources. In most jurisdictions, development funding comes from government sources in the form of grants to fund special programs for enhancement, education and conservation. Funding support is critical in the early stages of virtually any program. An initial pilot project should be used to determine the best technology to proceed in a given area. This project can expect to run for 2-3 years.

Role of the Fishing Industry. A formal industry advisory committee should be struck. Detailed terms of reference make explicit expectations regarding in-kind support to the project by fishermen in terms of vessels and gear, the need to honor designated research areas, enforcement issues, community education and any other issues considered relevant at the local level.

APPENDIX B

List of Contacts

APPENDIX B

LIST OF CONTACTS

U.S.

Nick Alfiero, Harbors Fish Market, Portland, ME

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Marsden Brewer, Fisherman, Stonington, ME

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Sam Daniels, Wanchese, VA

Joe Furtado, Eastern Fisheries, New Bedford, MA

Mike Hastings, Maine Aquaculture Innovation Center, Orono, ME

Will Hopkins, Cobscook Bay Resource Center, Cobscook Bay.

Sue Inches, Maine DMR

Jim Markos, Maine Shellfish Restaurant, Ellsworth, ME

Rod Mitchell, Browne Trading, Portland, ME.

Bill Mook, Mook Seafoods, Walpole, ME.

Charles Nagle, John Nagle Company, Boston, MA

Steve Parkes, Pigeon Cove Whole Food Market, Gloucester, MA.

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