

Economics of the Nova Scotia Snow Crab Industry

Submitted to:

Department of Agriculture & Fisheries

Submitted by:

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I.

About This Report

1. Context

Background

The fisheries of Atlantic Canada have changed dramatically over the past 25 years. The extension of jurisdiction in 1977 resulted in an immediate expansion in fleet capacity, with much of the focus on the groundfish fisheries. Landings increased rapidly and more effort was drawn into the fishery. The introduction of limited entry licencing and vessel replacement rules in the late 1970s slowed capacity growth somewhat, but competitive fishing provided a strong incentive to continue to invest in larger vessels and greater harvesting capacity.

Though the industry endured financial and market crises along the way, it was not until the early 1990s that the groundfish resource itself collapsed throwing thousands out of work around the region. But almost as swiftly as the groundfish economy was disintegrating, a fishing economy based on shellfish was emerging to replace it. To some extent this had started with lobster in the early 1980s, but the transition did not take off until the 1990s. Whereas in 1990 all species of shellfish accounted for about 50% of landed value in Atlantic Canada, by 2000 this had increased to 85%.

Snow crab leads all species in the rate at which landed value has increased since 1990. This increase was due to a combination of factors, including increased biomass and quotas, declining catches of substitute species (Alaskan king crab), rising prices and favourable exchange rates in the dominant market, Japan. Table 1 shows the relative growth in landed value across key species (crab, lobster and shrimp).

Table 1
Atlantic Canada Marine Fisheries Landed Value (\$millions)

| | 1990 | 2000 | Average annual % growth |
|---------------------------|-------------|-------------|------------------------------------|
| Crab | 49.5 | 461.6 | 25 |
| Lobster | 232.2 | 513.1 | 8 |
| Shrimp | 74.2 | 277.1 | 14 |
| Other shellfish | 118.1 | 197.5 | 5 |
| Total shellfish | 474.0 | 1,449.3 | 12 |
| Groundfish | 386.7 | 180.7 | -8 |
| Total landed value | 953.9 | 1,713.4 | 6 |

Source: DFO

While the crab expansion contributed greatly to strengthening coastal communities devastated by the groundfish collapse, it also led to considerable strain in these same communities. This is because, in the minds of many, the wealth resulting from the expansion was not shared equitably. It was concentrated in the few hands fortunate enough to hold the crab licences.

By the mid-1990s, Department of Fisheries and Oceans (DFO) was coming under increasing pressure to ease limitations on entry to the crab fishery. The inequities were plain to see. This presented DFO with a difficult problem. Those holding the licences did not wish to see their position eroded in circumstances that could change overnight (as they had with lobster in the 1970s and more recently with groundfish). By the same token, DFO did not wish to expand harvesting capacity, and in the face of possible declining stocks in the future, have to bail out yet another fishery. DFO was also sensitive to the risk of pressure to expand quotas as more capacity entered the fishery, resulting in the inevitable charges that it was mismanaging the resource.

The rapid expansion of the snow crab fishery in Nova Scotia has created strains as well in the processing sector. With rising landings, processing capacity has increased substantially. Prior to 1999, only four plants processed crab in Nova Scotia. Currently, there are 10, with a combined capacity of some 900,000 pounds per shift. This has created challenges for processors to secure sufficient raw material to operate their plants effectively.

Part of the challenge lies in the openness of Nova Scotia's borders. Competition for raw material is not limited to local processors. Buyers representing plants in New Brunswick, Newfoundland and even Quebec, also compete for locally caught raw material (though restrictions apply to the export of crab from Newfoundland and Quebec). Processing plant workers in Nova Scotia see the export of raw material as robbing them of their jobs. This led to a number of incidents in 2002, including a blockade of the Canso Causeway and interference with the movement of certain buyer's trucks. Effective May 2003, Nova Scotia introduced restrictions on the export of crab to Newfoundland and Quebec following several months of ultimately unsuccessful negotiations with those provinces aimed at lifting their export restrictions.

Issues

Two main issues have emerged in the crab industry in Nova Scotia against the backdrop of these developments:

How access to the resource should be shared in future between permanent and temporary harvesters and how it should be allocated – transferable or non-transferable quotas. This is a federal matter and is not addressed in this report except insofar as possible alternative approaches affect competition and landed prices for raw material.

The basis for allocating raw crab among processing plants – should this be left to market forces, with or without controls. Included among the controls advocated by some is the restriction of exports from the province (if nothing else to level the playing field), or controlling processing capacity in some way.

2. *Study Objectives*

In response to the difficulties facing the industry, the Government of Nova Scotia and industry stakeholders created a Working Group to address issues and try to develop long-term solutions.

Among the priority matters the Working Group identified are to:

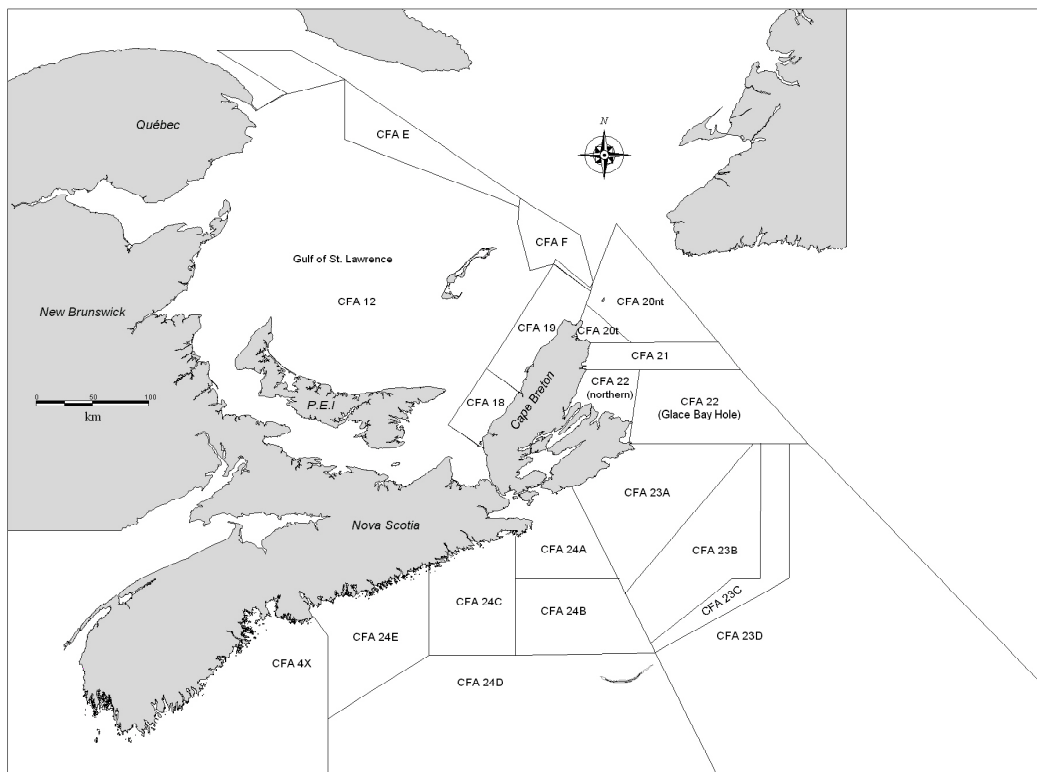
- develop options to maximize the amount of crab processed in Nova Scotia;
- develop mechanisms to provide fair prices to harvesters and processors for snow crab;
- discuss strategies to remove trade barriers in other provinces;
- review Nova Scotia snow crab buyers/processors licensing policy.

It became clear to the provincial officials that without some factual information about the structure and competitive behaviour of the industry, it would be impossible to address these matters effectively, and at the same time balancing the various interests. This study is intended to fill that gap, and to complement the efforts of the working group.

The specific objectives are to:

- define the value and importance of the snow crab industry in Nova Scotia, focusing specifically on CFAs 18-24 (see map below);
- quantify the contribution of the harvesting, buying and processing sectors to economic activity in the province;
- survey harvesters, buyers and processors to benchmark costs associated with their activities;
- and,
- assess the impacts of various pricing and production scenarios on the harvesting and processing sectors.

Crab Fishing Areas in Atlantic Canada



3. *Approach*

This report examines the competitive environment in the crab industry and the contribution it makes to the Nova Scotia economy. It does so by looking first at the structure of the industry and how this structure affects buying and selling activity, and ultimately the financial performance of the sectors: harvesters, buyers and processors. Structure – the number of harvesters, buyers and processors, their independence and how they interact – is important because it determines competitive conditions in the market and the “fairness” of resulting prices.

The information forming the basis for the analysis is obtained from two sources: directly from industry stakeholders and from published sources, including DFO and the Nova Scotia Department of Agriculture and Fisheries (DFA). In the course of the study we conducted some 40 interviews with: a) permanent licence-holders, temporary permit-holders, and their association representatives in each CFA; b) all major and some minor independent buyers; c) all active processing companies in the province; and d) federal and provincial officials.

In the discussions with harvesters, we gained valuable insights into their fishing operations and the various approaches to selling their crab catches. Many commented on difficulties they had encountered with processors and buyers in recent years, citing specific instances of bad faith leading to a climate of mistrust. Buyers explained their role in the industry and, described in detail, their operations and extent to which both harvesters and processors rely on their services. Processors provided details of the competitive environment in which they operate, including their efforts to secure supplies of raw materials, the products they produce and the markets they serve.

All those interviewed provided useful detail on competitive conditions in the industry, and several contributed information on their costs of doing business. This information has proved invaluable in developing insight into the cost structure of each sector.

A limiting factor in conducting the analysis is the detail in which information is provided. Most of those interviewed were (are) suspicious of the province’s motives in conducting the study. We did not have access to anyone’s books (not that the resources available for the study would have allowed such a detailed assessment). Most provided information from memory, though in fairness, when it comes to operating results, our experience is that harvesters’ and processors’ memories tend to be fairly accurate. That said, we take responsibility for any errors or omissions.

4. *Outline*

Following this introduction, Chapter II provides a description of the industry, focusing on the structural factors contributing to competitiveness in the processing, buying and harvesting sectors. This chapter also provides some insights into the cost structure of each sector.

Chapter III examines competitive behaviour among the sectors, assessing how shore prices are set, and the relationship between the market and shore price. Chapter III also addresses the economic impact of the industry. It provides a quantification of the economic contribution of the industry to the economy of Nova Scotia, and also assesses the implications of varying assumptions about production levels in the processing sector.

Concluding observations are set out in Chapter IV.

II.

Industry Economics

1. *Industry Structure and Operations*

Why structure matters

Industry structure plays a key role in determining competitiveness, how prices are set, how investment decisions are made, and how well industry sectors perform financially. By industry structure we mean those characteristics governing the nature of competition among buyers and sellers at each level of trade. The competitive market model assumes many buyers and sellers acting independently with full knowledge of market (demand and supply) conditions. The relevant structural characteristics are:

Industry Concentration

The number and relative size of buyers (processors) and sellers (vessels) provide an indication of market power and reflect the degree of competitiveness in an industry. Market power is normally expressed in terms of industry concentration: in this case, the share of sales or purchases of crab accounted for by the largest individual vessels or processors. The more buyers and sellers and the smaller their individual shares of purchases and sales, the more competitive the market is. An important provision in the model is that buyers and sellers act *independently* in their transactions.

The crab industry conforms to the competitive model because it is composed of many buyers and sellers, no single one of which is large enough to exert market power and influence prices *as long as each acts independently*.

Harvesting: on the selling (harvesting sector) side there are 286 permanent licence-holders and 157 temporary permit holders, each controlling a relatively small share of the total catch. A profile of the harvesting sector is set out in Table 2.

Buying: on the buying side (processing sector) there are 40 active buyers (over 200 others hold licences but are inactive), of which 27 are independent and 13 are processors who buy direct from harvesters. Independent buyers vary in size by quantity purchased, ranging from 100,000 to over 4,000,000 lbs.

Processing: 10 processors operated in 2002. Measured in terms of single-shift processing capacity, the plants range in size from about 50,000 to 200,000 lbs of raw crab. Plant capacity and employment levels are provided in Table 3. About 67% of raw material was processed in Nova Scotia in 2002, with 33% exported to other provinces. Figure 1 shows the flow of raw material from in the industry, together with relative plant production in 2002.

Table 2
Nova Scotia snow crab fishery profile, 2002

| | Crab Fishing Area | | | | | | | |
|---|-----------------------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|-------------------|-------------------|
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | |
| Permanent Fleet | | | | | | | | |
| License holders | 30 | 111 | 5 | 32 | 15 (o) 22 (i) | 37 | 34 | |
| Quota/licence (lbs) | 50,000 | 88,000 (1) | 45,000 | 37,500 | 43,200 47,800 | 163,100 | 158,000 | |
| Season (2002) | start date end date | Apr.16 July 30 | July 8 Sept 2 | July 20 Aug 13 | July 20 Aug 27 | July 20 Aug 12 | June 3 Sept 28 | June 15 Oct 10 |
| Active vessels (#) | 30 | 95 (2) | 5 | 32 | 37 | 37 | 34 | |
| Trap limit (#) | | 4-26 | 30 | 25 | 30 | 45 | 40 | |
| Average trips (#) | 30 | 27 | 14 | 14 | 10 | 21 | 23 | |
| Average days fished (#) | 30 | 28 | 14 | 14 | 11 | 37 | 32 | |
| Landings | weight (lbs 000) value (\$000) | 1,073 3,060 | 5,960 16,990 | 220 627 | 1,205 3,434 | 1,705 4,859 | 5,836 14,590 | 5,340 12,800 |
| Crew (include skipper) | | 3-4 | 3-4 | 3-4 | 3-4 | 3-4 | 3-5 | 4-5 |
| Average gross revenue per license holder (\$) | | 102,000 | 153,000 | 125,400 | 107,300 | 130,175 | 394,300 | 376,500 |
| Temporary Fleet | | | | | | | | |
| Number of permits | - | 73 | 6 | - | - | 38 | 40 | |
| Number of permit holders | - | 73 | 6 | - | - | 359 | 325 | |
| Quota/permit holder (lbs) (3) | - | 17,495 | 27,500 | - | - | 20,000 23,000 8,550 | 9,500 | |
| Season (2002) | start date end date | (4) Sept 2 | July 23 Aug 25 | - | - | May 29 Sept 29 | June 9 Oct 11 | |
| Active vessels (#) | | 14 | 6 | - | - | 38 | 40 | |
| Trap limit (#) | | 4 | 30 | - | - | 45 | 40 | |
| Average trips (#) | | 18 | 9 | - | - | 17 | 18 | |
| Average days fished (#) | | 18 | 9 | - | - | 34 | 36 | |
| Landings | weight (lbs 000) value (\$000) | - 3,633 | 1,275 470 | - - | - - | 4,460 11,150 | 3,458 8,300 | |
| Crew (include skipper) | | - | 3-4 | - | - | 3-5 | 3-5 | |
| Average gross revenue per permit holder (\$) | | - | 49,775 | 78,375 | - | - | 31,860 | 25,535 |
| Statistics for Entire Crab Fleet | | | | | | | | |
| Price (\$/lb) | | 2.85 | 2.85 | 2.85 | 2.85 | 2.85 | 2.50 | 2.40 |
| Catch per Unit of Effort (CPUE) (lbs/trap-haul) | | 41 | 195 | 153 | 210 | 263 | 261 | 224 |

Source: DFO, Fishery Management Plans, Stock Status Reports, Research Documents and personal communication.

Note:

1. Quota/licence depends on the trap shares held. The figure shown assumes 18 trap shares, the most common licence in the CFA 19 fleet.
2. Licences are combined on several vessels in CFA 19, so the number of vessels is less than the number of licence-holders.
3. In Area 23, temporary permits are divided into adjacent, non-adjacent, and groundfish-dependent. Quota for these permits varies by type.
4. Season starts as permanent quotas are caught and traps are removed.

Table 3
Nova Scotia Snow Crab Processing Sector profile, 2002

| Plant | Processing snow crab since | Rated Capacity* (lbs/hour) | Employment (10-hr shift) | Number of shifts |
|--|-----------------------------------|-----------------------------------|---------------------------------|-------------------------|
| Cheticamp Packers, Cheticamp | 1983 | 10,000 | 150 | 1-2 |
| Louisbourg Seafoods Ltd. (Louisbourg) | 1991 | 6,000 | 65 | 1-2 |
| Seafreez (Canso) | 1993 | 8,000 | 70 | 1-2 |
| Victoria Co-Op (Neil's Harbour) | 1994 | 6,000 | 70 | 1 |
| Han Beck Sea Products Ltd (Louisbourg) | 1999 | 15,000 | 65 | 1-2 |
| A & L Seafoods Limited (Louisbourg) | 1999 | 6,000 | 70 | 1-2 |
| Petit de Grat Packers, Petit de Grat | 2000 | 5,000 | 65 | 1 |
| North Nova Seafoods (Caribou) | 2000 | 5,000 | 80 | 1-2 |
| North Atlantic Seafood (Auld's Cove) | 2001 | 20,000 | 110 | 1-2 |
| Highland Fisheries (Glace Bay) | 2001 | 6,000 | 50 | 1-2 |

Source: Processing companies

Note: *Assumes high quality crab

Buyer-Seller Relationships

The competitive market model assumes buyers and sellers negotiate prices at arms length. Formal and informal links between processor and vessel may limit this independence and hence compromise the competitiveness of the prices set. A formal relationship exists (vertical integration) if the buyer owns the vessel and controls the catch, or where vessels have an ownership interest in processing facilities. This is the case with several plants in New Brunswick, and also with the member-owned Victoria Co-op.

The relationship is informal if there is separate ownership of vessel and plant, but with arrangements between them providing some mutual guarantees. For example, vessels would commit to supply catches of all species to a particular plant in exchange for concessions on bait, fuel, gear, vessel financing, etc. To the extent such arrangements limit independent action by fishermen, transactions may not be subject to price competition from other buyers. This could affect price levels and the speed with which prices change in response to market conditions.

Entry and Exit Conditions

Ease of entry and exit are fundamental characteristics of a competitive industry. Ease of entry ensures that enterprises will earn no more than normal profits. For example, any attempt by a company to increase product prices or decrease raw material prices to artificially high or low levels could lead to abnormal profits, but these would be short-lived. Abnormally high profits would attract investment in the industry, thereby increasing competition and causing prices to revert to competitive levels.

Ease of exit is also important to maintaining competitive prices. A failure to allow unprofitable companies to close (by propping them up with grants and soft loans) can intensify competition for raw material, often driving prices to levels leaving little or no margin to pay fixed costs or generate a profit. This is a familiar occurrence in the fishing

industry in Atlantic Canada where processing plants in small coastal communities are a key source of employment and income.

Competition in the crab industry

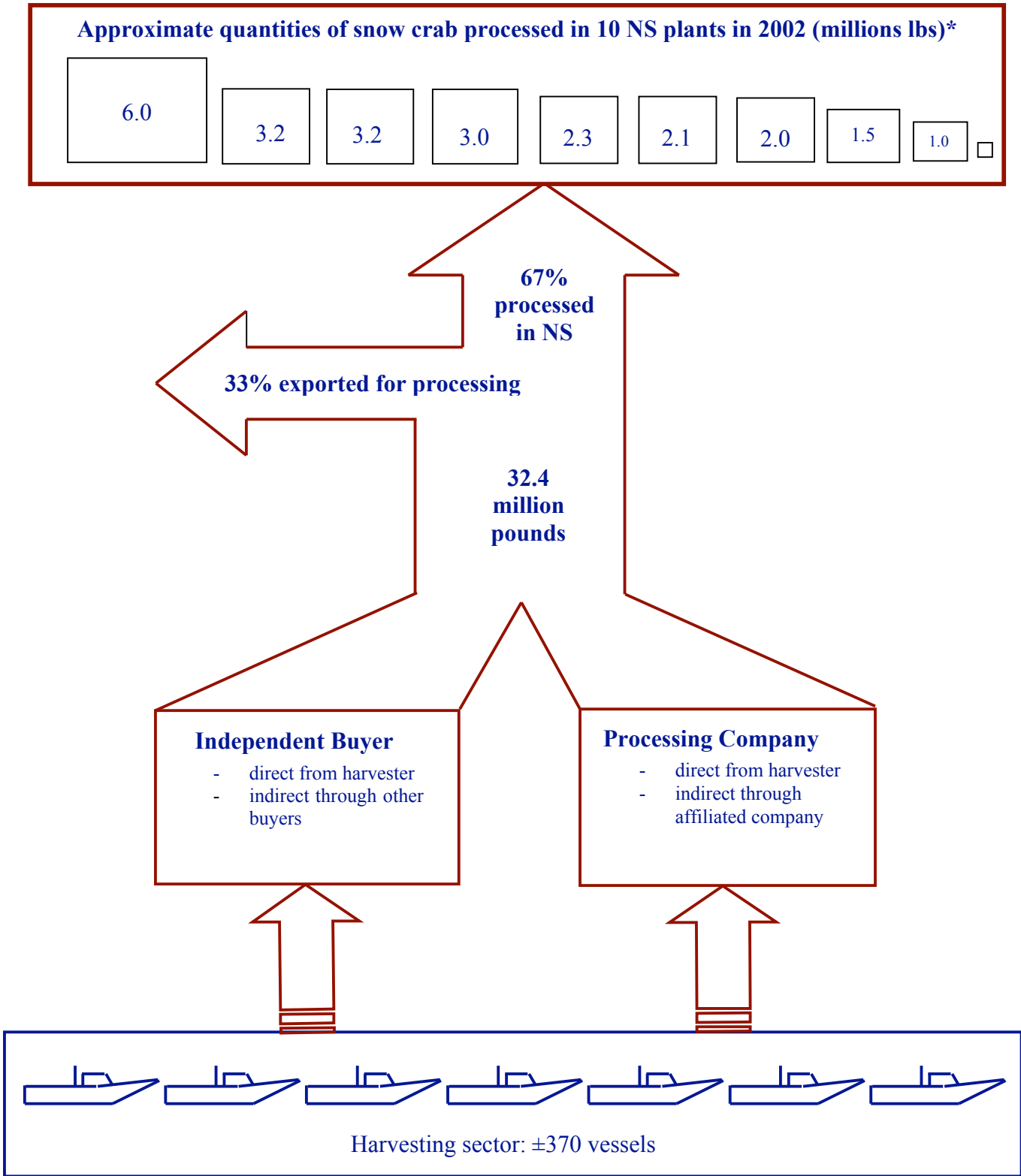
Price setting

The Nova Scotia snow crab industry conforms to the competitive model in a number of key ways. Industry concentration is low, meaning that no vessel (seller) or processor (buyer) *acting independently* would account for a sufficient share of the catch to be able to influence price. Formal and informal ties exist between vessels and processors/buyers, but this does not relieve the latter from paying the shore price. Even where crab has been sold, there is an understanding that the deal is not finally done until it is clear to the harvester that the price paid is in fact the shore price. Additional payments weeks after the initial transaction are not uncommon.

But if the industry conforms generally to the competitive model, it also departs from it in certain key ways. The structure of the fishing industry is such that there is a strong incentive for processors to try to avoid price competition when buying raw material. This is because they know that paying more for crab (or any other species) does not generally lead to increased supply for any individual plant, nor for the sector as a whole (because landings are quota-limited). As soon as one processor offers more, others are forced to pay the higher price or risk losing boats. Prices easily can be bid up to unprofitable levels resulting in a transfer of revenue from processors to vessels with no supply gain to any processor. There is generally a fair degree of stability in vessel-buyer relationships, but despite the strength of such arrangements, a failure to pay the shore price almost guarantees the vessel will go elsewhere.

Harvesters believe the processing sector acted in concert to hold prices down in 2000 and 2001. Whether this belief is well founded or not is not the subject of this report. But there is every reason for processors to attempt to limit price competition given circumstances in the industry. The key driver is processing capacity. It almost tripled between 1999 and 2001 as new companies entered the industry and some existing companies expanded. Competition could be expected to be aggressive, particularly against the backdrop of a long-standing buying presence by New Brunswick processors. How prices actually developed over the 1999-2002 period is analyzed in Chapter III.

Figure 1



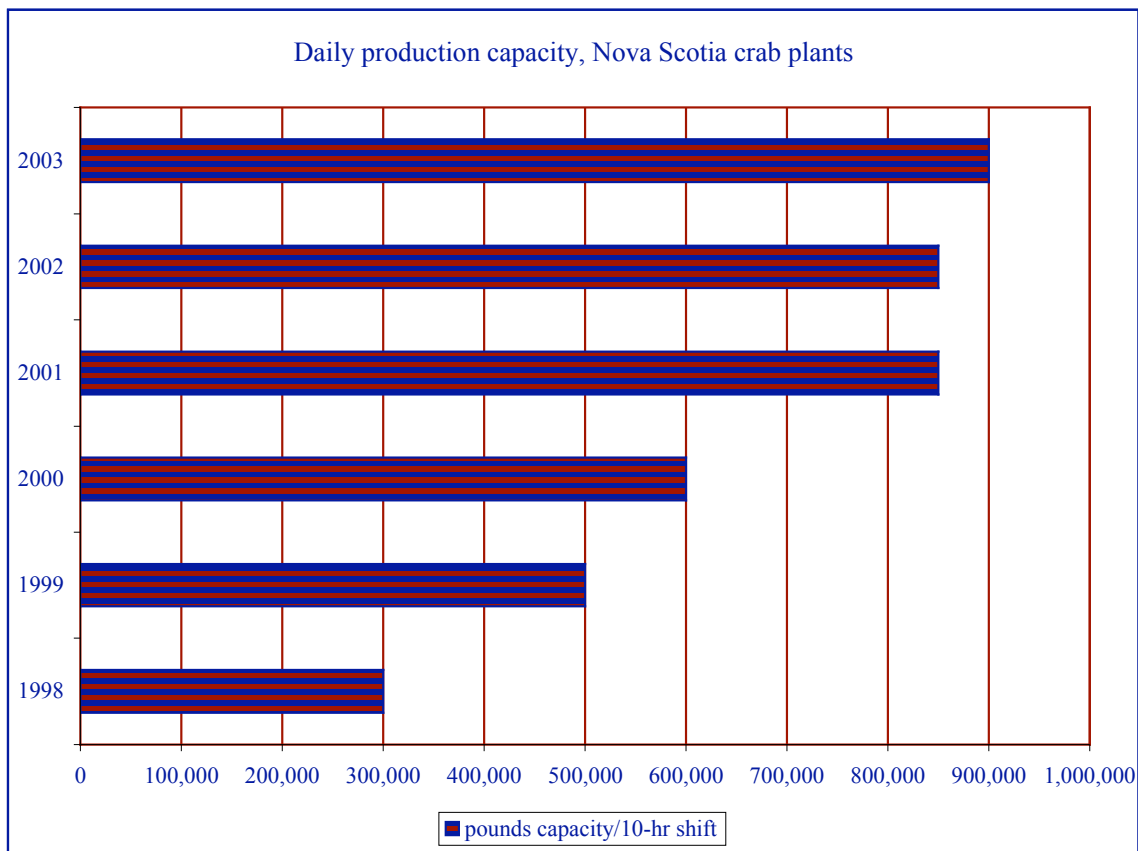
Note: Statistics from the Department of Agriculture and Fisheries indicate that 21.8 million pounds of crab were processed in NS in 2002. Data provided to the consultant by processors indicate 24.5 million pounds were processed. The source of the discrepancy is not clear.

Investment in processing capacity (adjusting demand)

By 2001, the processing sector had expanded to 10 active plants with a combined capacity of about 840,000 pounds per 10-hour shift. This is about triple the capacity in 1998 (Figure 2). A doubling of one plant's capacity in 2003 will bring the total to about 900,000 pounds per day. This throughput capacity assumes high quality crab requiring minimum cleaning before processing. Actual throughput would be less than this for most plants much of the time.

The plants in Nova Scotia appear to be capable of processing the daily landings from CFAs 18-24 on most days of the season. The relationship between daily landings and maximum capacity (single shift) in 2001 and 2002 is shown in Figure 3. In practice, most plants operated below their rated capacity because not all crab is of top quality. This results in increased cleaning time and reduced overall plant efficiency. While this means that effective capacity may be two-thirds or so of the technical maximum, by double shifting, most Nova Scotia processors could nonetheless handle the early season peak landings (assuming, of course, that any buying and logistical constraints were not an issue).

Figure 2



Source: Industry Interviews

*Includes only plants active in 2002

Crab fishing occurs over a 4-5 month period across CFAs 18-24, though landings and processing tend to be concentrated in a 6-8 week period from early-July to late August. Landings are concentrated in the first 2-3 weeks of the season in each CFA (mid-July to early August).

Despite individual quotas, harvesters fish much as though they were in a competitive fishery striving to maximize shares. The economic rationale for this is sound from the perspective of the individual vessel. Catch rates are high early in the season, resulting in fewer trips and lower operating costs. Also, many vessels are driven simply by financial pressures. Even EI rules provide an incentive to fish aggressively because qualification is based on income, not weeks worked.

Responding to this pattern of landings presents a major challenge for the processing sector. In most other industries, prices drop during periods of oversupply. This is not the case in the fishery, unless it is the final product market that is oversupplied (i.e, the US or Japan). Processors, therefore, do not have at their disposal a critical tool – price – to influence the rate at which raw material is supplied.

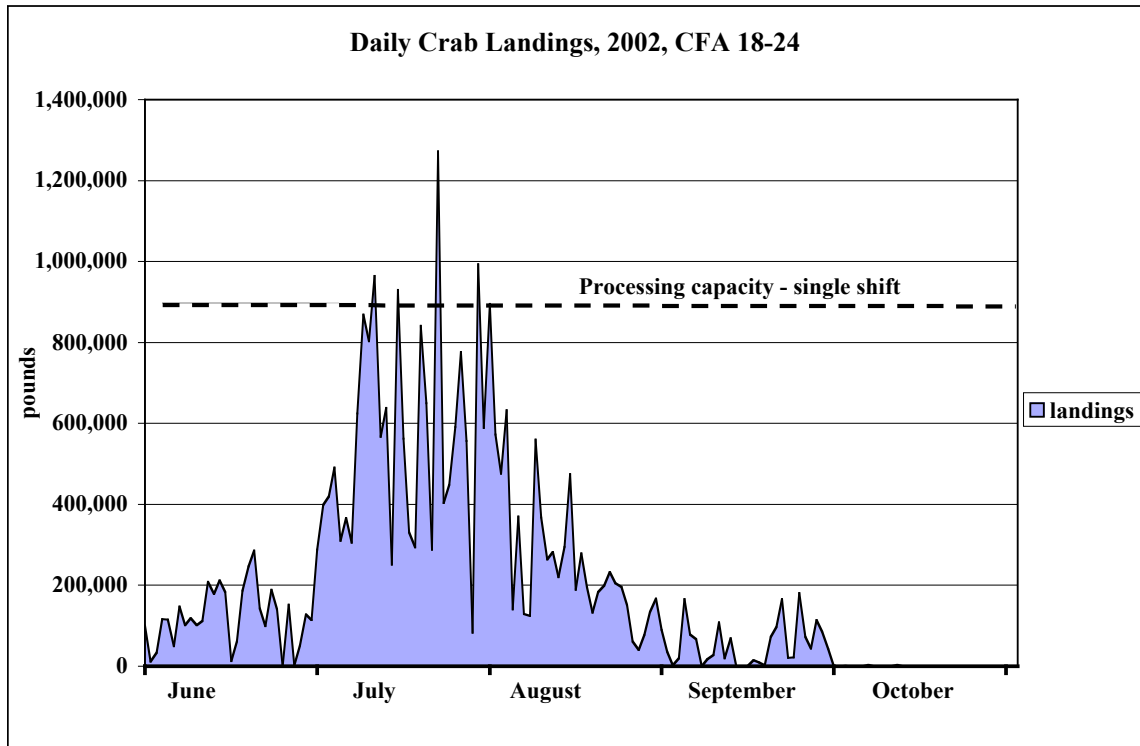
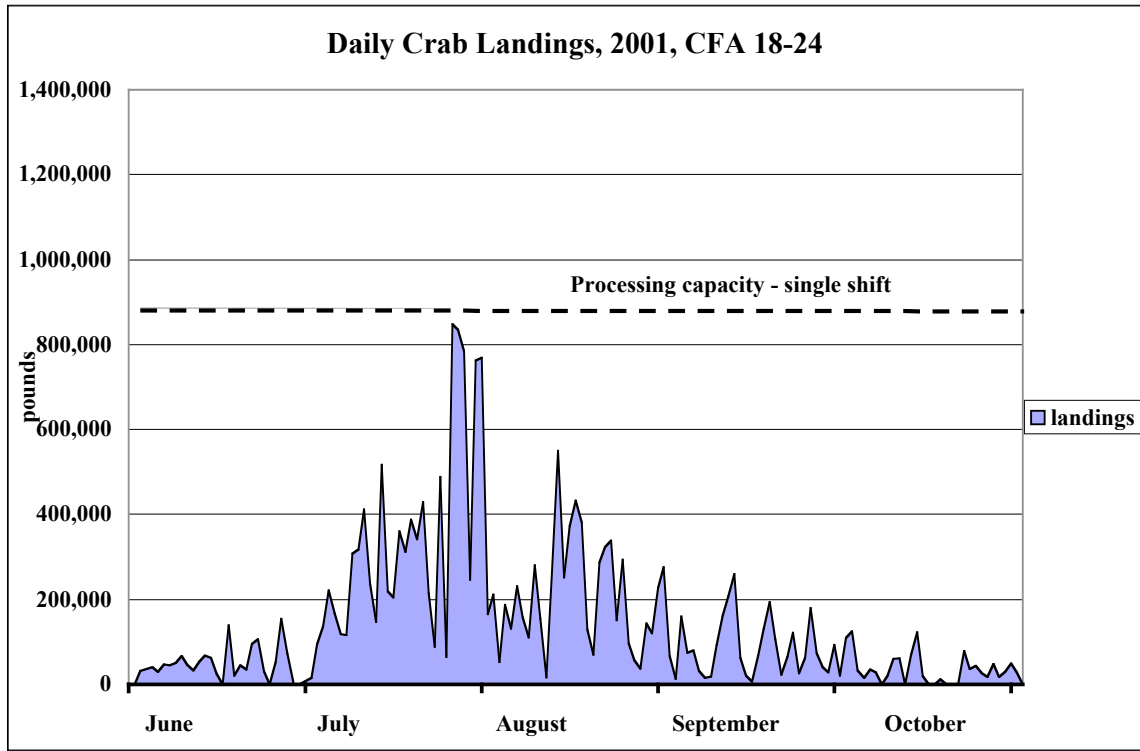
Only the Victoria Co-op is able to moderate the rate of supply through price (by paying less per pound for quantities exceeding a set amount). It manages this because its owner-suppliers have a direct stake in the plant's financial success. Other plants trying this would lose their boats to buyers prepared to pay the full shore price. Even this approach is only partially successful for the Co-op. It is forced to re-direct a substantial part of its early season buy to other plants because it cannot keep up with supply (because of a labour shortage the plant can only operate one shift).

Without price as a tool to moderate supply, plants have two options for dealing with the early season glut.

In the short run, they adjust in two ways. First, by double-shifting if possible (where there is an adequate work-force). All but two of the plants report they operate with two 10-hour shifts during the first week or two of the season. Second, by re-directing supply to other processors with available capacity. They will not turn boats away because they know they will lose them for the balance of the season (and possibly forever).

In the long run, they adjust by adding capacity. The processing sector does not optimize capacity on an industry-wide basis. Rather than continue to send over-supply to other plants, each processor is driven to expand to the level dictated by what it can buy from its own vessels. This means they operate at less than full capacity for much of the season (few plants operate more than 40-45 days).

Figure 3



Source: DFO, special tabulation

Crab exports

What seems clear from the relationship between industry capacity and peak landings is that capacity constraints are not responsible for the level of exports from the province. Three factors account for crab exports:

The long-standing relationships between harvesters, buyers and processors (particularly those in New Brunswick). As long as buyers and processors provide harvesters with good service and pay the shore price (and pay on time with no hassles), harvesters will stay with that buyer/processor. Simply because there is a plant in the community is not enough to cause harvesters to switch from a reliable, long-standing relationship. This is particularly the case if the local processor does not have a good reputation for paying the shore price or paying on time.

Aggressive buying tactics by new companies coupled with dissatisfaction with existing buyers/processors. Many of the harvesters interviewed switched buyers in 2001-2002 because they experienced poor treatment. Generally this took the form of broken promises on price and payment arrangements. There seems to be little question that the success some buyers enjoyed in inducing boats away from their previous arrangements is attributable also to higher prices. These prices are not always paid openly, since this would mean paying all vessels the same price. This would be costly to the buyer since the extra cents/lb often comes out of the commission.

The timing of the crab season in Nova Scotia favours New Brunswick and Newfoundland processors. This is in part because the seasons there are over and plants have covered overhead costs, allowing them to compete aggressively (pay as much or more) for raw material in Nova Scotia.

For Newfoundland processors, there would also appear to be an overall cost advantage. In most years (including 2001 and 2002) they pay less per pound for crab in Newfoundland than the shore price in Nova Scotia (e.g., in 2002, harvesters were paid upwards of \$2.40/lb in Nova Scotia, vs. \$1.80 in Newfoundland, plus any bonus payments). This means that their blended overall final product cost (including the additional \pm \$0.15/lb for transportation to and from Newfoundland) for all product sold would be below that of Nova Scotia processors selling into the same markets.

It makes good business sense to import raw material as long as this cost advantage holds and no other lower cost options are available. One of these options is to process in a Nova Scotia plant if the unit processing costs are less than the processing costs in Newfoundland plus the additional transportation costs. It would appear that the company accounting for most of the shipments to Newfoundland in 2002 has made the economics of this option work. Starting in 2003, that company's purchases will be processed by a Nova Scotia company.

Crab imports

Nova Scotia processors import little or no crab from other provinces. There are two main reasons for this. Exports of raw crab are prohibited from Newfoundland and Quebec, leaving only New Brunswick and PEI as potential sources. Crab processing is well established in New Brunswick in particular, with strong buyer-harvester relationships. Breaking into this market would be difficult for Nova Scotia companies, and judging from the interviews, most do not consider this a viable option.

2. *Financial Performance*

Overview

Each of the enterprises in the crab industry must cover its fixed and variable costs if it is to survive in the long run. Ideally, it would earn a profit over and above these costs, enabling growth and further investment. It is possible to survive in the short run by simply covering variable operating costs, but obviously this cannot continue for long. Those who have provided loans for vessels, plant and equipment need to be repaid.

The terms of reference for this study asked that information be compiled on key operating costs for each of the sectors: harvesting, buying and processing. None of the sectors was willing to provide the full range of information requested. Nonetheless, sufficient information was obtained to allow an indicative analysis of the industry performance.

Harvesting

Harvesters provided representative information on gear, fuel, bait and crew sharing arrangements. The latter varies widely across fleets, and consequently it is difficult to draw any reliable conclusions about what constitutes the norm. Crew share tends to be the largest element of variable costs. Information provided by individuals was augmented by cost and earnings studies prepared by two organizations and shared with the consultant.

Economic conditions for crab harvesters have improved substantially over the past 4-5 years in all areas except CFA18. Compared with conditions in the late 1980s, landings are up 3-5 fold in CFAs 19-22, and up 20-fold in CFAs 23-24. By contrast, landings are down by two-thirds in CFA 18. Landings by CFA are given in Table 4.

Landed value kept pace with landings for most of the period, lagging or leading at times due to price variation. Landings and landed value, 1986-2002, are shown in Figure 4.

Prices weakened during the early 1990s as global supply from all sources (Alaska, Russia, Japan and Canada) outstripped demand.

With quota cuts in the Alaskan fishery in the mid-1990s, prices increased sharply, resulting in higher prices and rapid revenue growth in Atlantic Canada despite lower landings.

A reversal of these factors caused prices to drop in the late 1990s, resulting in a decline in landed value from the peak in 1995.

Landings increased sharply in 2000, reaching a plateau of 14,000 tonnes. Landed value kept pace, then jumped in 2002 as the shore price rose from the \$2.00 to \$2.50-2.85/lb range.

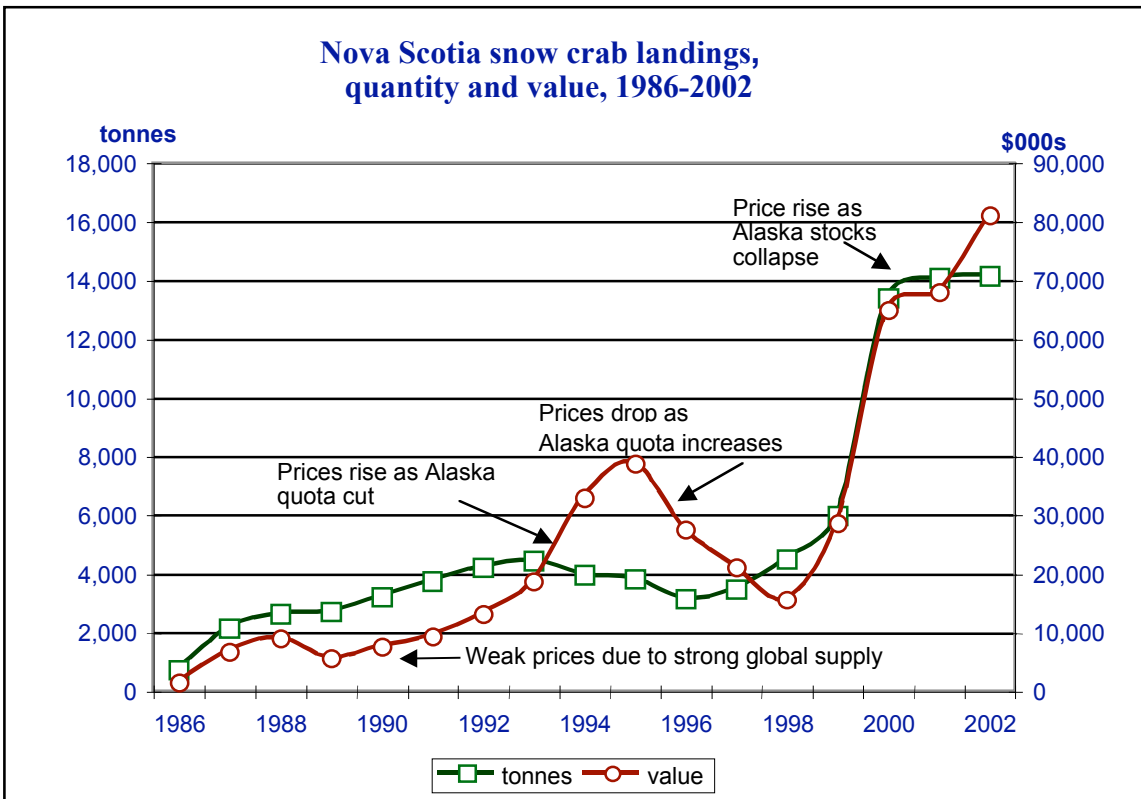
Though economic conditions for crab harvesters are favourable at present, it is important to bear in mind that it was not always so, and could change overnight if the resource declines or markets weaken.

Table 4
Snow Crab Landings by CFA, tonnes live weight

| CFA | 18 | 19 | 20 | 21 | 22 | 23 | 24 | Total |
|------|-----|-------|-----|-----|-----|-------|-------|--------|
| 1986 | 618 | n.a. | 0 | 7 | 18 | 49 | 49 | 741 |
| 1987 | 626 | 1,151 | 1 | 56 | 63 | 157 | 84 | 2,138 |
| 1988 | 669 | 1,337 | 17 | 125 | 114 | 207 | 163 | 2,632 |
| 1989 | 669 | 1,334 | 8 | 154 | 93 | 243 | 201 | 2,702 |
| 1990 | 662 | 1,333 | 5 | 167 | 119 | 386 | 543 | 3,215 |
| 1991 | 855 | 1,337 | 14 | 157 | 183 | 528 | 682 | 3,756 |
| 1992 | 741 | 1,678 | 18 | 196 | 240 | 595 | 743 | 4,211 |
| 1993 | 748 | 1,678 | 20 | 168 | 390 | 770 | 662 | 4,436 |
| 1994 | 734 | 1,672 | 29 | 107 | 259 | 497 | 682 | 3,980 |
| 1995 | 693 | 1,575 | 44 | 100 | 284 | 576 | 550 | 3,822 |
| 1996 | 306 | 1,342 | 43 | 136 | 189 | 564 | 560 | 3,140 |
| 1997 | 406 | 1,386 | 45 | 146 | 343 | 592 | 565 | 3,483 |
| 1998 | 289 | 1,988 | 45 | 216 | 396 | 813 | 745 | 4,492 |
| 1999 | 407 | 1,979 | 90 | 291 | 518 | 1,300 | 1,400 | 5,985 |
| 2000 | 472 | 3,225 | 118 | 364 | 535 | 4,401 | 4,300 | 13,415 |
| 2001 | 251 | 3,910 | 117 | 363 | 586 | 4,805 | 4,043 | 14,075 |
| 2002 | 487 | 3,279 | 100 | 547 | 773 | 4,673 | 4,298 | 14,157 |

Source: DFO

Figure 4



Source: DFO

Buying

Buyers provided limited financial information about their operations other than labour costs (\$9.00 -10.00/hour) and their basis of payment (\$0.30-0.35/lb). Their operations tend to be fairly similar in nature (dominated by unit labour and trucking costs), though they differ widely in scope. The largest buyers account for 4-5 million pounds; the smallest for less than 100,000 pounds.

The buyer in the crab industry is a key link in the chain of value from harvester to processor. Buyers are not “middlemen” as some would believe, simply buying and selling opportunistically without adding value. They are in a sense an extension of the processing sector, providing such specialized services as delivering bait and ice, unloading vessels, loading trucks, cleaning boats, arranging and paying monitors and observers, paying vessels, settling crew shares, and providing loans and financing.

For their services, buyers are paid a flat fee. A fee of \$0.30/lb seems to be standard among buyers, though some suggest that others may be receiving \$0.35 or more and using part of the fee to augment the price paid for crab where this is necessary to attract vessels. In cases where other harvesters hear about these higher prices, they go back to their buyer and demand a retroactive bump up in the price for crab already sold.

Buyers, though independent, tend to have long-term arrangements with particular processors. The relationship is built up over years and requires a considerable level of trust to survive. Many processors hold the buying function outside their companies because experience indicates that the uniqueness of the relationship between buyers and harvesters is not one they can easily duplicate.

Processing

Processors provided information on key operating cost items such as raw material, labour, transportation, cooking/freezing costs and plant overheads. Plants use the same technology (mainly brine freezing) to produce the same product (crab sections for the US market) and consequently operate within a narrow variable cost range. There is some variation in yield from plant to plant (ranging from 60-64%), and also in degree of automation. This accounts for differences in labour content and costs per packed up pound.

Processors are supply driven, buying what they can when they can through the season. Through their buyer network, they would have a good idea of the total quantity of crab they are likely to process for the season. But they tend to have little or no control over the day-to-day quantity, quality and timing of the raw material supply. This is in the hands of harvesters and buyers.

They pay the shore price for raw material, even if the price from time to time exceeds the level allowing profitable operations. This arises from destructive competition in the face of excess processing capacity. They are also subject to prices paid by competitors outside the province who may be in a position to bid up prices because of more favourable operating circumstances.

Most processors pay their suppliers (buyers/vessels) on a weekly or bi-weekly basis. In order to maintain cash flow, all production is shipped and sold immediately. There is little or no opportunity to play the market to try to take advantage of any September-October price increases.

Where the money goes

Each dollar of final product sales is divided among processors, buyers and harvesters according to the competitive position each holds in the industry. The price received must cover operating and fixed costs, as well as a return on investment. Operating costs tend to be fairly uniform on a per unit (pound) basis for the processing and buying components of the industry, but can vary widely for harvesters because of differences in how crews are paid, and because of differences in operating conditions among CFAs.

Annual fixed costs vary widely within each component, depending on the scale of operations and the level of capitalization. For example, there are differences in the age and cost of equipment in processing plants. Similarly, some harvesters carry hundreds of thousands of dollars on their books reflecting investments in new vessels and crab licences. Others operate 20-year old boats and hold licences that cost \$35.00. Without conducting a detailed cost and earnings study for each CFA it is impossible to draw any meaningful conclusions about financial requirements to cover fixed costs.

The focus of the analysis is on operating costs. The details of where the money goes are summarized in Figure 5. It breaks down the industry into its three main components, showing how, at each stage, revenue is allocated to costs on a per pound basis.

The dollar amounts in Figure 5 are broadly indicative of what went on in the industry in 2002. They are not intended to be read as definitive, and nor are they intended to represent the circumstances facing any particular company or CFA fleet. The results presented will vary from year to year depending mainly on the level of and relationship between market prices and shore prices.

Processing

The financial circumstances facing processors are straightforward. They are price-takers in product markets. This means they have no control over prices for crab in the US or Japan. In 2002, the market price for finished product (sections) ranged between US\$3.35 and \$3.65/lb (depending on size), averaging about \$3.50/lb during the July-August season (at prevailing exchange rates in 2002, this converted to a Canadian dollar price of \$5.40/lb).

All variable costs have to be covered out of the selling price, with any surplus directed to fixed costs and profit. In 2002, processors paid anywhere from \$2.50 to \$3.15/lb for crab depending on CFA and whether they were buying directly from vessels or buyers. Information compiled in interviews suggests that the prices typically fell in the \$2.85-3.15/lb range. This includes buyer commission.

Raw crab loses at least 36% of its weight during processing (assuming section production). When this loss is added to cost, it means processors are effectively paying \$4.45-4.90/lb for raw material. Added to this are operating costs, falling in the \$0.70-0.85 range. Given a market price in the \$5.30-5.75 range, the contribution to fixed costs and profit is then anywhere from \$0.00 to 0.10/lb.

Buying

The buyer's \$0.30/lb commission covers all operating costs, with any surplus going to fixed costs and profit. We received no operating cost information from buyers, so are unable to provide a cost breakdown. Anecdotal information suggests buyers earn a margin in the range of \$0.05/lb after fixed and variable costs are covered.

Harvesting

Given the very wide variation in revenue potential and operating conditions facing fleets and vessels within fleets, no attempt is made to present industry or CFA averages. The information in Figure 5 simply illustrates the revenue and cost profile of two typical vessels, one with a 40,000 lb quota (indicative of permanent licence-holders in CFAs 20-22), and the other with a 160,000 quota (indicative of permanent licence-holders in CFAs 23-24). CFAs 18 and 19 are somewhere in between, as are vessels harvesting the temporary allocations.

The results show that at quota levels and prices prevailing in 2002, vessels would have covered operating costs and produced a surplus ranging from \$0.55 to \$0.89/lb to cover fixed costs and profit. Without knowing more about the capital structures of the enterprises, it is impossible to comment on the attractiveness of these margins.

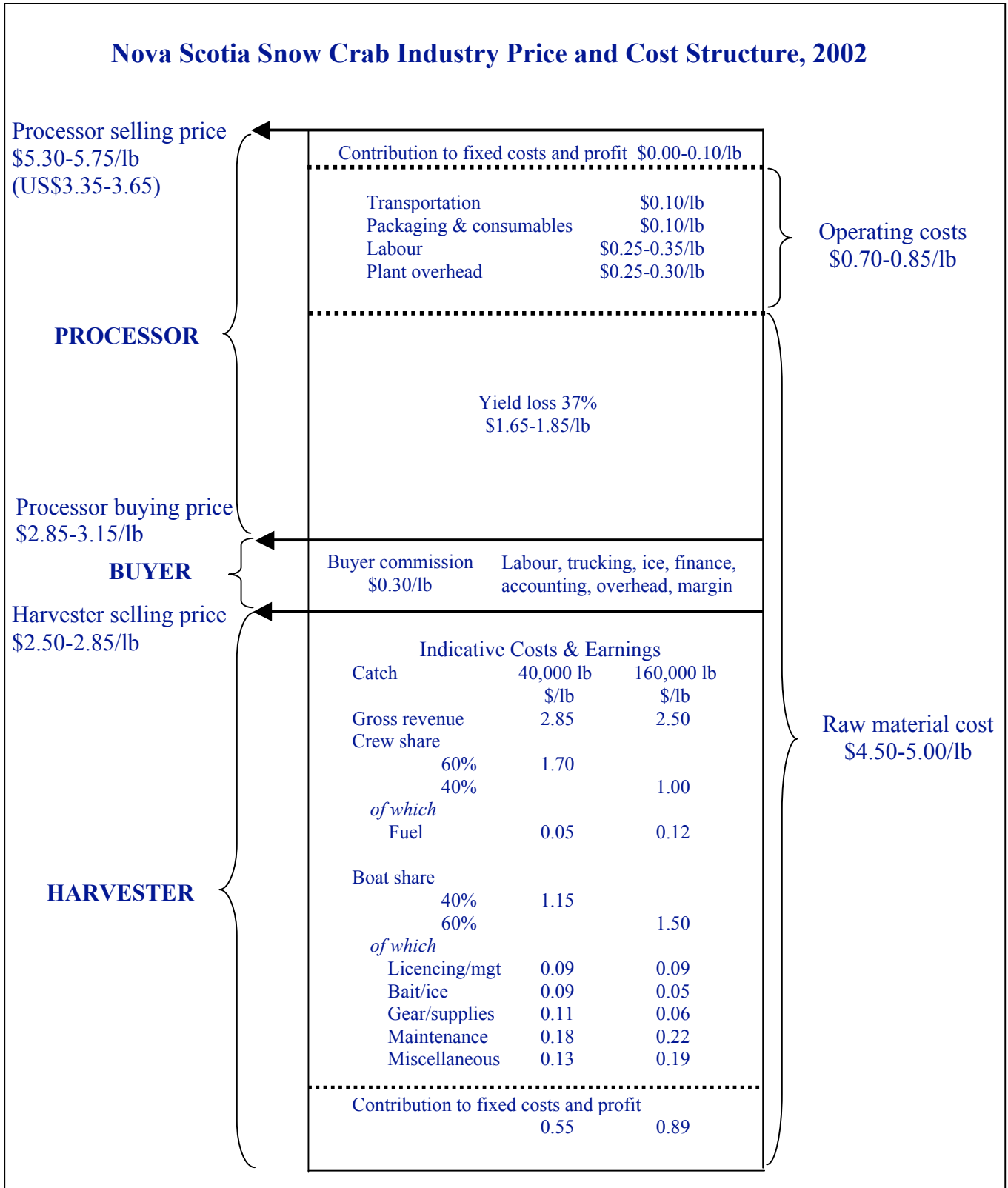
Some perspective on relative contributions to capital

If the respective financial pictures shown for the processing and harvesting sectors in Figure 5 provide even a rough approximation of operating conditions, then they indicate a wide difference in net revenue per pound. Two points are needed to put the difference in perspective.

Processors are able to rely on greater volumes to cover fixed costs and returns. The average processor in Nova Scotia produced over two million pounds of product in 2002. If the contribution margin were \$0.10/lb, this means a total contribution of \$200,000. For the vessels in Figure 5, the corresponding contribution margins would be \$22,000 and \$142,400.

The margin for vessels holding quota in the 160,000lb range may be considered substantial compared with the processor, though it is important to keep the respective levels of capitalization in perspective. Investment in the equipment for a 6,000lb/hour processing plant falls in the \$1.5-2.5 million range. This is not too different from the investment required to enter the crab harvesting sector in CFAs 23 and 24. A licence would cost in the range of \$800,000 to 1,000,000, and the vessel another \$500,000-800,000. The difference, of course, is that the vessel has substantially fewer units of output (pounds of crab) on which a margin can be earned to cover these costs. Granted, few, if any, harvesting enterprises currently in the fleets are capitalized to this extreme. But as vessels age and current licence-holders sell out, these are the costs that enterprises would be carrying.

Figure 5



III.

Prices and Economic Impact

1. *Price Formation*

Overview

Transactions between harvesters and buyers are the first link in the chain of market operations required to move snow crab from the ocean to final consumers. The ultimate aim is to satisfy consumer demand. It is with the consumer that price formation starts. Consumers are generally prepared to pay only so much for a particular product. When it goes higher, they look for substitutes. For example, there is a limit on how much a restaurant can charge for crab before they take it off the menu and substitute shrimp.

Prices are determined through the bargaining that takes place between buyers and sellers at each trade level: e.g., restaurants and wholesalers, wholesalers and processors, and processors, buyers and harvesters. Each participant is trying to maximize their income given the demand and supply conditions. The end result is a supply of crab at prices consumers are willing to pay.

Price and non-price payments

Setting fish prices in the Atlantic fisheries is nothing if not complex. In few instances does price setting conform to a textbook example of a simple bargaining process between a harvester (seller) and a processor (buyer). And in few instances is the price of fish the *only* element of the bargain struck. The revenue received for fish is usually composed of several elements, each with its own rationale. In addition to price, processors usually also provide a range of services, as well as side payments and financial assistance. Which vessels receive how much and in what form is ultimately a question of relative bargaining strength.

The system of prices, services, subsidies and side payments may strike the outside observer as odd, given that price tends to be the *only* factor mediating supply and demand in most industries. But the complexity of the system has a solid logic having to do with securing raw material supply in a sector where plant ownership of vessels (vertical integration) is officially prohibited (though quota ownership by plants is growing) and where excess processing capacity is pervasive.

Excess processing capacity leads to a familiar situation in the Atlantic fisheries: supply-driven competition – processors competing aggressively for raw material and paying prices resulting in zero or negative margins after operating costs. This cannot continue in the long run because companies go bankrupt.

The on-going challenge facing processors is to secure supply without engaging in destructive price competition. It is considered destructive by processors because, when price is the only consideration, the net result is a transfer of revenue from the processing to the harvesting sector without increasing overall crab supply or appreciably altering its distribution among plants.

The strategy most commonly used to attract and retain vessels is to provide a range of services and subsidies (loyalty payments). These are provided to secure a commitment from the vessel owner to deliver all crab caught to a particular plant. This does not relieve the processor from paying the going shore price, but it does mean that price is not used as the *exclusive* basis of competition for raw material.

Prices from plate to wharf

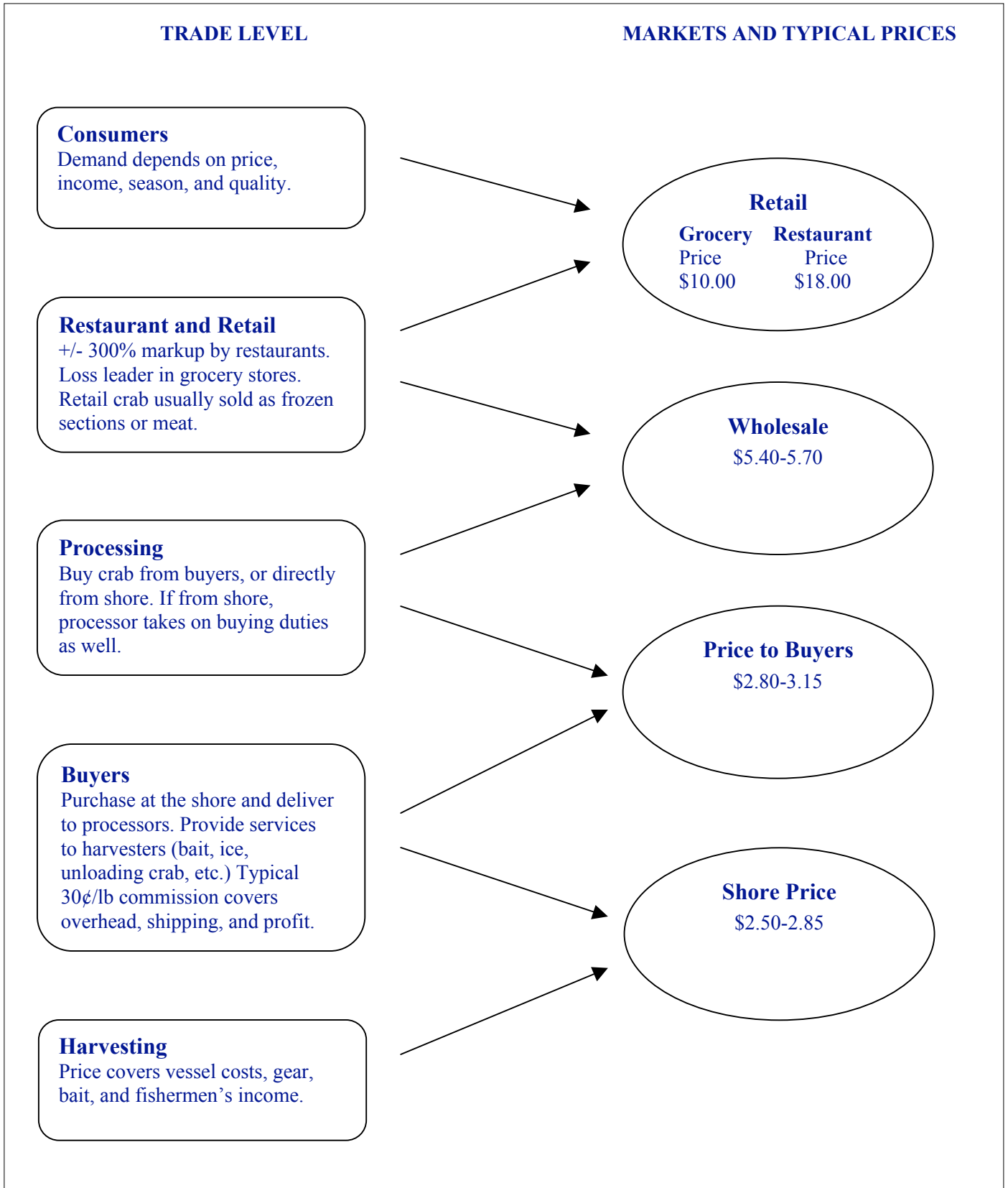
The crab section packed in a box in Neil's Harbour or Louisbourg ends up on a plate in Boston selling for US\$12.00. That is about CDN\$18.00/lb. The harvester receives about \$2.50/lb. Many harvesters wonder what goes on between the wharf and the plate and why they end up with such an apparently small share of the final product price.

The answer is illustrated in Figure 6. It shows price development at major points in the market chain. Price starts at the point of final demand. For snow crab, this is mostly in restaurants. Restaurant owners charge what they believe the market will bear for each of their meals. They know consumers have choices, so in pricing a product, they take into consideration not only the value of that product (in this case crab), but also potential substitutes such as shrimp and lobster. So, there is a ceiling above which restaurants know they will encounter consumer resistance. Market experts suggest this would occur at a wholesale price in the US\$4.00/lb range (the market is operating in this range in May 2003).

Restaurants typically charge a 300% mark-up on food to cover operating costs and overheads. When applied to crab, this determines how much they are prepared to pay wholesalers for the product. Wholesalers compete for this business, sourcing crab at lowest prices possible from Atlantic Canada and Alaska. They in turn require a margin and this determines their bargaining range with processors. Competition among processors to satisfy wholesale demand establishes prices at the wholesale level. Essentially, processors in Atlantic Canada are price takers in this market. Processors have their own operating costs to cover, as well as the need to earn a margin to cover fixed costs and profit. These needs determine the room they have to negotiate in establishing a price with harvesters. And so, market demand reaches the wharf.

Stripping away the detail, independent fishermen and processors are locked in an on-going battle over what is referred to as the competitive margin on final product revenues. Each sector is trying to maximize its share subject only to the constraint that the other must be kept viable in the long run (you don't want to kill the cow you are trying to milk). Where the balance lies in any particular case will depend on relative bargaining strength, which depends on several factors including knowledge of market conditions.

Figure 6



Sharing final product revenues

The implications of this may best be understood by showing in simplified terms (Figure 7) how a dollar of final product revenue is divided between the harvesting and processing sectors under different competitive conditions. In all cases, total revenue is fixed in the short run. This means that product prices (crab sections) are determined by supply and demand in external markets and no domestic processor is sufficiently large to have any influence over these prices.

Diagram A shows circumstances where the bargaining strength of the harvesting and processing sectors is equal. Enterprises in both sectors are covering fixed and variable costs and earning normal profits. Note that revenues earned by the harvesting sector are the processing sector's raw material costs. These costs represent the largest part of processing sector operating costs (see Figure 5 in Chapter II).

Diagram B shows conditions where the harvesting sector has relatively greater bargaining strength (a seller's market). This could be due to intense competition among processors due to over-capitalization, or to collective action by fishermen to set prices (where processors act individually). This ordinarily translates to higher landed prices and hence higher harvesting sector revenues (and net returns). The higher these revenues are, the higher the processing sector's raw material costs. With final product revenues fixed in external markets, higher raw material costs mean lower margins as indicated.

Diagram C shows conditions where the processing sector has relatively greater bargaining strength (a buyer's market). This could be due to limitations on competition for raw material arising from entry restrictions or to a concentration of buying power in the hands of a few processors. This ordinarily translates to lower landed prices and hence lower harvesting sector revenues (and net returns to fishermen). It also means higher margins for processors (other things equal).

Shore prices: 1999-2002

The relationship between the wholesale and shore prices indicates that the respective bargaining strengths of processors and harvesters shifted over the 1999-2002 period. This period was selected for analysis because the starting point corresponds to the emergence of the Nova Scotia processing sector as we know it today, and also because 1999 marks the emergence of the US as the dominant market for Canadian crab (hence justifying the use of the US wholesale price).

The changing competitive position is illustrated in Figure 8, first showing the market and shore prices in dollar terms, and second showing the shore price as a percentage of the wholesale market price. Note that the prices are expressed in terms of landed weight, i.e., before yield losses. This allows a direct comparison to be made between the harvester and processor shares of final product price.

Figure 8 indicates that the shore price moved between about 50 and 80% of the market price over the period. It should be noted that in the abstract there is no single price relationship that can be said to be the "correct" one. All we can do is compare results over time to see where the bargaining range lies.

Figure 7

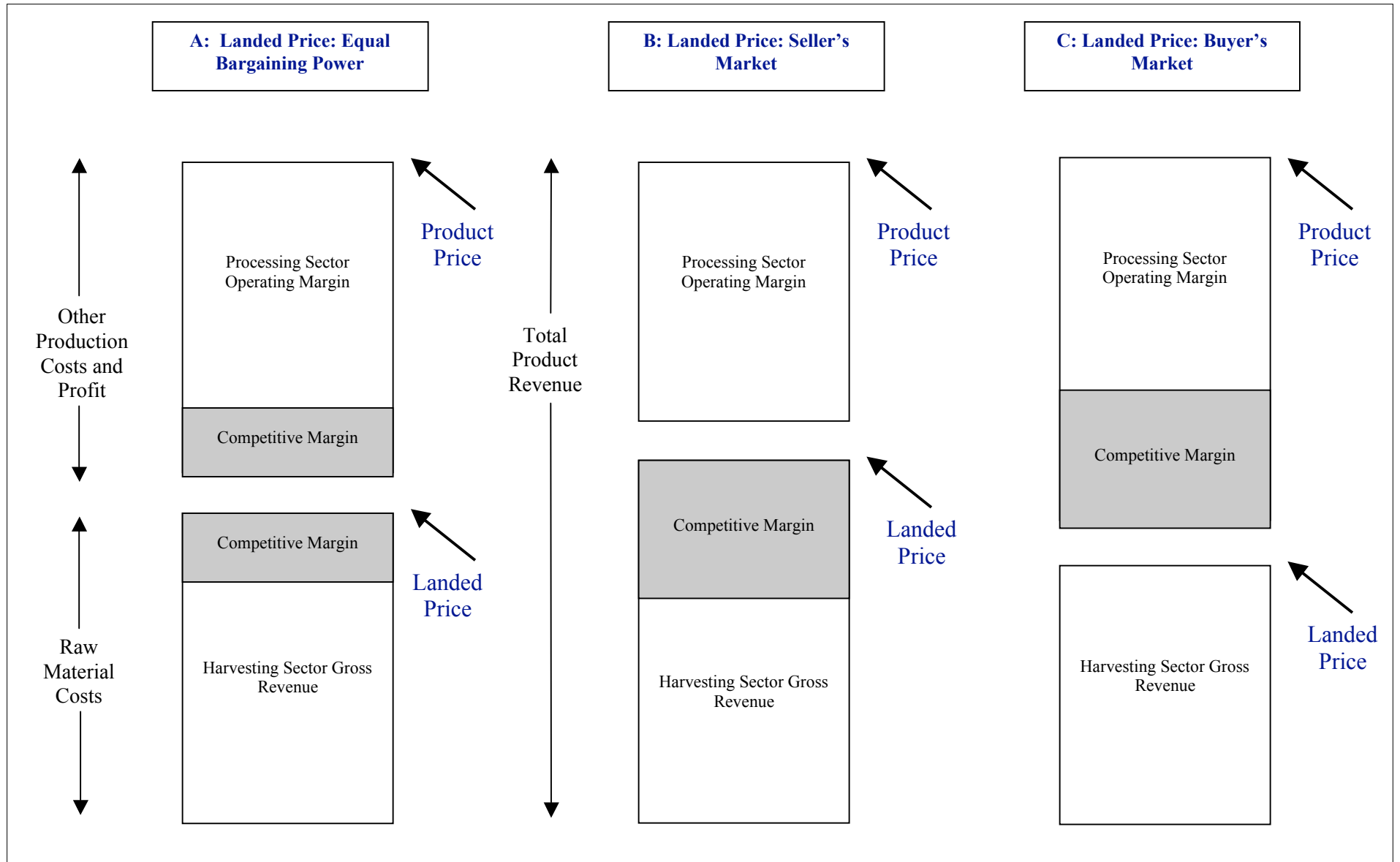
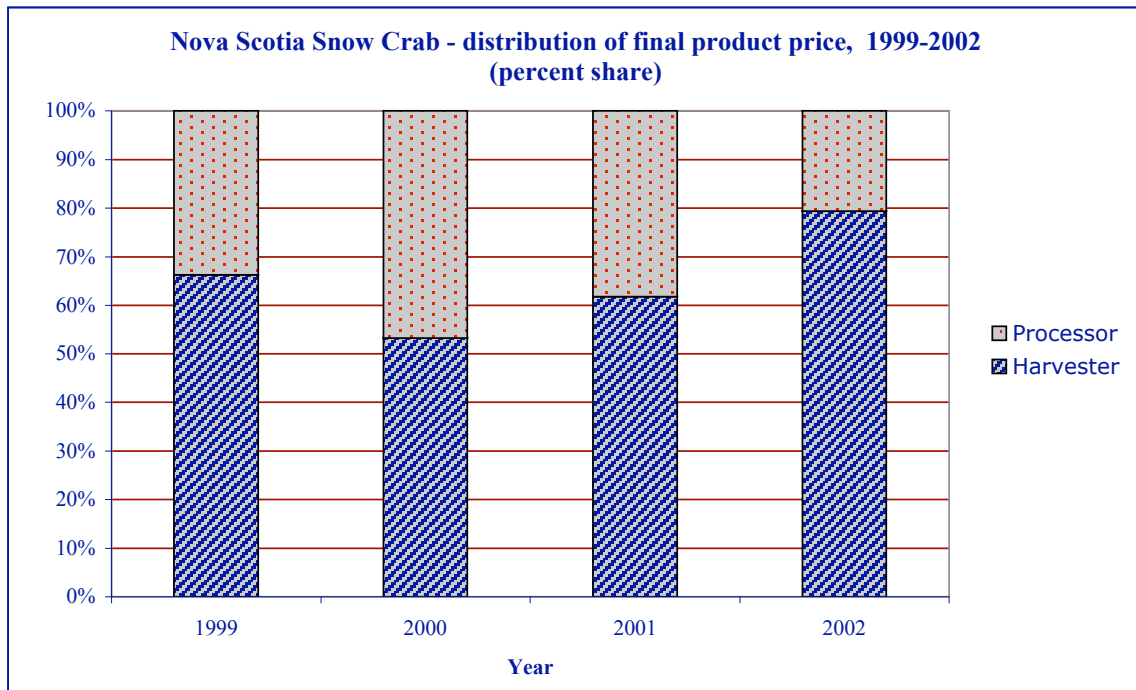
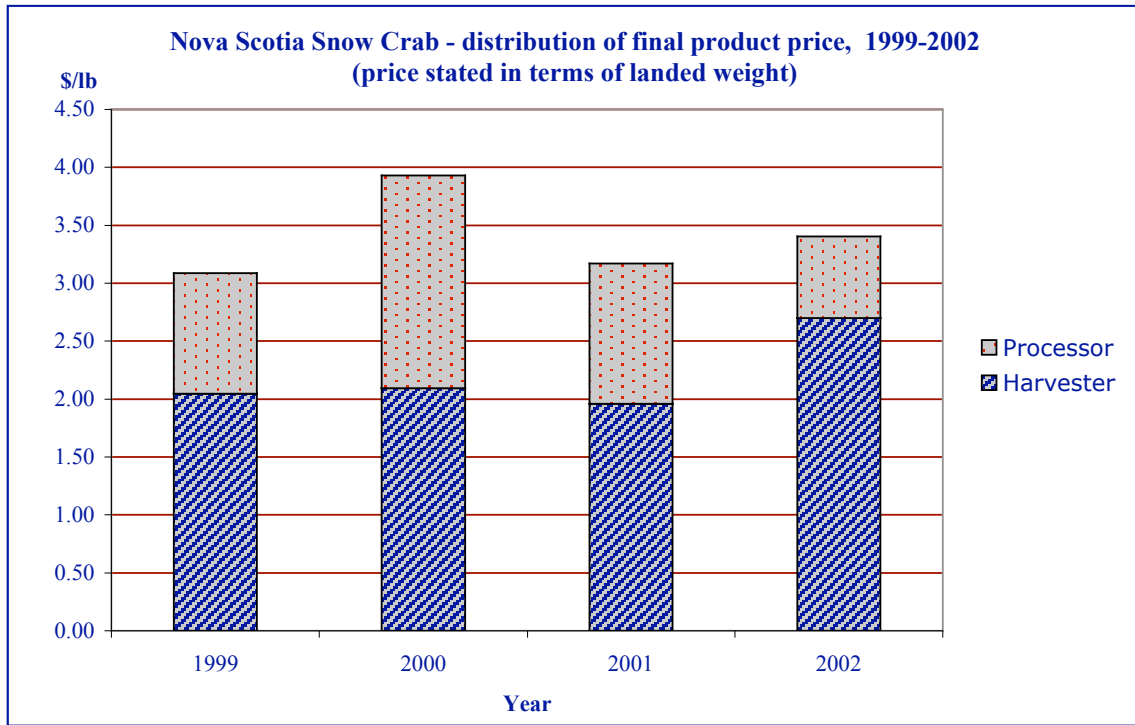


Figure 8



Source: Shore prices from interviews; market price from Uner Barry; *Seafood Prices 2003*

Comparing the relative shares of the wholesale price over the period suggests:

1999: bargaining strength seems to have been fairly balanced, with the share of market price (67%) at a mid-point between the extremes in 2000 and 2002;

2000-2001: bargaining strength shifted in favour of processors, with the shore price dropping to 52-62% of the market price;

2002: bargaining strength shifted in favour of harvesters in 2002, with the shore price rising to just under 80% of the market price.

The structure of the crab industry changed over this period and this helps to explain the shifts in relative prices.

Industry concentration effectively increased between 1999 and 2001. Even though the number of processing companies grew after 1999, and despite a market price exceeding \$6.00/lb in 2000, processors were successful in holding the shore price to the \$2.00/lb range. Harvesters attribute this to successful collusion on the part of processors (the “cartel” as many of those interviewed described the group).

Competition intensified sharply in 2002. Whatever control processors were able to exert between 2000 and 2001 disappeared in 2002. This happened for three reasons: more aggressive buying by independent buyers representing out of province processors; harvesting organizations emerged to negotiate prices collectively with buyers/processors; and in the face of these factors, processors engaged in supply-driven competition.

2. *Economic Impact*

Approach

The snow crab harvesting and processing sectors have grown to become integral parts of the provincial economy. In 2002, the industry generated about \$103 million in total value. The harvesting sector accounted for about \$81.1 million (value of landings), buyers for as much as \$9.4 million (assuming most of the crab were sold through buyers and only a small percentage directly to processors), and the processing sector about \$12.3 million (the additional value added to the 21.7 million pounds of crab processed in the province). The derivation of these figures using industry averages is shown in Table 5.

Estimating the full economic impact of crab harvesting and processing is a matter of determining how production expenditures are likely to affect the broader economy. In this case, we use employment, income (GDP) and government revenues as the main indicators. The full economic value of the industry is measured by the sum of the direct, indirect and induced impacts resulting from expenditures needed to produce the total value of \$103 million in 2002 (this includes harvesting, buying, processing, and all related industries).

Table 5
Estimated Value of the Nova Scotia Crab Industry, 2002

| Activity | Value (\$000) |
|-----------------------------------|-------------------|
| Harvesting | |
| landings (000 lb) | 31,200.00 |
| price (\$/lb) | 2.60 |
| value | 81,120.00 |
| Buying | |
| landings (000 lb) | 31,200.00 |
| commission (\$/lb) | 0.30 |
| value | 9,360.00 |
| Processing | |
| landings (000 lb) | 31,200.00 |
| processed in NS (000 lb) | 21,796.00 |
| yield | 0.63 |
| product weight (000 lb) | 13,731.48 |
| selling price (\$/lb) | 5.50 |
| revenue (\$000) | 75,523.14 |
| cost of raw material (\$000) | 63,208.40 |
| net revenue | 12,314.74 |
| value | 12,314.74 |
| Total value to Nova Scotia | 102,794.74 |

Source: DFO; Nova Scotia Department of Agriculture and Fisheries; industry interviews

Note: Cost of raw material reflects what processors paid for crab including the buyer's commission (i.e., \$2.90/lb).

Direct Impacts – arise from the expenditures made in carrying out the activity in question. In this case, both harvesting and processing (and buying) crab are considered separately even though they are an integrated industry from an economic perspective.

Indirect Impacts – arise from the linkages into the broader economy. Fishing for bait, cage manufacturing, making ice, vessel construction and maintenance, and supplying processing plants with materials are all examples of indirect activities. As the snow crab industry demands these inputs, suppliers have to increase their output to meet the demand. This in turn leads to an increase in activity in industries supplying the goods and services needed to produce these items, and so on.

Induced Impacts – result from the spending and re-spending of incomes earned in the sectors that expand to meet direct and indirect demand. For example, harvesters, processors, and workers in linked industries spend their incomes on a broad range of things such as food, clothing, entertainment, etc. These expenditures help to support retail businesses that, in turn, pay wages that are spent and re-spent, and so on.

Direct impacts

Direct employment in crab harvesting sector is approximately 1,295 persons (based on 370 vessels and an average crew size of 3.5). The harvesting sector generates about \$64 million in direct GDP (gross domestic product). The processing sector provides work for 800-1,000 persons (jobs in the processing sector typically last 6-10 weeks). Processing generates a GDP impact of about \$17 million. These impacts are summarized in Table 6.

Indirect and multiplier impacts

The industry also creates strong backward and forward linkages to the broader economy, thereby generating substantial employment and income in supporting industries in the province. Among the key backward linkages are vessel and gear construction, transportation and maintenance, and vessel/vehicle servicing. Key forward linkages are to marketing and transportation.

Overall impacts are estimated by running industry expenditures through an Input-Output Model. The results indicate that the equivalent of 410 full-time jobs are created elsewhere in the economy by the harvesting sector, and equivalent of about 106 full-time jobs by the processing sector. The harvesting and processing industries generate \$116 million in GDP, and \$27 million in tax revenue (federal and provincial). These results are for the Province of Nova Scotia, though impacts would be concentrated in northern Nova Scotia and Cape Breton.

Table 6
Economic Impact of Crab Harvesting and Processing in Nova Scotia

| Harvesting Sector | Employment | GDP (\$millions) | Taxes (\$millions) |
|--|-------------------|-----------------------------|-------------------------------|
| Direct (persons) | 1,295 | 63.96 | 11.81 |
| Indirect (person-years) | 120.2 | 10.89 | 2.08 |
| Induced (person-years) | 287.2 | 23.96 | 9.32 |
| Sub-total | * | 98.81 | 23.21 |
| Processing Sector | Employment | GDP (\$millions) | Taxes (\$millions) |
| Direct (persons) | 900 | 8.45 | 1.17 |
| Indirect (person-years) | 62.7 | 5.20 | 1.13 |
| Induced (person-years) | 43.0 | 3.63 | 1.45 |
| Sub-total | * | 17.28 | 3.75 |
| Total impact, Harvesting and Processing | * | 116.09 | 26.96 |

*note: due to differences in how employment is measured at the direct and indirect/induced stages, employment data cannot be added to produce a total for the industry as a whole.

Impact of processing additional crab

In this section we estimate the impact of processing an additional one million pounds of crab in Nova Scotia. The raw material is assumed to come from reduced exports from the province. It would therefore affect the buying and processing sector only.

Each additional million pounds of snow crab processed in Nova Scotia would add about 14 person-years of employment to the provincial economy, and generate about \$750,000 in GDP. Federal and provincial taxes would increase by about \$160,000 (Table 7).

Table 7
Economic Impact of Processing an Additional 1,000,000 lbs of Snow Crab in Nova Scotia

| | Employment (person-years) | GDP (\$millions) | Taxes (\$millions) |
|---------------------|-------------------------------------|----------------------------|------------------------------|
| Direct | 9.38 | 0.37 | 0.05 |
| Indirect | 2.73 | 0.23 | 0.05 |
| Induced | 1.87 | 0.16 | 0.06 |
| Total impact | 13.98 | 0.75 | 0.16 |

IV.

Concluding Observations

This analysis of the Nova Scotia crab industry arises from the need for a better understanding about how various economic forces are shaping industry structure and competitive behaviour. From extensive interviews with industry stakeholders and by examining available landings and production data, we are able to make several key observations.

1. Crab is a \$100 million industry in Nova Scotia

As a result of increased resource abundance, crab quotas and landings in Nova Scotia more than doubled between 1999 and 2002, rising from about 6,000 to over 14,000 tonnes. Landed value increased from \$30 to \$80 million. Buying and processing contributed an additional \$20 million in revenue, bringing the overall value of the industry to just over \$100 million. The industry employs some 1,000 in harvesting and another 900 or so in buying and processing.

2. The industry is adjusting to the rapid increase in resource abundance and value.

Substantially more licence/permit holders and vessels participate in the fishery today than a decade ago. Processing capacity has expanded three-fold in the past five years as companies try to match capacity to the seasonal peak available from the harvesters supplying them. This means processing capacity for the industry as a whole far exceeds that necessary to meet off-peak supply. While expansion has been good for the economy of northern Nova Scotia, it also creates challenges for the industry.

For harvesters, the challenge is finding buyers who are reliable and trustworthy, and prepared to pay the highest price for their crab. The main challenge facing processors is securing sufficient raw material to allow capacity to be utilized efficiently, without engaging in destructive price competition with other processors. Industry participants have found these objectives difficult to reconcile in the past few years, resulting in a climate of uncertainty and mistrust. This in turn contributed to instability in buying and selling relationships, and provided an opportunity for new arrangements to be developed.

3. Industry structure and demand for raw material are leading to intense price competition

With some 370 vessels, over 40 active buyers and 10 active processors in Nova Scotia (and several more outside the province), the industry conforms to the competitive model consisting of many buyers and sellers none of whom is large enough to influence price, *provided all act independently*. Processors face a great incentive to act jointly to limit price competition for raw material (and with small numbers and considerable discipline, can be successful). This is because they know that any attempt to increase price to gain supply will be matched by others. Since there is only so much crab to go around (due to quotas), a price increase will not lead to an overall increase in supply. Nor will it result in any difference in the distribution of supply among processors. It will simply result in a transfer of revenue to harvesters.

Recognizing this, processors are alleged to have tried to limit price competition in 2000-2001. Whether or not they did, or were successful if they did, many harvesters reacted by shopping around for buyers/processors not linked to what they saw as a cartel. This provided fertile ground for new processors to enter the market (including ones from outside Nova Scotia), resulting in intense price competition in 2002. Shore prices shifted sharply in favour of harvesters as a result.

4. Competition can be good, but it can also lead to unsustainable activity

Competition resulting in high shore prices is a good thing for harvesters. But high shore prices are not necessarily a good thing for processors. Processors are price takers in the US and Japanese markets where they sell most of their crab products. This means they have to accept what the market offers, and what the market offers depends on the supply and demand for crab and substitutes for crab such as lobster and shrimp. In 2002, for example, the market price increased slightly over 2001, but the shore price increased substantially causing processor margins to drop sharply from levels in 2000 and 2001.

While these swings in competitive position are typical in the fishing industry, high shore prices and narrow or negative processing margins may be inducing behaviour that imposes excessive pressure on the resource. Harvesters want to earn more. They can achieve this by exceeding their quotas. They then sell the excess at less than the shore price to processors trying to avoid narrow or negative margins (sustained negative earnings means they eventually go out of business). This is apparently how some processors are able to survive years like 2002. Several of those interviewed as part of this study indicate that arrangements between harvesters and processors for crab exceeding quotas are not uncommon. It is not clear how widespread the practice is, but it does highlight the close link between economic pressures and potential adverse affects on the resource.

5. Improving processing sector economics may be difficult

Three potential options exist for improving processing sector economics and enhancing employment opportunities for Nova Scotia plant workers. Each could contribute to meeting the objectives, but each also comes at a price for others in the industry. Industry structure and operations impose limits on the scope for action without adversely affecting others.

Restrict the export of crab from Nova Scotia. This would reduce competition for raw material and leave more in the province, but in so doing, it would eliminate a source of upward pressure on prices. This would be good for processors and plant workers, but not so good for harvesters who could face lower prices as a result.

Start the crab season earlier. This could reduce competition for crab from adjacent provinces where crab seasons are at or near an end and plants are looking for additional raw material to extend their operations. To be effective, the season would have to start before the seasons elsewhere begin to wind down. Many harvesters oppose this because it would conflict with other fisheries, lobster in particular.

Extend the harvesting season by slowing the rate at which crab is caught. This would reduce early season gluts and allow plants to utilize capacity more effectively. This could be achieved through trip limits, but not without penalizing harvesters with higher operating costs. Variable pricing is also a potential approach (i.e., lower prices for quantities exceeding a specified amount). But in the competitive environment in port markets, trying to limit supply through variable prices is not likely to be successful.

6. A stronger Canadian dollar means lower returns for crab sold in the US

Processors and harvesters should note that the recent currency shift is not good news for the fishing industry in Canada. The stronger Canadian dollar means that each US dollar earned through sales into the US market will be worth about 15% fewer Canadian dollars than a few months ago. So, for example, the pound of crab a processor sold last August for US\$3.50 was worth about \$5.50 in Canadian dollars. At the May 2003 exchange rate, that same pound of crab would be worth about \$4.70.

Processors and harvesters looking at the May 2003 US crab price would note that it is about US\$0.75/lb higher than in May 2002 (US\$4.50 vs. \$3.75/lb). While this is encouraging for the industry in Canada, the adverse shift in the exchange rate means that the full effect of the increase will not flow to the Canadian industry. Last year, that additional US\$0.75 would have been worth about CDN\$1.15. In May of 2003, it is worth about CDN\$1.00.