PRICE FORMULA OPTIONS FOR ALASKA PINK SALMON

Prepared for discussion at a conference on
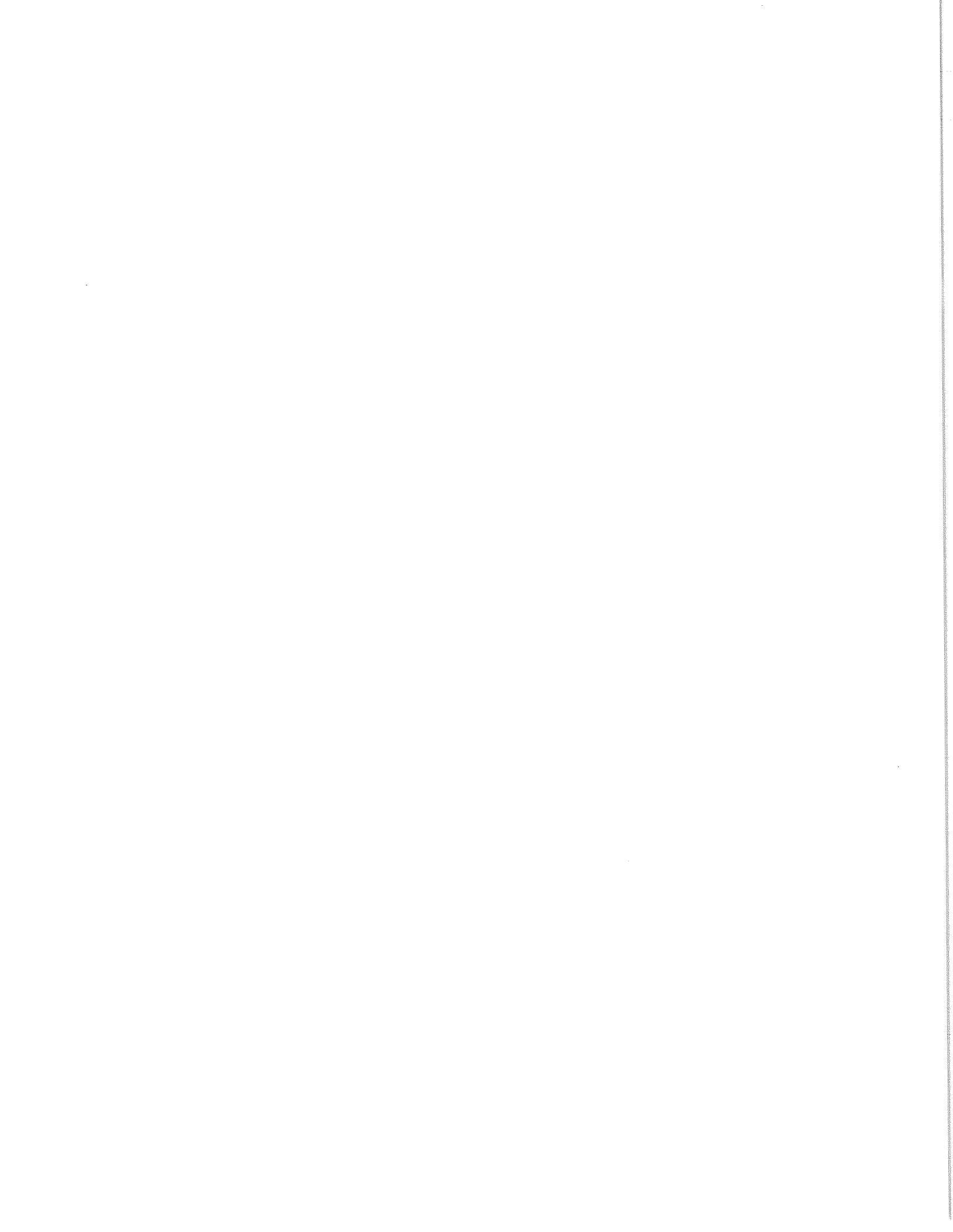
Toward Prosperity Through Stability:
Making the Most of Alaska's Pink Salmon

October 30-31, 1992
Ketchikan, Alaska

by

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Introduction

The wide swings in fishermen's prices for Alaska pink salmon in recent years has reawakened interest in the possibility of introducing price formulas under which fishermen's prices would be based on the wholesale prices received by processors. There are a wide variety of possible formulas which would have different implications for fishermen and processors. This paper presents a simple framework for thinking about price formula options.[1]

Simplifying Assumptions

In order to simplify this paper and focus on the basic features of different price formula options, in this paper I assume that canned salmon is the only product made from pink salmon--I ignore fresh and frozen salmon products and salmon roe products. Any actual price formula would have to be adjusted to take the value of these products into account. But since canned salmon are by far the most important product made from pink salmon, these would be relatively minor adjustments.

Data Sources

To illustrate historic trends in wholesale prices and fishermen's prices, and to illustrate how different price formula options would have worked during the period 1980-1991, I used Alaska statewide data for average wholesale case prices, average fishermen's prices, and statewide harvest volumes. I used the Anchorage consumer price index--the only price index available for Alaska--to adjust prices from nominal to "real 1991 dollars". None of these data necessarily reflect the situation of salmon fishermen or processors in specific regions of Alaska, since wholesale prices, harvest prices, harvest volumes, and inflation rates differ for different regions. However, whether or not these data accurately represent what happened in specific regions does not matter for this paper: the main purpose is to illustrate how different price formulas work and their advantages and disadvantages for fishermen and processors.

The Relationship Between Fishermen's price, Processor's Margin, and Wholesale Price

All of the revenue received by fishermen and processors has to come out of the wholesale value of canned salmon. Put differently, the wholesale value is divided up between the processors and the fishermen: processors receive the wholesale value minus what they pay to fishermen for the fish.

If we divide the total wholesale value by the volume of fish harvested, we

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[1]This paper represents my attempt to summarize and expand upon insights about pricing formulas developed by Bob Van Brocklin, Heather McCarty and John McMullen of Prince William Sound Aquaculture Corporation for a presentation at the conference on "Making the Most of Alaska's Pink Salmon," to be held in Ketchikan, Alaska on October 30-31, 1992. Most of the data were provided by Bob Van Brocklin, including harvest price data and wholesale price data. In addition, a number of the graphs shown in the analysis were modeled after graphs developed by Bob Van Brocklin for presentation at the Ketchikan conference.

get the *wholesale price per round pound.* Note that the wholesale price per round pound is lower than the wholesale price per canned pound, because the weight of canned product is lower than the harvest weight. The wholesale price per round pound can be calculated by multiplying the price per canned pound by the average processing yield. *In this paper, I use the term "wholesale price" to refer to wholesale price per round pound, rather than the usual meaning of wholesale price per canned pound.* This is necessary in order to accurately compare prices received by fishermen and processors.

I use the term *processor's margin* to refer to the difference between the wholesale price per round pound and the fishermen's price. The processor's margin, like the wholesale price and the fishermen's price, is measured in dollars per round pound.

We can describe the relationship between prices in any given year as follows:

processor's margin = wholesale price - fishermen's price

fishermen's price + processor's margin = wholesale price

In other words, for any given wholesale price, the higher the fishermen's price, the lower the processor's margin, and vice versa.

The Purpose of Price Formulas

The general purpose of price formulas is to share the risk between fishermen and processors in allocating the wholesale price between fishermen's price and processor's margin. Price formulas usually are designed so that if the wholesale price is higher than expected, neither the processor nor the fisherman enjoys all of the benefit. However, if the wholesale price is lower than expected, neither the processor nor the fisherman suffers all of the loss.

The specific purpose of a price formula varies depending on whether it is a formula which is negotiated for a single season, or whether it is a formula negotiated for a period of several years. Single-season price formulas are more common in Alaska, although they are often informal. Multi-year price formulas are rare, although they have been used.[2]

Both single-season and multi-year price formulas are based on the actual wholesale price received by processors after the season, as reported to an independent agency such as the Alaska Department of Revenue or the Alaska

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[2]One example is the price formula negotiated for a number of years by the Cordova Aquatic Marketing Association (CAMA), under which fishermen received 45% of average wholesale value, with adjustments for salmon roe value and processing yields.

Department of Fish and Game, both of which collect information each year on wholesale prices received by processors. Both single-season and multi-year formulas usually provide for fishermen to receive an up-front payment in-season, followed by an additional payment post-season to bring the total fishermen's price up to the level provided for by the formula.

Single-season price formulas

Single-season price formulas are formulas which are substantially renegotiated each year. The purpose of a single season formula is to define, in advance of the season, how the wholesale value for that season will be divided among fishermen and processors.

Usually, processors do not know before or during the season exactly what the wholesale price will be for the salmon caught during that season. As a result, if they promise fishermen a firm price prior to the season, they are taking a risk because the wholesale price may end up being lower than they expected, resulting in their having paid the fishermen more than they could afford to. However, if the wholesale price ends up being higher than they expected, they will enjoy a higher price margin.

Negotiating a price formula based on the actual wholesale value reported after the season allows fishermen and processors to share in the benefits if wholesale prices are higher than expected, although they both receive less if wholesale prices are lower than expected.

Many processors give fishermen post-season adjustments based in part on wholesale prices received by the processors. The calculation of these adjustments represents the use of more or less formal single-season price formulas--less formal when the fishermen are unaware how the adjustments are actually determined.

Multi-year price formulas

Multi-year price formulas are formulas which are negotiated for a period of several years. The purpose of a multi-year price formula is to define in advance how wholesale value will be divided among fishermen and processors over a several-year period.

The absence of multi-year price formulas--the fact that most prices are renegotiated each year--tends to increase the risk borne by both fishermen and processors over a multi-year period, in different ways. As will be shown below (see Figure 3), historically fishermen have borne more of the risk due to changing wholesale prices: in percentage terms, fishermen's prices have fluctuated more than processor's margins. The reasons for this are not entirely clear, but it is likely that at least part of the reason is that competition between processors drives fishermen's prices up when wholesale prices are high, but cannot keep fishermen's prices up when wholesale prices are low. The result is that fishermen

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gain more when wholesale prices rise, and lose more when prices fall.

The fact that prices are renegotiated each year is also risky for processors, because they do not know from year to year what the costs of their raw products may be. If the prices they pay to fishermen rise dramatically, as happened in 1988, this can wreak havoc with efforts to develop new products or sell into new markets.

The remainder of this paper focuses on multi-year price formulas.

Historic Fishermen's Prices and Processor's Margins

Before exploring how different price formulas might work, it's useful to review historic trends in Alaska wholesale prices, fishermen's prices and processor's margins.
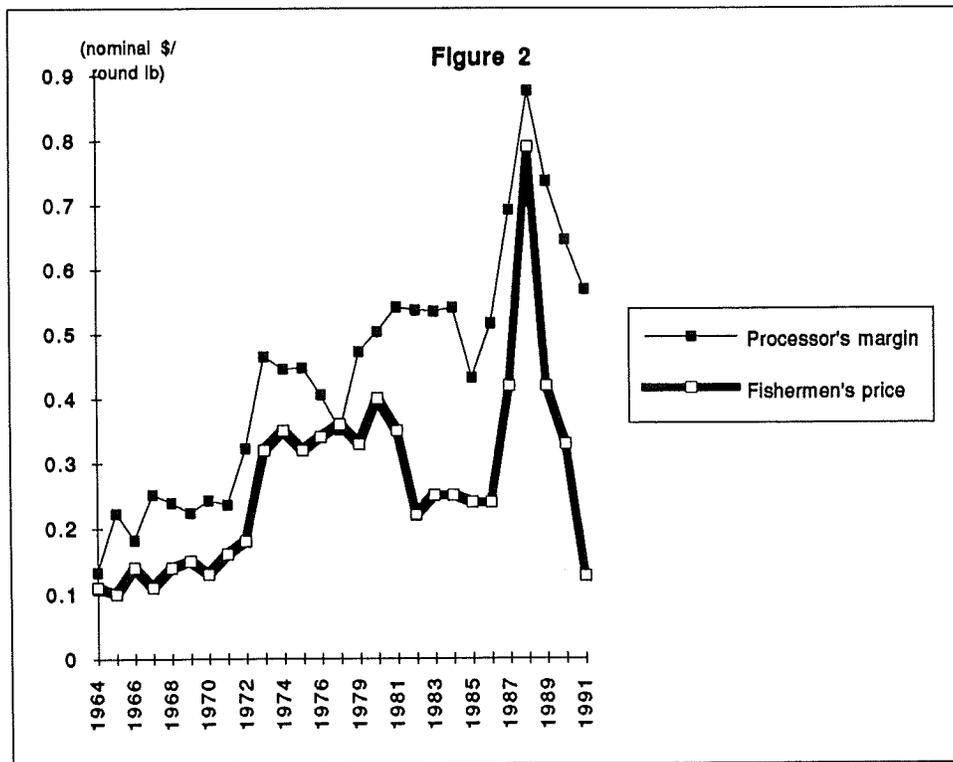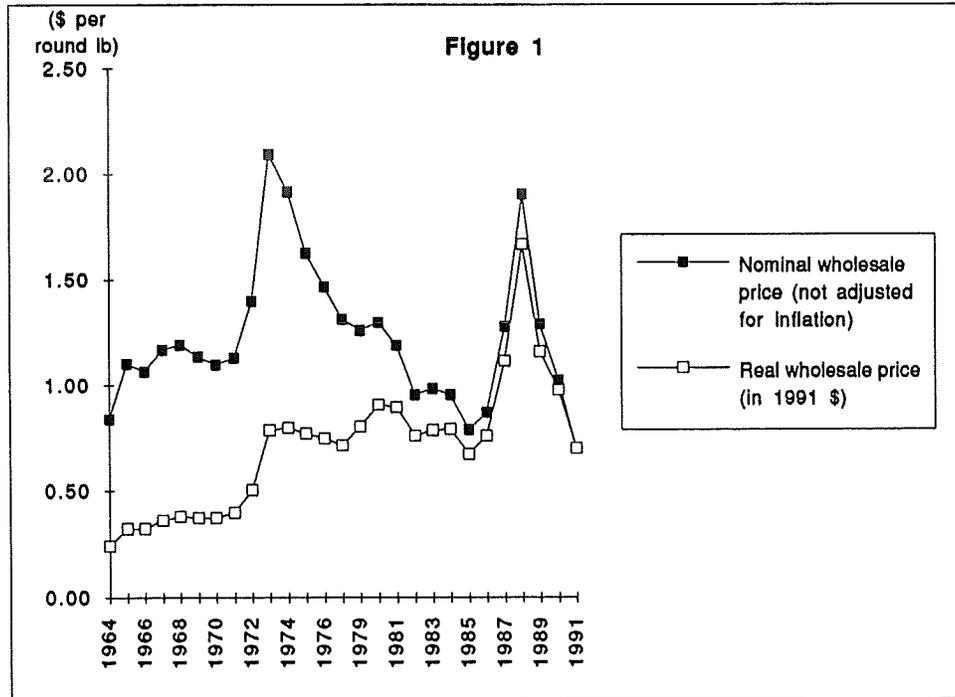
Figure 1 shows trends in both the nominal wholesale price, without adjustment for inflation, as well as the "real" wholesale price, adjusted for inflation and expressed in 1991 dollars. Expressed in nominal dollars, the 1991 wholesale price was much higher than in 1964. However, expressed in real dollars, the 1991 wholesale price was only slightly higher than in 1964. Real wholesale prices have trended downwards since 1973, except for a sharp rise between 1986 and 1988 followed by an equally sharp drop between 1988 and 1991.
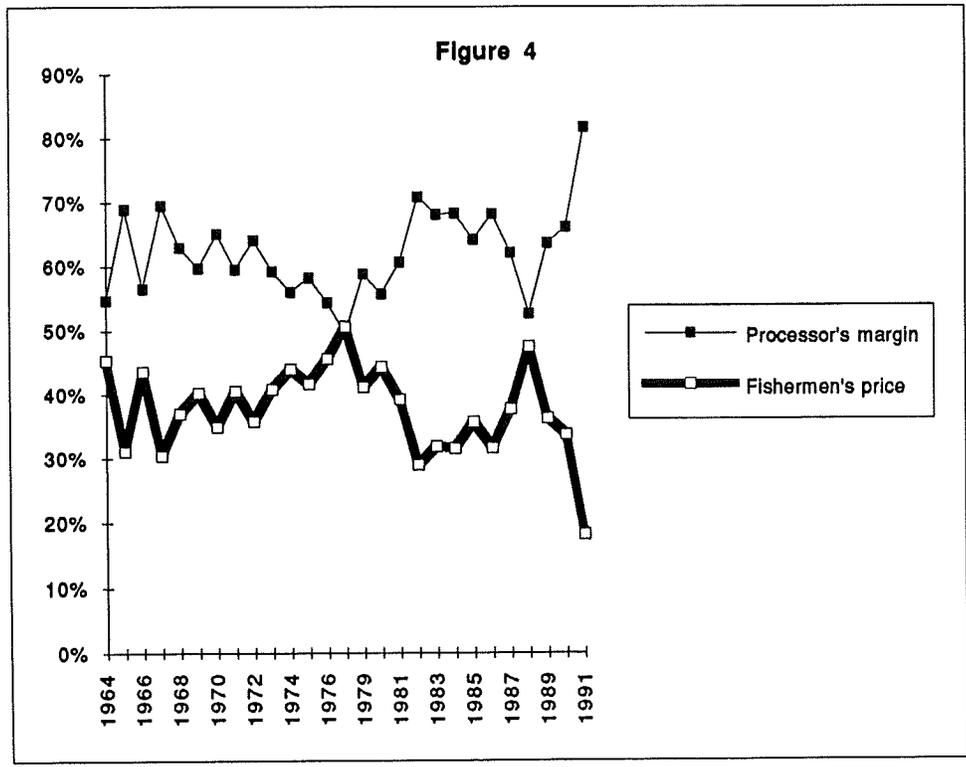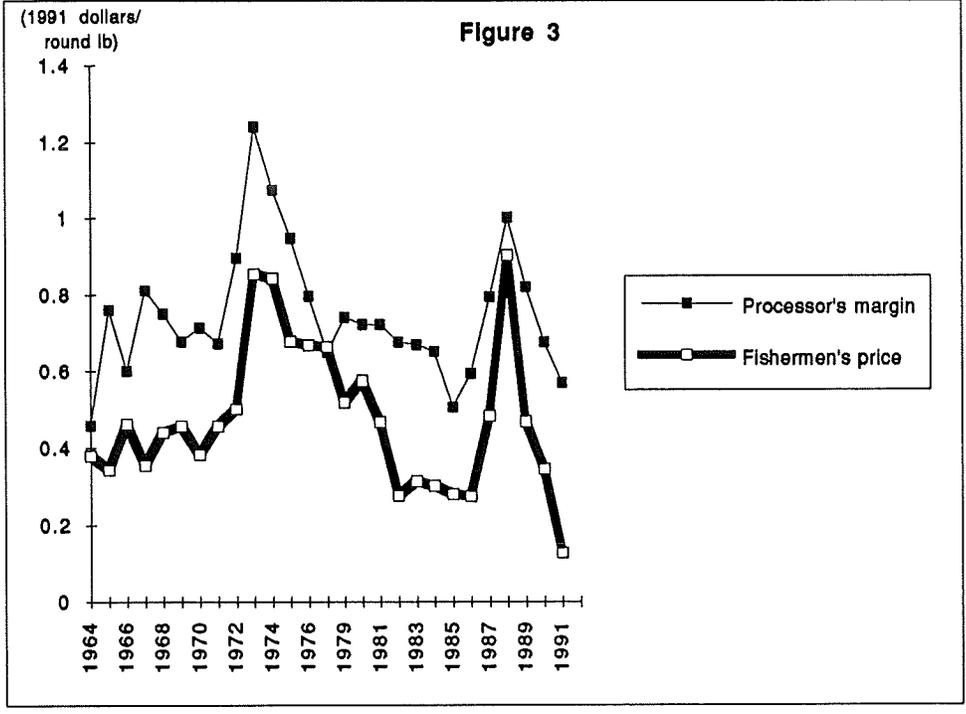
Figure 2 shows trends in *nominal* fishermen's prices and processors margins over the period 1964-1991, without any adjustments for inflation. Both fishermen's prices and processor's margins have fluctuated significantly, with several cycles of rising prices followed by falling prices, the most recent and dramatic of which occurred between 1986 and 1991.

Figure 3 shows the same fishermen's prices and processors' margins *expressed in 1991 dollars*, or after adjustment for inflation. After adjusting for inflation, there is no obvious long-term upward trend in fishermen's prices or processor's margins. Both have cycled up and down, usually following similar patterns, but fishermen's prices have fallen much more sharply than processor's margins since 1978, and in particular since 1988.

Figure 4 shows that as a percentage of wholesale value, fishermen's price has fallen from a range of 35%-45% for most of the period 1964-1981 to less than 35% for most of the period after 1981--and only 18% in 1991.

For this paper, I will not attempt to explain *why* fishermen's prices and processor's margins have fluctuated as they have. Regardless of the reasons, the fact is that prices have been what they have been. In considering price formula options, it is useful to consider what fishermen's prices might have been had price formulas been in effect.

Figure 1

($ per round lb)

Nominal wholesale price (not adjusted for inflation)

Real wholesale price (in 1991 $)

Figure 2

(nominal $/round lb)

Processor's margin

Fishermen's price

Figure 3

(1991 dollars/ round lb)

Processor's margin
Fishermen's price

Figure 4

Processor's margin
Fishermen's price

Price Formula Options

There are any number of ways to design price formulas. A simple way to think of a price formula is to divide the wholesale price into three components:

Guaranteed fishermen's price. This is a minimum price which is guaranteed to fishermen, regardless of what happens to the wholesale price.

Guaranteed processor's margin.. This is a minimum processor's margin which is guaranteed to the processor, regardless of what happens to the wholesale price.

Remaining non-guaranteed value. This is any remaining share of wholesale value left over after paying the guaranteed fishermen's price and the guaranteed processor's margin. This may be divided among fishermen and processors by some pre-determined formula.

Any price formula can be defined in terms of the guaranteed fishermen's price (if any), the guaranteed processor's margin (if any), and a way of dividing up the remaining value (if any) between fishermen and processors.

Note that the "guaranteed" fishermen's prices and any additions to this price may be but are not necessarily the same as the "in-season" and "post-season" prices received by fishermen. The price formulas I discuss below relate only to how to decide the total payment received by the fisherman. *When* the payment is to be received--what share is paid up-front instead of after the season--is a different issue (which is much easier to resolve if a formula for determining the total payment has been agreed upon).

We may now explore several different price formula options. In order to illustrate how each formula might work, I have graphed the fishermen's prices it would have resulted in during the period 1980-1991, if the formula were designed to produce the same total income over this period. In other words, the price formula illustrations are all revenue-neutral: they would have all resulted in the same total income for both fishermen and processors over the period 1980-1991, although different formulas would have resulted in different revenues in individual years.[3]

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[3]Total real income in 1991 dollars for the period 1980-1991 was $1134 million. This figure was calculated by multiplying the fishermen's price in each year (expressed in 1991 dollars) times the harvest volume, and summing the real income for all twelve years. All the price formula examples were calculated to result in the same total real income over this period.

Guaranteed Fixed Price for Fishermen

The least risky formula for fishermen would be one which guarantees a fixed price for fishermen, with all remaining value going to processors. Fishermen would have earned the same total real income during the period 1980-1991 if the real fishermen's price had been fixed at 37.5 cents per pound (Table 5). Instead, they received a higher price in some years and a lower price in other years.

The least risky formula for fishermen is the most risky for processors, however. Under this formula, the real processors' margin would have fluctuated from as high as $1.50 per pound to less than 40 cents per pound (Table 6). For this reason, although a fixed guaranteed price might be desirable for some fishermen, it is unlikely it would be acceptable to processors.
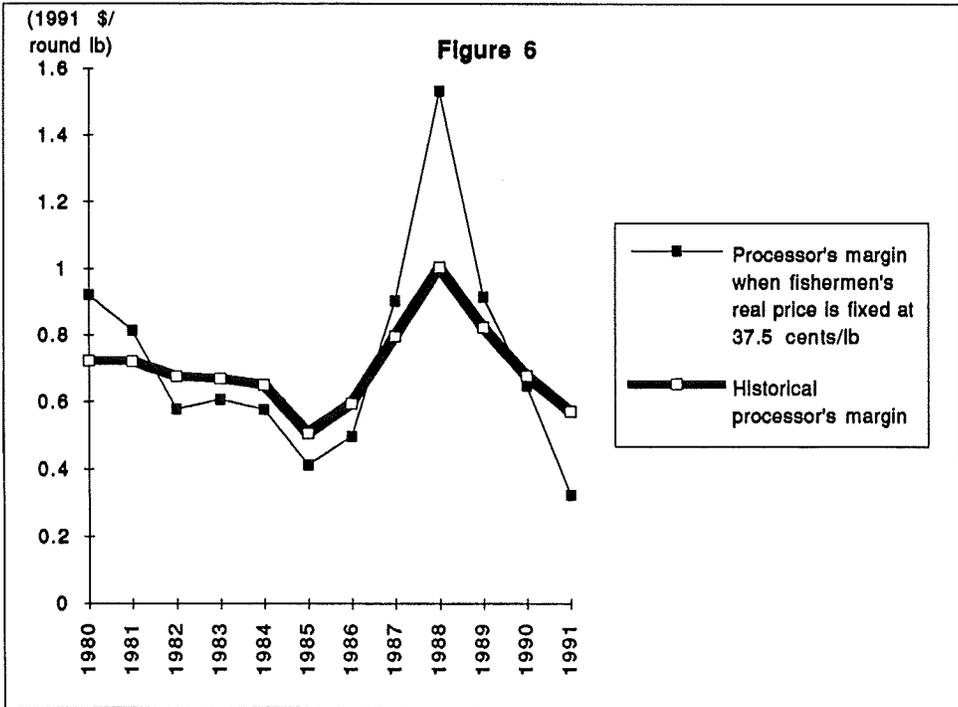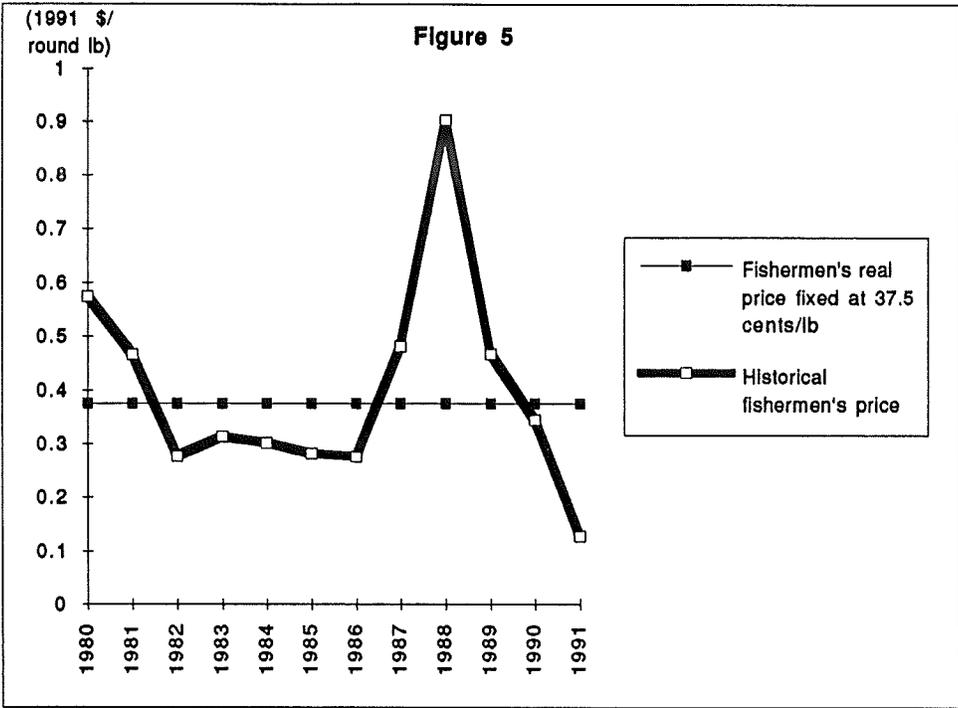
Guaranteed Fixed Real Margin for Processors

At the opposite extreme is a price formula which guarantees a fixed real margin for processors, with all remaining value going to fishermen. Fishermen would have earned the same total real income during the period 1980-1991 if the real processor's margin fishermen's price had been fixed at 68.5 cents per pound (Table 7). However, under this formula, fishermen's prices would have fluctuated even more than they did historically. Although they might welcome the opportunity to capture all the increased revenue when prices rise, fishermen would be unlikely to accept a price formula that would force them to bear all the losses when prices fall.
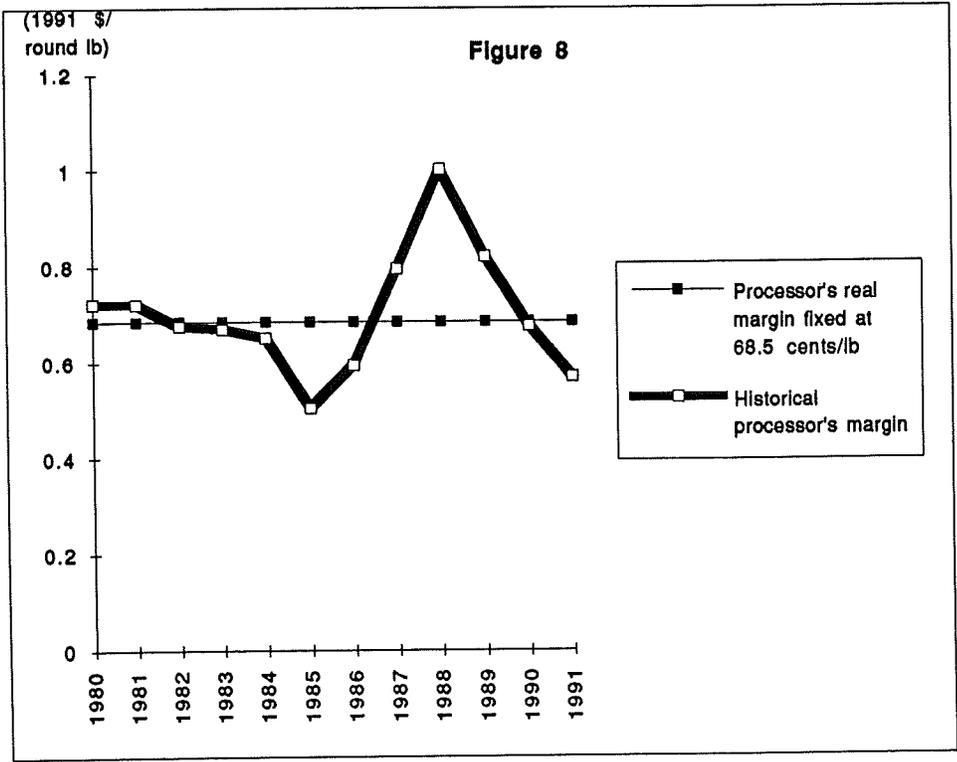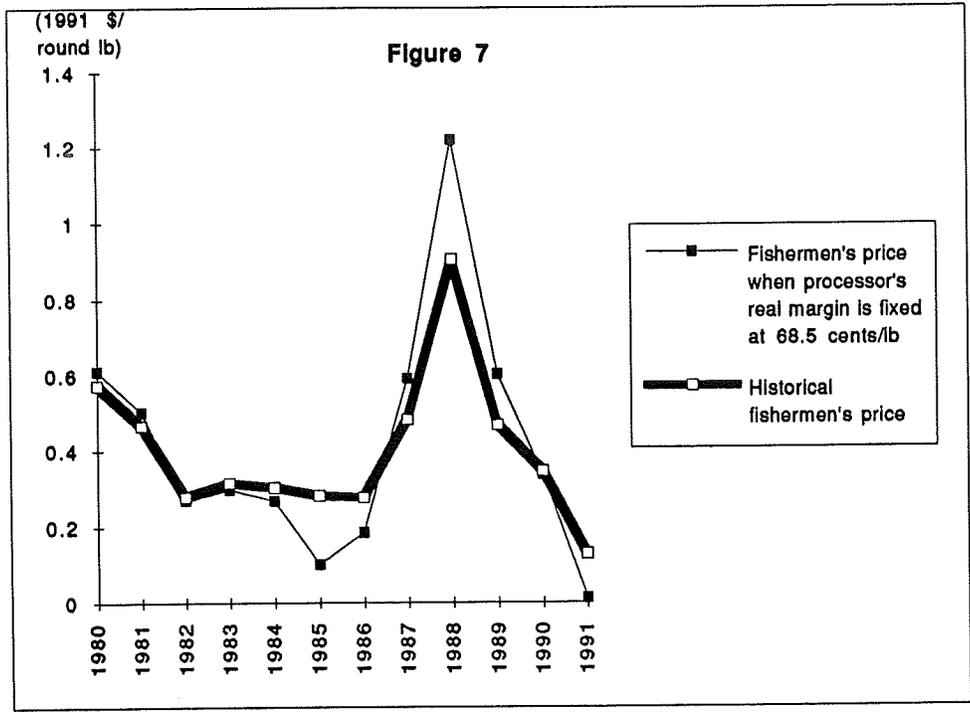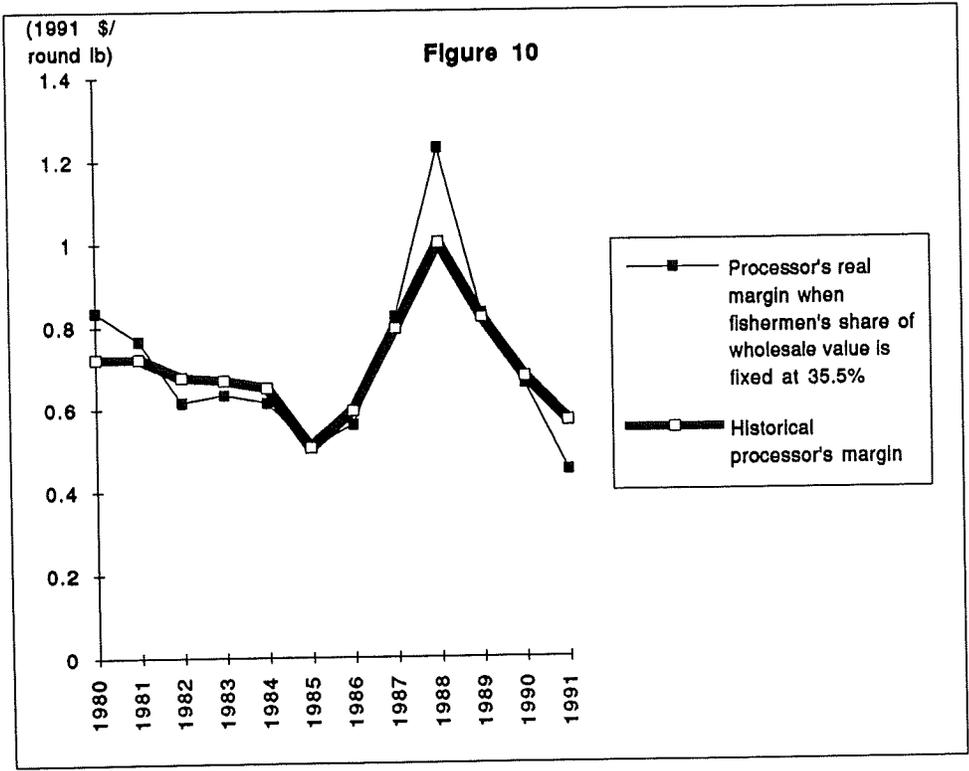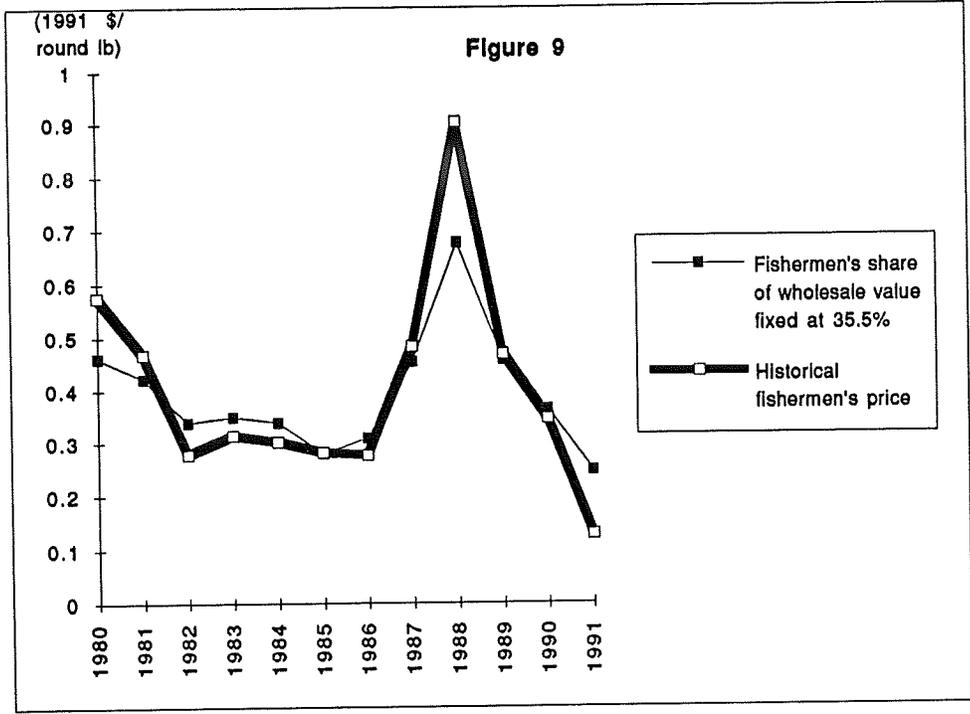
Fixed Percentage of Wholesale Value

The above two formulas place all the risk of price fluctuations on either fishermen or processors. A formula which provided for fishermen to receive a fixed percentage of wholesale value would share the risk equally between fishermen and processors. Fishermen would have earned the same total real income during the period 1980-1991 if their share of wholesale value had been fixed at 35.5 percent (Table 9). This price formula would still have left fishermen significant price fluctuations--reflecting the fluctuations in wholesale prices--but fishermen's prices would not have fallen as low when wholesale prices were low nor risen as high when wholesale prices were high.

This formula would have tended to increase real margin fluctuations for processors, resulting in higher real margins when wholesale prices were high and lower real margins when wholesale prices were low (Table 10).

Actual historical price trends for fishermen were between those shown in Figure 7 and Figure 9. This suggests that historically, fishermen have borne most but not all of the risk associated with wholesale price fluctuations.

Figure 5

Figure 6

Figure 7

(1991 $/round lb)

Legend:
- Fishermen's price when processor's real margin is fixed at 68.5 cents/lb
- Historical fishermen's price

Figure 8

(1991 $/round lb)

Legend:
- Processor's real margin fixed at 68.5 cents/lb
- Historical processor's margin

Figure 9

(1991 $/round lb)

Legend:
- Fishermen's share of wholesale value fixed at 35.5%
- Historical fishermen's price

Figure 10

(1991 $/round lb)

Legend:
- Processor's real margin when fishermen's share of wholesale value is fixed at 35.5%
- Historical processor's margin

Guaranteed Price to Fishermen,
with Fixed Percentage of Remaining Wholesale Value

Another price formula option which would share risk between fishermen and processors, but which involves less risk for fishermen, would be to guarantee fishermen a fixed price, as well as an additional fixed percentage of the remaining wholesale value.

Fishermen would have earned the same total real income during the period 1980-1991 if they had been paid a price of 20 cents per pound plus 20.5% of the remaining wholesale price (Table 11). This formula would have resulted in less fluctuation in fishermen's prices than a formula based on a fixed percentage of wholesale value, but would have resulted in greater fluctuation in processor's margins (Table 12).

Designing and Implementing Price Formulas

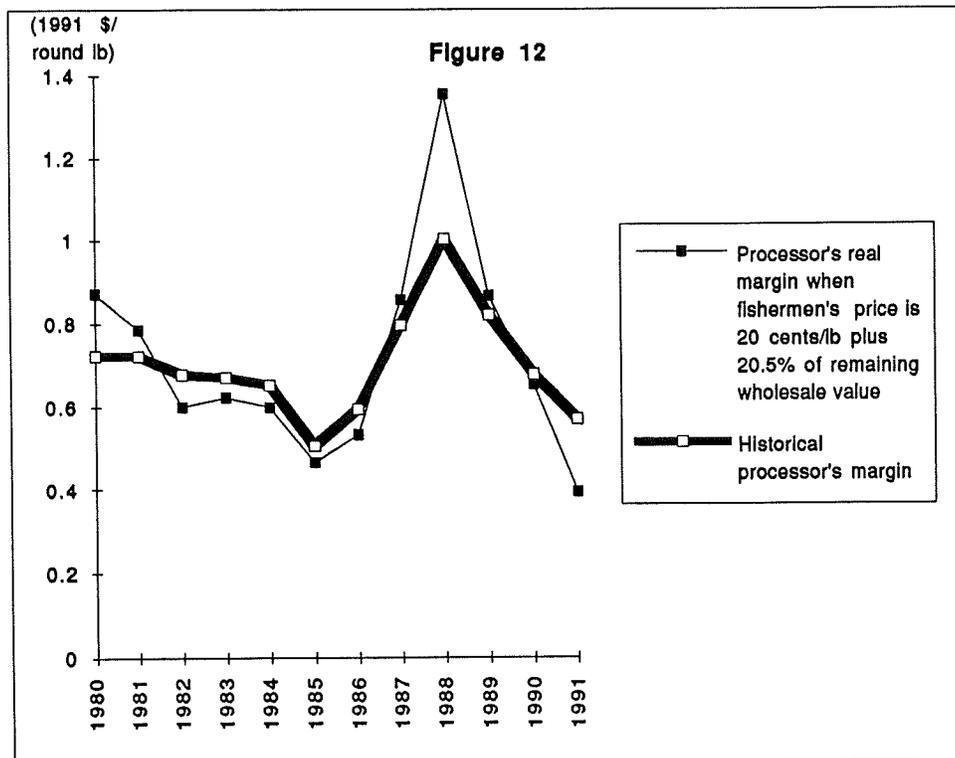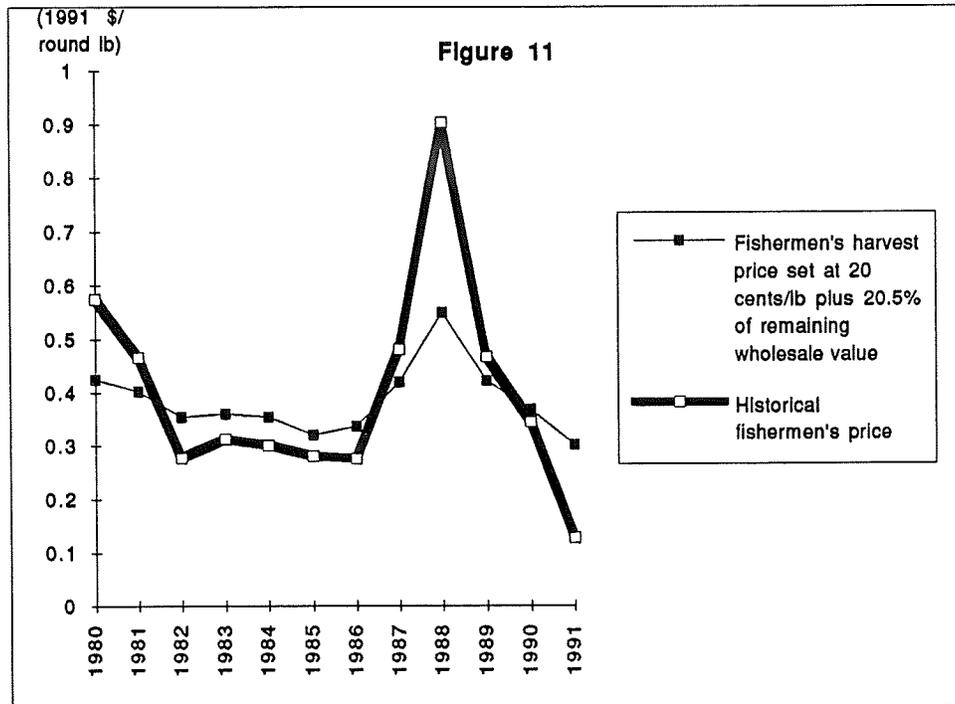Designing and implementing price formulas raises a variety of practical issues.

It is important to have a reliable measure of wholesale value. Average statewide wholesale value data which are already regularly reported by the Alaska state government represent the simplest option, but wholesale value information for specific regions or companies may be preferable.

Although in principle, a single fisherman could negotiate a price formula with a single processor--or different fishermen could negotiate different price formulas with the same processor--negotiations are most likely to be successful, and price formulas are most likely to last, if fishermen can bargain as a group. Because different fishermen have different goals and different attitudes towards risk, it can be difficult to bring fishermen together to agree upon and stick to a common price formula.

Price formulas must meet the needs of both fishermen and processors. Each side has to understand the needs and concerns of the other, or price formulas will not be implemented or will not last.

The basic problem in designing multi-year price formulas which work is that everyone likes to win, and nobody likes to lose. When wholesale prices rise, both fishermen and processors would naturally like to have all the increased income for themselves. When wholesale prices fall, both fishermen and processors would naturally like to avoid having their own income go down.

It is easier to implement and stick to price formulas when prices are high. It's easier to share when there's lots of money to go around. It's much more difficult to implement and stick to price formulas when wholesale prices are low. In particular, it is hard to stick to price formulas when wholesale prices are so low

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Figure 11

(1991 $/round lb)

Fishermen's harvest price set at 20 cents/lb plus 20.5% of remaining wholesale value

Historical fishermen's price

Figure 12

(1991 $/round lb)

Processor's real margin when fishermen's price is 20 cents/lb plus 20.5% of remaining wholesale value

Historical processor's margin

that there simply isn't enough money for both fishermen and processors to make a profit, so that someone is going to have to lose money.

It is easier to implement and stick to price formulas when prices are relatively stable. If prices fluctuate substantially, then circumstances are more likely to arise in which either fishermen or processors feel that the formulas are disadvantageous to them, and back out of the agreement.