THE BEHAVIOUR OF THE FARMED SALMON MARKET IN EUROPE

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Research Report

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Research Report

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A REVIEW

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1. PREFACE

In 1990, the Chamberlain Partnership - a firm of consultants, based in Huntingdon, Cambridgeshire, and specialising in public affairs relating to agriculture and the rural economy - was asked by representatives of the Scottish salmon industry to comment on the difficulties then facing the industry. Prices had collapsed towards the end of the 1980s and this, together with disease problems, had led to substantial losses being made by producers. The brief was to attempt to explain the current position; to explore how the market might develop in the 1990s; and to consider whether there might be a case for policy initiatives at either a national or European Community level.

The outcome was a confidential report, written jointly by Denis Chamberlain and Christopher Ritson, entitled "The Future Market for Farmed Salmon", and presented to representatives of the Scotland industry in July 1991. Although never published, the report was made available to a number of interested parties throughout the European salmon industry and reference was made to it in other documents, and in the fish farming press.

Some of the analysis and ideas contained in the 1991 report were developed into policy initiatives which are still the subject of debate between the industry, the respective governments in producing countries, and the European Community. In particular, after a series of informal meetings between representative organisations in the European salmon farming industry, the European Salmon Industry Forum (ESIF) was set up and had its first meeting in Glasgow in September 1992. ESIF is a voluntary organisation with no powers of instruction over its members. Its intended function is to provide a formal forum for the exchange of views on issues of mutual interest, specifically the short and long term outlook for supply, demand and prices of farmed Atlantic salmon. At present salmon farmers are represented on ESIF by officials of the national farmer associations in Norway, Ireland, Scotland, the Shetland Islands and the Faroe Islands. However, the intention is that ESIF will eventually draw its membership from producer organisations established in the European Community under the Common Fisheries Policy, together with similar organisations established in Norway.

In February 1993, ESIF asked the Chamberlain Partnership to reconsider the future of the European salmon industry in the light of developments in the market over the previous two years; the progress which had been made at a political and institutional level in terms of market management; and some of the arguments which had been prompted by the issues raised in the 1991 report. The results were presented to ESIF in the summer of
1993. Those present felt that, on this occasion, the results should be made widely available, as a background to the continuing debate over the development of producer organisations as a mean of introducing an element of stability into the European salmon industry.

This report, therefore, is based largely on the work undertaken for the European Salmon Industry Forum, though incorporating some analysis and observations from the 1991 paper written for the Scottish industry.

Thus it begins by summarising some of the 1991 report, as a background to recent developments. It then comments further on three issues which have been the subject of particular discussion, arising from the 1991 report. This is followed by a review of the way the industry has reacted to market conditions over the past few years, together with some comment on political and institutional developments during the same period. In particular, an attempt is made to answer the question “what might have been the outcome had a genuine free market for salmon been in place?”

The report concludes with a discussion of the important market characteristics which will influence the evolution of prices during the 1990s showing, in diagrammatical form, how alternative assumptions about these characteristics could be used to forecast future prices.

Parts of this report involve quite difficult theoretical and analytical material. The European salmon market is complex and understanding how the market might develop is not straightforward. I have attempted to make the argument and analysis as accessible as possible to a wide readership throughout the European salmon industry. (In particular it should be emphasised that the report is not written for a specialist academic audience.) Nevertheless, I have tried to avoid skating over the difficult issues or to give the impression that there are simple ways of solving the problems facing the salmon industry.

I am grateful to the European Salmon Industry Forum for allowing the Centre for Rural Economy at the University of Newcastle upon Tyne to publish this report. The representatives of the producer associations have also been extremely helpful by providing information and data, and by commenting on a draft report. I should also like to thank my colleague at Newcastle, Dr Ben White, for his comments on the draft report, and my Secretary, Lynn Robson, for her assistance in producing the typescript. Finally, I am indebted to Denis Chamberlain, who made a major input into the study upon which the report is based.
However, I alone am responsible for the contents of the report and any errors which remain.

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2. THE EUROPEAN SALMON INDUSTRY VIEWED FROM A 1991 PERSPECTIVE

In the summer of 1991, the European salmon industry was in a state of acute crises. Prices had been depressed for nearly three years: productivity had been hit by disease; and many firms were going bankrupt.

It was in fact predictable that the high prices achieved for salmon during the 1980s would not be sustained. The farmed salmon industry resembles closely a textbook example of a competitive industry:-

i) There is a relatively free - even global - market.

ii) There are a large number of small businesses.

The development of farmed salmon can thus be interpreted as the introduction of new, cost reducing, technology into a previously high cost industry. The industry does depart from the textbook case in the number of years over which prices were sustained and the suddeness, and the extent of, the price drop when it occurred. Unusually, the technology-induced expansion of production seems to have been associated with a semi-autonomous (i.e. non-price induced) expansion of the market.

The consequence was that real prices declined only gently during the 1980's, fuelling a sustained expansion programme, whereas in a normal competitive market, a fall in market prices would have discouraged further investment at an earlier stage.

With respect to the market crisis, the 1991 Report noted that:

"There seems to be a view within the industry that low prices have been sustained longer than should have been expected. In fact, this is not inconsistent with experience in those agricultural product markets which are prone to cyclical disturbance."

and that:

"Production forecasts imply some recovery of prices in 1992, as long as we are able to assume some further autonomous demand growth. Norwegian figures imply a sharp rise in price for 1993."

However, there could be optimism concerning the longer term prospects for the farmed salmon market. First, throughout the developed world, fish is increasingly being seen as a premium product, as limits to
availability of the "hunted" product fail to match the requirements of growing incomes and changing lifestyles. The consumption of Atlantic salmon, in countries with broadly similar levels of fish consumption, is extremely uneven. Second, the capacity to increase farmed fish production is limited by various environmental considerations.

Overall, it seemed that a well managed fish farming business should achieve long term profitability. However, it seemed equally likely that the future would be characterised by a greater degree of price instability than experienced during the 1980s. The annual price variation up to 1988 was low for a farmed product. For example, the annual average variation was 7% for the delivered price of Scottish salmon to Europe. Some cyclical element in prices now seemed bound to develop, and superimposed upon this would be the effect of various erratic factors. Thus the longer-term view of the market was summarised as: "potentially profitable, but less stable."

The 1991 paper then went on to explore the case for market management of farmed products, emphasising the distinction between policies developed "to support" and policies which merely "stabilised". The argument is summarised below.

The "farm income" problem occurs because growth in farm productivity leads to increases in production which are not met to the same extent by increased demand. In the European Community, the response to this problem has been to sustain market prices above market clearing levels, first by import controls, then by market intervention and export subsidies, and latterly by attempting to restrict production.

There are two further dimensions to the 'farm income' problem. The first is that the incidence of technological advance tends to be uneven. It is in realisation of this that there have been recent moves from Brussels to bias support towards small farms.

Second, agriculture (and fishing) often represents a major source of income and employment in what are regarded as disadvantaged regions. Because of this there is a certain degree of bias in EC agricultural policy towards production in "less favoured areas".

However, it is extremely difficult to argue that the farmed salmon industry merits a policy directed towards price and income support. Neither the production nor the demand characteristics subscribed to the model. Unlike traditional agriculture, where support is directed towards small family businesses, which go back generations, the salmon industry involves new investment, some of it locally, but much of it not locally, based. Demand is in fact buoyant, whereas much of traditional
agriculture in Western Europe is selling into static markets. Firms were leaving the salmon industry because of losses due to investment decisions based on over-optimistic price forecasts.

The argument that a degree of permanent support might be justified on the grounds of sustaining employment in remote regions is superficially more appealing. But production conditions are in fact often ideal in the remoter regions - though of course the islands do face high transport costs. Thus market forces should of themselves generate employment in the remote regions because of their economic advantage.\(^1\)

Turning to the arguments for agricultural policies which stabilise, the parallels with the farmed salmon market are much more convincing. Instability is caused, first, because consumers tend to be inflexible in their patterns of food consumption. Added to this, agricultural production is subject to erratic and unpredictable variation, and constrained by inflexible biological time-lags.

The farmed salmon market possesses all of these characteristics.

Moreover, the case for government intervention to reduce instability is not compassion for the adverse effects on producers; it is founded on the argument that price instability is inefficient.

The message of the above discussion for the Scottish Salmon industry in 1991 was therefore:

"that they are experiencing, and are likely to continue to experience, a problem of instability, and that they should seek a solution that aims to stabilise prices; not one that supports the industry."

The next question tackled by the 1991 paper was "How can prices be stabilised?" In the case of farm products, price instability is almost always supply induced - and a solution must seek to smooth out fluctuations in supply. The classic way of doing so for a storable product is known as a "buffer stock", in which produce is stored during periods of oversupply, and released when prices rise. The problem is establishing the correct intervention price; pressure from producers tends to lead to an over-optimistic "floor" price, and unsaleable stocks accumulate.

For non-storable produce, stabilisation is more difficult, but surpluses can still be removed from the market and destroyed, thus underpinning the

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\(^1\)It should be emphasised that this is an argument against a policy of permanent support. It strengthens the argument for stability, because of the disproportionate employment effect of an unstable industry in remote regions.
market. This can itself help to prevent price booms, if it encourages producers not to overreact in their production plans to depressed prices.

Another way of reducing instability is to attempt to manipulate the quantity actually produced, rather than released onto the commercial market. For such a policy to be effective, however, future price movements need to be predictable. Stabilisation is most effective when stocks of the product can be released or accumulated, in reaction to contemporary market events. Supply management (i.e. production control) can only be effective if the likelihood of a price boom/slump can be anticipated. Clearly this is not the case with erratic price movements caused, for example, by unexpectedly good harvests, or supply shortfall because of climatic or biological problems. It is a possible solution when instability is of a cyclical nature associated with producer decisions. This is how the idea of the European Salmon Industry Forum emerged - as a method of improving longer term market intelligence.

In the 1991 report, permanent production restriction was not advocated as a solution to the problems of the farmed salmon industry. This was because, where such control had been incorporated into agricultural policies, the effect had been to support prices above long term equilibrium levels - as evidenced by the way significant value is now attached to milk quotas. The peculiar two-stage production cycle for salmon does however raise the possibility of control over smolt placing as an additional stabilisation measure; that is, as a way of smoothing out supplies; not, as some have assumed, as a kind of cartel induced monopoly pricing. This point is returned to in section 3.3.

After briefly raising the possibility that a salmon futures market might help the industry to insure against the adverse effects of price volatility - a suggestion that does not appear to have been taken up by the industry - the 1991 report set out some general principles of a market management policy for the Scottish farmed salmon industry. Some of these have been overtaken by events, but the central principle remains valid:

"Any policy should seek to stabilise market prices for farmed salmon, not to introduce an element of permanent support into the sector".

The remainder of the paper went on to explore the possibility of a stabilisation policy for farmed salmon being incorporated into the European Community's Common Fisheries Policy (CFP). This aspect of the original report has been developed into a policy initiative, but it is worth restating what remains as a fundamental problem - that the market mechanisms which apply under the CFP are rather different from those that apply to most agricultural products, but very similar to the market regime for fruit and vegetables. The reason is that fruit and vegetables
and sea fish, share certain product characteristics, which do not apply to other agricultural products, and do not apply to farmed salmon. These are:-

- a very wide range of product qualities;
- localised markets;
- perishability, such that the product can only be stored at high cost and at considerable loss of product value;
- lack of producer control over timing of sales - such that an individual producer has to offer produce from sale at a particular time - even if market prices are very depressed.

"These product characteristics lead, logically, to a market management system in which intervention (withdrawal) is localised, and import controls are specific to individual suppliers. In contrast, a product which is storable; for which producers have some control over timing of sales; which is of a more uniform quality; and for which there is a European-wide market; is more suited to a uniform minimum import price and general intervention system."

Nevertheless the 1991 report recognised that political reality suggested that the correct route to follow was via the Fisheries Policy. In that context it explored the feasibility of introducing a reference price system and producer organisation financed withdrawal. Progress in both areas is now well advanced.
3. REVIEW OF ARGUMENTS RELATING TO THE FUTURE BEHAVIOUR OF THE EUROPEAN SALMON MARKET

The movement towards a producer organisation based stabilisation policy for the European salmon industry has led to an (often intensely political) debate over the behaviour of the market, and the extent to which it might be legitimate to control that behaviour. Three issues, in particular, have been the subject of discussion between Government and industry representatives and have been referred to in articles in the fish farming press.

There are:

- whether or not the industry is prone to cyclical behaviour;
- the sensitivity of salmon consumption to price; and
- whether the grouping of salmon farmers in producer organisations with a coordinated approach to market intelligence and produce planning is a disguised form of international cartel.

All three issues involve the application of complex economic analysis. In this section, an attempt is made to discuss the issues in a manner which it is hoped will make the arguments accessible to all those with an interest in the future development of the European salmon market.

3.1 Is the Salmon Industry Prone to Cyclical Behaviour?

The 1991 report seems to have been the first time that the possibility that the salmon industry might subscribe to the conditions of long term cyclical behaviour had been formally articulated, although the popular term "boom and bust" was already being used by some producers. The suggestion grew out of the argument that the salmon industry resembled, much more, intensive livestock production than 'caught' fish. It should be emphasised however that it was not intended to suggest any of:-

a) that such an outcome was axiomatic;

b) that the behaviour of such a cycle would be simple;

c) that cycles would be likely to "explode".

Cyclical behaviour is not something which can, at this stage, be "proved". A new industry will take time to develop cycles and during the 1980s the strong expansion in demand allowed a sustained expansion in supply.
For the moment this is an issue which must be considered on the basis of reasoned argument supported by the evidence of recent market behaviour.

The basic conditions for cycles to develop in agricultural product markets are a biologically induced time-lag between the decision to produce and the product becoming available for supply onto the market; and a large number of producers deciding to increase production after market prices have risen and to curtail production after prices have declined. (In an expanding market, “curtailed” might be reinterpreted as “not expanding”.)

It is also necessary for demand to be sufficiently inelastic\(^2\) for fluctuations in supply to be translated into significant price variation. If demand is very elastic, then increasing output is absorbed by the market with only a small reduction in price; lower supplies do not lead to a significant price increase; and there is then no longer the market price variation necessary to induce the cycles in production in the first place.

There is a *prima facie* case for arguing that the Atlantic salmon market contains the necessary conditions for cyclical behaviour. There is a biological production time-lag, (albeit a complicated one); there are a large number of producers taking independent production decisions (though some producers have a larger share of the market than would be typical for most agricultural products); and the market has recently been subject to substantial price variation.

However, a number of arguments have been put forward to suggest that the Atlantic salmon market is unlikely to develop cycles. These are listed below, with a comment on each.

a) **Producers will be subject to a learning process.**

In only the most simple cycles do producers react immediately to market prices - that is, they assume that “today’s prices will be the future market price”. More typically, they are cautious and “have some memory” of past prices. Thus, both high and low prices need to be sustained for a period before producers react; this is why cycles are typically longer than implied by the length of the biological time-lag. In the case of salmon, production plans can

\(^2\)This does not mean that demand has to be “inelastic”, in the technical economics sense, of a given percentage change in quantity inducing a greater percentage change in price. However, if demand is more elastic than implied by a price elasticity of demand of -2, then significant cycles are unlikely to develop. A price elasticity of demand of -2 implies that a 10% increase in supply will lead to a 5% reduction in price. An elasticity of -1 would imply a 10% fall in price; and elasticity of -0.5 a 20% fall in price. To the extent that the salmon market continues to expand due to non-price induced factors, then “10% increase in supply” would need to be interpreted as “10% in excess of the normal growth in the market”. These issues are explored further in Appendix 2 at the end of the report.
effectively only be altered once a year - helping to delay the response.

For the learning process to eliminate cycles, it requires producers to adopt a different form of behaviour, namely to plan production on the basis of longer term average price expectations; not predominately plan on the basis of prevailing market prices. As explained in Appendix 2, if only some (say the larger) producers adopt this mode of behaviour, cycles are still likely to develop.

b) The industry, particularly in Norway, is becoming more vertically integrated.

This could affect the market in two ways. First, it could mean better market intelligence for small producers, reducing the extent to which production plans are based on prevailing market prices. Second, exporting groups could take the market towards long term contracts, such that both production plans and market returns for a part of supplies are isolated from the free market. Whether the widespread use of contracts would add stability to the market is open to debate - particularly if contract prices are dependent on a residual “free” market. Both buyers and sellers are notorious for looking elsewhere when market prices depart from contracted prices. In any case, the day when there would be enough contracted production to dominate the market seems a long way off.

c) There is a two-stage production process in the case of salmon.

This certainly complicates the market for Atlantic salmon, but it is far from clear just what it means for cyclical behaviour. The critical issues concern the extent to which there is flexibility in the proportion of available smolts put to sea; and whether smolt production reacts to salmon prices or to smolt prices. If (as was said to the Author in Norway) “once an egg is placed it is destined to become a salmon, come what may”, and if most smolt production is linked to on-growing, then we are really dealing with a complete biological process, implying a cycle of several years.

At the other extreme, an independent smolt market might develop its own cycle, which might not be synchronised with salmon prices. A variety of possibilities emerge from this which take us a long way from the simple livestock market cycle. There could for example be an abundance of smolts when salmon prices might imply a reduction in smolt placements. Would some of these smolts fail to find a buyer - even at the resulting depressed prices?
The complication of the two-stage production process is something the Author has discussed with a number of experts. Most information supports the view that, in Norway anyway, eggs have become marketed salmon with a certain inevitability, and the way the structure of the industry is developing suggests that the critical production decision there is the placing of eggs. In other countries, producers may lay down many more eggs than required and it is only at the parr stage that production becomes committed. In either case, salmon production is best viewed as a single biological process, and any cycle in production and prices is likely to be longer rather than shorter.³

d) There is flexibility over the timing of sales

Salmon can be harvested at different weights; different breeds of salmon grow at different rates; salmon grow faster in warmer water; smolts can be placed at different sizes; salmon can be brought forward or held back between harvest years.⁴ Thus the biological time-lag is not rigid but flexible. This flexibility seems to be increasing - that is, producers have reacted to unstable prices by becoming more sophisticated over the timing of sales. The induced flexibility involves several months, and could dampen a short salmon cycle which was independent of smolt production. It does not however radically affect the cycle from egg to harvest, over a period of several years.

Overall, then, it remains the Author’s view that a free market for Atlantic salmon is likely to be subject to periods of high and depressed prices - measured over a period of years. There are however a number of complicating factors, and “cycle” should not be interpreted to imply a very regular pronounced pattern. The market is cyclical in that part of the price instability, to which the market has clearly now become subject, is the consequence of production plans responding to market prices; and the production cycle means a time-lag in that production response.

Some of those who read the 1991 report interpreted “the market becoming less stable” to imply that price cycles would become more pronounced (or “explode”) - as discussed in Appendix 2, but that is not what was meant. In the very simple model, the price cycles became more pronounced if the response of supply to a movement in market prices is greater than the response of demand. This point is explained in Appendix 2 - and leads on to the second issue - the responsiveness of demand to price.

³This does not preclude the possibility of co-ordinated intervention in the smolt market to “interrupt” the cycle. Indeed the cut back in Norwegian supplies is ascribed by some wholly to the 1991 policy of smolt killing.
⁴Though, greater efficiency may reduce flexibility once optimum biomass is reached in a cage.
3.2 How Price Elastic is the Demand for Atlantic Salmon?

An unstable market requires there to be a degree of price inelasticity. The less elastic the market, the greater the fluctuations in price which result from fluctuating output, whether caused by producer decisions, or "unplanned" effects - such as disease or an unexpected boost in productivity.

The demand for most major agricultural products or product groups (e.g. milk; eggs; meat; fish) is very price inelastic. This means that relatively small changes in the quantity of produce coming into the market can lead to substantial movements in price. Thus agricultural product markets are prone to instability - one of the main justifications for the development of government agricultural policies. The behaviour of marketing margins also tends to make the demand facing the producer less elastic than consumer demand - so that prices to producers fluctuate proportionally more than do consumer prices.\(^5\)

However, as food products are broken down into more discrete categories (pork rather than meat; oranges rather than fruit) demand becomes more elastic, because of the tendency for consumers to substitute one product for another in response to price changes - that is, to switch, for example, from oranges to apples and back again in response to fluctuating orange prices. It is also evident that demand for food products tends to become less price elastic as we move towards cheaper products which are regular purchases, and seen less of a luxury.

It is possible to find a priori arguments to support either an elastic or an inelastic demand for salmon. The important considerations are the extent to which salmon (and smoked salmon) is regarded as a luxury product; and whether it is easily substituted by other foods. It is not at all clear whether the fact that salmon has become, over the last decade, a much more familiar consumer product will have made demand more or less elastic. Lower prices and more regular consumption mean it is no longer seen as a luxury (only to be consumed at expensive restaurants) and thus demand becomes less elastic; against this, the movement of the product into fishmongers and supermarkets might lead it to be regarded as more substitutable with other fresh fish - "just another fish". Thus, the segmented market, both nationally and in terms of product characteristics, means it is not possible to be confident about aggregate price responsiveness on the basis of a priori reasoning. The alternative is of course empirical evaluation, but this approach is also not without problems and uncertainties.

\(^5\)This is a technical point, which is not explained in this report.
A number of econometric studies of the Atlantic salmon market have been undertaken. These have attempted, *inter alia*, to estimate the response of demand to changes in prices (and incomes). Those published a few years ago (e.g. Lin et al and DeVoretz and Salvanes in DeVoretz DJ (Ed) 1989)) indicated that demand was very responsive to changes in prices and incomes, with in particular a price elasticity of demand somewhere between -2 and -3. (A table summarising estimates is published in Bjornadal (1990) and reproduced as Table 1.)

The DeVoretz 1989 publication is a report on a salmon price forecasting workshop and this also includes an interesting discussion of the difference between a short run (in practice, month by month) and long run (several months or even years) response; and whether the latter would be expected to be greater or less than the former. The outcome hinges around the nature of consumer habits. It may for example take several months before consumers become aware of lower prices and react to them; and it may then take several months of higher prices to persuade them to “lose” the habit of salmon consumption. Conversely, for an occasional purchase like salmon, consumers may be willing to forgo consumption in the short term but not in the long term, so that they are more responsive from week to week or month to month, than they are from year to year.

**Table 1 : Estimated Demand and Income Elasticities for Atlantic Salmon**

<table>
<thead>
<tr>
<th>Geographical market</th>
<th>Time period</th>
<th>Own price elasticity</th>
<th>Cross price elasticity</th>
<th>Income elasticity</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>Jan 1983-March 1987</td>
<td>-2.51</td>
<td>0.35</td>
<td>5.56</td>
<td>Hermann and Lin (1988)</td>
</tr>
<tr>
<td>European Economic Community United States</td>
<td>Jan 1983-March 1986</td>
<td>-2.82</td>
<td>0.56</td>
<td>3.66</td>
<td>Hermann and Lin (1988)</td>
</tr>
<tr>
<td>United States</td>
<td>Jan 1983-Dec 1988</td>
<td>-2.00</td>
<td>0.95</td>
<td>2.11</td>
<td>DeVoretz and Salvanes (1990)</td>
</tr>
</tbody>
</table>

**Source:** Bjornadal (1990)

The high price elasticities shown in Table 1 are not really consistent with the extent of the fall in market prices at the end of the decade, nor with the degree to which prices recovered. However, more recent estimates indicate a less elastic demand. For example, an article on the French market published last year in Applied Economics (Bjornadal, Salvanes and Andreassen, 1992) indicates price elasticity of little more than one. Their study attempts a very careful specification of the characteristics of French
demand and incorporates an intelligent view of the implications of the marketing system in France. It also benefits from the inclusion of 1989 data when prices were lower and supplies much higher.

The most recently published article (DeVoretz and Salvanes 1993) was submitted in 1990 and therefore covers the period only up to 1988. This suggests a price elasticity for Atlantic Salmon of about -2 for both the European and North American markets - but even then notes that these are the mid-period estimates and that “elasticities trend from high (1983) to low (1988)”.

As an aside, it is worth noting that the very high response of salmon consumption to rising real incomes suggested by Table 1 is quite out of line with virtually all theoretical and empirical work on the characteristics of the demand for food products in developed countries. For example, Chesher and Rees (1987) have undertaken a very thorough and sophisticated study of food demand in the UK using National Food Survey Data. They break food consumption in the UK down into 56 components and none of these display income elasticities in excess of one for the average household. Less sophisticated analysis of National Food Survey data for 1988 breaks food consumption down into 150 items. Of these, only 5 have income elasticities in excess of one, (and none more than two.) Of the 15 fish items, the most elastic (0.96) is, though, for the category which includes fresh (but not smoked) salmon.

There are two reasons why current empirical investigation may now be indicating that salmon demand is less responsive to price that implied by earlier work. First, the market itself may be changing. Plausible reasons have already suggested why the more mature market may be becoming less price elastic. In addition, if demand is linear, falling real prices imply a less elastic demand. This is another technical point, but it could be important for price instability.

Second, it may be that demand was never that elastic in the first place and that econometric models applied in the 1980s incorrectly ascribed part of the increasing consumption to changes in prices (and incomes)

The problem concerns the specific circumstances of the market for farmed salmon during the 1980s. A technological revolution induced a rapid expansion in supply, which was production, rather than market, led. At prevailing prices, farming salmon was profitable and there was no great need to ‘market’ the product,6 nor to be too concerned about biological efficiency.

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6Though considerable sums have been spent on generic (national) promotion.
Meanwhile the market expanded to absorb the rapid increase in supplies. Real prices declined a little, and there was some rise in personal incomes in the major consuming countries. The specific problem concerns the extent to which the decline in price, and rise in incomes, caused the increase in consumption. We know that changes in relative prices and growth in consumer incomes are major causes of changing patterns of consumption of food products (though, in the UK anyway, since about 1980, price changes and income growth have been responsible for only a small proportion of changes in patterns of food consumption - Ritson and Hutchins, 1991). In the specific circumstances of the market for farmed salmon during the 1980s, a simple demand model, in which quantity purchased is assumed to be dependent on relative prices and consumer incomes, will ascribe the growth in consumption to income growth and fall in real price, and thus produce very high estimates of price and income elasticities. Even a sophisticated model will find it very difficult not to over-estimate price elasticities, because of the problem of measuring independently the other factors which might have caused the market to expand.

These other factors - sometimes known collectively as the “underlying trend in demand” - encompass a whole range of forces derived from such developments as changing patterns of consumer preferences (e.g. a move towards “healthy eating”); changing lifestyles (more restaurant meals, more single or small households requiring “portion purchases”, demand for products which are quick and easy to cook); and changes in the structure of the market.

The factor which is most commonly mentioned by those associated with salmon marketing is “availability”. A product which, for most households, would previously have been regarded as the preserve of restaurant meals, becomes more widely available. Consumers become aware of its existence, it enters menu planning and becomes a regular purchase. The product becomes part of the diet, simply because it has become available.8

Where increasing availability is complemented by falling real price it is clearly going to be statistically very difficult to distinguish between consumption increasing, on the one hand, because of availability, and on the other, because of falling prices. Indeed, it is rather difficult to distinguish intellectually between consumers beginning to purchase salmon (perhaps with increasing regularity) as they become aware of its

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7 Though a statistical problem known as auto-correlation will be evident.
8 The reverse can also apply. For example, a study carried out at Newcastle University some years ago concluded that the main reason for the decline in fresh fish consumption in the UK then being experienced was the general move towards “one shop” food purchasing in supermarkets; a reduction in the number of independent fresh fish retailers; and the reluctance of the supermarkets chains at that time to embrace the “inconvenience” of fresh fish counters.
availability, and purchasing it with increasing regularity at what they perceive of as an increasingly affordable price.

The problem is illustrated in Appendix 1 which shows that, if the expansion in the market is divided simply into two effects - price induced, and non-price induced, then the events of the past decade are perfectly consistent with either a highly price elastic market in which falling real price has largely been responsible for the growth in consumption, or a relatively price inelastic market in which the growth in consumption has been caused by other factors (and indeed also consistent with several combinations between these extremes.)

The key to all of this is reversibility. If demand is price elastic, and much of the expansion in consumption has been induced by falling prices, then we would expect similar prices in 1993 compared with 1992, given that current estimates suggest a zero growth in quantities available for consumption. Similarly, if supplies of Atlantic salmon next year are down on this year, a highly price elastic market would imply that a small increase in price would be sufficient to match demand to supply.

In contrast, if much of the expansion in the market has been caused by factors such as changing lifestyles, food preferences, and availability, leading to the “habit formation” of including salmon in menu planning, then we would expect some further growth in underlying demand between 1992 and 1993. This would in turn imply higher average prices in 1993 compared with 1992, and perhaps a sharp rise in prices next year, in order to match reduced supplies to the expanding demand.9

Had the available elasticity estimates been able to incorporate data encompassing the period 1988-1990, when market prices fell sharply, and the current period in which the rapid growth in supplies has, for the first time, been arrested, then we could have been much more confident of their accuracy, with the important implications for the price instability (or otherwise) of the market discussed above.

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9Since this paragraph was first written, forecasts of Atlantic salmon consumption for 1993 and 1994 have been revised upwards, (because of better productivity), such that even a small recovery in prices during 1993/94 will provide evidence of a less price elastic market.
3.3 Does the Establishment of Producer Organisations Amount to Cartelization of the Industry?

The debate over the introduction of producer organisations has involved the suggestion that this would facilitate an element of coordinated production planning. This has led to some producers in Norway being concerned that they might be forced to curtail production, and articles in the fish farming press (e.g. Macrae 1993) have likened it to the exploitation of monopoly power by a producer cartel.

The establishment of a set of producer organisations does not, of course, of itself create a cartel. The accusation that this is what is involved can only be made in the context of co-operation between producer organisations via the European Salmon Industry Forum. (ESIF)

First, it needs to be emphasised that a (arguably the) major role of ESIF would be one of market intelligence - a forum for the exchange of information between producer organisations and periodic opportunities collectively to take a considered view of the future development of the market. This in turn should reduce the over-reaction by individual producers to current prices, bringing with it greater stability, and at least the possibility that no further action would be required.

Next, it is not clear quite what the cartel argument is all about in this particular case. That is, it is not clear whether it is suggested that the creation of co-operating producer organisations should be opposed because they would then proceed to restrict supplies and push up prices; or that they could not be successful in doing so because of the incentive for individual producers to “cheat”, by not participating in output restricting activity, but benefiting from the higher market prices induced by the cartel. If a significant number of producers “cheat” in this way, then the cartel is unsuccessful and it is then argued, it would seem, that there is no point in establishing the producer organisations in the first place. There is clearly an element of contradiction here.

It is also worth drawing attention to the importance again of price elasticity in this context. An output restricting, price raising, cartel can only be successful if there is a significant element of inelasticity in the market. If demand is highly price elastic, then no significant producer benefit can accrue from a collective decision to restrict supplies - everyone would benefit more by expanding output and selling into the elastic market. Thus if the market for Atlantic salmon is not prone to price instability, neither does it present the opportunity for the collective exploitation of monopoly power by restricting supplies.
In a sense this brings us full circle. This Author has always seen any regulation of supplies by producer organisations as directed towards market stability, not market support; this much should be clear from section 2 of this Report, and it is appropriate only to highlight one or two issues here.

First, the market for Atlantic salmon is likely to continue to expand (though perhaps not as rapidly as in the past) through non-price induced factors - the underlying trend in demand referred to above - as new markets are developed, and the salmon purchasing habit spreads further within existing markets. Thus, any regulation of supply would involve control over expansion - not a reduction in output.

Second, and most fundamentally, regulation of supplies can be positive as well as negative. This point seems to have been missed entirely by those who are critical of the creation of producer organisations as “anti-competitive”. As long as any regulation of supply is directed towards the problem of instability, and not sustained excess profits from the exploitation of collective monopoly power, then ESIF is as much concerned with encouraging production during periods when supply might otherwise be inadequate as it is in controlling over-expansion to avoid a price slump.

Third, co-operation between producer organisations must be seen in the context of the regulation of markets under the European Community’s Common Agricultural and Fisheries Policies, and participation by Norway needs to be interpreted, now, as anticipating adoption of the Common Fisheries Policy.

Many of those working in the farmed salmon industry have not been involved in the agricultural industry and are not aware of the way agricultural policy has developed in the EEC and the problems which it has confronted. In fact, farmed fish now stands virtually isolated as a major farmed product with no EEC market regulation (which is why it has been necessary intermittently to adopt minimum import prices under the generalised safeguard clause). Any regulation of supplies under the producer organisation system would involve mechanisms approved and monitored under the Common Fisheries Policy. Of course, in the case of some agricultural products, this has not prevented the development of excessive price support, but this is not what is proposed for salmon. Producer action would require Management Committee approval involving, in this case, some strong member state consuming interests as a safeguard against any development which might go beyond the requirements of stability.
4. REVIEW OF RECENT DEVELOPMENTS\textsuperscript{10}

The purpose of this section is to review developments over the past few years to identify what new information has become available on the behaviour of the salmon market; and in particular, on how the industry reacted to the period of depressed prices. Events in each of the four major European producing countries are considered. This is followed by some general conclusions.

4.1 Faroe Islands

Salmon farming began in the Faroe Islands, a self-governing state of the Kingdom of Denmark, in 1982. In that year a total of 60 tonnes was harvested. The number of producers peaked in 1990 when there were 15 hatcheries and 63 sea farms, but by 1993 this had fallen to 11 hatcheries and 30 sea farms. Since 1990, production has increased by more than 30\% from 13,000 tonnes (91 per cent of which was exported) to an estimated 17,000 tonnes in 1993 (of which 98 per cent is likely to be exported.)

Most salmon are farmed in offshore cage farms, using the large-scale Bridgestone and similar cages. This reduces overall unit cost of production but means that farms are more vulnerable to storm damage. Severe storm damage was inflicted on the industry in the winter of 1989-90.

Rationalisation in the Faroese industry 1992 and 1993 has been largely the result of bankruptcies and mergers. Further restructuring is anticipated over the next few years, with the number of producers expected to stabilise at between 15 and 20.

A combination of improved technology and lighter market weights has resulted in a shorter on-growth period for salmon farmed in the Faroe Islands. Salmon now take an average of 16 months to reach marketing weight of 3 to 4kg. This means that smolts put to sea in April/May will be ready for harvest in July/August the following year.

The Faroese industry is comprised of small independent companies. The largest company produces just 2,500 tonnes/year (15\% of total output). To date there have been no moves to form collective marketing groups within the industry.

\textsuperscript{10}I am grateful to Daniel Pearsall of the Chamberlain Partnership for his help in the preparation of this section and Appendix 3.
Denmark is the most important market for Faroese salmon farmers. Salmon are sold to Danish processors and re-exported as smoked salmon into EC markets, particularly Germany and France. There they compete with Norwegian and Scottish smoked salmon, but do not appear to command as high a price as their rivals.

In 1992, the Faroese Salmon Farmers Association supported the initiative to form producer organisations, and joined the informal group known as the European Salmon Industry Forum in a joint effort, with other European salmon producing countries, to seek ways of stabilising market returns.

Table 2: Faroe Island Salmon Production 1990-1993

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Production (tonnes)</td>
<td>13,000</td>
<td>16,000</td>
<td>16,000</td>
<td>17,000</td>
</tr>
<tr>
<td>Number of sea farmers</td>
<td>63</td>
<td>58</td>
<td>54</td>
<td>30</td>
</tr>
<tr>
<td>Number of hatcheries</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Exports (% of output)</td>
<td>91%</td>
<td>98%</td>
<td>98%</td>
<td>98%</td>
</tr>
</tbody>
</table>

Source: Kontali and personal communication, Faroe Fish Industry Association.

4.2 Norway

Geographical, climatic, structural and social conditions have combined to make Norway the world’s leading producer of farmed Atlantic salmon. Salmon farming began there during the 1960s. In 1980, 173 Norwegian farms produced 4,300 tonnes of salmon. By 1990, production had increased more than 35-fold to 158,000 tonnes from over 700 individual farms.

Exports account for some 90% of Norwegian output of farmed salmon. France and Denmark are Norway’s two major export customers, closely followed by Spain and Germany. A significant market for Norwegian salmon was also developing in the United States until anti-dumping allegations resulted in the imposition of restrictive import duties in 1991.

The recent developments in monthly production and export prices for Norwegian salmon are shown in Figures 1 and 2.
Source: Kontali

The unfettered expansion of farmed salmon production in Norway between 1986 and 1990 outstripped the rise in demand and resulted in a crisis of oversupply and subsequent price collapse in the second half of 1988. The industry was facing bankruptcy on a massive scale, and in January 1990 the Fish Farmers’ Sales Organisation (FOS) announced
plans for a freezing programme to withdraw substantial quantities of salmon from the market.

As a short-term measure, this programme was initially successful, but it did not resolve the structural problem of surplus capacity and over-production. By November 1991, FOS was declared bankrupt, leaving a trail of unpaid salmon farmers and a surplus "mountain" of between 35 and 40,000 tonnes of frozen salmon. Although it was too late to save FOS, the Norwegians had recognised in 1991 that providing intervention on open-ended production would not solve the industry's oversupply problems, and a cull of 15 to 20 million smolts was instigated.

The industry's oversupply problems were further compounded by anti-dumping action taken by its major export customers, the European Community and the United States. Minimum Import Prices to the EC were enforced between November 1991 and May 1992, while an effective 26.5% US import levy introduced in April 1991 is still in force.

The Norwegian Government stepped in with a rescue package after the collapse of FOS, both to dispose of the surplus production and to provide structural support to fish farmers. However, Norwegian salmon farmers remain hard hit by the events described above, and there now seems to be a general willingness within the industry to co-operate with other salmon farming nations in exploring ways to co-ordinate future production planning and market intelligence.

In the meantime a gradual process of rationalisation is taking place within the industry. A number of farmer "co-operatives" have been established to market collective production, and there is a growing pattern of vertical integration from hatchery to exporter.

**Table 3: Norwegian Salmon Production 1990-1993**

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (tonnes)</td>
<td>158,147</td>
<td>145,900</td>
<td>141,000</td>
<td>150,000</td>
</tr>
<tr>
<td>Number of sea farmers</td>
<td>729</td>
<td>660</td>
<td>632</td>
<td>598</td>
</tr>
<tr>
<td>Number of hatcheries</td>
<td>280</td>
<td>263</td>
<td>240</td>
<td>228</td>
</tr>
<tr>
<td>Exports (% of output)</td>
<td>70%</td>
<td>91%</td>
<td>92%</td>
<td>92%</td>
</tr>
</tbody>
</table>

**Source:** Kontali and personal communication: Norwegian Fish Farmers Association.

Kontali is now forecasting farmed salmon production in Norway to reach 200,000 tonnes by 1995, but the industry has the capacity to produce well over 200,000 tonnes. Smolt production is currently running at just 74% of capacity.
The FOS smolt killing policy of 1991 had the effect of taking between 12 and 20 million smolts out of production, reducing final output by some 20 to 30%, but it also had the effect of removing lower grade smolts from the market. This, in combination with technological improvements and favourable climatic conditions, has enabled a much more rapid growth rate in salmon. A significant quantity of salmon harvested in 1992 actually came from 1991 placements originally intended for harvest in 1993.

This development, allied to improvements in management practices such as disease control, seems likely to bring greater flexibility to salmon farmers in responding (rightly or wrongly) to market signals. It also raises serious questions about traditional methods of forecasting supply via smolt placement rates.

There are 150 Norwegian exporters of farmed salmon. Four companies comprise 50-60% of total exports. Royal Norwegian Salmon, a group of 10 salmon farmers, currently produces between 12 and 15,000 tonnes of salmon per year (around 10% of total Norwegian output). The group is contemplating expansion, with a long-term goal of achieving 25% of total production. Grieg Norwegian Salmon have around 50 on-growing farmers within their group - their target is 70.

Three basic principles lie at the centre of the process of reorganisation currently taking place within the Norwegian salmon farming industry:

- Vertical Integration;
- Value-Added Products;
- Quality Assurance Schemes.

4.3 Ireland

The first salmon farm in Ireland was established in 1975, yielding a harvest of 10 tonnes in 1977. In 1986, output from 13 salmon farms totalled 1,215 tonnes. By 1990, 22 salmon farms were employing 500 people to produce 6,323 tonnes. The number of salmon farm operators peaked at 26 in 1991. There are now 22 salmon farming companies working 33 sites. 1993 production is estimated at between 9,000 and 10,000 tonnes, although capacity exists within the industry to produce up to 13,000 tonnes.

Expansion was running at an average rate of 69% per year between 1981 and 1991, when production totalled 8,700 tonnes. In the mid-1980s, bullish forecasts suggested that, by 1995, Irish salmon farming would have generated 4,000 new jobs in an industry producing 15,000 tonnes and contributing over £500 million to the Republic’s GNP.
The rate of expansion has declined considerably over the past two years, however, due to depressed prices, disease problems and environmental constraints. Opposition to salmon farming from environmental groups stems primarily from concern over the use of chemicals, visual impact of sites and disease problems in wild fish. As a result, the Irish Government now requires a detailed environmental impact assessment for all new licence applications.

Nevertheless, financial assistance for salmon farming from the Irish Government has continued at a significant level. In 1991, investment grants in the Irish salmon farming industry from Government and EC sources totalled £35 million, or 37% of total investment in the industry during that year (c. £94 million).

Public opposition to the establishment of new fish farms, as well as the declining number of coastal sites, prompted many Irish salmon farmers to invest in off-shore Bridgestone cages. Ireland is now a leader in high seas salmon farming.

Irish smokers and processors have played a large part in maintaining a relatively significant domestic market for home-grown salmon. Exports represent around two-thirds of total production, with France accounting for over half of all consignments.

Table 4: Irish Salmon Production 1990-1993

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Production (tonnes)</td>
<td>6,323</td>
<td>8,700</td>
<td>9,400</td>
<td>10,000</td>
</tr>
<tr>
<td>Number of on-growing companies</td>
<td>22</td>
<td>26</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Number of sea farms</td>
<td>28</td>
<td>29</td>
<td>30</td>
<td>33</td>
</tr>
<tr>
<td>Number of hatcheries</td>
<td>20</td>
<td>22</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Exports (% of output)</td>
<td>65%</td>
<td>55%</td>
<td>60%</td>
<td>65%</td>
</tr>
</tbody>
</table>

Source: Kontali and personal communication: Irish Salmon Growers Association.

4.4 United Kingdom

With production set to reach 44,000 tonnes in 1993, the UK is the second largest salmon farming nation in the world, though Chile does seem to be catching up. The industry is located in and around the many inlets, islands and lochs along the western and northern coast of Scotland.

The first commercial salmon farm was established in Scotland in 1969. In 1981, there were 32 salmon farming companies operating 62 sites -
production totalled 1,133 tonnes. By 1991, UK production of farmed salmon from 163 companies had risen to 40,600 tonnes.

Geographically, salmon farming in Scotland can be broken down roughly as follows (1992 figures):

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage of Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highland Region</td>
<td>39%</td>
</tr>
<tr>
<td>Western Isles</td>
<td>11%</td>
</tr>
<tr>
<td>Strathclyde</td>
<td>18%</td>
</tr>
<tr>
<td>Orkney Islands</td>
<td>3%</td>
</tr>
<tr>
<td>Shetland Islands</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Table 5: Scotland and Shetland Salmon Production 1990-1993**

<table>
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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Production (tonnes)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scotland</td>
<td>33,000</td>
<td>40,600</td>
<td>37,000</td>
<td>44,000</td>
</tr>
<tr>
<td>Shetland</td>
<td>26,170</td>
<td>29,990</td>
<td>26,320</td>
<td>35,440</td>
</tr>
<tr>
<td><strong>Number of on-growing companies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scotland</td>
<td>158</td>
<td>163</td>
<td>146</td>
<td>134</td>
</tr>
<tr>
<td>Shetland</td>
<td>6,830</td>
<td>10,610</td>
<td>10,680</td>
<td>8,560*</td>
</tr>
<tr>
<td><strong>Number of operational sea farms</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scotland</td>
<td>158</td>
<td>163</td>
<td>146</td>
<td>134</td>
</tr>
<tr>
<td>Shetland</td>
<td>6,830</td>
<td>10,610</td>
<td>10,680</td>
<td>8,560*</td>
</tr>
<tr>
<td><strong>Number of smolt producers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scotland</td>
<td>100</td>
<td>105</td>
<td>89</td>
<td>84</td>
</tr>
<tr>
<td>Shetland</td>
<td>58</td>
<td>58</td>
<td>57</td>
<td>50</td>
</tr>
<tr>
<td><strong>Exports (% of output)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scotland</td>
<td>86</td>
<td>80</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Shetland</td>
<td>80</td>
<td>73</td>
<td>79</td>
<td>79</td>
</tr>
<tr>
<td>40%</td>
<td>42%</td>
<td>42%</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>30-35%</td>
<td>30-35%</td>
<td>30-35%</td>
<td>30-35%</td>
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</tr>
</tbody>
</table>

* - 11,500 tonnes forecast for 1993, but 25% affected by Braer disaster. **Source:** Kontali and personal communication: Scottish Salmon Growers Association, Shetland Salmon Farmers Association.

The industry’s largest producer, Marine Harvest, accounts for some 25% of UK output, while two other companies, McConnell Salmon and Golden Sea Produce, share a further 20% of the total. One Shetland producer accounts for 7.5% of national output, and the combined production of six other companies takes a further 20%. The remaining 25-30% comes from around 120 small companies - this number having declined from over 150.

The evolution of production and average delivered price on a monthly basis since 1988 are shown in Figures 3 and 4.
Source: Scottish Salmon Growers Association

The 1988 fall in prices coincided with a period of substantial losses from sea lice and furunculosis, so the profitability of the industry was doubly hit. The month by month, and year by year, pattern of production was then influenced by biological as well as economic factors. A substantial increase in production for 1989 and 1990 was already built into the

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11 The two are of course connected, since it can be argued that over-expansion was partly responsible for both the biological and market problems.
system, fuelled by previous profitability. This was boosted by some companies bringing harvests forward because of disease problems.

Two factors with the potential to retract production then applied. A number of companies went bankrupt - but in almost all cases they were bought by new entrants or existing, stronger, producers, and so the flow of salmon continued. Second, companies became much more cautious over production plans. Fallowing increased and stocking densities were reduced, and the number of smolts put to sea fell from a record 23,800 in 1989 to 20,200 in 1991. Production fell from 40,600 tonnes in 1991 to 36,000 in 1992. But vastly improved biological productivity is leading to a production forecast for 1993 of 44,000 tonnes. The fall in losses means that, whereas two or three years ago, 20 million smolts might have been expected to yield 36,000 tonnes, the figure is now some 20% higher.

4.5 Overview of Industry Reaction to Depressed Prices

The expansion of the industry occurred, first, by the development of new sites, and second by increasing capacity (extra cages) on existing sites. The major effect of low prices was to end (or more correctly, to suspend) that expansion.

Contraction could have occurred by bankruptcies, but in general this did not reduce production because facilities were bought by new entrants or existing firms. A major contraction could also have occurred by reduced production on individual sites. But much of this potential effect was offset by improvements in biological productivity. A complex mixture of forces are involved here and it is extremely difficult to say to what extent they were coincidental (e.g. better climate); the normal learning process of a new industry; an explicit reaction to substantial losses from disease; or the accidental, beneficial, by-product of an economic reaction to low prices. Only in Norway was there a significant reduction in production, associated with the smolt killing programme. Whether these smolts would have become salmon in the absence of the programme is open to debate.

The overall effect has been to lead to a three year period (1991-93) of roughly stable production of Atlantic Salmon, of between 280 and 300 thousand tonnes, following the phenomenal growth in the previous four years, from only 67 thousand tonnes in 1987. Consumption continued to expand during this period, because of the Norwegian programme of market intervention and subsequent release of stocks.

The intriguing question to be answered in the context of this report is whether the productivity improvement represents a major, once and for all, shift in the behaviour of farmed salmon production, taking the whole
industry to a lower cost base? If so, any future over-expansion of the industry could mean much lower (real) prices than 1989-1992 before expansion is arrested; and it could also mean a significant contraction next time (and subsequently higher real prices than 1993/4), because there will be no productivity improvement to offset reduced smolt placements.

Alternatively, much of the productivity improvement may be part of the cycle, brought about by producer reactions to low prices, and could therefore be reversible. Higher prices might induce a more cavalier attitude to production, leading to more and poorer quality smolts being placed, less fallowing, and a fall in productivity, and a repeat of 1989-1991 later in the decade.

4.6 A “Free” Salmon Market?

In the current debate over the extent to which it is appropriate to introduce an element of management into the European farmed salmon market, it is sometimes forgotten that, in the past, the market has been subject to a very considerable degree of policy control - though most of the mechanisms have operated within Norway.

As outlined above, a number of policy decisions by the Norwegian Government fuelled the growth in supplies during the 1980s. However, following the collapse in prices during 1988 and 1989, a number of new policy initiatives served to stabilise prices, during 1990, 1991, and 1992, at approximately the 1989 level. In the light of this, it is worth speculating on what market prices might have applied, in the absence of these policy initiatives, i.e. - had a completely free market operated for farmed salmon in Europe.

Four price stabilisation measures can be identified. They are:

a) The FOS freezing programme;

b) The associated FOS minimum price system;

c) The imposition of EEC minimum import prices;

d) The smolt killing policy.

Taking, first, the freezing programme; without it, an additional 26,000 tonnes would have been released onto the European Market in 1990, and a further 11,000 in 1991.
Taking, first, the freezing programme; without it, an additional 26,000 tonnes would have been released onto the European Market in 1990, and a further 11,000 in 1991.

There are a number of problems in estimating the impact which these supplies would have had on market prices. First, lower market prices would have taken salmon into direct price competition with cheaper white fish and it is possible that a greater degree of substitution could have occurred than did take place when prices fell during 1988 and 1989. Second, it is not clear to what extent the minimum import prices were in practice supporting the market; that is, without the EEC and FOS minimum prices, would market prices have been lower even without the added downward pressure of the additional supplies which would have occurred with a free market? There is considerable evidence to suggest that commercial prices were anyway lower than indicated by the official Norwegian trade statistics. These indicate an average FOB prices of 36 Kr per kg in 1989; 37 in 1990; 34.5 in 1991; and 36 in 1992 roughly corresponding to the FOS minimum prices.

However in 1991, the period directly before the imposition of Minimum Import Prices, Official Norwegian FOB prices were around 31 Kr/kg. In evidence submitted to the European Commission, the Scottish Salmon Growers Association estimated (by deducting marketing margins from quoted French CIF prices) that much lower prices of around 25kr/kg must have applied. During this period, Scottish delivered prices remained at about £1.50 per lb - at prevailing exchange rates quite consistent with a genuine Norwegian FOB price of 25 Kr/Kg.

Thus there is considerable circumstantial evidence to suggest that:-

a) Commercial prices were lower than reported in official trade statistics; and

b) The imposition of Minimum Prices in 1991, and the Norwegian response to complaints in 1989, did have a price raising effect.

Average (official) prices during 1989-91 would perhaps have been around 30 Kr/kg in the absence of the pressure to respect Norwegian and EC minimum price schemes. To this must be added the effect of the Norwegian intervention stocks. If we assume a relatively elastic market response at the very low prices that would have prevailed, then adding the extra tonnage (which was in fact absorbed by FOS) to the market on an annual basis would have implied average prices 10-20% lower in 1990 and 3-6% lower in 1991. However, the effect during the first half of 1990, when the bulk of the freezing programme operated, would have been much more severe.
Norwegian farmers would of course have recouped much of this by not having to pay the FOS levy, which was used to finance the intervention programme; but the effect on Scottish and Irish producers would have been devastating. Prices for Scottish salmon between 1989 and 1991 could have fallen at times towards £1 per lb, averaging perhaps around £1.20 to £1.30, rather than the £1.50 to £1.70 which applied (Figure 4).

The hypothetical picture for 1992 becomes even more complicated. First, there would have been 30,000 tonnes less salmon released onto the market, because of the absence of the intervention stocks in Norway. Against this, the smolt killing policy was now beginning to take effect. But we do not know to what extent all these smolts would have been farmed-on, and estimates of the quantity of smolts killed vary between 12 and 20 million. Assuming that, effectively, only 10 million smolts were removed, and allowing for fairly low productivity, then another 20,000 tonnes would have been produced, (most of it, however, harvested in 1993.)

In addition to this, it is argued that the smolt killing policy contributed to the improvement in productivity - suggesting that the impact on quantity of salmon produced might have been considerably less than a 20,000 tonnes reduction.

Thus on balance, salmon supplies would have been much lower in 1992 - say by about 25,000 tonnes - and perhaps about the same in 1993.

But to all this must be added the greatest unknown of all - to what extent would the much lower “free market” prices of 1990 and 1991 have led to a cutback in production plans for 1992 and 1993. Even with no such cutback, prices would have risen to between 40Kr/kg and 45Kr/kg in 1992, depending on the elasticity of the market.

In retrospect, the Norwegian measures can be seen to have been a massive (though ultimately unsuccessful) market management policy, supporting the market in 1990 and 1991, and preventing an explosion of prices in 1992 and 1993. It is however no longer credible (if it ever was) to expect one country to carry the full burden of a market management policy.
5. A FRAMEWORK FOR ANALYSING FUTURE MARKET DEVELOPMENTS

It is essential to emphasise at the onset that the purpose of this section is not to forecast the evolution of salmon production and prices during the 1990s. It is, rather, to explain what are the important market characteristics which will affect the evolution of prices, and to explore how prices might develop on the basis of alternative assumptions concerning these market characteristics. The material is presented entirely in diagrammatical form in the hope that this will make it accessible to the widest possible readership. The outcome essentially represents a framework for analysis which should allow those working in the industry to come to conclusions concerning the future development of salmon prices on the basis of their own assumptions with respect to, for example, production costs, productivity levels, market growth, and so on.

5.1 Demand Projections

We have already indicated that the development of the market during the 1980s is consistent with a number of different assumptions concerning price elasticity; essentially, the more price elastic the market, the greater the proportion of growth in consumption which should be ascribed to the fall in real prices, and the lesser to other factors which affect market growth.

This is illustrated in figures A2-A6 of Appendix 1. Under the price elastic demand of -2, more than half the growth in consumption (from 87,000 tonnes in 1987 to 288,000 tonnes in 1992) is caused by the fall in real prices; whereas with the inelastic demand of -0.5, only about 50,000 tonnes consumption increase is caused by the price effect. (The extreme case of where only price induces market growth is also shown as figure A6 - by way of illustration).

In order to illustrate the development of the salmon market, a number of quite arbitrary (though perfectly plausible) assumptions have been made about the structure of the market. These are

a) that demand curves are linear;
b) that elasticity is defined at the 1987 real price (which means a less elastic demand at lower prices); and

c) that the growth in the market has taken the form of an absolute annual amount at the 1987 price. Of course, growth need not necessarily be of this form, nor be constant.
The market is defined as consisting of the total world market for farmed Atlantic salmon. Arguably, the market should be more tightly defined - say European consumption - but the available figures (which are those published in the Kontali monthly report) specify total Atlantic consumption (i.e. production net of Norwegian stock changes) on an annual basis.

The prices are also those published by Kontali; that is, in Krone/kg but adjusted to a real (1991) basis by adjusting for the Norwegian inflation rate. (Thus the early prices were somewhat lower in nominal terms).

Irrespective of the elasticity chosen, projected demand seems to overshoot actual consumption in 1991 and 1992, implying a slowdown in the growth of the market, illustrated by the broken lines in figures A2-5.

These four alternative interpretations of the historical evolution of the market for Atlantic salmon in recent years provide the basis for the alternative demand scenarios for the 1990s. These are as follows:

**Scenario A** (Figure A7)

Unitary price elasticity (-1), with underlying market expansion of 30,000 tonnes per annum throughout the 1990s.

Under this scenario, underlying demand is already well ahead of consumption by 1992 implying an over-optimistic view of the future expansion of the market. For this reason, the remaining scenarios all incorporate an assumption of a slow down in the expansion of demand, consistent with actual consumption in 1991 and 1992. These are:-

**Scenario B** (Figure A8)

Unit price elasticity with underlying market expansion of 30,000 tonnes per annum during the late 1980s and 20,000 tonnes per annum during the 1990s.

**Scenario C** (Figure A9)

Price elastic demand (-2), underlying market expansion of 20,000 tonnes till 1990, 15,000 thereafter.

**Scenario D** (Figure A10)

Relatively price elastic demand (-1.5), annual market expansion of 25,000 tonnes declining to 18,000 tonnes.
Scenario E (Figure A11)

Price inelastic demand (-0.5), annual market expansion of 40,000 tonnes declining to 25,000 tonnes.

5.2 Supply Projections

Four main supply projections are used to illustrate the effect of alternative assumptions about future levels of production for the development of market prices for salmon. These are based on information available in early 1993. Brief reference is then made to two further supply projections, which incorporate the most recent information on 1993 quantities. Projections I and II are based on the long term supply forecasts published in the Kontali Monthly Report. These are restricted to Norway and are extremely simplistic - the originator is quite open about this. Projection I applies a steady growth of 10% per annum to non-Norway production and adds this to the Kontali Norwegian forecast (which is strongly cyclical). Projection II applies the same percentage cycle pattern to non-Norwegian supplies as Kontali projects for Norway. The outcome is listed in Table 6.

Table 6: Atlantic Salmon Supply Projections (‘000 tonnes)

<table>
<thead>
<tr>
<th>Year</th>
<th>Projection I</th>
<th>Project II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Norway</td>
<td>Other Producers</td>
</tr>
<tr>
<td>1991</td>
<td>145</td>
<td>111</td>
</tr>
<tr>
<td>1992</td>
<td>171</td>
<td>117</td>
</tr>
<tr>
<td>1993</td>
<td>147</td>
<td>134</td>
</tr>
<tr>
<td>1994</td>
<td>125</td>
<td>143</td>
</tr>
<tr>
<td>1995</td>
<td>140</td>
<td>157</td>
</tr>
<tr>
<td>1996</td>
<td>190</td>
<td>173</td>
</tr>
<tr>
<td>1997</td>
<td>210</td>
<td>190</td>
</tr>
<tr>
<td>1998</td>
<td>230</td>
<td>209</td>
</tr>
<tr>
<td>1999</td>
<td>220</td>
<td>230</td>
</tr>
<tr>
<td>2000</td>
<td>160</td>
<td>253</td>
</tr>
</tbody>
</table>

N.B. Norway includes stocks effect on supplies.

The problem with these projections is that, although implicit in the Norway cycle is a demand reaction, this will vary depending on assumptions concerning the characteristics of demand. This is evident if we attempt to combine supply Projections I and II with Demand Scenario A, because prices are never low enough to generate the kind of supply reaction projected by Kontali. For this reason, Projections III and IV incorporate a very simple interactive process (again it must be emphasised, for illustrative purposes). Under Projection III, the effect of
depressed prices is to lead to static production until prices recover. Production then expands at the average 1987-1992 rate of 50,000 tonnes per annum. Under Projection IV, low prices lead to a fall (of 20,000 tonnes per annum) in production until prices recover. (These projections relate to the discussion in the previous section concerning whether or not biological productivity improvements offset producer economic decisions during a price slump.)

A (1991) real price of 40 Kr per Kg FOB is taken as the level above which, in the past, production was (on average) regarded as profitable and worthy of investment. A period of two years of prices above or below 40 Kr is taken as necessary to reverse the production trend. (The Norwegian intervention policy clearly prolonged the recent period of depressed prices).

Throughout 1993, information has become available concerning vastly improved productivity in salmon production, particularly in Norway. If these higher productivity levels are sustained, it serves to underline just how difficult the market for farmed salmon is to forecast at this stage of its development. The implications for supply projections I-IV would be as follows.

First, after a prolonged period of publishing the same long term supply forecasts, the Kontali monthly report began revising these upwards, and then (perhaps wisely) appears to have discontinued the attempt altogether. However, to show just how dramatic has been the effect, Table 7 reproduces the long term Norwegian production forecasts from the March and July issues of Kontali.

Table 7:

<table>
<thead>
<tr>
<th>Year</th>
<th>March 1993 Forecast</th>
<th>July 1993 Forecast</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>141</td>
<td>141</td>
<td>0</td>
</tr>
<tr>
<td>1993</td>
<td>140</td>
<td>163</td>
<td>16</td>
</tr>
<tr>
<td>1994</td>
<td>125</td>
<td>181</td>
<td>45</td>
</tr>
<tr>
<td>1995</td>
<td>140</td>
<td>200</td>
<td>43</td>
</tr>
<tr>
<td>1996</td>
<td>190</td>
<td>220</td>
<td>16</td>
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<tr>
<td>1997</td>
<td>210</td>
<td>260</td>
<td>24</td>
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<td>1998</td>
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<td>17</td>
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<td>1999</td>
<td>220</td>
<td>270</td>
<td>23</td>
</tr>
<tr>
<td>2000</td>
<td>160</td>
<td>200</td>
<td>25</td>
</tr>
</tbody>
</table>

Source: Kontali

With respect to the interactive supply projections, III and IV, the 1993 productivity improvements, if sustained, mean that the historically based
expand/contract trigger price becomes far too high. By late summer in 1993, a price of 30 Kr/Kg (or less) looks much more realistic. What this does is to interrupt the cycle. A loss-making price becomes a profitable price, and prices do not have “to recover” before a new expansion is fuelled. Thus, compared to supply projections III and IV, prices do not rise significantly in 1993/4, because productivity gains have meant much higher levels of supply than previously expected; and prices decline sooner, and of course fall to lower levels, before depressed conditions arrest the growth in production.

5.3 Price Projections

The implication of combining each of the demand scenarios with the four main supply projections is shown in figures 5-13.

Figure 5 illustrates the very optimistic demand Scenario (A) in which the apparent strong growth in demand experienced during the late 1980s re-asserts itself from 1993 onwards, and prices rise rapidly during 1993-1995. Price projections I and II can be discounted, because these supply projections do not induce the low market prices implicit in the reduced production forecast for the late 1990s. Under supply projections III and IV, prices fall gently after 1994 as increasing production (of 50,000 tonnes per annum) slowly catches up with the (strong) demand growth (of 40,000 tonnes per annum) assumed under this (very optimistic) demand scenario.

Figures 6-9 serve to illustrate the impact of alternative price elasticity assumptions on market stability. Prices fluctuate least with the most elastic market (Scenario C - figure 6), and progressively become greater as elasticity becomes less (-1.5, -1.0 and -0.5 under Scenarios D, B and E respectively - figures 7-9).

Figure 9 includes only supply projections I and III. With the very price inelastic market, the fallback in supply which applies in the case of projections II and IV pushes prices “through the roof” in 1994, and again at the end of the decade. In fact, by combining Demand Scenario E with supply projections II and IV, we are in effect creating the conditions for the “exploding” cycle of the simple cobweb model, discussed in Appendix 2.

Figures 10-13 show the same price projections as figures 5-9, but grouped according to the four supply projections. The generally much higher prices induced by an assumption of strong market growth (Scenario A) or price inelastic demand (Scenario E) are now clearly shown. Otherwise, Scenarios B, C and D produce somewhat similar patterns of price development with, as already mentioned, the
fluctuations in price being greater with the less price elastic markets. Prices overall are higher with the independent (Kontali-based) supply projections I and II, than with projections III and IV, in which supply is only allowed to expand after prices have been depressed for a period.

Figure 14 provides a hypothetical free market scenario, that is, what might have happened, with implications for the future, if a genuine free market in salmon had been present. The assumptions correspond to the discussion in section 4.6, with production higher in 1990 or 1991, falling by 25,000 tonnes in 1992 and 1993, and then subscribing to supply projection IV. Prices do not fall as much in 1990 and 1991 as suggested in section 4.6, because the model cannot take account of the “psychological” and “hidden” effects of the minimum import price.

Finally, Figure 15 serves to illustrate the effect of adjusting supply projections I and III (Ia and IIIa) to take account of the most recent information relating to productivity levels, as discussed in section 5.2.

Throughout this section, the intention has been to illustrate how different assumptions concerning the growth in demand and supply, and the reaction of producers, can be used to forecast the evolution of future prices; and to illustrate how sensitive future price levels are to different assumptions about the characteristics of the market. However, it would be fair to say that, in October 1993, a combination of Demand Scenario D and Supply Projection IIIa) (Figure 15) would represent the Author’s “best bet” over the future - unless a policy initiative should lead to some control over the expansion of production.
Figure 5: Price Projections Under Scenario A
Figure 8

Price Projections Under Scenario B

AI
II
III
I
Figure 12

Price Projections Under Supply Projection III

a, b, c, d, e
Figure 1.4
Price Projection under Hypothetical Free Market

Demand Scenario I
KR per Kg
REFERENCES


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Macrae D. “At last a market to cheer about”, Fish Farmer, Vol. 16, No. 1, 1993.

MAFF (1989), Estimates of income elasticities of demand for individual foods, 1988, Annual Report of the National Food Survey Supplementary Tables Appendix B.

DEMAND FOR ATLANTIC SALMON

Figure A1 plots total estimated consumption of Atlantic salmon against real (1991) price. The latter is the average annual FOB Norwegian price adjusted for the Norwegian inflation rate.

Figures A2 - A6 illustrate how the data is consistent with alternative interpretations concerning price sensitivity (elasticity).

With the least sensitive (inelastic) market shown in Figure A2, only about 20% of the growth in consumption is caused by the decline in price; whereas with the sensitive (elastic) market of Figure A5, 60% of the growth in consumption is associated with the price decline. The extreme case, where only price is responsible for consumption growth, is shown in Figure A6.

Figures A7 - A11 depict the five demand scenarios, as discussed in section 5.1.
TECHNICAL NOTE

There has apparently been some confusion over what was meant when previously describing the salmon market as "inherently unstable". This does not necessarily mean that any salmon cycle would itself be unstable (or explosive); that is, involve progressively greater variation over time.

The conditions for a diverging or conveying cycle are illustrated in Figure T1. Essentially, if supply is less responsive than demand, the cycles contract; and if it is more responsive they converge. However, the nature of the supply response in Figure T1 is unrealistic for the time period covered by a salmon cycle.

We might more realistically expect supply to respond as shown by the rather odd shaped curve in Figure T3. (The numbers are realistic, but intended only for illustrative purposes). Over a (quite substantial) range of output, supply responds rapidly to increasing and decreasing prices (though it may well respond more rapidly to a rising than a falling price). However supply becomes highly unresponsive once prices reach a particular limit and existing productive capacity is reached; beyond this point output can only be increased by further major long term investment. Similarly, at low prices the contraction of supply comes to an end because of the willingness of a number of large producers to behave strategically and to "ride-out" the price depression. The amplitude of the price fluctuations then becomes a function of the elasticity of demand. In the diagram this is assumed to be equal to one (that is neither elastic nor inelastic). As noted in the text, the less elastic the demand, the greater the price volatility.

It should be emphasised that the diagram does oversimplify. In particular, it ignores the fact that both supply and demand are shifting to the right. That is why there is a high price in the first place and means, as discussed in the text, that supply may be characterised more by rapid growth and slight decline, than equal expansion and contraction. However, for the sake of completeness, the conditions required for the development of the regular cycle are illustrated in Figure T2.

Any cycle will be continuous if it passes through the four corners or a rectangle, as in Figure T2. the slopes at a, b, c and d need not be equal; if you start at a,
Figure T1

Figure T2
you go through $b$, $c$, $d$, and back to $a$. For such a solution to be stable, a further condition is required; the slopes of the curves must be such that any small deviation from the path of the continuous oscillation takes the cycle back to the rectangle, rather than away from it.

This is what could happen with farmed salmon. The equilibrium price and quantity are at point $e$. A small shortfall in production to $Q_1$ sets up a cycle which diverges towards the rectangle $abcd$, where it becomes continuous. A large shortfall of production - to $Q_2$, say - sets up a converging cycle which becomes continuous when it reaches the rectangle. Once the continuous cycle is in existence, any deviation between planned and actual output (for example, an outbreak of disease) will introduce an erratic disturbance into the market, but the oscillations will then return to a continuous rectangle.
POLITICAL AND INSTITUTIONAL DEVELOPMENTS: KEY INDUSTRY DATES 1980-93

Government and institutional involvement in the farmed salmon industry has evolved as the industry itself has developed - reacting to environmental and market circumstances. This involvement can be seen as a series of stages.

Rapid Expansion - 1980s

The European farmed Atlantic salmon industry expanded rapidly during the 1980s, fuelled by revolutionary developments in production technology and high profitability. Two major decisions taken by the Norwegian Government in 1985 and 1988 contributed significantly to the production boom. In 1985, controls on the Norwegian smolt industry were relaxed after imports of furunculosis-infected smolts from Scotland had forced several on-growing companies in Norway out of business. As a result, the number of registered smolt producers in Norway increased from 152 in 1985 (producing 23.5 million smolts) to 659 in 1988 (with a combined production capacity of 205 million smolts.) In 1988 the Government responded to political pressure from investors, eager to cash in on the high profitability reported by producers in the mid-1980s, by announcing a 50% increase in the permitted salmon cage volume from 8,000 cubic metres to 12,000 cubic metres.

EC Anti-Dumping Allegations

The rate of expansion in the mid to late 1980s eventually overhauled the rise in market demand, resulting in the industry wide price collapse of 1989. The market disruption caused by cheap imports of farmed salmon prompted anti-dumping complaints against Norway from Scotland and Ireland in November 1989. In response, the European Commission announced in February 1990 that it would investigate the dumping allegations. The enquiry, carried out during 1990, concluded that Norwegian salmon was being sold to EC processors at 20-30% below market prices, causing Scottish and Irish salmon farmers to lose a significant share of French and Danish markets. The Commission report proposed that the EC should impose an anti-dumping levy of 11.4% on Community imports of Norwegian farmed salmon. However, the EC dropped its threatened import duty in November 1990 after receiving assurances that the Norwegian industry was taking steps to raise export prices and that Norway's
Government would co-operate with the EC to combat future market disturbance.

Despite the EC’s decision to drop the threatened 11.4% import levy on Norwegian salmon, Scottish and Irish salmon farmers reiterated their dumping allegations throughout 1991. In June, the Irish called on the EC to fix a reference price for salmon, while in September the Scots demanded EC action to protect their industry from the alleged dumping of Norwegian salmon at prices of up to 20% below their own production costs. In response to these repeated calls for protective measures, the European Community adopted Minimum Import Prices for farmed Atlantic salmon in November 1991 under EC Regulation 3383/91. Originally imposed until the end of February 1992, the EC renewed the application of MIPs until 31st May 1992.

When the Common Fisheries Policy was reformed in late 1992, salmon were included among species for which a Reference Price could be declared. Negotiations are currently going on between the EC Fisheries Directorate and the industry concerning appropriate levels, definition and method of enforcing Reference Prices.

**US Anti-Dumping Allegations**

The US salmon farming industry began to feel the impact of the drop in salmon prices in 1989 when imports doubled to 45,000 tonnes and average import prices fell by more than 25% from $6.86/kg in 1988 to $5.09/kg in 1989. Encouraged by the anti-dumping complaints lodged by Scottish and Irish producers, in February 1990, a group of 21 US salmon farmers collectively known as the *Coalition for Fair Atlantic Salmon Trade* filed a petition with US trade regulation authorities claiming that the Norwegian Government was unfairly subsidising its salmon farming industry.

The US International Trade Commission delivered a provisional ruling in April 1990 that US salmon farmers were losing out unfairly to cheap imports of salmon from Norway, and a preliminary levy of 2.43% was imposed on fresh and chilled imports of Norwegian salmon. A final ruling was made in February 1991, when it was concluded that Norwegian salmon farmers and traders were receiving unfair Government assistance, placing US producers at a competitive disadvantage. A weighted average import levy of 26.5% was imposed on all shipments of fresh and chilled Norwegian salmon with effect from April 1991. This duty is still in place, much to the resentment of the Norwegian industry, which saw its total exports of salmon to the US fall by more than 90% between 1989 and 1991 as a direct consequence of the anti-dumping allegations.
**Norwegian Support Initiatives**

In response to the overproduction and downward spiral in prices which hit the industry in 1989, in January 1990 the Norwegian Fish Farmers’ Sales Organisation (FOS) announced a freezing programme to remove between 20 and 40,000 tonnes of salmon from the market. Initially successful in raising market prices, the provision of long-term intervention on unrestricted production was ultimately a disaster and FOS was declared bankrupt in November 1991. In a last-ditch attempt to restrict output, a separate smolt killing policy was also introduced in 1991 to buy up and destroy about 15 million smolts.

**European Salmon Industry Forum**

The inaugural meeting of the European Salmon Industry Forum took place in September 1992. This voluntary body, established to co-ordinate the collection and dissemination of production and marketing statistics against the background of a Europe-wide system of Producer Organisations, comprises representatives of salmon farmers in Norway, Scotland, Shetland, Ireland and the Faroe Islands.

At a meeting of over 200 salmon farmers in Norway in August 1991, 89% voted in favour of the introduction of producer organisations. In January 1993, a poll of registered salmon farmers in Scotland and Shetland showed 83% support for POs. A more specific poll of all Norwegian salmon farmers on the PO issue is planned for late autumn 1993.
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