FRESH FISH SUPPLIES FROM ICELAND

Prospects for trade in whole fish and assessment of quality control procedures

Seafish Report No. 392

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SUMMARY

Following a meeting between the Seafish Board and the Humberside fish trade in August 1991, it was agreed that Seafish would organise a mission to Iceland to assess the likely trends of future trading in fresh fish and also see if improvements could be made to the quality of fresh fish arriving at the Humber ports.

The mission took place between the 19th and 26th October 1991.

For the next few years the cod TAC is likely to remain around 250,000 tonnes. It has fluctuated during the last 10 years from 200,000 to 300,000 tonnes although actual landings have been 283,000 to 369,000. Haddock will be about 50,000 tonnes which is less than in previous years, but there are some strong year classes coming through. The prospects for other species important to Hull and Grimsby, such as plaice, halibut and ling, remain about the same. Overall it is anticipated that for the next 6 months or so the UK will receive about 1,000 tonnes per week of all species in whole fresh fish form, which is 20% less than 1990.

There is, however, strong pressure from the Icelandic processors to retain more whole fresh fish in Iceland, for export as added value products, especially fresh fish fillets. This is considerably helped by

the removal in January 1993 of the EEC 18% tariff on such products. The actual level of processing, however, will be limited by the availability of labour and their ability to compete in price and quality with fish processed on Humberside or with frozen fillets. Nevertheless, it can be predicted that Iceland will seek to expand the fresh fillet trade although not necessarily to the exclusion of the whole fish trade.

The key to maintaining a viable level of business with Iceland is the price differential paid on Humberside, currently 30-40% higher, and the willingness on the part of the Humberside traders to adapt to changes in supply and product range. There is a very stong desire to strengthen trading links with the UK and this can only be good news for Humberside.

It is, however, essential to maintain an awareness of the changing patterns of quotas and internal changes in Iceland and also to make them aware of the changing needs of the UK market. Whilst there are many contacts on a one-to-one basis, the value of a mission such as this at 6 monthly intervals cannot be under-estimated.

There is a long term proposal for all fish caught by Icelandic vessels to be auctioned in Iceland on a free access market. The implications of this are that foreign buyers could take their share but would then be responsible for transporting their material to the UK or elsewhere or possibly having it contract filleted in Iceland.

There is a special relationship with Iceland which must not be ignored and that is in the trade of fresh whole fish as distinct from frozen fish.

The quality at the point of landing is generally very good with high freshness scores as would be expected from fish only a few hours or days since capture. The majority of vessels use the 660 litre insulated plastic skip and a few use 90 litre plastic boxes. There were a number of observ- ations associated with the skips:

- Some poor gutting - day boats do not gut at all between 15th October and 15th May; the throat is merely cut to facilitate bleeding.

- Poor washing in some cases with blood and slime still adhering to fish.

- Crush damage was commonly found in the bottom layers, i.e. at about 60cm depth.

- Poor drainage in some skips leaving the bottom fish lying in melt water contaminated with blood and slime.

It is argued these are not serious for fish which is to be processed in a few hours and most fish at the point of landing are still in rigor. For fish to be transported to Humberside, these shortcomings can be the seeds of later low quality. Even with fresh fillets, it can be expected that bruising and poor handling immediately after capture will result in a less than high quality fillet. These problems are recognised by the Icelandic trade, but there needs to be a change of attitude by fishermen to onboard quality and a set of guidelines issued relating to the use of skips. Certain top performing vessels refuse to use the skips, preferring the 90 litre box, and these vessels also pay special attention to gutting and washing.

Many of the difficulties over quality loss are easy to identify and action taken to minimise this loss is certainly possible.

Seafish have made provisional plans to work with the Icelandic Fisheries Laboratory and the Icelandic Fish Quality Institute to monitor the quality of fresh fish from catching to sale at Humberside using different methods of handling, temperature control and post harvest care. From this a set of recommended guidelines for good practice will emerge. The application of these in practice, however, rests with the Icelandic Trade Associations.

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1. INTRODUCTION

There has been a trade in cod fish between Britain and Iceland for nearly 600 years. In the early days this was in stockfish (dried cod) and in more recent time it has been fresh whole fish, frozen whole fish and frozen fillets. The range of species has increased and now includes haddock, plaice, catfish, cod fish and halibut. Humberside has been the main trading centre where there has always been a keen demand for fresh whole fish which suits the pattern of trade at Hull and Grimsby.

The Seafish Board met the Humberside Trade in August 1991 and two areas of concern were expressed:

- the future trends in trade with Iceland;
- the low quality of some fish, especially prevalant in that delivered in containers to Hull or Grimsby.

At the same time, Seafish had commissioned Mr. David Symes of the University of Hull, to prepare a series of papers on the importance of the UK's trading links with the Nordic countries, including Iceland. this had highlighted the mutual dependence of Iceland and Humberside. All Icelandic fresh fish imports come through Hull and Grimsby and the UK now depends for 60% of its fresh fish imports on Iceland.

Reports in the press had indicated that the Icelandic Government were having to make substantial cuts in cod quotas in 1992 and that there was acute pressure on the exporters of whole fish to retain more of this fish in Iceland for processing. This statement had obvious implications for Hull and Grimsby.

Between August and October, Seafish staff examined a number of consignments of fish from Iceland. Fish landed directly from Icelandic vessels on balance was in good condition and with freshness values compatible with the storage time. The container fish, however, did exhibit evidence of more rapid spoilage and quite extensive variability within a container.

Against this background it was agreed that Seafish would lead a mission of Humberside buyers and importers to Iceland in late October to discuss these two key issues. The party consisted of:

Alan Hopper	Technical Director Seafish - Party Leader
Petur Bjornsson	Managing Director, Isberg, Hull.
John Olgeirsson	Managing Director, Fylkir, Grimsby.
David Latus	Chairman, Hull FMA.
William Hobson	Grimsby FMA.
Robert Allen	Seafish (Fish Technology Group).
David Symes	Seafish Consultant, Hull University.

The mission took place from 19th to 26th October and this report describes the current status of the Icelandic fishery, its trends and the likely pattern in the future. It also makes initial observations on the quality question, but more work is needed before conclusions can be drawn on this matter.

2. ITINERARY

The party arrived in Reykjavik late on the 19th October. Sunday 20th October was a free day. On the Monday meetings were held with the LIU (Trawler Owners Association), the Icelandic Fisheries Laboratory who are responsible for Food Science and Technology, and the Marine Research Institute who are responsible for stock asessment and recommendations on quotas. Tuesday included a visit to the Hafnarfjordur Fishmarket and the Grandi fish processing and freezing plant. Later a meeting was held with the Federation of Icelandic Fish Processing Plants and this was followed by discussion on quality control with the Icelandic Fish Quality Institute.

On the Wednesday morning, the party visited Faxamarkadur Market and later some of the party visited Grimdavik to see containers being loaded for Hull and Grimsby, whilst others visited the Marine Instutute to discuss in more detail the quota situation and the gear research programmes. On Wednesday afternoon, a formal meeting was held with the Permanent Secretary at the Ministry of Fisheries to discuss the visit, its outcome and the future of trade in fish and fish products. The party also witnessed the MFV FREYA discharging boxed fish which was containerised for the market in Grimsby on Tuesday 29th October.

The main part of the visit then concluded with a dinner hosted by the Trawler Owners Association.

On Thursday D. Symes and R. Allen flew to Vestmannaeyjar to examine the packing of containers with skips and the loading of containers onto the container vessel for transshipment to the UK. Short discussions were also held with an owner of several fishing vessels and the local fish processing factory manager.

Throughout the visit the party were extremely well received by the Icelandic fish industry, and our questions were answered frankly and honestly. The party unanimously agreed that there was a genuine willingness to trade with the UK at the right price and that, although changes were inevitable, there was no reason to be pessimistic about the future. It will, however, require a sustained effort to develop these relationships if the trade is to be prevented from slipping away to other EC Member States.

3. FACTS AND FIGURES ON ICELANDIC FISHERIES AND TRADE WITH HUMBERSIDE

3.1 Main Species and Quotas

From this year, the quota year runs from 1st September to 31st August. The quotas and TACs are decided by the Ministry of Fisheries based on advice given by the Marine Research Institute MRI.

TABLE I: Main Special and TACs with Selected Catches in Recent Years

Species	TACs 1991-92 tonnes	Catch Jan-June 1991 tonnes	Catch 1990 tonnes	Catch 1989 tonnes	Catch 1988 tonnes
Cod	265000	181500	331000	354000	375000
Haddock	50000	28000	66000	62000	53000
Saithe	75000	47200	95000	80000	74000
Red fish	90000	47800			
Greenland halibut	25000	28200	36000	58000	49000
Plaice	11000	5700	11000	11000	14000
Herring	110000	8500			
Prawns (borealis)	28000	14900	30000	27000	30000
(nephrops)	5500	1500	1690	1860	2240

Source: Samband

3.2 Other Non Quota Species

TABLE II:

Species	Catch 1990 tonnes
Monkfish	600
Blue Ling	2000
Ling	5000
Catfish	14000
White Halibut	1600

Source: Samband

3.3 Fresh Fish Exports to the UK 1990 and 1991

Almost all whole fish exported to the UK is sold at Hull or Grimsby. The figures in Table III compare the first 9 months of 1990 and 1991.

TABLE III: Fresh Whole Fish to the UK Jan-Sept 1990 and 1991

Species	1990		1991		% charges	
	tonnes	£/kg	tonnes	£/kg	weight	price
Cod	22954	1.28	12830	1.39	(44.1)	8.6
Haddock	13319	1.38	9652	1.48	(27.5)	9.6
Saith	1677	0.58	1292	0.74	(23.0)	27.6
Red Fish	1055	0.72	1168	0.77	10.7	6.9
Plaice	4827	1.08	4512	1.28	(6.5)	18.5
Halibut	668	1.10	505	1.31	(24.4)	19.1
Other Species	4267	1.11	4751	1.13	(11.3)	1.8
TOTAL	48408	1.22	34710	1.32	(28.3)	8.2

TABLE IV: Contribution of Icelandic Fish to all UK Imports 1984-90

	1984	1985	1986	1987	1988	1989	1990
Thousand tonnes							
Fresh	22.1	44.4	57.1	59.4	64.8	61.6	64.3
Frozen	16.0	23.2	30.5	30.1	31.4	31.6	44.3
Fresh and Frozen	38.1	67.6	87.6	89.5	96.2	93.2	108.6
Relative							
Fresh	100	201	258	269	293	279	291
Frozen	100	145	191	188	196	198	277
Fresh and Frozen	100	177	230	235	252	245	285
Icelandic fish as % all imports							
Fresh	24	44	52	52	56	56	60
Frozen	14	19	23	22	21	20	26
Fresh and Frozen	19	30	36	36	37	35	40

Source:

TABLE V: Humberside Coastal Markets 1990: Sources of Supplies

	Hull		Grimsby		Humberside	
	Tons	%	Tons	%	Tons	%
A.Mode of origin						
Vessel landings: UK	2550	-	7480	-	10030	-
Foreign	7340	-	8280	-	15620	-
Total	9890	23	15760	38	25650	30
Containers	28260	65	18580	44	46840	55
Overland	5390	12	7435	18	12825	15
Total	43540	100	41775	100	85315	100
B.Geogaphical origin						
UK	7940	18	14915	36	22855	27
Iceland	33830	78	24520	59	58350	68
Other	1770	4	2340	5	4110	5
Total	43540	100	41775	100	85315	100

Source: Russells Lists

4. RESOURCES AND FUTURE PROSPECTS

4.1 Resources

The resource evaluation is carried out continuously by the MRI using 4 research vessels and commercial vessel charters. There is a continuous programme of sampling and monitoring.

The main feature observed in the first half of 1991 are a return to favourable environmental conditions caused by the warmer Atlantic water extending further north of Iceland than in recent years and giving higher than average concentrations of zooplankton and phytoplankton.

As regards the cod stock, the fishable size is 55cm (note this is not a minimum landing size) and cod recruit to this size at about 4 years. The recruitment of year classes since 1986 has not been good and the 1986 class is the weakest on record in the last 40 years. Catches have been substantially higher than recommended in recent years and this has reduced the fishable and spawning stocks to an undesirable level. Thus, although the environmental conditions are good for the future, the brakes must be applied now to the cod fishery to permit recruitment to build up. The recommendation is for a TAC 265,000 tonnes for 1991-92 (September to September) and this is likely to be enforced and held for some years leading to a relative shortage of cod from Iceland and keener competition for supplies.

It should be noted that the Icelandic cod does not grow as quickly as the North Sea cod and, therefore, the stock does not recover as quickly. It should also be noted that there have been annual migrations of Greenland cod to Icelandic waters in the past, but these are not expected in the immediate future because of the warmer Atlantic waters on the northern shelf.

The second most important species of interest to the UK is haddock. There is a good year class in 1985 followed by two weak years with recovery again in 1989 and 1990. Caution is needed this year and a TAC of 50,000 tonnes has been set with some optimism for increases in 1993 and 1994. The TAC for haddock in 1990 was 60,000 tonnes.

Saithe, too, is reduced to 70,000 tonnes from 90,000 tonnes, redfish from 80,000 to 55,000 tonnes and plaice is held at 10,000 tonnes,

The overall strategy is to contain fishing effort in Iceland at a lower level in 1991, 1992 and 1993 to encourage some recovery in 1994. The long term prospects would seem favourable, firstly because the management strategies are well structured and relatively easy to apply in contrast to EC waters, and the environmental conditions in Icelandic waters are presently good.

4.2 Control Measures

The control measures in place are sensible, clear and reasonably effective within the limits of human failings. They are:

- Each vessel is allocated an individual vessel quota.

- There is not a minimum landing size. Instead there is a fishable size which for cod is 55cm and for haddock 47cm. All fish above these sizes are deducted from quota. Below these sizes all landings are permissible and 33% are deducted from quota. Anecdotal evidence suggests that there is obviously some discarding at sea of totally unmarketable fish. On the auction market, cod of 25cm was seen on offer for sale. A further difficulty for the system is assessing the above and below fishable size quantities since there is no sorting on board.

- There is a constant programme of monitoring by inspectors on commercial vessels and research vessels. This permits a zone to be closed if the catch exceeds more than 20% of fish under the fishable size. The closure initially lasts for a week, but can then be confirmed by Government order if further surveys show no changes.

- Vessels under 10GT do not at present adhere to the quota system. By 1994 it is planned to bring all vessels down to 6GT to within the quota system.

- The minimum permissible mesh size is 155mm and restricting devices such as ropes are not permitted. A double twin construction for the codend is, however, permitted.

5. QUALITY CONTROL

5.1 Handling Procedures

Since the early 1980s, the 660 litre plastic skip has been widely used because of its obvious advantages in mechanical handling. The depth of the skip is 60cm.

The skips are filled on board the fishing vessel with a single species, but without any size grading. Except on vessels making a voyage of less than 24 hours, the fish are placed in the skip in layers interspaced with ice. The State Fish Inspection Service do not permit fish to be more than 7 days from capture for processing by Icelandic processors. This does not apply to whole fish for export. Day boats do not use ice.

The skips are used from catching to processing without any intermediate inspection. Sample skips are tipped and check-weighed to give a selling weight at the auction or sale by contract to the processor. Each skip contains about 350kg fish.

Several vessels have rejected the skip because of the damage caused by the deep stowage (60cm) opting for the 90 litre plastic stack nest box in which they pack 50-60kg. By UK standards this is about 10kg too much and there inevitably will be less than an ideal amount of ice.

Where 90 litre boxes are used, they follow the same sequence of events as the skips, including check weighing.

Whole fish for export, whether in skips or boxes, are unloaded from the vessel and placed immediately into the containers where they are re-iced. The container is sealed and remains on the quayside until taken aboard a container vessel.

On arrival at Hull or Grimsby the skips are emptied and sorted by size, grade and species. The same applies to boxed fish. The fish are then displayed for auction.

The practice can result in the oldest fish being as much as 18 days on ice. The main time loss is the delay at each end of the sea voyage and the voyage time which could be hindered by weather.

5.2 Observations on Quality

The quality of most fish at the point of landing in Reykjavik, Grindavik and on the Westmann Islands was excellent condition with TRS scores in excess of 8 on a 10 to 0 scale. This is a very fresh standard.

In the skips the following failings were noted:

- Evidence of crush damage, even after 24 hours in the lower layers in the skip.

- Evidence of ambient temperatures (eg 7-10^{o}C) in all un-iced fish and in some fish where the ice had melted.

- Incidents of poor washing on day boat fish leaving traces of blood and slime on the fish and ice.

- Day boats only gut fish between 15 May and 15 October. At other times they merely bleed the fish by cutting the throat. It is believed that day boat fish is rarely, if ever, exported.

- Incidents of pieces of gut, liver and heart left in the gut cavity. The gutting, however, seemed clean cut and rarely extended beyond the anal vent.

- Evidence of melt water accumulation in the bottom of the skips, especially where the drain holes were blocked by fish or debris.

The overall observation is that within the 7 day permissible limit, these failings were not considered by Icelandic processors to be important. However, it is the Seafish experience that these problems lead to accelerated spoilage over the longer period and this, therefore, must be a contributory cause to any quality loss in transit.

There was less opportunity to inspect 90 litre boxes. One vessel landed boxes and these were immediately loaded into a container for Grimsby. The quality gutting and washing seemed excellent on a cursory examination. The boxes were possibly a little overfilled by Seafish recommended standards.

5.3 Further Action on Quality Control

There was complete frankness about the quality control and a general recognition that improvements could be made.

It was, therefore, suggested that Seafish, the Icelandic Fisheries Laboratory and the Icelandic Fish Quality Institute, should collaborate on a joint project to monitor quality and temperature from capture in Iceland to landing and sale in the UK. This would result in a set of guidelines for fishermen and exporters. It would then be a matter of agreement with all concerned how the improvements could be put into practice. This would be through information, training, demonstration and possibly some quality control indexing showing that the procedures had been adopted.

Appendix IX shows the outline of this programme.

6. FUTURE TRADE PATTERNS

6.1 Increase in Processed Fish Exports

Iceland depends on fish and fish products for 75% of its foreign trade earnings. 60% of the UK's imports of fresh fish come from Iceland. It can be seen, therefore, that there is a considerable interdependence between the two countries (Tables IV and V). The EC is Iceland's biggest trading partner in all goods.

Both the Icelandic Government and the Processors' Association understandably want to increase the amount of added value material produced at the expense of lower value whole fish and salt fish. Prior to 20th October 1991, when the formation of the wider European Economic Zone was announced, this trade had always been hindered by the 18% tariff on processed imports into the EC.

At the same time exporters of fresh whole fish have been penalised by a 20% supplementary deduction of quota on all fish sent abroad. Obviously, the combined effect of the removal of the tariff whilst retaining this penalty will seriously affect fresh whole fish supplies into the Humber ports. It is hoped that in the spirit of fair competition that the quota penalty would be removed at the same time as the EC tariff.

6.2 Practical Problems in Iceland

However, there are a number of practical problems to be overcome. Firstly, although there is substantial over-capacity in processing in machine terms, there is an acute shortage of labour. The population is just over 250,000 of which 58% are concentrated in the Reykjavik area. Unemployment is measured

as 1.7% which is negligible. This leads to shortage of manual workers and management, especially in the remote areas. There have been some influxes of Vietnamese and short stay workers from the EC, but the underlying difficulties remain.

Secondly, the cost of labour is estimated at 25% higher than in the UK which would place a premium on processed fish, although this could be reduced by greater use of machines.
Thirdly, there is a preference by many fishermen and exporters to take the higher prices on the UK markets, especially as the cuts in individual vessel quotas are already affecting their revenues. Prices on Hull and Grimsby are on average 40% above the prices at Faxamarkadur and Hafnarfjordur markets and could go higher if the quality loss in transit is minimised.

6.3 Special Relationship with UK

At all the meetings it was agreed that a unique feature of the Icelandic fishery was that it could supply fresh fish both to the US and EC markets because of its favourable geographical location. Clearly, this special relationship would be eroded if Icelandic processors concentrated on frozen products. These are less favoured and the world price is fixed in US$ by the trading activities in the USA.

For these reasons it is difficult to see an immediate large scale reduction in the percentage of whole fish exported to the UK although there will be weight reductions because of the cut backs in quotas.

In time there will inevitably a realignment of the trade with a growth in processed fresh fish, but this could be taken from whole fish exports, frozen processed fish and salt fish.

The UK is likely to receive much of this fish because of the interdependence mentioned earlier. However, some of the buyers and processors in Hull and Grimsby will see this as a down turn in their own trading patterns. Others will see it to their advantage. It is essential that the UK identifies its best trading opportunity within this re-alignment process.

The movement of fresh fish fillets into the UK and wider EC market is a very complex and well organised activity. The Icelandic exporters will have to depend on such a system being in place before they can expect to succeed in this area.

6.4 Importance of Maintaining Trade Links

On several occasions the mission was complimented on its initiative to talk frankly and broadly across a wide range of issues. Whilst there are many one to one visits between UK and Icelandic companies, there has not been the opportunity to look at wider issues.

It was reported that the German State Governments of Bremen and Cuxhaven regularly brought a team of political and government officials together with trade leaders to discuss future trade in detail. Similar missions came from the Netherlands, Denmark and France.

It is concluded, therefore, that such a mission is necessary for the UK, say bi-annually, because of the special relationship which exists between the two countries in cod and the trade in fresh fish generally.

6.5 Iceland Auctions

Visits were made to the two Iceland auctions at Faxamarkadur and Hafnarfjordur. Both operate by an ascending bid system and there is a single auctioneer employed by the Market Authority. At Faxamarkadur the auction takes place in a separate room after the fish have been viewed with telephone bids from distant markets being common.

The Government have declared their wish that all Icelandic caught fish should be auctioned before it is sent to the plants or exported as whole fish. This in theory would retain more of the revenue in Iceland and increase the difficulties for exporters of whole fish. From the observations made by the mission, this practice would certainly introduce further delays and accentuate the quality loss.

These plans are not yet developed, but the concept would have a much greater impact on trade with Humberside than cuts in quotas or a realignment of the trading mix.

7. CONCLUSIONS

7.1 In the short term there will be reduced quotas for Icelandic vessels, especially of cod. This will inevitably mean a reduction of fresh whole fish supplies to the Humberside ports. The best estimate of this reduction, due to quota limitations, is about 20% less than 1990.

2. In the longer term there will be some recovery of stocks provided the measures proposed by the Icelandic Government take effect. At the same time, the elimination of tariffs on processed imports into the EC in 1993 and the pressure from Icelandic Processors and Government to add more value, will result in some re-adjustment of the trade mix with the UK.

3. The UK remains the main customer for Icelandic fish and there is a genuine will to develop and strengthen this trade, The UK should, therefore, reciprocate and regular trade, technical and policy missions should be held at 6 month intervals. The Icelanders are well disposed to broad based missions of this type.

4. There is evidence of shortcomings in post harvest care of the catch on Icelandic vessels which, when coupled with the long voyage time from Iceland to Humberside, result in unnecessary spoilage. It is believed that quality loss can be minimised and Seafish will work with the Icelandic Agencies to achieve this.

5. The Icelandic authorities and processors would like to capitalise on the special relationship with the EC of their ability to supply fresh fish into the high value sector of the market. The Icelandic processors will need some co-operation. If the UK fails to respond to this, then it is likely that this trade will slip away to other EC states and then supplies will come into this country by another route.

6. An important trend to watch in Iceland is the possible introduction of a ban on exports unless they pass through an auction in Iceland.

APPENDICES

APPENDIX I	Survey of fish temperatures on unloading of containers of Icelandic Fish on Hull Fish Market 0.00am 25th September 1991.
APPENDIX II	Regulation on handling, storing and transportation of processed fresh fish.
APPENDIX III	Icelandic Fish Quality Institute
APPENDIX IV	The Icelandic Fisheries Laboratories
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APPENDIX I

Survey of fish temperatures on unloading of containers of Icelandic Fish on Hull Fish Market 0.00am 25th September 1991

Insulated containers with no mechanical refrigeration devices are used to transport fish from the Westermann Islands to Hull. The containers can be ventilated by two 450mm ventilators located on the opposite wall to the door but these were closed.

Each container was packed with 30 insulated tote-bins stacked 2x5x3 (w,d,h). Each tote-bin had internal measurements of approximately 1x1.4x0.9m (w,d,h) and hold 1 000 l. These were stacked with limited vertical air gaps between bins and horizontal air gaps of approximately 150mm, created by the feet of each bin, between each layer of tote-bins. In some cases each stack of 3 tote-bins was wrapped in polyethylene sheet.

The tote-bins are constructed of a double layer of polyethylene sandwiching an insulating layer of polyurethane. The single 50mm drain hole is located on the side of the container about 50mm from the internal bottom.

Of the 7 Isberg containers to be unloaded time/manpower only permitted the profiling of one container. However fish from other containers were examined on a somewhat random basis during and after boxing for the following market.

In the seven tote-bins thoroughly investigated, it was found that there was a large variation in the amount of ice used; ice being located throughout the bin, to only a layer of ice on the top.

In tote-bins with limited icing crush damage was observed in a number of fish located at and near the bottom of the tote-bins, due to the weight of fish positioned above it.

The design of the tote-bins means that melt water and fish slime can create a bacterial "soup" at the bottom of the tote-bin which may provide ideal conditions for anaerobic spoilage and creation of "stinkers", this is more conceivable if the drain hole is blocked by a fish.

It was the generally considered by myself and the other SFIA personnel that the level of icing was in inverse proportion to the quality of the fish. Thus poorer quality fish had been thoroughly iced at Westermann Islands to prevent further spoilage.

In general it was found that the smaller fish (eg red fish, small haddocks) were well iced. The larger cod had little ice mainly on the top of each tote-bin. In some cases the fish at the bottom of a poorly iced tote-bin was at a temperature of between 3.7 and 6.0 (Av 4.9; SD 0.4) this indicated that the fish was packed whilst still at a relatively warm temperature. Ice on the top had no cooling effect because of the insulating effect of layers of fish.

Of the material in the container profiled there was a significant variation in quality of the cod examined (based on the TRS scoring system of 10-0) where 6 is the cut off point below which quality is not acceptable. However it is known that fish with a score of 4 can be sold in certain sectors of the market. Most of the material was found to have TRS scores of between 6 and 8 however extremes of 5 and 8.5 were encountered.

Temperature of fish was also measured when it was placed on the market floor at 3.00am and again at 6.30am. During this period there was an average temperature rise of 1.0°C to 3.8°C, but in extreme cases the rise had been 4.0°C to 5.7°C, during a fall in air temperature from 15.4°C to 11.8°C. This suggests that during the higher temperatures of summer months a larger increase in temperature would be found.

App.I.iii

Temperature profile of fish stored in tote-bins within the insulated container (Average Temperature °C and Standard Deviation of ten fish located at indicated position)

Av	SD		Av	SD		Av	SD	
4.5	0.7		2.6	1.9		3.2	5.3	
						1.3	1.5	
1.1	0.7		0.7	0.8		0.3	0.2	
			Av	SD				D
			0.2	0.0				O
			0.4	0.1				O
Av	SD		Av	SD		Av	SD	R
1.0	0.6		1.2	1.9		1.6	1.1	
						1.7	0.9	
1.0	0.2		0.4	0.2		4.9	0.4	

TRS scoring profile for cod stored in tote-bins located at the indicated positions within the insulated container

6-7 (8)		6		6-7	
				6-7 (8)	
8-8.5		7-8		8	
		6-8			D
					O
		7-8 (8.5)			O
8		6-8		7-8	R
				(5) 6-7	
8		7-8.5		5	

APPENDIX II

Regulation on handling, storing and transportation of processed fresh fish

Article 1. If fish is headed, split, filleted or processed in other way and intended for sale as fresh or second processing which is not in direct continuation the pprimary processing, good care should be taken that the fish is well iced or cooled in another accepable manner from the time of capture until it is in the hands of the buyer or the reciever.
Fish processed in this way must be in the hands of the buyer or reciever at the place of processing or distribution no later than seven days from the time the fish was caught. Fresh fish shall be transported in containers securing it from pollution and that ensures hygienic handling

.

Article 2. The State Fish Inspection supervises processing and storage of processed fish and that institute should be informed about exports of freh fish with due notice. In that notice it should be decleared on which day the fish was caught where it was processed and how it will be transported to the buyer or reciever within the time-limit set out in article no.1. The sState Fish Inspection issues an export certificate for the fish in question which among other things takes in to account whether the fish will be in the hands of the reciever or buyer within the above mentioned time limit.

Article 3. Processed fresh fish , according to this regulation, is fish which shelf life has not been extended by other means than cooling. Processing in this context means subjecting the fish to chemical or physical alteratopns in the fish flesh such as heating, freezing, salting or drying. Fish is considerederd frozen if its temperature is minus 20° Centigrade or lower.

Article 4. Fish or fishery products shall not be transported or kept under conditions where the temperature is between of minus 1° to minus 20° Centigrade.

Article 5. Non compliance with this regulation is punishable according to law no. 53, 30th of May 1984, on the State Fish Inspection.

Article 6. This regulation is in force according to article 23 of law no. 53, dated May 30th, 1984 about the State Fish Inspection. The regulation becomes effective as from April 9th 1990. An older regulation, no. 109 from March 2nd, 1990 is no longer effective.

The Ministry of Fisheries, April 4th 1990

Halldór Ásgrímsson, Árni Kolbeinsson.

APPENDIX III

Icelandic Fish Quality Institute

Everyone in Iceland engaged in fishing and the processing and exporting of seafood is subject to the authority of the Icelandic Fish Quality Institute. The Institute is a government body, working in cooperation with the fishing industry to improve and secure the quality of the landed catch as well. Laws and regulations are set by the Icelandic authorities in an effort to secure and maintain the highest quality of fish products and ensure that production facilities meet the standards set for hygiene and quality.

The Institute controls:

Fishing Vessels	✓
Raw Material	✓
Local Fish Markets	✓
Transport Facilites	✓
Production Facilites	✓
Products	✓
Officially Approved Inspectors	✓

ASSURANCE OF QUALITY

The Institute ensures the quality of fish products from Iceland by providing technical guidance to the fish industry on handling and processing of fish, based on regulations and specific hygienic standards.

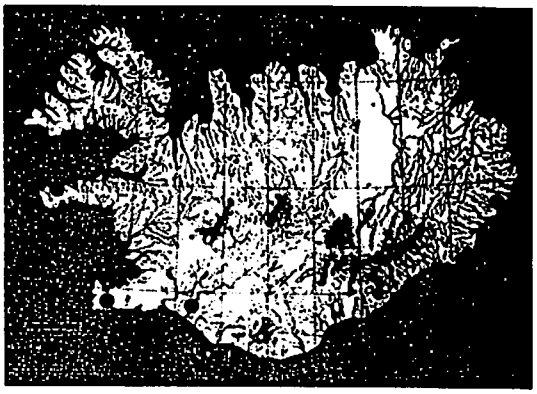
The Icelandic Fish Quality Institute inspects all processing plants and premises and grants licences where standards of construction and hygiene are met. All fishing vessels are subject to an annual inspection for compliance with hygiene and operational requirements.

The Institute serves and advises the fishing industry in maintaining and improving the quality of all fish products for export.

THE INSTITUTE´S NEWSLETTER

A regular newsletter is a valuable means of reaching everyone within the fishing industry, to promote the importance of quality of all products for export from Iceland. Quality can only be maintained or improved when everyone taking part in handling fish, from the moment it is caught until it reaches the consumer, is aware of the responsibilities involved.

The newsletter is distributed free to readers all over Iceland.



Ríkismat sjávarafurða

FRÉTTABRÉF 06.90

6.tbl.5.árg. 1990 15. júlí

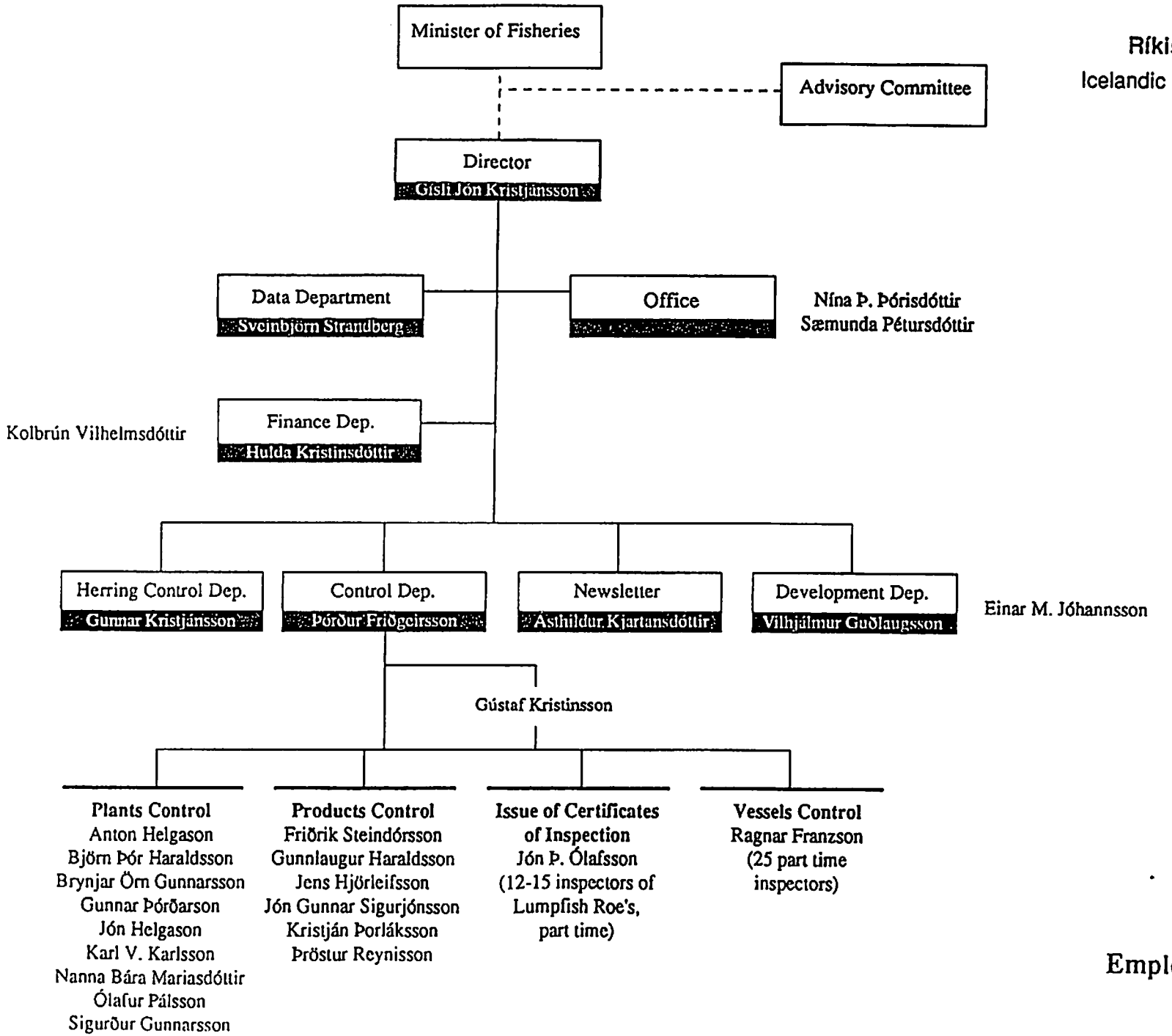
„að vinna jafnan sem nytsamast verk með sem minstum erfiðismunum"

OPERATIONAL REGIONS

The Icelandic Fish Quality Institute has a central office in Reykjavík. For management purposes the country is divided into nine operational regions, each controlled by a chief inspector in charge of inspection of fish products for export, fishing vessels and processing facilities, and granting licences for:

1. Freezing plants
2. Saltfish processing
3. Stockfish production
4. Curing of herring
5. Fish canning and preservation
6. Curing of lumpfish roe
7. Fresh fish
8. Vessels

Official fish inspection in Iceland dates back to 1904 when a chief fish inspector in Reykjavík was appointed. The first law on fish inspection was passed in 1909.



Employees 29

APPENDIX IV

The Icelandic Fisheries Laboratories

Research in the fishing industry is no longer confined to Government institutes. More and more companies have established their own facilities to enhance product development. Managers have become more and more aware of the fact that without product development and their own laboratories, the companies will not make sustained profits.

Over the past two years the Institute has experienced significant increase in requested by companies to conduct various examinations and research. Such projects include quality improvements, developing new products, test new equipment which Icelandic companies have built, etc. During the period 1989 and 1990, a total of 50 research projects were carried out at the Institute in cooperation with 30 companies and associations.

Most of the cooperative projects were partially financed with Government grants and partially with the Institute's Government funding. Looking at the fishing industry as a whole it is estimated that the firms pay around 60% of the total cost of research and product development in the field.

During the last two years almost all of the IFL State funding has gone toward the daily running of the Institute and co-funding of projects along with firms. Various applied projects in cooperation with companies and testing and analytical services have thus had a priority in the Institute's activity over the past two years. As a result the Institutue has not had the opportunity to conduct the amount of basic research it would have preferred.

This has to change. The Instititue must have the opportunity to carry out basic research projects as well as to provide analytical and measurement services and to solve problems in cooperation with firms. It must also have better opportunity to participate in international research programs. Otherwise the professional foundations of the Institute may weaken. The Institute will endeavor to adjust its course accordingly in the coming years.

List of Projects 31.12.1990

88.305 **Developing products from liver oil.**
Possibilities of producing valuable materials from excess fat left over after w-3 fatty acids have been removed from liver oil will be examined. Ways are also sought leading to increased value of inexpensive or underutilized raw material, such as capelin liver oil and shark liver oil. Demand for various products from fat will be examined and technical solutions for possible production will be sought.
Geir Arnesen
Börkur Gunnarsson
Baldur Hjaltason
Guðjón Atli Auðunsson
(Lýsi Ltd., The Research Fund of the National Research Council)

88.504 **The effect of environmental factors on the growth of microorganisms.**
The aim is to define the connection between environmental factors such as heat and the composition of air on the growth of microorganisms in order to determine storage life of fish.
Hjörleifur Einarsson.

89.107 **Quality evaluation of salmon (chemical examination).**
The aim is to investigate the practical use of chemical analysis to evaluate quality of salmon since mesurements of TMA are useless for this purpose. The first part of this project has been directed at measuring certain breakdown chemicals of ATP, the socalled K-value.
Kristberg Kristbergsson
Sigrún Guðmundsdóttir
(The University of Iceland)

89:108 **Development of bread crumbs with a salted fish flavor.**
The aim is to develop a method by a extrusion boiling to produce bread crumbs mixed with salted fish.
Irek Adam Klonowski
Einar Matthíasson, The Technical Institute of Iceland
Kristberg Kristbergsson
(The Research Fund of the State Research Council, The Technical Institute of Iceland, The University of Iceland, The Association of Icelandic Fish Producers)

89.201 **Removal of pollutants from liver oil.**
The aim is to investigate whether dioxins and toxaphenes can be measured in Icelandic liver oil. Also to investigate ways of removing them.
Snorri Þórisson
Guðjón Atli Auðunsson
(Fiskafurðir Ltd., Bernh. Petersen)

89.202 **Biogenic amines in capelin meal and fish feed.**
Feeding experiments on smolt consisting of investigations of rotamine content (break-down chemicals from spoiled raw material) in capelin meal both as it comes from the factories as well as with synthetic biogenic amines added to first class capelin meal to isolate their effect. The possible poisonous effect of biogenic amines on feed as evidenced by a drop in growth of smolts is investigated.
Soffía Vala Tryggvadóttir
Jónas Bjarnason
(The Agricultural Research Institute, The Cooperative Wholesele Society on Grain and Feed Imports, The Research Fund of the National Research Council.

89.351 **Skin damage of spiced herring.**
The aim is to find a chemical explanation for white scabs which occasionally appear during the processing of spiced herring.
Geir Arnesen
Iceland Herring Board)

89.401 **Increased storage life of fish fillets.**
The aim of the project is to estimate the storage life of fresh fish fillets in wholesale packaging at different air conditions and temperatures using carbon dioxide for preservation. It will also be investigated whether the enzymes glucose oxidase and lysozyme do increase the storage life of fresh cod or haddock fillets.
Guðmundur Stefánsson
Friðrik Blomsterberg
(The Research Fund of the National Research Council)

89.402 **The storage life of fresh lumpfish roe.**
The aim of the project is to evaluate the storage life of fresh lumpfish roes at different temperatures and air conditions with or without preservatives.
Emilía Martinsdóttir
Hannes Magnússon
(The Association of Icelandic Small Vessel Owners)

89.403 **Producing caviar from salmon roe.**
The project deals with experimental production, experiments on storage life and marketing research on different types of salmon roe caviar, both preserved and fresh. Roes will be obtained by squeezing salmon from pens or ocean ranches.
Friðrik Blomsterberg
Guðmundur Stefánsson

89.405 **Membrane removal of salted fish.**
The aim of the project is to investigate whether enzymes are suitable for removing membrane of salted fish.
Unnur Steingrímsdóttir
(The Research Fund of the National Research Council, the Association of Icelandic Fish Producers).

89.501 **The storage life of caviar.**
The aim is to investigate the effect of various factors such as storage temperature, salt content, pasteurization and preservatives on the storage life of lumpfish roe caviar.
Hannes Magnússon
Emilía Martinsdóttir
(Iceland Waters Corporation)

89.502 **The storage life of salted lumpfish roe.**
The aim is to discover what quantity of salt is necessary for the salting of lumpfish roe without benzoate in order to get the same storage life as by traditional salting with benzoate.
Emilía Martinsdóttir
Hannes Magnússon
(The Association of Icelandic Small Vessel Owners, The Icelandic Fish Quality Institute)

89.503 **Biopreservation of seafood.**
The aim is to find ways to increase the storage life of seafood by using natural preservatives produced by bacteriocins.
Hjörleifur Einarsson
(The Natural Science Instute of the University of Iceland, the Research Fund of the National Research Council, Nordic Fund for Industry and Development)

89.603 **Frost damage of stockfish.**
The aim is to evaluate spoilage of stockfish which has frozen during the drying period. Comparison will be made of stockfish from the same raw material which has frozen on the one hand and on the other hand stockfish which has not frozen. Studies will be made to find the stage during the drying period at which stockfish is the most vulnerable to freezing damage.
Sigurjón Arason
Ástríður M. Sigurðardóttir
(The Icelandic Fish Quality Institute)

89.604 **The chemical composition of fresh scallops.**
The aim is to check the chemical composition of scallops by the season of the year. Samples will be taken of fresh scallops over a period of one year, cleaned by hand and analysed chemically. Processing lines will also be examined in connnection with the chemical composition of the final product.
Snorri Þórisson
Jón Heiðar Ríkharðsson
(The Icelandic Freezing Plants Corporation, Iceland Seafood Ltd.

89.615 **Silage production at sea.**
The aim is to prove that silage production at sea is possible and to solve the technical problems which may appear. Several voyages will be made and the silage then processed.
Einar Þór Bjarnason
Sigurjón Arason
Guðmundur Þóroddsson
(The Committee on Yield and Utilization, Faxamjöl, Krossanes and Stálskip, Gunnvör and Einar Guðfinnsson).

89.616 **By-catch bank.**
The aim is to set up a contact between fishermen and market organizations to commercialize the by-catch, seeing to it that payments to fishermen go smoothly and well and create a constant supply of by-catch to encourage the processing and selling of these species.
Einar Þór Bjarnason
Sigurjón Arason
Guðmundur Þóroddsson
(The Committee on Yield and Utilization, Grandi Ltd., The Icelandic Freezing Plants Corporation, Iceland Seafood International Ltd.)

89.617 **Marketing of silage concentrate.**
The aim is to investigate the marketing and further product development of silage concentrate, especially from gut silage and silage from freezer trawlers. The aim is to use this in producing feed for pets, fur-bearing animals and fish farming.
Sigurjón Arason
Guðmundur Þóroddsson
Einar Þór Bjarnason
(The Committee on Yield and Utilization, Krossanes, Lýsi Ltd., Einar Guðfinnsson Ltd.)

89.618 **New gutting machine for freezer trawlers.**
The aim is to increase the utilization of fillets 3–4% and decrease the amount of work aboard freezer trawlers. This is possible by using a new gutting machine which heads in front of the collar bone in connection with a filleting machine which can cut the collar bone off.
Sigurjón Arason
Guðmundur Þóroddsson
Einar Þór Bjarnason
(The Committee on Yield and Utilization, Baader, Meka, Grandi Ltd.)

89.652 **Examination of fillets from freezer trawlers.**
The aim is to investigate whether it is possible to determine the yield of cod fillets aboard freezer trawlers by examination ashore.
Sigurjón Arason
(Ministry of Fisheries, The Icelandic Fish Quality Institute)

89.801 **Digestibility of Icelandic capelin meal.**
The aim is to compare different capelin meal according to drying methods, chemical contents, digestibility (pepsin digestibility) and titration value. The project is related to the preparation of standard methods in cooperation with IAFMM.
Gunnlaugur Friðbjarnarson
Snorri Þórisson

90.107 **Fatty acids composition of ocean ranched salmon.**
The aim of the project is to analyse the fatty acid composition of the flesh of ocean ranched salmon, mainly with regard to n-3 polyunsaturated fatty acids. The positive effect of n-3 fatty acids on the cholesterol in humans has been proven and it is likely that they decrease heart and artery disease. Furthermore, it is necessary to recognize the fatty acids composition of salmon to evaluate the storage life of frozen products but the storage life is mainly limited by the rancidity of fat.
Kristberg Kristbergsson
Ásbjörn Jónsson
(The University of Iceland, Silfurlax Ltd.)

90.200 **Sulfite in lobster.**
The aim is to investigate the connection between the quantity of sulfite used in the bathing of lobster and measurable sulfite in the final product.
Sigurður Einarsson
Jónas Bjarnason

90.201 **The standardization of fish meal production for fish feed.**
Feed experiments on salmon aimed at investigating the quality levels of capelin meal for feed production. The breakdown chemicals biogenic amines will be studied further but these form in raw material which has become spoiled before processing. It will be studied whether it is possible to use rotamine contents to determine the quality of capelin meal. More spoiling factors in capelin meal will be investigated such as the rancidity of fat and the smolts sensitivity to smell and taste of fish feed made from capelin meal of variable quality.
Soffía Vala Tryggvadóttir
(The Agricultural Research Institute, the Cooperative Wholesale Society for Grain and Feed Imports, the Association of Icelandic Fish Meal Producers, the Research Fund of the National Research Council)

90.208 **The storage life of frozen salmon.**
The aim is to investigate the storage life of frozen salmon. Different methods of freezing and handling before freezing of whole ocean ranched, shore farmed and pen farmed salmon will be compared. The storage life of frozen salmon fillets will furthermore be investigated.
Snorri Þórisson
Margarét Bragadóttir
(The Research Fund of the National Research Council, Silfurlax, Vogalax, the Icelandic Freezing Plants Corporation, Iceland Seafood International Ltd.)

90.306 **Yellowing of cod flesh.**
Systematic examinations will be conducted in order to describe the nature of the chemical reactions responsible for the yellowing of cod flesh and the environmental factors which may have an effect thereupon will be studied. The knowledge which is thus gathered will be used to prevent diminished quality due to yellowing.
Geir Arnesen
(The National Science Fund)

90.307 **Sewage in Reykjavík.**
The aim of this project is to define the chemical and microbiological composition of sewage in Reykjavik and its dispersion in the sea.
Guðjón Atli Auðunsson
Hannes Magnússon
(The City of Reykjavík, Vatnaskil Consulting Engineers Ltd., The Marine Research Institute)

90.363. **Fixed and digestible lysine in fish meal and fish feed.**
The aim is to render it possible to measure the total quantity of fixed and digestible lysine by a liquid chromatography but these factors will be used in evaluating a possible drop in the quality of fish meal due to the drying process.
Guðjón Atli Auðunsson
Ralf Hartemink

90.364 **Amino acids in fish products.**
The aim is to render it possible to determine free amino acids as well as amino acids fixed in protein by liquid chromatography. Also a quick method to determine hydroxyproline, which is i.a. a measure of collagen. The results of such measures will be used to study for example the nutritional value of fish products, the nature of various curing and processing methods, processes of spoiling and looseness of fish flesh.
Guðjón Atli Auðunsson,
Ralf Hartemink

90.365 **Measurements of putrifactive amines in fish meal.**
The aim is to render it possible to measure biogenic amines (putrefactive amines) by liquid chromatography but these substances occur due to bacterial breakdown of free amino acids. The quantity of those will, among other things, be used to evaluate the handling of raw material for meal production.
Guðjón Atli Auðunsson
Ralf Hartemink
(The National Science Fund)

90.366 **Astaxanthin and cantaxanthin in fish feed.**
The aim is to render it possible to measure these pigments in fish feed but they have a limited storage life. Their quantity will also be investigated in various products which might be a source (for example shrimp shell) to supplement expensive chemically produced astaxanthine. Such analysis is used in chemical evaluations of color quality, for example of ocean perch, salmon, shrimp and trout.
Guðjón Atli Auðunsson
Ralf Hartemink
(Fóðurblandan Ltd.)

90.376 **Organic pollutants in seafood.**
Methods will be developed to determine various organic pollutants in seafood, which originate from industry (for example PCB compounds), agriculture (for example DDT and its break-down elments) and various human activity (for example PAH compounds). The methodology is based on gas chromatography connected to a mass spectrometer and conducted in such a fashion that it fulfills comparative tests by the International Council for the Exploration of the Sea (ICES) before it will be applied to test samples from the marine life around Iceland as a part of Iceland's responsibility within the framework of the Oslo and Paris Conventions.
Stefán Einarsson
Guðjón Atli Auðunsson
(State Directorate of Shipping, the Marine Research Institute)

90.385 **Selenium and arsenic in sea food.**
Assessments will be made of these semimetals accompanying a project with the registration number 90.386.
Eva Yngvadóttir

90.386 **Heavy metals in seafood.**
Heavy metals (copper, lead, cadmium, mercury and zink) in marine life around Iceland will be measured as a part of an international project (the Oslo and Paris Conventions). 13 nations around the North Atlantic participate in this project. The aim is to discover whether and to what extent this ocean area is chemically polluted.
Guðjón Atli Auðunsson
Guðrún Ólafsdóttir
Eva Yngvadóttir
(The State Directorate of Shipping, The Marine Research Institute, the National Institute of Radiation Protection)

90.395 **The development of a standard for cod liver oil for the European Pharmacopoeia.**
The work involves preparing a standard which is based on the Pharmacopoeia which is now in effect in the Nordic Countries. Changes being contemplated are for example a further description of the fatty acid composition, methodolgy to determine fatty acids, preservatives and vitamins A, D and E. A possible guarantee that liver oil may not contain harmful contaminants, will be considered.
Guðjón Atli Auðunsson
(The Ministry of Health, European Pharmacopoeia Commission (Expert Group 13H))

90.397 **Copper pollution in salt.**
The aim is to locate those environmental factors in the transport and handling of salt which can pollute it with copper and thus cause damage in fish products by turning them yellow. A testing method will be developed which will increase the sensitivity of the present method up to 10 fold.
Guðjón Atli Auðunsson
(Hafnarbakki Ltd.)

90.401 **Studies on the ripening of salted herring.**
The aim is to investigate traditional curing methods of salted headed and gutted herring aiming at conrolling the processing for example by added enzymes and/or bacteria.
Guðmundur Stefánsson
(The Research Fund of the National Research Council, the Iceland Herring Board)

90.402 **Quality characteristics of ocean perch and storage life.**
The aim is to collect data domestically and abroad on the quality characteristics of ocean perch. Experiments on storage life will be conducted using sensory evaluation and other factors to determine storage life. Results will be made compatible with a computer program for data processing in quality assessment of fish.
Emilía Martinsdóttir
Hannes Árnason
(Nordic Fund for Industry and Development)

90.405 **Better utilization of lumpfish.**
The aim is to define and organize a research and development project in order to obtain better utilization of lumpfish and lumpfish products.
Halldór Þórarinsson
Guðmundur Stefánsson
(The Research Fund of the National Research Council, the Association of Icelandic Small Vessel Owners)

90.407 **Collagenases in catfish viscera.**
The aim of the project is to locate where collagenatic reactions are concentrated in viscera. The enzyme will be purified and its effectiveness evaluated. Finally its storage life will be studied.
Unnur Steingrímsdóttir
Ólöf Hafsteinsdóttir
Ágústa Gísladóttir
(The Research Fund of the National Research Council, Nordic Fund for Industry and Development, The Institute's Branch in Ísafjörður, Norðurtanginn Ltd. and Vísir Ltd.)

90.504 **Storage life of thawed fish fillets.**
The aim is to investigate the effects of freezing and freezer storage on the storage life of fillets of haddock and ocean perch stored on ice after thawing.
Emilía Martinsdóttir
Hannes Magnússon
Páll Steinþórsson
(The Icelandic Freezing Plants Corporation, Iceland Seafood International Ltd. and the Research Fund of the National Research Council)

90.603 **"VIRKNI" – Project management.**
Project management of a large joint Nordic cooperation project. The Icelandic Fisheries Laboratories and the Technological Institute of Iceland cooperate in this project. The aim of the project is to increase effectiveness by automation in packaging and freezing in processing plants along with increased efficiency of transportation and data systems in the plants. The project is divided into four parts having the project numbers 90.604-90.607.
Sveinn V. Árnason
(The Technological Institute of Iceland (TII), Marel Ltd., Efli Ltd., the Icelandic Freezing Plants Corporation (IFPC), the Stefán Ólafsson Consulting Engineers (VSÓ), the Standardization Council of Iceland (SCI), Aalborg Industrial Corporation, Denmark (AIC), N&R-Consult Denmark (N&R).

90.604 **"VIRKNI" – Development of a processing line.**
Development of dynamic grading- and packaging equipment for freezing plants in order to decrease the need for manpower and improve yield and quality. The part of the Institute is mainly analysing the need, market size and conducting tests.
Hannes Árnason
(IFPC, Efli, Marel, N&C, AIC)

90.605 **"VIRKNI" – Automation in freezing.**
The aim is to develop a system to facilitate work in freezing by automatic or semi-automatic equioment with the aim of decreasing the need for manpower and improve working condition.
Árni Geirsson
(IFPC, Efli)

90.606 **"VIRKNI" – Logistics.**
The aim is to analyse and improve product and dataflow within the freezing plants.
Hannes Árnason
(TII, VSÓ, AIC, N&R)

90.607 **"VIRKNI" – Packaging.**
Evaluation and improvements of the freezing industry's present packaging. The aim of this part is to improve packaging for frozen fish in order render it more suitable for all transportation stages.
Hannes Árnason
Guðmundur Stefánsson
(TII, IFPS, SCI)

90.611 **Machine for gutting plaice.**
The aim is to develop a suitable method for gutting of plaice. Design and build a prototype of a gutting machine. Experiments will be made and equipment improved as necessary.
Hannes Árnason
(The Research Fund of the National Research Council, Efli Ltd.)

90.613 **Wing-cutter for starry ray.**
The aim is to develop a machine to cut the wings off the starry ray.

Árni Geirsson
(The mechanical workshop of Oddgeir and Ási,
Keflavik, Sjólastöðin Ltd., Hafnarfjörður)

APPENDIX V

Icelandic Freezing Plants Corporation

The Icelandic Freezing Plants Corporation is the largest exporter from Iceland. It was established in 1942 and ever since it has pioneered the exploration of new markets for Icelandic frozen fish products. New product categories and processing techniques are constantly being developed within the corporation.

The IFPC is owned by its members, 70 freezing plants and freezing trawlers. Their total annual production is about 90,000 metric tons. All plants and trawlers are equipped to handle fish in the hygienic and efficient manner demanded by the most stringent buyers of seafood worldwide.

The IFPC now operates a sales network spanning the entire United States of America, Europe, the Soviet Union and the Far East.

The IFPC opened a sales office in the United Kingdom in 1956. Much later, in 1983, a modern processing plant was built in Grimsby and a subsidiary company, the Icelandic Freezing Plants Limited was establish. Today the main buyers of the ICELANDIC brand include many of the largest supermarkets and restaurants chains known for the emphasis on produce quality and the proper handling of seafood.

APPENDIX VI

Samband of Iceland
Iceland Seafood International

Iceland Seafood International is a sales and marketing company specialising in seafood. High quality frozen seafood accounts for approximaately 90% of annual sales while the remaining 10% consists of fresh fish, stockfish and salted roes.

Iceland Seafood International was founded in 1990 and took over all the activities of Samband's Seafood Division. The founders of Iceland Seafood International were Samband of Iceland and some 32 freezing plants and freezer trawlers. The new company took over all the assets and liabilities that were related to the operation of Samband's Seafood Division, including Samband's shareholdings in Iceland Seafoods Corporation in the USA and Iceland Seafood Ltd. in England and Europe.

APPENDIX VII

GRANDI HF

Reykjavík's largest fishing and fishprocessing company

Grandi hf. is one of Iceland's most modern and largest fishing and fish processing companies, and by far the largest one in the capital city, Reykjavík. Grandi hf. was established in November 1985 by merger of two large fishing companies. Its fishing fleet consists of seven trawlers and the company employs a total staff of around 370. The company is located in the colourful old harbour of Reykjavík, where most of the city's fishing industry is based. Reykjavík is the second most important fisheries centre in the country, after the fishingtown of Vestmannaeyjar.

Trawler fleet

The company's trawler fleet is composed of seven fresh fish trawlers; Ásbjörn (50 metres), Ásgeir (50 m.), Engey (69 m.), Jón Baldvinsson (54 m.), Ottó N. Þorláksson (57 m.), Viðey (69 m.) and one factory trawler, Snorri Sturluson (69 m.), which freezes and processes the catch on board at sea. All the Grandi trawlers fish the rich and unpolluted North Atlantic grounds around Iceland. The catch is landed in Reykjavík harbour but also in fresh fish markets in Europe.

Grandi's catch

The total fish catch has been around 28.000 tons per year. The main species in tonnage are as follows:

Cod 5.000
Haddock 1.000
Saithe/Pollock 6.000
Redfish/Ocean Perch 14.000
Greenland halibut 1.200
Other 600

APPENDIX VIII

Hafrannsoknastofnunin
Marine Research Institute, Reykjavik

The Marine Research Institute in Reykjavik was established in 1965 when it overtook the duties of the Fisheries Department of the University Research Institute dating from 1937. Institutional marine research in Iceland thus spans half a century. The Marine Research Institute is a government institute responsible to the Ministry of Fisheries and is financed through the national budget.

The primary objective of the Marine Research Institute is to obtain knowledge of the sea around Iceland and its living resources. Research is carried out in most disciplines of modern oceanography, i.e. physical and chemical properties of the sea, morphology and nature of the sea floor, environmental conditions, and life history of algae, zooplankton, benthos, and fish. Furthermore, studies in mariculture have recently been initiated. The greatest effort is, however, put into research pertaining to the exploitation of marine resources, including analysis of stock sizes and recommendations of catch quotas, fishing gear research, and study of species as yet unexploited.

The Institute runs three research vessels, the BJARNI SAEMUNDSSON (55m), the ARNI FRIDRIKSSON (39m), and the DROFN (25m). It also shares the use of a small boat, the MIMIR. About 80 scientists, technicians and office staff are employed ashore at the Reykjavik headquarters, and in the five branch laboratories located in fishing communities in different parts of Iceland. About 30 people man the ships.

APPENDIX IX

Proposed Collaborative Work Programme
Quality Control

Proposed collaborative work with the Icelandic Fisheries Laboratory (Grimur Valdimarsson - Director) and Icelandic Fish Quality Institute (Gisli Jon Kristjansson - Director)

It is proposed to carry out a series of comparisons to determine the effect of poor handling techniques on the quality and the price achieved by containerised Icelandic Fish landed on Humberside. It is hoped that the work will enable guidelines to be published which indicate the amount of damage that can be caused and the systems to be employed to avoid excessive damage and deterioration of fish for transshipment to the UK

The work should be able to determine the following effects and their significance at three times of year, ie January, July and October.

1) Effect of the physical abuse of fish on board the catching vessel.

   - Fish to be purposely abused on board boat by dropping a predetermined number of times from a height of 1m

2) Effect of poor icing of skips

3) Effect of poor drainage within skips

4) Effect of age of fish when containerised for transshipment to Humberside

   - Line caught fish from each days catch of a vessel on a trip of several days to be placed on the market.

5) Effect of skip type

   - identical fish to be transshiped in skips, small skips and the standard 901 fish box

6) Effect of overfilling of skips

All work to be carried out on Cod of a specified size range, and all fish within the study to be quality scored (Torry Freshness Scale) prior to both transshipment and placing on the market. It is hoped that such experimental treatments will not adversely effect the buyers decisions on the market and that a fair price comparison is achieved between the different treatments.

ICELAND: A SPECIAL CASE

Norfish Project : Working Paper 4

Summary Report

1. Introduction

Iceland, a small mid-Atlantic State (pop. 265,000) is dependent on its fisheries. They provide 12% of total employment, 21% of GNP and 75% of all visible export earnings. Concern for the present state of the fishing industry thus embraces basic issues of national economic growth, employment, standards of living and regional development.

2. Crisis in the fishing industry

The industry is entering a critical phase caused initially by the declining cod stocks and the need for drastic reductions in TACs. Economic returns to the industry are likely to deteriorate markedly. Forcasts by the NEI predict an overall deficit in the maritime sector of 5.4% for 1991, increasing frequency of bankruptcies and a reduction in seafood export revenues of around 10%. Both the fishing fleet and shore based processing industries have substantial overcapacity; in the latter case it is apparently made worse by the continuing high level of wholefish exports to the UK and Europe.

3. Policy aims

An urgent political debate is taking place in Iceland over the future strategy for the industry. The broad policy aims of the right-of-centre coalition government are the maximisation of net returns to the fishing industry and high added value in domestic processing. There is continuing pressure from powerful processing interests and labour unions to impose further restraints on fresh wholefish exports. Restrictions already exist in the form of export licences and quota surcharges which have made significant inroads into the fresh fish export trade. A total ban on such exports is considered unlikely at present.

The government is anxious to see the economic state of the industry strengthened by rationalisation of the processing sector through the operation of market forces. A stronger, more concentrated processing industry would be in a better position to compete for scarce expensive raw materials. The government is also prepared to abandon the interventionist regional policy which has maintained local employment through financial assistance to the widely dispersed and financially vulnerable shore-based processing industry.

4. Future developments

(a) **The auction markets** Great hopes are pinned on the further development of the auction market system's ability to raise quayside prices and intercept supplies of fish destined for fresh fish exports. At present the few markets are poorly coordinated: they act simply to give local processors the chance to supplement supplies from their own vessels. If the auction markets were to control a significant share of total landings they might attract UK buyers with the likely

consequence of raising quayside prices above the level that local processors could afford.

(b) **Restructuring the export trade** The recent decision to remove tarifs on seafood products entering the EC from EFTA countries opens up the opportunity for Iceland to restructure her export trade. In future Iceland is likely to focus production on two underdeveloped sectors: fresh fillets, substituting for existing wholefish exports, and high value added products designed for the UK and European supermarket trade.

Internally there are no serious obstacles to realising such aims: the processing capacity and appropriate skills exist; scarce labour resources can be released by modernisation and rationalisation of the processing industry. Air freighting of higher unit value products could open up markets throughout Europe and break the near monopoly of the UK market. However, new markets would have to be created and new distribution systems developed. The new markets would impose very strict disciplines on the Icelandic processors in terms of quality control, product specification and delivery schedules within very tight profit margins.

Such a transformation is far from guaranteed. There is unlikely to be any drastic changes in the overall pattern in the immediate future. In the longer term, exports of fresh fish, mainly in fillet form, will increase at the expense of frozen and fresh wholefish exports.

5. Implications for the Humber markets

The 'special relationship' which has bound Britain and Iceland together in mutual dependency is at risk from the possible restructuring of Iceland's export trade. In particular the survival of wetfish mrkets at Hull and Grimsby could be threatened if supplies of Icelandic fish are drastically reduced. The Humber markets have served Iceland well in recent years, removing large but fluctuating 'surpluses' and paying consistently high prices for what at times has been indifferent quality. The markets have provided a reliable clearing house for Icelandic fish and established a strong reference price for cod and haddock throughout Europe.

Collapse of the bulk wholefish markets could lead the displaced buying power to relocate on the Icelandic auction markets driving up quayside prices, removing considerable quantities of fish and increasing raw material costs to the domestic processing industry. Ultimately primary and secondary processing capacity could be transferred from near-market locations in Britain and Europe to the point of raw material supplies in Iceland, creating unwelcome competition for Icelandic firms. The consequences of undermining fresh wholefish exports to the UK could thus have serious long term repercusions for the health of Iceland's own fishing industry.

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