Icelandic Fisheries Laboratories

Annual Report 2002

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Director General's Address

The pattern of activities at IFL in 2002 was similar to that of previous years. The organization is divided into the Research Division and the Analytical Services Division. The Analytical Services Division specializes in microbiological and chemical testing. Service testing is performed for the government, companies and the organization's particular research projects. The Research Division worked on 68 research and development projects during the year, including ones in collaboration with domestic and foreign universities, companies and research institutions. IFL was thus formally collaborating with numerous foreign and domestic universities, research institutions and companies and, as before, placed its main emphasis on the projects being practical and for the benefit of the Icelandic economy.

Ambition and professional working methods characterize the research performed at IFL. The staff and management's frame of mind is never to be satisfied but rather always to endeavour to do better than before. During the year a new Director General took over, and following this, reorganization of IFL's work was begun with the goal of increasing the efficiency and results from research. In purposeful policy formulation, the guideline is to strengthen research activities so that they produce more valuable, better and safer products from Icelanders' marine catch. In this regard, hopes are tied to a new fund under the auspices of the Ministry of Fisheries to open ways to finance more diverse research and development projects in cooperation with other researchers and companies.

A noteworthy example of a project IFL is working on is the development of a database of identifiable flavourings and odorants formed through enzyme treatment, fermentation and temperature treatment of fresh fish (raw material from fish). The database will be utilized in the production of different flavouring products from raw material accumulating as by-products in the Icelandic fisheries industry and will be an important foundation for various IFL projects in the field of biotechnology regarding the processing and utilization of fish protein. This development project is being done in collaboration with Primex ehf.

The traceability of seafood products has been in the spotlight the last several years in a discussion about their safety and that of other food. The prerequisite of being able to trace the origin of seafood products is the organized recording of information about raw material throughout processing, from the catch to consumers. IFL has participated in EU projects where important quality factors are defined as well as conceivable obstacles standing in the way of information on product quality reaching consumers.

Work has been done on another project with the goal of mapping the factors affecting the value of cod products and developing methods to increase the processing quality. The findings indicate that it will be possible to use the data in managing fisheries and the use of fishing gear to maximize quality and utilization of products for different work processes. IFL has participat-

ed in projects emphasizing increased hygiene in the processing of seafood products and has sought ways to further increase their quality and safety.

IFL is involved in training and teaching in the fisheries sector and fish processing. The organization is thus collaborating with the University of Iceland, The University of Akureyri Iceland and the Fisheries Training Programme of the United Nations University, where IFL specialists are involved in teaching related to IFL's speciality fields. In addition, IFL has organized courses of various kinds, such as the teaching of quality evaluation (QIM – Quality Index Method) for fish market employees and instruction on freezing and shrimp processing in cooperation with the Federation of Icelandic Fish-processing Industries.

The Icelandic fishing industry is fully competitive in the international market regarding quality and safety of products. On the other hand, it is important to strengthen data collection still more to ensure this competitiveness in the future and to be able to demonstrate the safety of the Icelandic marine catch.

The organization's undertakings are extremely diverse, and it can be said that more than one party is involved in the financing of most of the organization's projects. When a particular undertaking has been selected, grants are sought far and wide to finance it. Thus, many funds are involved in projects, but financing from foreign funds was xx% of the organization's total revenues in 2002.

Extensive collaboration with foreign universities, research institutions and companies shows that IFL is a recognized and competitive research organization by international standards. The importance of scientific work is not least entailed in the heavy demands made of specialists and also provides them opportunities to participate in and closely follow developments in foreign research.

Collaboration in Iceland is of course also extremely important, and IFL will continue its efforts to increase cooperation with Icelandic universities, organizations and companies, with the goal of strengthening research and development to increase the value of marine catches, their quality and safety. IFL's state contribution is used for particular research projects that generally require a matching contribution from research funds corresponding to 50% of the cost. IFL's contribution corresponds to 10–50% of the projects' cost, depending on their nature and scope. Under current circumstances, IFL clearly cannot noticeably increase the number of its research projects since the organization's revenues from research funds are nearly equal to the state contribution to IFL. This will not change without the establishment of a fund like IVMC (Increased Value of Marine Catch) or an increased contribution from the State. There are also high hopes for a reorganization of the Science and Technology Fund, which could open new avenues of financing for projects.

By working closely with the economy and universities in Iceland and abroad, IFL will promote the acquisition of new knowledge and disseminate it between researchers and the economy. Well-educated and good employees, who are ambitious on behalf of the organization, are the most important premise for IFL's success.

Analytical Services Division 2002

The IFL Analytical Services Division's activities in 2002 were similar to those of the past several years. In our opinion, quality and short turnaround time are the most important things to our customers.

The Analytical Services Division performs various kinds of chemical and microbiological analyses of seafood products, including analysis of chemical composition and evaluation of the most important quality characteristics. Various microbiological tests are also offered to provide information about the wholesomeness of food, hygiene during production and shelf life.

The clientele of the IFL Analytical Services Division does not vary much from year to year. The customers are few in number but large, with about 80% of the division's turnover attributable to the servicing of 17 customers.

In recent years, the main changes in external circumstances have been that companies have merged and grown. This can and has had various consequences for the Analytical Services Division's operations. Large companies are more capable of performing their own inspections and tests on their production, and this can thereby reduce dealings with the Analytical Services Division. However, in many instances the merger of companies can create new opportunities for the IFL Analytical Services Division, for example, new needs for increased consultancy and more diverse analyses than previously. IFL has accumulated a great deal of experience and knowledge after decades of serving Iceland's food industry.

In total, the IFL Analytical Services Division performed 62,915 analyses in 2002; this was an increase of 6%, compared with 2001. The number of analyses increased in Reykjavik, Neskaupstadur and the Westman Islands. It must be kept in mind that the IFL Research Division purchases a large part of the analyses performed in Reykjavik from the Analytical Services Division.

The traditional, annual accreditation evaluation by Swedac and the Weights and Measures Office, which was done in September according to ISO 17025, went well.

The Analytical Services Division's operations are diverse, and it is important that they keep step with changing circumstances. The division's efforts in instruction and dissemination of knowledge have increased greatly in recent years. Each year five to six students come from the Fisheries Training Programme of the United Nations University for vocational training in the chemical and biological laboratories in Reykjavik, and it is common for individual student projects to be done there as well as in the branches under the guidance of the division's specialists. Also, employees prepare educational materials for foreign and domestic parties.
Interest has been expressed in further disseminating information in the form of summaries of findings to IFL customers. The Navís sample receiving system that is used facilitates such summaries. Currently, weekly summaries are sent to the Association of Icelandic Fishmeal Producers, showing the quantities of exported fishmeal certified by the IFL Analytical Services Division.

During the year, a summary was prepared for the Food and Agricultural Organization of the United Nations of the results of microbiological analyses of frozen Icelandic shrimp for the period 1985–1999. FAO will further analyze the data with respect to changes in the incidence of certain microbes in Icelandic shelled shrimp and the effect of changed regulations on microbes in this product.

R&D Division

The function of the IFL R&D Division is to promote increased competitiveness of Icelandic fisheries, fish processing and other food companies through research and development. Through its research, often in close collaboration with domestic and foreign parties, IFL has promoted the growth of new branches of production as well as strengthened existing ones.

As previously, the R&D Division's projects in 2002 were of various kinds. The R&D Division's staff continued existing studies, began new ones and completed several. Project financing was similar to that of previous years: the biggest projects were financed by the Icelandic Centre for Research (RANNÍS), the EU and Nordic funds. Many projects were done in collaboration with domestic food companies, often financed in part with grants from RANNÍS.

The division's activities are divided among three workgroups: quality and stability, the environment and wholesomeness and information technology, processing technology and measuring technology.

Findings presented

In 2002, the findings of research projects were presented in 20 IFL reports. Also, 10 refereed articles, whose principal and co-authors are employees of the R&D Division, were published in scientific journals. Several articles were also published in domestic journals, not least in Aegir. Finally, many conferences and meetings may be mentioned, both in Iceland and abroad, where the employees of the IFL R&D Division presented talks and projects done by the organization.

Nine students at the University of Iceland engaged in Master's studies in food processing and fisheries during the year under the guidance of specialists in the R&D Division, most of them at IFL. In addition, one student in Industrial Engineering was also under the guidance of IFL specialists. Two Master's students completed their degrees this year.

The following is a presentation of several projects done in 2002. This is not an exhaustive list but rather a selection to show the diversity of the projects done at IFL.

Database of flavourings from marine catches (#1486)

Project manager at IFL:
Rósa Jónsdóttir

The project received a grant from RANNÍS; it took two years and was done in collaboration with Primex ehf. Primex has developed methods to manufacture flavouring products from by-products of fish processing, employing various enzymes and fermentation. The flavourings, for example, were processed from ground fish flesh, shrimp shell and whey.

The project's goal was to create a database to utilize in manufacturing various flavouring products from raw materials produced as by-products in the Icelandic fishing industry. Characteristic flavour and smell substances were mapped with gas analysis (GC/MS and GC/sniff) and sense evaluation. Odorant compounds form during processing with enzymes, fermentation and heat methods applied to raw materials, which causes decomposition of amino acids and fatty acids. The interaction of the substances of decomposition from these processes form many different flavour and odorant compounds.

This project has produced detailed information on the composition of flavour compounds and the effect of raw materials and different enzymes on the characteristics of flavour compounds. The organization now has a database where the relation between production variables and flavours can be examined, and this will facilitate the development of new flavour compounds in the future This will shorten development time and increase flexibility in servicing customers. The findings will be utilized in marketing flavour compound products. The project has reinforced studies in the field of flavour and odorant compounds, and there is now knowledge, experience and competence at IFL to

engage in further research to support the development of new products from the by-products of marine catches.

TRACEFISH – "Traceability of Fish Products" (#1517)

Project manager at IFL:
Gudrún Ólafsdóttir

The project, which was supported by the EU (QLK1-2000-00164), was a communications project with the participation of 24 companies and organizations. The Norwegian Institute of Fisheries and Aquaculture (Fiskeriforskning) was responsible for project management.

The project's primary purpose was to find ways to facilitate communications and the dissemination of information in fish transactions. The outcome of the project is two standards: on the one hand, for traceability in aquaculture and, on the other, traceability of wild fish. The standards were approved as CWA standards (Commité Européan de Normalisation- Workshop Agreement); they deal with the following points:

1) which information must be recorded, how and where to ensure traceability throughout the chain of aquaculture and fish-farmed products
2) which information must be recorded, how and where to ensure traceability throughout the wild fish chain,

The third standard, which was the fruit of the technology group, deals with how information is to be transmitted electronically between links in the traceability chain; however, it is not in accordance with the CWA standard.

The standards are flexible in that it is not necessary to record all information stated in the standards; however, certain basic information is necessary to meet the standards. The key point is that "recording" can be done on paper or electronically, but the electronic format is recommended. It shall be clearly stated that the standards are not statutory standards, but rather the industry determines whether it will utilize them to facilitate traceability and communications in the chain. The project's findings are on the home page www.tracefish.org.

TRACEFISH is the short title for the "Traceability of Fish Products" concerted action project, co-ordinated by the Norwegian Institute of Fisheries and Aquaculture (Fiskeriforskning) and running from 2000–2002. It is funded by the European Commission under the "Quality of life and management of living resources" thematic programme, project number QLK1-2000-00164.

24 companies/institutes are members of the TRACEFISH consortium, including major European fish exporters, processors, importers and research institutes. The premise is that with increasing information demands from buyers and consumers of food products, it is no longer practical to transmit all the relevant data physically along with the product. A more sensible approach is to mark each package with a unique identifier, and then transmit or extract all the relevant information electronically. The aim of the TRACEFISH project is to bring together companies and research institutes to establish common views with respect to what data should follow a fish product through the chain from catch/farming to consumer.

The project will host 4 international conferences and arrange workshops discussing traceability issues specifically relating to farmed fish, captured fish and technical aspects. A set of recommendations for common European standards in these areas will be the main tangible deliverable from the project.

Quality labelling of Fish FQLM – Fish Quality Labelling and Monitoring (#1416)

Project manager at IFL:
Gudrún Ólafsdóttir

The project for the quality labelling of fish is a communications project supported by the EU, "Fish Quality Labelling and Monitoring," EU-FAIR CT98-4174, and the project manager is Joop Luten, RIVO-DLO, the Netherlands. The foreign participants in the project were fisheries laboratories from 14 countries in Europe, contacts from interested associations in the fisheries industry in the relevant countries along with corresponding European associations. The project's home page is: www.fqlm.nl

The project's goal was to define what quality labelling of fish entailed, and its guideline was the needs of all those involved, from catching to consuming fish. It also dealt with how quality labelling of fish should be done, and how to monitor the implementation of such labelling. Information was gathered on which quality characteristics are important for labelling at each stage of the fish production process, and what the need for quality labelling was. It also dealt with which problems or hindrances could foreseeably impede quality labelling.

The project's findings were presented at a project completion conference in Florence, Italy, 15–17 April 2002, and proceedings of the conference have been published (Quality of Fish from Catch to Consumers http://www.wageningenacademic.com/). The book has a good summary of the fish distribution chains in Europe, the types of production and quality grading aboard ships and in fish markets, different quality standards and labelling for marine catches, and presentation of fast methods for fish quality evaluation, along with a future vision of the needs of the industry and consumers' attitudes toward quality labelling.

The EU-FAIR PL98-4174 Concerted Action "Fish Quality Labelling and Monitoring" will bring together scientists from different disciplines from all regions in Europe in a coordinated multidisciplinary action, where representatives from the various parts of the fish processing chain (fishermen, port markets (auctions), processors, wholesalers, retailers) will be involved, in the development of common opinions, views and recommendations for fish quality labelling and monitoring.

In total 14 fish core research institutes, 5 European fish sector organisations and 6 food quality labelling experts are participating in the Concerted Action. The composition of the participants in the Concerted Action guarantees

that all needed expertises (fish/food quality labelling, instrumental and sensorial quality measurements) are well represented in a balanced way. The Concerted Action started 01-11-1998 and will last for three years.

Campylobacteriosis: Epidemiology and interventionary measures (#1450)

Project manager at IFL:
Sigrún Gudmundsdóttir

This project was done in collaboration with six parties in Iceland, which are: The Environmental Research Institute, the Department of Bacteriology at Landspitali University Hospital, the Institute of Experimental Pathology at Keldur, the Directorate of Public Health, the Chief Veterinary Officer, the Quarantine Service and Fisheries Research Laboratories. The project was finished at the beginning of 2003.

The project's main goal was to investigate the epidemiology and incidence of Campylobacter infections/contamination in humans, foods and animals and then take interventionary measures, i.e., measures to reduce infections and contamination. IFL's part in this project was to analyze strains of Campylobacter jejuni isolated from humans, animals and foods over the period 1999–2001. Altogether 544 strains were analyzed and were divided into 152 PFGE types. Two types contained most of the strains; the first, Type 1, contained 118 strains (21.7%), and Type 7 contained 65 strains (11.9%). Type 1 seemed to be predominant for the period 1999–2000, while Type 7 predominated for the period 2001–2002. These types contained only strains from humans and poultry (except for one strain from sheep in Type 1). For 97 PFGE types, there was only one strain. These findings indicate that the increase in infection in 1999 may be attributed to Type 1; however, Campylobacter infections are generally incidental or connected with many strains arising every now and then. This is best seen in the number of strains or PFGE types that were identified.

Coordinated methods for evaluating fresh fish in Europe – QIMCHAIN – Introduction of Quality Index Method (QIM) in the European Fishery Chain (#1554)

Project manager at IFL:
Emilía Martinsdóttir

The Quality Index Method (QIM) is now used to evaluate the freshness of fish in studies in most laboratories in Europe. The Quality Index Method entails evaluating each quality attribute separately, e.g., odour of the gills and looseness, and giving a grade from 0 to 3 or 0 to 2, depending on the importance of the attribute. These grades are later combined into an overall grade, the so-called quality index, which correlates directly with the storage time on ice. There is some experience with the use of the Quality Index Method in Iceland, especially regarding the training of people. The method is very suitable for teaching and training and coordination of evaluations. Interest in the Quality Index Method (QIM) has been growing in the fishing industry and fish markets in Europe. In recent years, IFL has worked on development of QIM in collaboration with Dutch and Danish fisheries research laboratories, and now Norway, Germany, Spain and Portugal have been added to the group. The European Union has supported this research, and there is now an evaluation system for 12 species of fish using photographs in the handbook "Sensory Evaluation of Fish Freshness; Reference Manual for the Fish Industry". A new European project in this field, directed by IFL, began in 2002 (QIMCHAIN – Introduction of Quality Index Method (QIM) in the European Fishery Chain No. QLAM-2002-00152). Its goal is to introduce QIM into the fish industry in Europe. The manual for this project will be translated into nine additional European languages. Clearly the QIM will be very well known in Europe within two years. Several Dutch and Belgian fish markets have adopted this method. British fish markets have also shown great interest in the method. During the project, QIM will be presented at fisheries exhibitions in Europe, articles written in newspapers and magazines, and an attempt made to

generate discussion about the evaluation of fish freshness through participation in meetings with interested parties. It is important for Icelanders to utilize the advantage they have by participating in this development from the beginning. This method's adoption as a coordinated method in Europe is expected.

The project's home page is: http://www.qim-eurofish.com

Thawed MAP-fillets shipped by vessel to foreign markets (#1433)

Project manager:
Emilía Martinsdóttir

The project on the storage of sea-frozen, thawed fillets in modified atmosphere packaging is supported by RANNÍS and the companies ÚA and Ísaga. Modified atmosphere packages (MAP) have become popular in recent years for many kinds of food, especially meat. Consumer packages of fish have appeared in various countries but have not achieved equally good results as those for meat. The proportion of sea-frozen fish of the total volume of frozen products now exceeds 50% in Iceland. The plan in this project is to investigate whether thawed sea-frozen fish can be stored longer than unfrozen fish in modified atmosphere packages. In recent years, Danish scientists have hypothesized that the bacterium Photobacterium phosphoreum is one of the main causes of fish spoilage in modified atmosphere packaging, and it is thought that it is sensitive to freezing and frozen storage. Research was done to investigate the tolerance to freezing of certain types of damaging bacteria. A comparison was made of fast methods of counting damaging bacteria with Malthus technology with traditional methods. Research on the shelf life of gas-packed, thawed sea-frozen fillets at 0°C was done, with an emphasis on monitoring the growth of specialized spoilage microbes, drip loss, and chemical indicators like pH, trimethyloxide (TMAO) and trimethylamine (TMA and changes in taste, smell and texture during storage). A consumer survey was done on consumer attitudes toward such fish, and its results were used in correlation with sense evaluation of a specialized sense evaluation group. If the findings of the project show that shelf life of thawed fillets in MAP packages is sufficiently great to be able to ship them by vessel to foreign markets, the sales possibilities of sea-frozen fillets in the chilled market could increase substantially.

Development of multisensor technology to evaluate freshness and quality of fish (#1418)

Project manager at IFL:
Soffía Vala Tryggvadóttir

The project, which was supported by the European Union (FAIR CT98 4076), began in December 1988 and was completed in May 2002. The project is a collaborative project of seven European countries: Iceland, Britain, Norway, Denmark, Spain, Germany, and Italy. A large part of the project was that scientists from the seven European countries met four times for work meetings (Reykjavik, Trondheim, Madrid and Hamburg) to test and compare old and new methods to measure the freshness of fish. The scientists brought their own equipment to the work meetings and measured

fish of varying degrees of freshness. No previous instance of scientists comparing results in this manner is known; people usually test fish in their home countries with their equipment, and it is therefore difficult to compare findings since circumstances can vary greatly.

The purpose of the project was to lay the foundation for assembling a fast-working, trustworthy device to measure the freshness of fish that would build on the interplay of many procedures and would be highly correlated with traditional methods like sense evaluation.

The Quality Index Method (QIM) was used as a reference procedure in the project. IFL's function was to develop fast techniques for measuring changes in freshness, using texture analysis and an electronic nose that detects substances formed as fish spoils. In this study, equipment developed a rather long time ago was also used. The Quality Index Method (QIM) was used as a baseline in the project. IFL's function was to develop fast techniques for measuring changes in freshness through texture analysis and an electronic nose that detects substances formed as fish spoils. In this study, equipment developed a rather long time ago was also used. In this regard, the RT-Freshmeter, the Torry meter from Scotland and also the German "Fishtester" can be mentioned. Other methods were also used, such as Image with photographic technology and light absorption methods with infrared and visible radiation (NIR/VIS), along with traditional chemical analysis (TVN) and a newer, faster method (FIGD) to measure TVN.

Work meeting at IFL in Reykjavik

Findings from the project have shown that the measuring techniques developed in the project have the potential to be used in a multisensor device that can be used to construct an Artificial Quality Index (AQI), which correlates well with the QIM sense evaluation method.

These methods therefore have the potential to be a basis for instructing equipment manufacturers producing freshness meters for the fisheries industry and those trading in fish. A convenient, fast device to evaluate freshness would result in a better definition of fish quality for consumers.

The multisensor concept reported herein includes an electronic nose (FreshSense), texture analyser (Stable Micro Systems texture analyser, model TA.XT2i) and an electrical tester (RT Freshmeter) to detect changes in freshness quality of fresh cod (Gadus morhua) and haddock (Melanogrammus aeglefinus). The electronic nose used in the project was developed at IFL in collaboration with an Icelandic company Bodvaki. The instrument is able to classify samples according to freshness level (fresh, intermediate and spoiled) and can be used to predict sensory scores of cod stored in ice. Texture changes were measured with a commercial instrument and a non-destructive puncture test for fish fillets was developed.

Results of electronic nose, texture and RT Freshmeter in different ice storage studies have shown that these rapid instrumental techniques can be used to evaluate changes in the freshness quality of cod and haddock. The RT Freshmeter shows a very good correlation with QIM. The texture measurements show pronounced firmness changes during the first days in ice storage of cod while the electronic nose are more sensitive to changes at later stages of storage. The benefits of combining the different techniques in a multisensor approach have been demonstrated. These techniques have a potential to be used in a multisensor device to form an Artificial Quality Index by calibrating with the sensory method QIM. The results form a basis for the construction of a device to guide instrument manufacturers in the production of a device for the application in the fish industry resulting in better-defined fish quality for the consumers.

Hygiene in dairy industry (#1529)

Project manager at IFL:
Jóhann Örlygsson

The project is part of a larger project that began in the Nordic countries in April 2001 and is called "Dairynet – hygiene control in the dairy environment". The five Nordic countries are participating in this project, which runs for three years at a total cost of about ISK 160 million. Icelandic Fisheries Laboratories, the University in Akureyri, Nordurmjólk hf. and Mjöll hf. are Iceland's participants in the project. Icelanders' participation is two-pronged. First, they are to research the presence and prevalence of Listeria bacteria in raw milk, selected milk products and in the general dairy work environment. Second, the project focuses generally on hygiene in the dairy industry. Listeria bacteria have received more attention in recent years because of increased contamination of food. In this first year, the prevalence of Listeria bacteria has been investigated in the above-mentioned places at Nordurmjólk in the summer and winter. Isolated strains have been tested with biochemical, immunological and genetic methods. In the second part of the project, microbial hygiene in the milk industry will be investigated, where special emphasis will be placed on Clostridium and Bacillus bacteria, both of whose genera reproduce by spores and are often a problem in the dairy industry. The sensitivity of these bacteria to cleaners and disinfectants used in the industry today will be researched, and a trial will be conducted on whether it is possible to adopt environmentally sounder substances than those currently used.

NF – Saltfish (# 1380)

Project manager at IFL:
Sigurjón Arason

During the year, the NF-saltfish Project, comparing saltfish produced from fresh raw material, on the one hand, and frozen raw material, on the other, was completed The goal of the project was to examine the effect of different thawing methods on the characteristics and quality of saltfish. The fish was thawed in water, salt water and moist air, and the effect of different temperatures was investigated. The effects of seasonal fluctuations in raw material and different periods of freezer storage were evaluated. The factors measured included yield, water resistance and sense characteristics, such as texture and taste. The goal was to achieve the same quality and yield for saltfish from frozen raw material as when unfrozen raw material was used for saltfish production.

The effect of different thawing methods was not as variable as might be expected. Thawing in moist, heated air seemed to produce better results than when the fish was thawed in water although the difference was not significant. Storage of the fish in liquid ice following thawing was not deemed to improve the condition of the fish; on the other hand, there were indications that storage on ice overnight could lead to better yield and quality. Fish processed after a longer freezer storage period (15 vs. 7 weeks) seem to be more similar to products made a fresh raw material. The effect of seasonal fluctuations was not significant.

For the most part, the project was financed with a grant from the Nordic Industrial Development Fund and a contribution from IFL.

The project participants were SÍF (The Union of Icelandic Fish Producers), IFL, Thorbjörn hf., SINTEF Chemistry, Norway, EidetFisk A.S., Norway, Cabinplant A/S, Denmark, and DIFRES, Denmark

Model construction for decision guidance in ground fish processing (#1542)

Project manager at IFL:
Sigurjón Arason

The goal of the project is to increase profitability in cod processing by decreasing costs and increasing value along with improved yield. The goal will be achieved by mapping the factors affecting the value of cod products and developing methods to increase the processing quality. The results will be set up in a model that will facilitate decision-making in choosing

the fishing areas yielding the best fish for processing each time. The new elements in the project are:

- to correlate the fleshiness of cod with its characteristics and thus obtain in a simple way information to be utilized in the processing management of raw material
- development of a geographical information system for ship owners and the fisheries industry to guide fisheries. Those in the fisheries sector will, among other things, be able to infer from the maps where they should seek the fish giving the best utilization and processing at each time of the year. It is thus possible to promote self-sustaining fisheries by directing fishing effort to the fishing grounds where the condition of the fish is good.
- use of electronic catch diaries to track the status of catches throughout processing.

This is a cooperative project of IFL, Samherji, the Faculty of Engineering of the University of Iceland, the University of Iceland Fisheries Institute and AGR.

Light salting (#1483)

Project manager at IFL:
Kristín Anna Thórarinsdóttir

The purpose of the project was to evaluate the effect of mild pickling on the utilization and stability of cod fillets and various fillet parts during freezing. The goal was to produce methods making it possible for the fishing industry to produce fillets or fillet parts of equal quality by improving yield and increasing stability for freezer storage. In this way, better control of the content of products subject to seasonal fluctuations, e.g., because of spawning, would also be possible.

The effect of a salt pickling solution, phosphate and soya protein by injection and pickling was examined, both of the substances alone and when used in combination. The project's findings created a foundation for further experiments where the effect of using fish proteins in various forms was examined. Yield and water resistance increased with increased salting, which was achieved with longer pickling periods and/or injection. Soya proteins did not have as much effect has salt and phosphate. When all substances were combined, a yield was achieved with the equivalent of about 38 hours of pickling in a salt pickling solution. Dried fish proteins proved not to have as much effect as soya proteins when they were used together with salt and/or phosphate, but the results of using hydrolyzed fish proteins in solution and atrophied muscle, regarding water capacity and drip loss, were positive.

The project participants were IFL and Kambur ehf. in Flateyri.

Fish binder (#1525)

Project manager at IFL:
Gudjón Thorkelsson

The goal of the project was to develop "fish binder" to reshape bits of fish, e.g., from trimmings accumulating during fillet processing, to increase the value of such products. Another goal was to minimize all use of additives and adjuvant substances.

The experiments were divided into six parts. After the first experiment, it came to light that the quantity of salt and water along with the mixing time of the binder had the most effect on the characteristics of fish binder. These factors were therefore tested in an optimization experiment where fish bits were reshaped by tumbling. The main finding of this experiment was the salient effect of freezer storage on increased binding characteristics of the glue mixtures, but no irrefutable finding was obtained on what glue mixture was best suited for reshaping. The next step decided was therefore to employ another method of measurement for texture analysis that gave better results for evaluating the characteristics of various types of binder. A pulling test was developed that proved suitable for measuring different binding characteristics of types of fish binder. It was possible to select fish binder for two species of fish that seemed best suited for reshaping; this

contained 20% water and 2% salt in both instances. Following this, an optimization experiment was done where fish binder with 20% water and 2% salt was used to reshape three different species of fish.

Samherji in Dalvík participated in this project along with IFL.

Storage technology for pelagic fish (#1521)

Project manager at IFL:
Sigurjón Arason

This project will develop new storage technology expected to substantially improve the quality of landed catches from purse seiners. This storage technology is flexible and will be utilized for all species of pelagic fish. The goal is to make investment in this technology no more expensive than investment in traditional purse seiner cooling systems. Another purpose of the project is development of a simulation model to simulate a new method of cooling and storage of fish aboard purse seiners. The model will be based on measurements of processing variables related to energy use, temperature, time and quality measurements of catches landed after having been handled in different ways aboard ships. Traditional methods of measuring the quality of catches will be used, but possibilities of utilizing rapid measurements with gas sensors and electronic nose technology will also be examined. The model ought to provide insight into the best handling of catches and their expected quality under different fishing conditions and thus to optimize the quality of the catch each time and, at the same time, minimize operating expenses.

The participants in the project are YORK Refrigeration, IFL, the University of Iceland, Skipatækni, Vik-Sandvik, Síldarvinnslan Neskaupsstadur (SVN), P/F Vardin Ship Owners of the Faroe Islands and Sildolje- og Sildemelindustriens Forskningsinstitutt (SSF), Aalborg Universitet.

New protein products from herring (#1520)

Project manager at IFL:
Margrét Geirsdóttir

The goal of the project is to develop a production process to extract protein from herring for human consumption. Two possibilities for use will be tested. On the one hand, the protein mass will be frozen as surimi. On the other, a drying method will be developed and the mass used as a substance for blending in food production.

The participants in the project are IFL, Alfa Laval, Dtech, Haraldur Bödvarsson hf., Fiskeriforskning, SIK and SINTEF.

RF-heating (#1530)

Project manager at IFL:
Páll Gunnar Pálsson

The main goal of the project is to develop a new method of heating fish products. The plan is to vacuum-pack fish sticks in plastic and then heat the fish sticks by radio frequency. The fish sticks are kept in a hot water bath under pressure while being heated; in this way fish can be heated and boiled in a much shorter time than when using traditional methods in an oven or pot. This method has not been used before, and equipment must therefore be developed and built to do the experiments. IFL and HB's function in the project is to provide samples and perform sense evaluation of all the samples produced using this method. In addition IFL and HB are to evaluate the market in Europe for pre-boiled, cooled or frozen fish products; in addition, they are to evaluate the advantageousness of this processing. Fraunhofer IVV will construct new equipment for the heating in cooperation with Paul Kiefer GmbH. Norconserv will primarily work on food safety, i.e., whether this heating method succeeds in destroying all dangerous microbes and their spores, along with performing sense evaluation and preparing samples in cooperation with Fjordkökken and IFL. Huhtamaki Van Leer, a packaging company, will work on developing suitable packaging for these products.

The members of the project are Fraunhofer Institut Verfahrensteknik und Verpackung in Germany, Norconserv in Norway, IFL, Haraldur Bödvarsson hf. (HB), Fjordkökken A/S in Norway, Paul Kiefel GmbH in Germany and Huhtamaki Van Leer in Germany.

Softening of herring bones (#1526)

Project manager at IFL:
Páll Gunnar Pálsson

The goal of the project is to develop a production process to soften the bones in herring fillets without having much impact on the taste characteristics or texture of the products. The market's evaluation is that bones in herring prevent increased consumption, but herring has many advantages, from the nutritional point of view, and it is therefore worthwhile to work on increasing the consumption of herring products. If there is success in softening the bones in herring fillets without having much impact on taste or texture, this will mean an extremely innovative processing method that could conceivably be adapted to more species.

The members of the project are: IFL, the Cooperative of Fáskrúdsfjördur, Ísfélag Vestmannaeyja, SÍF in France, Universiate de Santiago de Compostella and Altesa in Spain.

Activities of IFL Branches

Neskaupstadur

IFL's principal activity in Neskaupstadur, as in previous years, was analytical service testing for the fisheries industry in East Iceland, of which about 90% were for the fishmeal industry in the area. In the branch's service area, there are eight fishmeal factories, producing between 60–70% of all the fishmeal produced in Iceland; this explains the large share of the fishmeal industry in the branch's operations.

Services

The number of samples in 2001 and 2002 was extremely similar. In fact, the blue whiting catch in 2002 was not as great as the year before because a quota was imposed on blue whiting fisheries last year. Offsetting this, however, was an increase in testing of fresh herring for SÍF.

In the latter part of the year, samples from salmon farming companies in the region began to come in although the quantity was not very great, but there are hopes that the servicing of these companies will increase in 2003. Services to smaller fish processors in the area for hygiene evaluations, microbial testing of products, and the sale of Rodac bowls continued during the year and increased slightly.

Collaborative projects

This year the IFL branch began a project in collaboration with Dis ehf. and Síldarvinnslan in Neskaupstadur on "an evaluation of disinfecting with a mister using Byotrol disinfectant." The project will continue in 2003.

As previously, the branch assisted in taking samples of raw material and products for dioxin testing of fish used for fishmeal and other projects.

Collaboration with schools

There was considerable gathering of raw material for projects for students in the Fisheries Training Programme of the United Nations University. Collaboration with the East Iceland Higher Secondary Vocational School increased during the year, and a collaboration agreement

between IFL, the East Iceland Higher Secondary Vocational School and the East Iceland Natural History Museum was signed. The agreement's stipulations include specialists' assistance, student work, mutual research projects, internal work and mutual recording between the libraries of these organizations. Students in health sciences and biology have obtained assistance to work on several projects under the guidance of the branch's employees.

Personnel changes

Personnel changes occurred at the branch when Karl R. Róbertsson received a two-year leave of absence, as of 1 September 2002, to fill the position of IFL branch manager in Ísafjördur. Sóley Thórdardóttir, who has worked at the branch as a stand-in during summer vacation the last three summers, was hired part time as of the first of the year.

The branch has two full-time employees and one part-time employee, but, in addition, IFL jointly utilizes the services of a building superintendent and janitorial staff with the East Iceland Higher Secondary Vocational School and the East Iceland Natural History Museum.

Akureyri

The year 2002 was advantageous for the branch in Akureyri. The activities of the Analytical Services Division, which is the largest operational component, grew, but work was also done on several research projects in the field of hygiene in the food industry and aquaculture.

Collaboration between IFL and the University of Akureyri Iceland followed the same pattern as before; two IFL specialists worked half time at the University, teaching and doing research.

Westman Islands

IFL activities in the Westman Islands were similar to those of the past several years.

As usual, the fishmeal factories there were the largest customers, and the testing of fishmeal and fish oil for them was a large part of the operations during the year. The testing of herring, herring fillets and capelin roe for freezing plants was also a large part of IFL's activities.

The branch saw to public health inspections in the Westman Islands, as in previous years, under an agreement with the South Iceland Public Health Board, and that part of the operations accounted for approximately one full-time equivalent position.

There were no personnel changes at the branch during the year, and three employees worked there in 2.4 full-time equivalent positions.

Ísafjördur

As in previous years, the activities of the Analytical Services Division were the major part of the Ísafjördur branch's operations, with services to the shrimp industry weighing heaviest. The number of samples was similar to that in 2001 since the operation of the shrimp factories was steady and even throughout the year.

As usual, the branch's employees participated in research projects during the year, and in this regard, the continuation of a project related to extended farming of cod may be mentioned.

More than a few courses were held during the year. In this regard, courses in sense evaluation, internal monitoring and hygiene can be mentioned.

Branch Manager Kristinn Thór Kristinsson went on a two-year sabbatical during the year, and Karl Rúnar Róbertsson took over for him. There were three employees at the IFL branch in Ísafjördur.

Publications and speeches 2002

In 2002 IFL published 20 reports in addition to four expositions prepared at the request of various parties. About half of the reports were for projects receiving grants from foreign funds, primarily the EU and Nordisk industrifond.

Also, 10 articles by IFL employees were published in recognized scientific journals, with strict requirements for publication. These involved articles where IFL employees were either the principal authors or co-authors.

Several reports were submitted directly to various funds without being recorded specifically as IFL reports.

In addition, various articles by IFL employees were published in magazines. IFL employees also gave talks at a number of conferences and meetings, both in Iceland and abroad.

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Utilisation and Stabilisation of By-products from Cod Species QLK1-CT-2000-01017. Poster in connection with a conference on the introduction on the EU 6th. Framework Programme in Nov. 2002 in Perlan, Reykjavik, Iceland.

Sigurjón Arason, Gudjonsdottir, S.A., Gunnar Páll Jónsson og Kristín Anna Thórarinsdóttir. 2002.
High Quality Baccalao from Frozen Cod. Poster at the conference: Nordic food innovation in a European context. Held in Stockholm, 28–29 January 2002.

Miscellaneous

Sjöfn Sigurgísladóttir. 2002.
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Emilía Martinsdóttir. 2002.
Quality Management of Stored Fish. In Bremner, A. (ed.) Safety and Quality issues in fish processing. Woodhead Publishing Ltd. 2002.:360-378.

Fisheries Training Programme of the United Nations University

Teaching in the Fisheries Training Program of the United Nations University has become part of IFL's regular activities. It is the Marine Research Institute that has the responsibility and honour of running the school, but it is operated in close collaboration with IFL, the University of Akureyri Iceland and the University of Iceland; in addition, other organizations and companies also contribute. The school is operated under a special arrangement with the United Nations University, and its financing is mostly part of Iceland's contributions to development aid. The school offers a six-month curriculum and training for professionals and specialists from developing countries and states of the former Soviet Union. The admission requirements are a university education and work experience, and the academic year runs from the beginning of September to the end of February.

In academic year 2002–2003, there were a total of 19 students, and this was the largest group to date; altogether 62 students have graduated since the school opened in 1998. The school's curriculum is divided into a general course of studies that everyone takes; an attempt is made there to provide the best comprehensive overview possible of fisheries and the fields related to the sector. After five to six weeks, a specialized course begins, and students are then divided into different fields in accordance with their previous studies and work experience. The specialized studies begin with a four- to five-week course, after which come projects and vocational training. There, great emphasis is placed on the course's practicality, and it is tailored to the needs of each and every student.

Specialty studies are offered in a total of six fields, most commonly three to four each academic year. This time seven students specialized in fishery biology and six in studies on the management of fisheries companies and marketing; the latter were taught at the University of Akureyri Iceland, and the students did their projects in Akureyri. Finally, in close collaboration with IFL, six students specialized in the field of quality management in the handling and processing of catches. Of the students' projects, the following may be mentioned: Traceability of fish products – a proposal was prepared on how such a system could be adapted to conditions in China. Also, instructions were written for fish processors in Kenya, taking into account research done on fish processing in Iceland. Also noteworthy were projects on the storage stability of herring under different conditions and different ways to evaluate it, a project on evaluation of chemical and microbial aspects of the processing of saithe and, finally, a project on the effect of different cooling methods on aspects of herring quality, with respect to the conditions of fisheries in Malaysia, and the design of suitable cooling systems in fishing ships in that country.

IFL Management and Staff 2002

Board of Directors and Director General

Fridrik Fridriksson.
Economist
Chairman of the Board

Pétur Bjarnason.
Managing Director of the
Fisheries Association of Iceland.

Arnar Sigurmundsson.
Chairman of the Federation of
Icelandic Fish-processing Industries

Sjöfn Sigurgísladóttir, Ph.D.
IFL Director General
Food Scientist. Appointed Director
General of IFL As of 1 May 2002.

Kristján B. Ólafsson, cand-merc.
Management Consultant
Set Director General as of 1 Oct 2001
**Resigned during the year*

Operations Division

Adalbjörg Elín Halldórsdóttir, Cand. oecon.
Business Administration IFL 2002
Director of Finance

Gudlaug Gudmundsdóttir.
Clerk IFL 1990.
Reception

Gudlaug Thóra Marinósdóttir
Office Manager IFL 1995.

Hjördís Bergstad.
Clerk. IFL 1991.
Reception and archivist

Hrafnhildur Björgvinsdóttir
Driver for the Fisheries House

Agnar Hardarson.
Janitor of the Fisheries House since 1999

Björn E. Audunsson, B.A.
Project manager. IFL 1998

Eiríkur Einarsson, B.A.
Librarian. IFL 1971.
Manager of the Fisheries Library.

Helga R. Eyjólfsdóttir, M.S. Chemist.
IFL 1995.
Quality and Education Director

Mark Townley, B.S. (Hons).
Chemist . IFL 1990.

Sigurlína Gunnarsdóttir, B.A.
Librarian. IFL 1988.
Fisheries Library.

Sveinn V. Árnason, M.S.
Mechanical Engineer . IFL 1986.

Research Division

Gudmundur Stefánsson*, Ph.D.
Food Scientist. IFL 1986.
Director of Research
**Resigned during the year*

Ása Thorkelsdóttir, B.S.
Food Scientist. IFL 1988.

Birna Gudbjörnsdóttir, B.S.
Food Scientist. IFL 1980.

Emilía Martinsdóttir, Siv.ing.
Chemist. IFL 1975.

Eva Yngvadóttir, M.S.
Chemist. IFL 1989.

Gudjón Atli Audunsson, Ph.D.
Chemist. IFL 1988.

Gudjón Thorkelsson, M.S.
Biologist and Food Scientist. IFL. 1998

Gudrún Ólafsdóttir, M.S. Food Scientist.
IFL 1988.

Gudný Gudmundsdóttir, M.S.
Food Scientist. IFL 1 March 2002

Gústaf Helgi Hjálmarsson, M.S.
Food Scientist. IFL 1999

Hélène Liette Lauzon, M.S.
Food Scientist. IFL 1992.

Kolbrún Sveinsdóttir, M.S.
Food Scientist. IFL 1999

Kristberg Kristbergsson, Ph.D.
Food Scientist. IFL 1998

Kristín Anna Thórarinsdóttir, M.S.
Food Scientist. IFL 1999

Margrét Bragadóttir, M.S.
Food Scientist. IFL 1985.

Margrét Geirsdóttir, M.S.
Food Scientist. IFL. 1998

Helga Halldórsdóttir, B.S.
Chemist. IFL 1994.

Rósa Jónsdóttir, M.S.
Food Scientist. IFL 1999

Sigrún Gudmundsdóttir, M.S.
Microbiologist. IFL 1995.

Sigurjón Arason, M.S.
Chemist. IFL 1995.

Soffía V. Tryggvadóttir, B.S.
Food Scientist and Fish Biologist. IFL 1986.

Thyrí Valdimarsdóttir*, Tekn.Lic.
Food Scientist. IFL 1998
**Resigned during the year*

Páll Gunnar Pálsson, B.S.
Food Scientist. IFL 1999

Sigurjón Arason, M.S.
Chemist. IFL 1978.

Information Services Division

Heida Pálmadóttir, Siv.ing.
Chemist. IFL 1982.
Director of the Information Services Division

Anna Lilja Pétursdóttir B.S.
Food Scientist. IFL 1999
**Resigned during the year*

Ásthildur Eyjólfsdóttir.
Researcher. IFL 1971.

Erla H. Karelsdóttir,
Researcher. IFL 1999

Elín Árnadóttir, B.S.,
Chemicals Technical Engineer. IFL 1976

Eyrún Thorsteinsdóttir.
Researcher. IFL 1974.

Gréta M. Gardarsdóttir.
Researcher. IFL 1990.

Gunnhildur Gísladóttir, B.S.
Chemist. IFL 1997
**Resigned during the year*

Hannes Magnússon, M.S.
Microbiologist. IFL 1977.

Helga Björg Hafberg.
Food Scientist. 10. October 2002.

Ingibjörg Jónsdóttir, B.S.
Food Scientist. IFL 1997.

Ingibjörg Rósa Thorvaldsdóttir, B.S.
Food Scientist and Industrial Technical Engineer. IFL. 1998

Jarmíla Hermannsdóttir.
Researcher. IFL 1972.

Páll Steinthórsson, B.S.
Food Scientist. IFL 1985.

Thurídur Ragnarsdóttir.
Chemical Technician IFL 1994.

IFL in Akureyri

Jón Jóhannesson, B.S.
Chemist. IFL 2000 (first in 1974).
Branch Manager of Analytical Services Division

Jóhann Örlygsson, Ph.D.
Microbiologist. IFL 1996
Research Division.

Katja Laun.
Researcher. IFL 2001.
Analytical Services Division
**Resigned during the year*

María Pétursdóttir.
Researcher. IFL 2000
Information Services Division

Rannveig Björnsdóttir, M.S.
Immunologist and Fish Pathologist IFL 1991.
Research Division.

Svanhildur Gunnarsdóttir.
Researcher. IFL 1987.
Analytical Services Division.

Thrúdur Adalbjörg Gísladóttir.
Researcher. IFL 2000.
Information Services Division

IFL in Ísafjördur

Kristinn Thór Kristinsson, B.S.
Fisheries Specialist IFL 1995
Branch Manager of Analytical Services Division. On sabbatical

Karl Rúnar Róbertsson. B.S.
Food Scientist IFL 1997.
Information Services Division
**Temporarily appointed Ísafjördur Branch Manager*

Halldóra Jóhannsdóttir.
Researcher. IFL 1997.
Analytical Services Division.

María Gudrún Halldórsdóttir.
Researcher. IFL 1989.
Analytical Services Division.

IFL in Neskaupstadur

Thorsteinn Ingvarsson,
Fisheries Technologist IFL 1977.
Branch Manager of Analytical Services Division.

Karl Rúnar Róbertsson. B.S.
Food Scientist IFL 1997.
Information Services Division
**Temporarily appointed Ísafjördur Branch Manager*

Lilja H. Audunsdóttir.
Researcher. IFL 1985.
Analytical Services Division.

IFL in Westman Islands

Sigmar Hjartarson, cand. scient.
Fisheries Biologist and Aquaculture Scientist IFL 1995. Branch Manager of Research Division.

Áslaug Rut Áslaugsdóttir, B.S.
Biologist. IFL 1994

Sigurbjörg Vilhjálmsdóttir.
Researcher. IFL 1996.

Master's degree students at IFL 2002

Harpa Hlynsdóttir, B.S.
Master's studies in food science IFL 2000

Sveinn Margeirsson, M.S.
Master's studies in food science. IFL 2001

Jón Ragnar Gunnarsson, B.S.
Master's studies in food science. IFL 2000

Mei Manxue, M.S.
Master's studies in food science. IFL 1999

Helga Halldórsdóttir
Master´s studies in chemistry

Birnu Guðbjörnsdóttur
Master´s studies in food science

PhD students at IFL in 2002

Sigrún Guðmundsdóttir
PhD studies at the Medical Faculty, University of Iceland

Financial Statements 2003

Board of Directors´ Report

Icelandic Fisheries Laboratories is an independent organization under the Ministry of Fisheries. It operates under the Act on industry research, no. 64/1965, with subsequent amendments The organization is a research and service organization for fisheries, other food industries and related occupations. The organization's function is, on the one hand, to increase the value, quality and safety of marine catches with research, development, dissemination of knowledge and consulting. On the other, it is to promote innovation and development in the Icelandic fisheries industry. Knowledge and facilities will be utilized in other fields of the food industry when appropriate.

In 2002 there was a surplus of ISK 27,954,000 from the organization's operations. According to the balance sheet, the organization's assets were ISK 74,191,000, and its equity capital was negative by ISK 14,328,000 at the end of 2002.

The Board of Directors and managing director of Icelandic Fisheries Laboratories hereby confirm with their signatures the organization's financial statements for 2002.

Reykjavik, 16 May 2003

On the board:

Fridrik Fridriksson
Chairman

Pétur Bjarnason

Arnar Sigurmundsson

Director General:
Sjöfn Sigurgísladóttir

Auditors´ Report

To the Board Of Directors and Managing Director of Icelandic Fisheries Laboratories

We have audited the financial statements of Icelandic Fisheries Laboratories for 2002. The financial statements include the profit and loss account, balance sheet, statement of cash flows and notes. The financial statements are submitted by the Icelandic Fisheries Laboratories management on their responsibility in accordance with laws and regulations. Our responsibility is entailed in the opinion we express on the Financial Statements on the basis of the audit.

The audit was conducted in accordance with the provisions of the National Audit Bureau Act and generally accepted auditing practice, which entail:

- verifying that the Annual Financial Statement is, in all material respects, without defects
- checking internal monitoring and evaluating whether it ensures appropriate results
- checking whether accounts are in accordance with the authorization of the Budget Act, supplementary budget act and other laws, lawful instructions, work practices and operational tasks, as appropriate, and
- checking and certifying the reliability of key figures on operations and results of activities published in the Financial Statements.

The audit includes spot checks on data to verify amounts and other information presented in the financial statements. The audit also entails checking the accounting practices and valuation rules used and applying to Part-A organizations on preparing the financial statements, as well as its presentation as a whole. We believe that the audit is a sufficiently reliable as a basis for our opinion.

It is our opinion that the financial statements present fairly the financial position of the Icelandic Fisheries Laboratories as of 31 December 2002 and change in cash flows during 2002, in accordance with the law, regulations and generally accepted accounting practices for Part-A organizations.

The Icelandic National Audit office, 16 May 2003

Sigurdur Thordarson
Auditor General

Sigurjón I. Haraldsson
Audit Manager

Profit and Loss Account 2002

	Notes	*2002*	*2001*
Revenues			
Unspecified revenues	1	109.727.912	117.068.444
Constributions	2	91.740.489	76.474.330
		201.468.401	193.542.774
Expenses			
Payroll	3	231.606.269	223.002.453
Work-related expenses	4	16.915.308	23.663.028
Specialist and other services	5	23.912.493	29.026.433
Costs for premises	6	32.525.439	30.802.399
Other operating costs	7	31.593.827	25.362.054
Contributions	8	1.488.126	1.153.860
		338.041.463	333.010.227
Asset purchases	9	15.137.498	9.246.029
		353.178.961	342.256.256
Surplus (deficit) before financial items		(151.710.560)	(148.713.482)
Financial income and (financial expenses)	10	(335.752)	42.180
Surplus (deficit) before State appropriation		(152.046.312)	(148.671.302)
State appropriation		180.000.000	130.800.000
Surplus (deficit) for the year		27.953.688	(17.871.302)

Balance Sheet as of 31 December 2002

	Notes.	2002	2001
Assets			
Investments			
Ownership shares in companies		100.000	100.000
Current assets			
Accounts receivable	11	51.138.050	43.665.708
Cash		22.952.971	8.878.988
Current assets		74.091.021	52.544.696
Total assets		74.191.021	52.644.696
Liabilities and equity			
Equity			
Capital at the beginning of year		(42.251.848)	(24.380.546)
Revaluation transferred to capital		(30.018)	
Surplus (deficit)		27.953.688	(17.871.302)
Capital		(14.328.177)	(42.251.848)
Other equity capital			
Revaluation account			(30.018)
Other equity capital		-	(30.018)
Equity capital at end of year	14	(14.328.177)	(42.281.866)
Liabilities:			
Floating debt			
State Treasury	13	44.789.387	70.537.265
Acounts payable	12	43.729.811	24.389.297
Liabilities		88.519.198	94.926.562
Liabilities and equity		74.191.021	52.644.696

Statement of Cash Flows 2002

	Notes.	2002	2001
Operating activities			
Working capital from operations			
Surplus (deficit)		27.953.688	(17.871.302)
Working capital from operations		27.953.688	(17.871.302)
Changes in assets and liabilities related to operations:			
Accounts receivable, (increase)		(7.472.342)	8.752.905
Accounts payable, (decrease)		19.340.515	(3.862.542)
		11.868.173	4.890.363
Cash inflow from operating activities		39.821.861	(12.980.939)
Cash flow from investments:			
Shares			(100.000)
Cash flow from investments			(100.000)
Cash flows from financing activities			
Changes in State Treasury balance			
State Treasury appropriations		(180.000.000)	(130.800.000)
Payments from State Treasury		154.252.122	147.189.251
Cash flows from financing activities		(25.747.878)	16.389.251
Increase (decrease) in Cash		14.073.983	3.308.312
Cash at beginning of year		8.878.988	5.570.676
Cash at end of year		22.952.971	8.878.988

Notes to the Financial Statements 2002

Accounting procedures

Basis for accounting

The Financial Statements of Icelandic Fisheries Laboratories is prepared in accordance with the State Finances Act, no. 88/1997, the Act on annual financial statements, no. 144/1994 and the Regulation on presentation and contents of financial statements and consolidated financial statements, no. 696/1996.

Under the State Finances Act, Part-A state organizations should not capitalize fixed tangible assets, but they shall be expensed in the year of purchase. The organizations should generally not take long-term loans, and they may not undertake long-term obligations unless so authorized in the Budget Act.

Foreign currencies and domestic indexes

Monetary assets and liabilities in foreign currencies are converted to ISK at the purchase exchange rate at the end of the year, while liabilities are converted at the sale exchange rate. Foreign currency transactions during the year are converted to ISK on the transaction date.

Taxes

Icelandic Fisheries Laboratories does not pay income tax or equity tax on general operations, but taxes are calculated for competitive operations.

Recording of revenues

The organization's revenues are booked upon the issue of invoices.

Recording of expenditures

Expenditures are booked when the accounting party receives invoices from the organization. At the end of the year, accrued expenses, associated with the relevant fiscal year, are entered into the profit and loss account as well as unpaid expenses at the end of the year.

Work organization and internal transactions

The operations are divided by subject areas tailored to IFL's organization. Specified projects compete with companies in the private market. Sales of products and services between projects are on the same terms as those applying to transactions with unrelated parties, or according to a price list, if appropriate. In the presentation of the Financial Statement, internal transactions and the balance of transactions between projects are excluded and are not specifically shown.

Receivables

Receivables are entered at face value after taking into account exchange-rate differential and accrued interest, where applicable.

Cash

Cash consist of bank balances.

Pension obligation

There is an unpaid pension obligation in respect of the organization's employees. In accordance with the State Treasury's accounting rules for Part A, pension obligations are not entered in financial statements of particular Part-A state organizations, but are rather entered as a lump sum for the State Treasury. The organization's pension obligation for current and former employees has not been separately calculated.

Accounts payable
Accounts payable are entered at face value after taking into account exchange-rate differential and accrued interest, where applicable.

Accounting and financial custody
The Joint Office of the Industry Research Institutes is responsible for accounting and financial custody for the organization along with accounting for payroll, which is paid through the State Accounting Office.

Appropriations and operations
The Budget Act appropriations for Icelandic Fisheries Laboratories were ISK 125,700,000. Indexation for wages was ISK 300,000 during the year. Also, the organization received an appropriation from a supplementary budget act totalling ISK 54.0 million to meet accumulated operational difficulties of the last several years and to pay severance allowances because of reorganization of the organization's activities and procedures. The total appropriations for 2002 were therefore ISK 180 million.

After deducting unspecified revenues, total operating expenses were ISK 152,046,000, therefore being ISK 27,954,000 less than the appropriations authorized for the year. The breakdown is as follows:

Amounts in thousands of ISK	*Appropriation*	*Account*	*Deviation*
Payroll	215.200	231.606	(16.406)
Other expenses	102.300	105.283	(2.983)
Transfers	19.500	1.488	18.012
Unspecified revenues	(174.300)	(201.468)	27.168
	162.700	136.909	25.791
Asset purchases	17.300	15.137	2.163
	180.000	**152.046**	**27.954**

Profit and loss account 2002, broken down by types:

	2002	*2001*
Payroll	231.606	223.002
Other operating expenses	105.283	108.812
Transfers	1.488	1.154
Revenues	(201.468)	(193.543)
	136.909	139.425
Asset purchases	15.137	9.246
Total	**152.046**	**148.671**

The amounts are stated at the price level for each year, and the price decrease between 2001 and 2002, without asset purchases, was ISK 2.5 million, or nearly 2%.