

MINISTERIE VAN LANDBOUW
Bestuur voor Landbouwkundig Onderzoek
Rijkscentrum voor Landbouwkundig onderzoek
RIJKSSTATION VOOR ZEEVISSERIJ

REPORT
OF THE
SIXTH MEETING OF THE WEST-EUROPEAN FISH
TECHNOLOGISTS ASSOCIATION

Oostende
Belgium
8 - 10 September 1975

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OPENING OF THE MEETING

Dr. P. Hovart, director of the Fisheries Research Station, welcomed the participants of the 6th WEFTA-meeting. He first gave a review of the work of the Fisheries Research Station at Ostend. It was founded in 1962 and constitutes part of the Governmental Centre for Agricultural Research of Ghent comprising 9 Stations. This Centre is part of the Administration for Agricultural Research of the Ministry of Agriculture.

The Station is working in the three main fields of scientific fisheries research : biology, fishing techniques and fish technology.

Dr. Hovart then stressed the importance of scientific research in the field of fish technology and analyzed a few points to illustrate this.

Owing to "Overfishing" of several traditional fish species it has become necessary to look out for lesser known or even unknown fish species. The study of the quality of these species and their processing possibilities is an absolute necessity if these species are to be commercialized.

Fishery products on the other hand, are not spared from environmental pollution. Traces of heavy metals, pesticides and oil derivatives etc., can alter the hygienic quality of the product. Although this aspect concerns in the first place the Public Health Authorities an important task is reserved for the fish technologist. It must not be lost out of sight that the technologist has the right and indeed the obligation to act in a threefold manner. He can trace which noxious residues occur in the fishery products, he can try to elucidate as to how these residues were taken up by the fish and thirdly, he can carry out investigations as to how these residues can eventually be eliminated or prevented.

Finally, the consumer makes ever increasing demands as to the quality - in the broadest sense - of the fishery products. The quality investigations and the study of the objective and subjective quality assessment methods becomes thus more and more necessary, especially as international trade has also increased, requiring reliable reference methods and quality schemes. For all these reasons the annual meetings of WEFTA are very important, because they offer an opportunity for fruitful international collaboration.

Dr. Hovart then declared the meeting open. Before the start of session 1, he invited Dr. R. Kreuzer to give a lecture on his further work on cultural aspects of fisheries.

Dr. R. Kreuzer confined himself to the ancient civilisations of Mesopotamia, Babylonia, Sumeria and Egypt and showed the richness of these cultures also with regard to fish and fisheries.

SESSION 1 - POLLUTION

Chairman : L. Herborg

Mercury and other trace metals in Icelandic seafoods.

(Geir Arnesen ; presented by B. Dagbjartsson)

The results of a great number of mercury determinations in various Icelandic seafood items are presented. The mercury content is relatively low with few exceptions. The effect of volcanic activity on the mercury content of migrating capelin and lake trout has been studied, without finding any direct correlation.

A survey of the content of some metals in Icelandic fishes and marine organisms is being conducted and preliminary results are presented in the paper. Some of the nutritionally important elements are also included in this survey.

The presence in and interaction of petroleum compounds with the marine ecosystem.

(R. Hardy, K.J. Whittle, P. Mackie and J. Murray)

A brief review of work done at Torry Research Station on petroleum pollution and hydrocarbon metabolism is given.

The measurements made to date on alkanes in the marine ecosystem do not on the whole seem to correlate in amount or composition with the expected petroleum hydrocarbon input. This would suggest that the residence time of the alkanes within the system is short and their measurement is possibly of little value in determining the input except where it is high such as that attained in an oil spill. Whether this is true of other petroleum components is not yet known but as the problem of carrying out analyses of the ecosystem for all petroleum components is impractical, efforts should be concentrated on determining the levels of the most objectionable components.

SESSION 2 - ADDITIVES

Chairman : B. Dagbjartsson

Polyphosphates - Glazing and added water.

(A. Aitken)

The use of polyphosphates in fish processing is increasing. The benefits claimed for polyphosphates are critically considered from the point of view of the processor and the consumer. By polyphosphate treatment, water is added to the product ; other aspects of addition of water to fish are considered, especially the application of glaze.

Control of the uptake of glaze and the measurement of added glaze are considered and the possible need for legislative control is discussed.

Traitement de filets de poissons par des polyphosphates.

(P. Nérissou)

Les essais ont porté sur les polyphosphates fabriqués par 3 firmes différentes et sur trois espèces de poissons : merlan, lieu noir et morue.

Les filets congelés à l'azote liquide ont subi chaque mois, pendant 3 mois, des tests physiques et chimiques.

- mesures sur l'exsudat (quantité, indice de réfraction, protéines),
- perte de poids à la cuisson,
- aptitude à la rétention d'eau après décongélation,
- qualités organoleptiques,
- bases volatiles totales, TMA, azote ammoniacal,
- indice thiobarbiturique,
- teneur en polyphosphates non hydrolysés.

Pour cette dernière mesure une méthode originale a été mise au point. Elle permet de distinguer facilement le phosphore ajouté par traitement et donc de préciser, lors d'une expertise, si des filets ont été traités ou non.

The use of polyphosphates on cod fillets.

(J. Oosterhuis)

An experimental examination was made of the use of polyphosphates on fresh cod fillets.

In some tests drip losses, weight losses after cooking and the shelf-life were determined.

The following factors were studied :

1. different dipping-baths (water, NaCl and polyphosphate)
2. dipping time
3. packing (aerobic and vacuum)
4. storage circumstances (+ 0° C, + 4° C, deep-frozen and deep-frozen with temperature fluctuations).

SESSION 3 - IRRADIATION

Chairman : W. Schietecatte

Experiments on irradiation of fresh fish on board.

(E. Reinacher)

Since 1972 the Institut für Biochemie und Technologie has carried out experiments on fresh fish irradiation on board of FRS "Walther Herwig" (now "Anton Bohrn"), using an X-ray plant.

The influence of X-ray treatment under varying conditions with doses from 50 to 200 krad has been investigated by sensory, bacteriological and chemical methods. Seven voyages have been undertaken for this purpose. Redfish, cod, saithe and haddock were used. The samples have been examined as whole fishes, raw fillets and cooked fillets. For each storage time and kind of treatment 3-12 fishes have been investigated by 4-12 panel members. Cooking has been carried out in glass-jars for 30 minutes in a cooking water bath without adding water, salt or other spices to the samples.

In all these cases over the years experienced panel members have been able to detect whether the samples have been irradiated or not because of some developments in colour, odour and taste.

On the other hand there was no significant difference in given score numbers between the several series.

Irradiation pasteurisation of prepacked cod fillets.

(J. Obdam and J. Oosterhuis)

The effect of irradiation with a dose of 100 krad (with a max./min. ratio of 1.2) on the shelf life of prepacked cod fillets has been studied in combination with other factors that influence the shelf life of fish fillets :

- storage time of whole fish in ice
- packing method
- filleting procedure.

The storage temperature was + 4° C.

The results of these experiments indicate that irradiation with 100 krad can more than double the shelf life of prepacked cod fillets, stored at 4° C.

The importance of the storage time of the whole fish in ice, prior to filleting was demonstrated.

The packing methods, aerobic vs. vacuum packing did not show much difference in shelf life for the unirradiated samples, while for the irradiated samples vacuumpacking resulted in a better shelf life than aerobic packing.

The filleting procedure influenced the shelf life in the sense, that measurements taken to limit bacterial contamination resulted in a better keeping quality of the fillets.

The differences in the shelf life obtained for the prepacked fillets could to a great extent be explained by the differences in the microbiological data.

Storage time of whole fish in ice and the filleting procedure clearly showed their influence on the bacterial numbers.

Irradiation caused significant quantitative changes in the bacterial loads (reductions of 2 log. units were recorded), but in addition to this, there was also a qualitative change in the microflora. Bacteria of the type *Ps. putrefaciens* and *Photobacterium*, both active in the spoilage process of fresh fish, were eliminated by an irradiation dose of 100 krad. The remaining flora (*Moraxella* group) was also decimated by irradiation, but still caused spoilage. This spoilage was different from the normal pattern, which was shown by the lack of development of TMA and hypoxanthine in the irradiated fish fillets.

Irradiation of cooked brown shrimps (*Crangon vulgaris*).

(H. Houwing)

In our Institute several experiments have been carried out on irradiation of brown, cooked, shrimps, both in the unpeeled and peeled state, but always prepacked. The samples were kept during the storage period at 4° C.

The main criterium for determining the shelf life is the organoleptical appreciation. In many cases the odour and in fewer cases the taste gives the lowest score and is thus determining the shelf life.

From a technological point of view adding 0.4 % of benzoic acid to shrimps to be irradiated is almost inevitable. Adding no benzoic acid not only results in a shorter shelf life but will also be trouble giving in case the whole landings cannot be irradiated at the same day.

Irradiation of peeled shrimps, containing 0.4 % HBe may result in a shelf life of 17 days at 4° C (3 days for the untreated samples) and of 12 days with unpeeled shrimps (almost three days if untreated).

SESSION 4 - METHODOLOGY AND INSTRUMENTATION

Chairman : A. Ruiter

The automated analysis of volatile bases in fish and shrimp.

(A. Ruiter)

Methods are discussed for the simultaneous automated determination of trimethylamine (TMA), dimethylamine (DMA) and ammonia in fish and shrimp extracts. The TMA determination is based upon the method developed by Murray and Burt, which implies volatilization of TMA from an alkaline medium and subsequent injection of the vapour into an indicator stream. This method was further improved ; interference by ammonia is completely eliminated now.

For the automated DMA determination the reaction with carbon disulphide, ammonia and copper sulphate is employed. A continuous extraction step is involved in this method. Ammonia is determined by the hypochlorite/phenol reaction. In this procedure a continuous dialyzer is used.

The automatic determination of total nitrogen in cod muscle extract.

(H. Devriendt)

A modification of a previously reported method for quantitative determination of total nitrogen in cod muscle extract, using the Technicon AutoAnalyzer digester system, is described.

Freeze-dried cod muscle, made up as solutions and standardized by manual Kjeldahl analysis, was used for calibration instead of the ordinary ammonium sulphate liquid standard. 100 % recoveries, relative to the manual method, were obtained with the former, but only 90 % with the latter.

Some corrections of the ordinary Kjeldahl determination.

(H. Hansen)

An attempt was made to clarify why the ordinary Kjeldahl determination sometimes does not give quite reliable results. The importance of correct heating during the digestion time as well as the efficiency of some catalytic agents were examined.

From the examination of heat sources and catalysts used for Kjeldahl determinations it looked as if most of the former difficulties were due to unequal heating of the samples during the digestion. Probably it is not possible to make accurate Kjeldahl determinations without using adjusted heaters, which give all samples the same maximum heat effect. Gas burners such as ordinary Bunsen burners do not seem sufficiently enough adjustable, and, also, they are rather much influenced by draught in the room.

The catalyst tests showed that it is possible to avoid mercury in the Kjeldahl digestion. However, when, for example, copper is used as the only catalyst, a little longer digestion time is required.

Determination of the softness of fish flesh by a new auxiliary device to the Warner-Bratzler Shear.

(E. Salomonsdottir and J. Bjarnason ; presented by B. Dagbjartsson)

A method has been developed by the Icelandic Fisheries Laboratories to measure the consistency e.g. tear-strength of fish flesh. A set of interlocking combs with spikes piercing through preweighed piece of fish flesh is connected to the Warner-Bratzler Shear and the tear-strength recorded. The ~~last~~ tear-strength was recorded in the middle of the fish, the tail end being toughest. A good

agreement was found between "left" and "right" fillets of the same fish. Statistically significant differences were found between individual fishes of the same species. Fishes varied in size (age), time of catch and state of sexual cyclus. Tear-strength of flesh from iced-stored fish decreased significantly the first 7 days of storage. Increased tear-strength was then recorded up to the 17th storage-day followed by a rapid decrease.

Measurement and control of relative humidity.

(A. Lees)

Instruments used in the routine measurement of relative humidity were outlined and a new form of the aluminium oxide humidity sensor was described. Details of various methods for generating known humidities and vapour pressures were also given.

L'inosine et l'hypoxanthine utilisées comme critère de qualité du poisson frais et en conserve.

(M. Morel)

La mesure des produits de dégradation de l'ATP est une technique couramment utilisée pour exprimer la fraîcheur du poisson.

Jones et ses collaborateurs utilisent la mesure de l'Hypoxanthine (Hx) pour évaluer la fraîcheur du poisson ; cependant cette technique ne semble pas donner satisfaction avec les poissons "gras" au début de leur altération. Une étude de Ehira et Uchiyama a d'ailleurs montré que dans près des 2/3 des espèces pêchées la formation d'Hx était lente et qu'il se formerait plutôt de l'inosine (ino.). Nous avons donc été amenés à utiliser, pour exprimer la fraîcheur du poisson, non pas la méthode de Jones mais celle de Saito qui consiste à déterminer le rapport des quantités d'ino et d'Hx apparues sur la somme des produits de dégradation de l'ATP.

Sachant que ces produits de dégradation sont assez stables à la chaleur, nous avons essayé d'établir une relation entre les teneurs trouvées dans le poisson en glace fondante et sa conserve.

Il deviendrait alors possible de dire pour une conserve quel était l'état de fraîcheur du poisson avant sa mise en boîte.

SESSION 5 - INTERNATIONAL ASPECTS OF RESEARCH IN THE FIELD OF FISH TECHNOLOGY

Chairman : R. Kreuzer

An outline of the FAO programme of cooperative research in fish technology.

(D. James)

During the next FAO budget biennium (1976-77) the Fish Production and Marketing Service of the Fishery Industries Division will make a major effort to establish in developing countries, programmes of cooperative research in fish technology. These programmes are designed to encourage institutes in these countries to pool their limited resources and it is envisaged that two or more institutes, in different countries, will work together to solve common problems. In south east Asia discussions with institutes have already taken place and it is hoped that the programme will start before the end of this year. Next year more attention will be paid to West Africa and subsequently to South America. Although much can be accomplished by cooperation between institutes in developing countries, it is recognised that the programme will have to be strengthened by considerable input of experience from institutes in developed countries. FAO can act as the catalyst for these developments by coordinating the programme, bringing people together and arranging for finance to be channelled to research projects. However, FAO is prevented by shortage of staff and the structure of the Organization from contributing new technology and direct assistance. As a result, FAO will have to rely on institutes in developed countries for essential assistance with design of experiments, interpretation of data and above all the writing up of experimental results for publication in international journals. A great deal of the work already done in the tropics is not available as it has not been written up. The aim of the programme is not only to facilitate the transfer of technology but to apply it at a point where it is required. Encouragement of the growth of sophisticated research institutes, to repeat work which has already been done, is counter-productive and does not make the best use of the limited facilities. By working together it is hoped that more and better fish products will be made available to needy populations in developing countries.

Activités de la CCE dans le domaine des denrées alimentaires industriellement transformées.

(J. Rateau)

L'exposé a porté sur les points suivants :

1. Quels sont les Services de la Commission qui s'occupent des problèmes de recherche dans le domaine des pêches maritimes ? Leurs actions ?

Au sein de la Direction Générale XII "Recherche, Science et Education" : groupe de conception "Océanologie" dans le cadre du CREST.

Au sein de la Direction Générale VI "Agriculture" : Comité Permanent de la Recherche Agronomique.

Au sein de la Direction Générale VIII "Développement et Coopération" : Centre pour le Développement Industriel et Comité de Coopération Industrielle".

Au sein de la Direction Générale III "Affaires Industrielles et Technologiques" : Bureau Eurisotop et Division "Alimentation, Bois et Papier".

2. Activités de la Division "Alimentation, Bois et Papier".

Etude sur la "Recherche Industrielle Alimentaire dans les Pays de la Communauté Européenne".

Principaux résultats.

3. Cas particulier du secteur dans les produits de la mer.

Résultats de l'Etude.

Collaboration à l'action du ATOEP.

Activities of the WEFTA-Working group on sensory assessment.

(H. Houwing)

H. Houwing, chairman, pointed out that the group had met six times since 1972. In the first place, the actual EEC-scoring scheme for fresh fish was studied and several improvements could be proposed. Attention was then paid to a draft EEC scoring system for frozen fish. A completely new scheme is being worked out and is nearing completion now. The group will hold its 7th meeting immediately after the present WEFTA-meeting.

SESSION 6 - MINCED FISH

Chairman : L. Jarenbäck

Quality changes in minced flesh from different parts of cod during storage at -10 and -20° C.

(L. Jarenbäck)

As a first step in work on frozen fish mince as raw material for fabricated products the following study was undertaken.

Minced flesh of cod (Gadus morhua L.), obtained from fillets, fillets with skin, belly flaps, necks and frames was frozen and stored at -10 and -20° C for three months.

At -10° C, rapid changes in the amount of salt-extractable proteins and in water-holding capacity of the raw materials took place. Similar changes occurred during storage at -20° C, but at a slower rate. The rate and extent of changes were most pronounced for flesh from the frames, closely followed by fillets with skin.

The textural characteristics of a model product, prepared from the stored raw materials, were tested with an Instron Universal Testing Machine.

When stored at -10° C, only flesh from fillets and belly flaps could form a satisfactory product within two weeks. Products from the other tissue fractions very rapidly lost their ability to keep together.

Products prepared from flesh from fillets, belly flaps and necks, stored at -20° C, showed an increased firmness but were considered acceptable if prepared within twelve weeks. Flesh from fillets with skin and from frames were able to form acceptable products only within three weeks.

The analytical results showed that certain minimum values of salt extractable proteins or water-holding capacity of the raw materials were required for final products with acceptable texture properties.

The organoleptic assessment of the texture of minced fish (method to determine texture profiles).

(P. Ikkala)

The growing use of meat separators in the fishing industry yields more flesh from fish than does ordinary filleting. In some factories it is found more economical to separate the whole fish than to fillet it and afterwards only separate the trimmings and the offal.

This tendency in the fishing industry calls for ideas in the utilization of the growing output of minced fish. Not all minced fish can be made into fillet blocks or breaded fish fingers. Mince from meat separators should be regarded as a new raw material with properties that might be different from those of traditional fish products, and it is obvious that it is very important to get a basic knowledge of this raw material that can be used for developing new products.

In our work on collecting a knowledge of minced fish we have assessed the texture of minced fish (of various fishes) after various treatments.

The present paper is an attempt to describe why and how we recently tried to set up an organoleptic method for determining texture profiles of minced fish.

Since the method is not fully developed, the work done is still at an early stage.

The assessment of the textural characteristics of separated fish mince by objective measurements

(T. Sørensen)

The binding properties of fish proteins have been studied extensively, showing that the gel is a ternary network structure formed from the hydrated fish protein. The gel properties are governed by the ability of the protein to hydrate and on the nature of the network structure finally formed. In this work the binding strength is evaluated from the elasticity (Youngs Modulus) and the breaking stress of the samples. These properties are measured on the deformation/force curves obtained from an Okada gelometer and from a specially constructed compression cell.

A Kramer shear press was used to measure the fibrousness or toughness of the samples objectively.

An organoleptic texture assessment scheme developed independently (Bruun) defines the structural characteristics of heat gelled fish mince in a series of fundamental terms. In this analysis the initial mouth feel of the whole sample is defined in terms of resilience and hardness. These values are evaluated from the whole sample as it is pressed between the tongue and the palate. A soft, fragnaseous sample would be given a low score, whereas a hard, springy sample would be given higher scores.

SESSION 7 - PROCESSED FISHERY PRODUCTS

Chairman : A. Aitken

Canned Mangrove crab (Scylla serrata) : a product with limited shelf life.

(D. Declerck)

Mangrove crab meat (Scylla serrata) of Malaysian origin presented especially at the beginning certain processing problems for the Belgian canning industry.

In this context the quality of the raw material as well as that of the canned product was examined. The autoclaved cans were stored during four months at -18° , $+5^{\circ}$, $+20^{\circ}$, $+35^{\circ}$ and $+50^{\circ}$ C.

For each series the quality of the product was determined. A number of tests was also carried out to ascertain the microbiological safety of the product.

At 20° C the limit of acceptability was almost reached after 4 months indicating that the canned Mangrove crab should be kept cool.

Quelques possibilités d'utilisation des sardines de grande taille.

(H. Durand)

Les sardines d'un poids unitaire supérieur à 50/60 gr environ sont difficiles à commercialiser sur le marché français. Elles sont peu recherchées à l'état frais, et ne conviennent pas pour la fabrication des conserves à l'huile traditionnelle en petits formats qui constituent l'essentiel de la production.

Nous avons voulu montrer qu'elles peuvent être utilisées pour la préparation de semi-conserves nécessitant au maximum un simple réchauffage pour leur consommation. Nous les avons présentées sous les formes suivantes :

- fumées à chaud,
- frites à l'huile,
- cuites au four à air chaud,
- marinées au vinaigre et présentées en gelée.

Ces produits ont été conditionnés sous vide, les trois premiers en sachets, le dernier en barquettes.

La durée de conservation a été estimée d'après l'évolution des caractères organoleptiques, de la flore bactérienne totale et de l'indice thiobarbiturique. Cette durée est de une à deux semaines environ selon les produits à $+2^{\circ}$ C. Elle peut être prolongée par la congélation.

Studies of fish viscera : composition, preservation, autolysis and utilization.

(J. Raa and A. Gildberg)

In Norway approx. 50-60.000 tons of fish viscera are wasted each year. This represents not only a pollution problem, but also a waste of a protein rich material (approx. 90 % protein of fat free dry matter). Depending on the liver being removed or not, the fat content in the fish viscera will vary between 10 to 30 % (of dry matter). A method for the preservation of the fish viscera has been worked out, using a mixture of propionic acid (0.75 %, v/v) and formic acid (0.75 %, v/v) as a preservative. This mixture is added to minced fish viscera, giving a homogenate with pH varying from 4.2 to 4.5. Except for a small gas production during the first few days of storage, probably due to the growth of lactic acid bacteria, the homogenate can be stored for weeks at temperatures up to 30° C without any spoilage of the raw material. During storage there is an autolytic breakdown of proteins, resulting in more than 80 % of the total protein being solubilized. However, approximately 10 % of the total protein remains undissolved even after prolonged storage.

The utilization of the hydrolysate as animal feedstuff is being investigated.

FORTHCOMING MEETINGS.

At the end of the meeting, Mr. McGrath offered to organize the next meeting in Dublin. Norway and Iceland also declared to be happy to act as hosts in 1977 and 1978 respectively. These proposals were accepted and it was agreed to hold the 7th WEFTA-meeting in Dublin on 13, 14 and 15 September 1976.

