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JAPAN

THE ATLANTIC
HERRING ROE
MARKET

THE ATLANTIC HERRING ROE MARKET

Improving the Product for an Expanding Japanese Market

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prepared for

Fisheries Council of Canada
Ad Hoc Herring Roe Research Committee

and

The Japan Trade Development Division
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Preface

Canadian exporters are discovering a new Japan. Firms which have focussed their efforts on specific target market segments have seen their results soar. Their success bears witness to important changes which have recently occurred in the Japanese market.

Since the mid 1980s, the substantial appreciation of the yen, Japan's concerted policy of domestic demand stimulation and a shift towards a more open import regime have significantly enhanced the competitiveness of Canadian goods in the Japanese market. Specific opportunities have emerged in areas previously closed to foreign suppliers.

This "Export Opportunities in Japan" series is published by the Department of External Affairs to assist Canadian exporters in seizing these exciting new opportunities. It pinpoints specific market segments where new Japanese import demand meets proven Canadian capability. It includes market segment profiles, details specific market technical characteristics, documents success stories and provides market bibliographies and key contact lists.

The series is designed not only as a reference and guide but also as the basis for future joint marketing action by Canadian firms, their trade associations and Canadian government departments. The series has been produced in consultation with the Japanese Export Trade Organization (JETRO) and has the support of the Japanese Ministry of International Trade and Industry (MITI).

The present study addresses specific, technical and presentational requirements for the Japanese herring roe market. Its objective is to sharpen Canadian industry response to the growing Japanese demand for this product and to lay the base for future market promotion and research activity over the coming months. The study was initiated and supported by the Japan Trade Development Division of the Department of External Affairs and was carried out in close consultation with the Fisheries Council of Canada and the Fisheries and Fish Products Division of the Department of External Affairs.

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The Canadian Embassy in Japan has made important contributions to this series of market studies. Additional assistance and information is available from the Embassy in Tokyo.

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Dedication

This report is dedicated in memory of Shoichi (Bob) Matsuura who worked with the Canadian fisheries industries out of the Canadian Embassy in Tokyo for 33 years.

Table of Contents

	Page
List of Tables and Figures	6
1 Introduction	7
2 Objectives	7
3 Background Information	7
4 Co-operating Sectors of Japanese Industry	10
5 Quality Concerns	12
6 Freshness	13
7 Size	15
8 Sorting Practices	16
9 The Freezing Process	17
10 Other Quality Concerns	18
11 Quality Comparison of Atlantic Canadian Herring Roe with Herring Roe from Other Countries	18
12 Grading Concerns	21
13 Review of Ajitsuke Kazunoko Product and Process	23
14 Further Processing of Atlantic Canadian Roe	23
15 Ajitsuke Kazunoko: Future Prospects	24
16 1988 Fall Mission and Future Directions	24
Literature Cited	25
Appendix I — Fishing Vessel Certification Requirements	25
Appendix II — Unloading, Handling, Holding and Transportation and Requirements	26

List of Tables and Figures

Tables	Page
1. Prices of 1988 Frozen Versus Salted Roe to Japanese Industry	8
2. Comparison of East Coast Roe Versus West Coast Roe	8
3. Basic Grades for British Columbia Herring Roe	10
4. Typical Atlantic Canadian Grades	10
5. Japan Importers of Atlantic Canadian Herring Roe	11
6. Principal Flavoured Herring Roe Processors in Japan	12
7. Imports of Herring Roe (Frozen) by Country of Origin	20
8. Japan Marine Products Importers Association Guidelines for Minimal Quality Standards of Atlantic Canadian Roe	22
9. Recommended Minimum Quality Standards for Grade 2 and Grade 3 Atlantic Canadian Herring Roe	22
 Figures	
1. East Coast Versus West Coast Processing	9
2. Gonosomatic Index in Female Herring Collected in Trinity, Nova Scotia	15

1 Introduction

The Japanese market represents a lucrative and expanding opportunity for the Canadian fishing industry. Trade links have long been established based on traditional fish species. In recent years new fish products have been identified allowing the Canadian industry to expand exports to Japan. The Atlantic Canadian herring roe fishery represents a relatively new export opportunity.

Herring roe or "kazunoko" is a traditional food of the Japanese, consumed predominantly during the festive New Year's season. The Japanese consumer purchases kazunoko in two forms: as a salted product (shio kazunoko) and as a newer ready-to-eat seasoned roe product (ajitsuke kazunoko). British Columbia herring roe is utilized as shio kazunoko and its high price limits consumption to the festive New Year's season. The latter is eaten on a regular basis as an accompaniment dish (sozai). The price is more affordable and larger quantities are consumed. It is this kazunoko product that was developed in recent years to utilize the abundant Atlantic Canadian herring roe resource and that has the greatest market potential.

To meet consumer demand the Japanese have turned to various world suppliers of herring roe. The product quality from different parts of the world varies tremendously due to processing, handling techniques utilized and the roe's inherent qualities.

Understanding and observing the quality standards of the Japanese industry are essential to enhancing Atlantic Canada's position as a major exporter of herring roe to Japan in the years to come.

2 Objectives

The broad objective of this study is to upgrade Atlantic Canadian roe handling and processing methods to meet the quality standards required by Japanese industry. Specifically, this objective can be achieved by carrying out the following activities:

- Review aspects of current practices including on-board and in-plant handling, processing methods, grading practices and compare with Pacific coast practices.
- Investigate the effects of various handling and preservation techniques on quality and recommend "best practice" methods.

- Incorporate the requirements of Japanese processors and trading companies into recommended minimal grading quality standards. These standards can then be used as a basis for subsequent development of industry grading specifications.
- Assess existing and potential interest by Japanese trading and processing companies in a semi-processed Atlantic Canadian herring roe product, and the specific processing requirements for this product.
- Communicate the results of the current study to industry in Atlantic Canada through this report's distribution and through a series of seminars and workshops to industry associations. This aspect of the study will be undertaken in association with the Fisheries Council of Canada.

3 Background Information

Comparison of Canadian East Coast and West Coast Industry

British Columbia has been the major supplier of herring roe to the Japanese market since 1970. Pacific roe is used almost exclusively in the traditional (and expensive) salted kazunoko, and thus returns a high price to Canadian processors.

Herring roe from British Columbia is extracted from whole fish, which have been frozen then thawed. The extracted roe is washed in a series of brine concentrations, then cured in 100 per cent brine. This process firms the roe, providing it with the "crunchy" texture the Japanese consumer desires.

Atlantic Canadian roe has also been sold to the Japanese since the early 1970s, initially in very small amounts. However, it was not until 1982 that Hokkaido processors identified a product in which the abundant supply of Atlantic herring roe could be utilized fully. This development led to an increase in the demand for Atlantic herring to satisfy production requirements for this seasoned roe, or ajitsuke kazunoko.

The Atlantic Canadian industry involves little in-plant processing in the traditional sense. Rather, roe is extracted from fresh herring, packed in polyethylene-lined 9 kg (20 lb) boxes which are plate frozen and shipped to Japan. Japanese "processors" then thaw the raw product, which they utilize in their secondary manufacturing processes.

By 1985 the Atlantic Canadian roe fishery had begun to demonstrate strong potential for becoming an important east-coast industry. At that time, initial studies (Huynh, 1986; Watson, 1986 b) were undertaken to develop a greater understanding of the reasons behind the price differential between east and west coast herring roe.

Table 1

Prices of 1988 Frozen Versus Salted Roe to Japanese Industry

Level	Frozen Roe		Salted Roe	
	¥/Kg	Profit Margin	¥/Kg	Profit Margin
Importer	1960-1980	2%-3%	4000	2%
Processor	2000	78%	4080	37%
Wholesaler	3550	27%-38%	5580	13%-20%
Retailer	4500-4900	41%-44%	6300-6700	43%-64%
Consumer	6500-6900		9000-11000	

Source: *ASI Intech Research Inc.*, Study of the Flavoured Herring Roe Market in Japan, Tokyo, 1988.

Table 1 depicts the 1988 price differential between British Columbia salted roe, and seasoned Atlantic Canadian herring roe. A comparison of the processing methods used to prepare salted (west coast) roe, and frozen (east coast) roe are illustrated in Figure 1.

Physiological differences between east and west coast herring, as identified in previous studies (Table 2), are responsible for differences in product type and price range. The important characteristics (crunchiness, size and appearance) of roe from herring harvested along Canada's Pacific coast are more similar to those of the now scarce Japanese herring, than to those of the Atlantic herring.

Table 2

Comparison of East Coast Roe Versus West Coast Roe

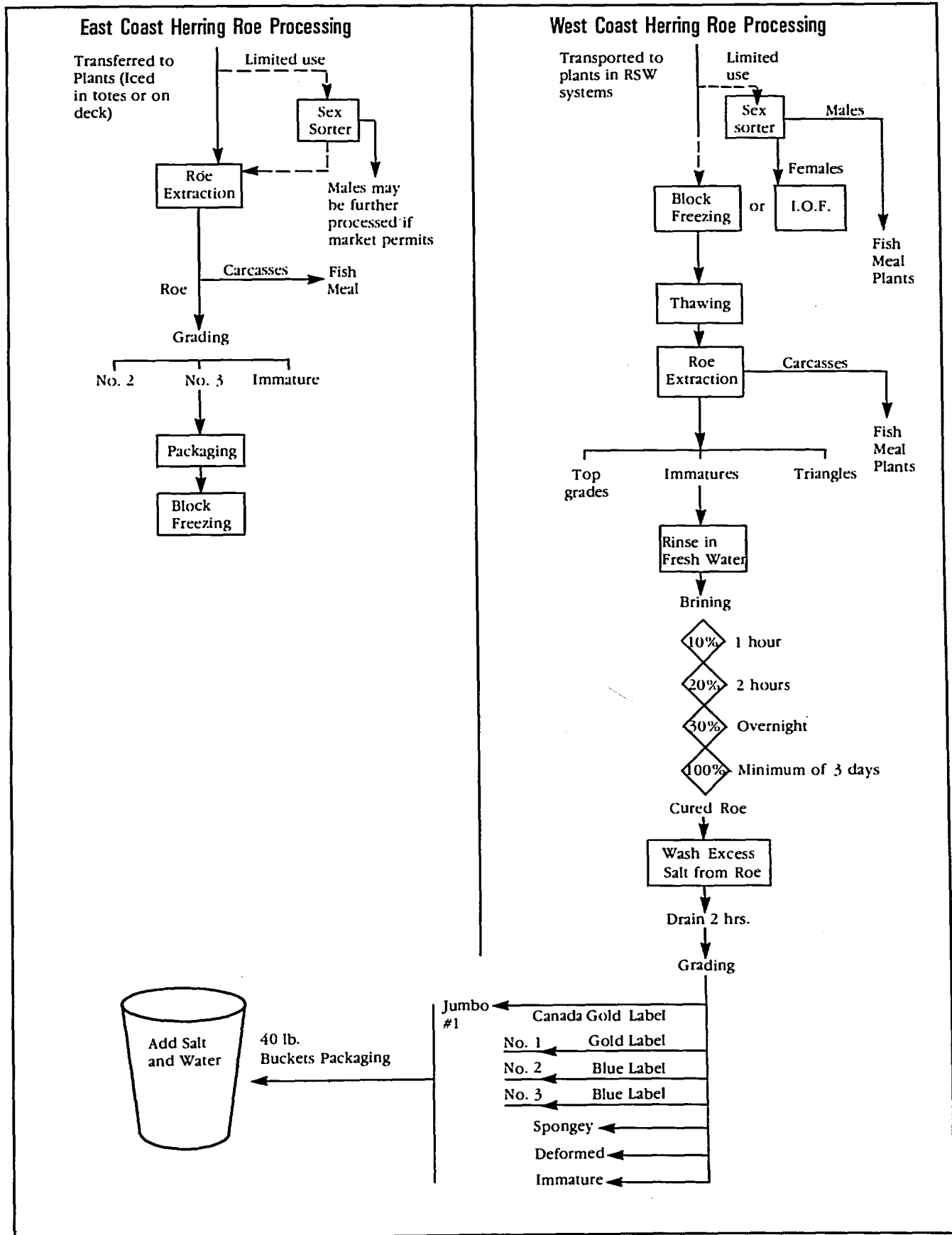
	Atlantic Herring	Pacific Herring
Subspecies:	<i>Clupea harengus harengus</i>	<i>Clupea harengus pallasi</i>
Length of Whole Fish:	29 cm	23 cm
Belly Wall Thickness:	1.5 mm	3 mm
Peak Spawning Time:	May - August (high degree of variability)	April
Egg Diameters: (100 eggs)	1 mm	1.5 mm
Fat Content of Whole Fish:	12-14%	6-8%

Source: *Watson, K.A.*, An Investigation of New Brunswick Herring Roe and its Potential for Value Added Processing, *Fredericton, N.B., Research and Productivity Council, 1986.*

The softer texture, smaller egg size and unprocessed state of the Atlantic Canadian roe resulted in a product that exhibited less of the desirable "crunchy" characteristics and a higher incidence of discoloration and deformity. As a result, the product commanded a much lower price from Japanese consumers. Seasoned herring roe was thus developed as a product to be marketed year round rather than as an alternative to the expensive, better quality salted product, which has only a seasonal market.

Seasoned herring roe has now become a Japanese "yuppie food" and the demand is expected to increase as the product becomes more popular in unserved market areas of the country.

Figure 1



Grading Standards

Pacific herring roe is graded in British Columbia according to a rigorous system developed by the Hokkaido Federation of Fish Product Processors Association and the Japanese Fisheries Council. A 1986 report by K.A. Watson (1986 a) explains the complexities of the Japanese system, which includes nine grades of roe and requires considerable skill to be able to distinguish amongst the various grades. Table 3 presents the criteria for the first six basic grades. Upon arrival in Japan from British Columbia the roe undergoes additional grading by Japanese processors.

Table 3

Basic Grades for British Columbia Herring Roe

Grade	Description
No. 1	larger than 7.5 cm (3 in.); intact; firm
No. 2	5.0-7.5 cm (2-3 in.), fragmented
No. 3	less than 5 cm (2 in.); broken
No. 4	deformed shapes, rubbery texture
No. 5	immature
No. 6	triangles

Source: Huynh, M.D. and Hildebrand, L., B.C. Herring Roe Processing, *Industry Rep. 5, Vancouver, B.C., Research, 1982.*

With the absence of clearly defined standards for Atlantic roe, grading is carried out on an *ad hoc* basis at the discretion of Japanese technicians in Canadian plants. This practice has led to considerable confusion and dispute regarding the quality of Atlantic roe. It is an unfortunate situation, encouraged by the loosely structured grading system currently used in most Atlantic Canadian plants and illustrated in Table 4. Under this system Grade 1 roe does not even occur in Atlantic Canada.

Table 4

Typical Atlantic Canadian Grades

Grade*	Description
No. 2	Mature, larger than 7.5 cm (3 in.); 10 to 25% broken
No. 3	Mature, larger than 7.5 cm (3 in.); 25 to 50% broken
No. 4	Mature, 50% breakage
No. 5	Immature roe

* Grades vary according to region, processing plant and buyer.

4 Co-operating Sectors of Japanese Industry

Traditionally the Japan herring roe industry has been based on imports brought into the country by the powerful trading/importing companies. The trading companies rely on worldwide, strategically placed offices to identify sources of supply and establish trade links with supplier companies. In Japan, the importer may sell the roe through a wholesale market, or directly to a processing plant where it is manufactured into one of several end products for the retail market.

During the 1988 June herring roe study visit to Japan, K.A. Watson met with officials of the Japan Marine Importers Association as well as with trading and processing company officials. In some instances companies were found to engage in both trade and processing activities, thus circumventing the need for a third party. The overwhelming majority of Japanese processors, however, respect the traditional mode of purchasing imported goods solely through designated traders. A list of Japanese trading companies that import Atlantic Canadian herring roe is presented in Table 5.

Competition among Japanese importers is very intense and results in problems which are discussed later in this report. Speculation by the importer may be especially damaging, when in reaction to a drop in market price, the importer quickly pulls out of a proposed contract. Canadian processors must clearly be aware of the complexities involved when dealing in the Japanese roe industry.

The principal Japanese processors of Atlantic Canadian herring roe, together with their approximate production levels are presented in Table 6. The remaining volumes are processed in multi-species processing plants where both ajitsuke kazunoko and marinated products (seasoned mixtures of roe and other seafood) are produced.

Table 5

Japan Importers of Atlantic Canadian Herring Roe
(Units - Tons)

	1986	1987	1988		
			South	North	Total
Nichirei	290	390	270	419	689
Taiyo Fishery	480	880	790	410	1 200
Nippon Suisan	610	940	601	355	956
Daimaru Kogyo	900	650			
Mitsubishi Corp.	280	670	565		565
Nikkyobo	370	420	50	175	225
Takechi	170	200		56	56
Kyokuyo	170	280	81	110	191
Hokkaido Gyogyo Kosha	105	140		290	290
Hanwa Kogyo (Tokyo)	150	190	335	40	375
Hanwa Kogyo (Osaka)				40	40
Marubeni Corp.	140	70		16	16
Minoru International	150	250	100		100
Schooner Shoji	85	140	364		364
Toshoku	155	410			
Tokyo Seafoods				22	22
Koki Gyorui	130	230	331		331
Kato Tsusho	140	170	258		258
Shin-Nippon G.		420			
Takashima Suisan		240			
Nomura Boeki		180	205		205
Nichiro Gyogyo	75				
Mitsui & Co.	100				
Toyota Tsusho	50				
Sumisho Suisan	40				
Nissho-Iwai	40				
Shinko Shoji					
Momokawa			750		750
Nunokawa-Tomen Suisan			326	258	584
Lee-Intl Daiei			60		60
Matsuba Bussan				40	40
Okaya Koki			20		20
Other	640	460	238		238
TOTAL	5 270	7 330	5 344	2 231	7 575

Source: Sea Foods Trading & Marketing News, November 21, 1988 and other.

Table 6

Principal Flavoured Herring Roe Processors in Japan

Processors	Location	1986	1987 (Units - Tons)	1988 Estimate
Honma Suisan	Sapporo	1 200	1 200	
Hokuei Shokai	Sapporo	150	500	
Kaneshime Shokuhin	Sapporo	200	500	
Kasei Foods	Sapporo		400	
Mitsuwa Shokuhin	Sapporo	100	250	
Daiyoshi Takashima	Sapporo	200	200	
Tezukuri Shokuhin	Sapporo	50	100	
Shinrei Shokuhin	Niigata	750	1 000	
Yamazaki Reizo Shokuhin	Niigata	250	300	
Maruta Shokuhin	Niigata	200	100	
Kyoshoku	Nationwide	1 500	1 500	
Ohno Suisan	Rumoi		100	
Kawakami Shoten	Yoichi	200	200	
Nichirei	Tokyo		400	
Chugai Shokuhin	Tokyo	200	250	
Marine Foods	Tokyo	100	100	
Minami Shokuhin	Shiogama	100	100	
Marutomo	Shikoku	150	500	
Yamaki	Shikoku	50	200	
Marunami Shokuhin	Nagoya	100	100	
Mashige Yamani Suisan	Mashige		100	
Kaneka Seafoods	Kesennuma		300	
Yamaya	Hakata		200	
Yamamoto Shokuhin	Aomori	300	300	
Okamura Shokuhin	Aomori		100	
Other		600	1 600	
TOTAL		6 400	10 600	11 800

Source: Daily Hokkai Keizai, August 11, 1988.

Other companies visited during the June study visit included Takahashi Suisan Co. Ltd. of the Sapporo Central Fish Market as well as the Hokkaido Fish Processors Co-operative (Hokkaido Processing Fish Products Co-operative Federation) in Sapporo, Hokkaido.

A subsequent mission in November of 1988 provided representatives of the Atlantic Canadian herring roe industry with the opportunity to develop a dialogue with Japanese industry representatives regarding minimum grade standards, market situation and opportunities for market development and promotional activities.

5 Quality Concerns

The major quality concerns regarding Atlantic Canadian roe identified through discussions and observations in Japan include the following:

- *Freshness* was a major concern for 75 per cent of the Japanese companies. Problems observed included high incidence of breakage or egg seepage, discolouration, poor textural qualities, bitterness detected in end products and short shelf life.
- *Small roe size* was a major concern for 65 per cent of the Japanese companies. This problem was localized in the 1987 Bay of Fundy fishery where reportedly an increasing percentage of the catch had a whole fish weight of less than 200 g. Roe weight must be a minimum weight of 10-15 g per piece. The 1988 Bay of Fundy fishery reflected a substantial increase in average roe weight, thus roe size was not a concern for the majority of the 1988 product.

- *Sorting* was identified as a chief quality concern by 65 per cent of the companies contacted. Atlantic Canadian roe has a high incidence of off-grade roe in its final product including roe that is spent, pencil roe and immature roe. There also appears to be a high percentage of Grade 3 and 4 roe present in Grade 2.
- *Problems incurred during freezing* due to packaging and freezing methods were identified by 60 per cent of the companies as being a major quality concern. End products from this roe had a high incidence of deformity, sponginess and breakage.
- *Other* less prevalent quality concerns included roe maturity, or more specifically, harvesting the fish prior to, or following the period of optimum maturity.

6 Freshness

Freshness of the raw material is of vital importance to the quality of the end product. To understand the implications of a loss of freshness, it is necessary to expand upon the biological and chemical changes a whole herring undergoes during storage.

With loss of freshness, roe herring will exhibit softening of the flesh, egg seepage, rancidity and discolouration. These symptoms develop following *rigor mortis* when the fish is subject to autolytic, bacterial, chemical and physical changes (Aiken, 1982; Woyewoda, 1986).

Autolytic or self-digesting changes may occur within two hours after harvesting as enzymes within the flesh and organs break down the tissue. Tissue degradation leads to the production of free fatty acids and ethanol, causing discoloration and softening of the flesh. If the fish is kept in a chilled condition (i.e., less than 4°C) the autolytic process is slowed considerably.

Bacteria may be responsible for spoilage when large quantities are present. Bacteria act upon the flesh and organs of the fish creating volatile bases, ammonia, TMA and histamines. The bacterial species and quantities present depend upon environmental parameters (e.g., temperature, pH, salt content, water activity, oxygen, toxins). The most convenient form of spoilage control for a herring processor prior to extraction of the roe is to reduce the temperature below 4°C, thus inhibiting the proliferation of bacteria.

Because of the fatty nature of herring, it is especially susceptible to undesirable chemical changes. Fat oxidation is a chemical reaction that occurs when free fatty acids oxidize to form various aldehydes, carboxyls, peroxides and polymers. The effects these compounds have on flavour and odour are termed rancidity factors. Reducing the effects of fat oxidation depends upon maintaining a low storage temperature and restricting contact with oxygen. Frozen roe is also susceptible to oxidation over prolonged periods, but again, limiting contact with oxygen will inhibit the reaction.

Physical changes occur during the freezing process and during frozen storage of the product. Using GMP, following extraction the roe is fast frozen, then maintained in cold storage to await shipment. Textural deterioration during frozen storage can be inhibited by maintaining a cold storage temperature of below -30°C. The phenomenon of sponge roe is discussed in more detail in Chapter 9.

In summary, each change outlined above affects the quality or freshness of the product reaching the consumer in Japan. Deterioration may occur more quickly as a result of rough handling and physical damage. Any handling that mixes enzymes and bacteria with fish flesh accelerates autolytic and bacterial spoilage. Proteins autolyze more rapidly at higher temperatures, particularly above 4°C, and during rough handling.

The following sections highlight recommended on-board and in-plant processing technology that will minimize loss of product freshness.

On-Board Handling

Protection from loss of freshness should begin as soon as the herring is landed on the deck of the fishing vessel.

Atlantic Canadian herring roe is harvested by seiners and gillnetters subject to "fishing vessel certification requirements" outlined in Schedule III of the Canada Department of Fisheries and Oceans (DFO) Fish Inspections Regulations. (Appendix I)

The fish and ice must be protected from the sun and weather conditions, and the storage area provided with shelves or false bottoms of approved materials to protect the catch from contact with bilge water and other contaminants such as oil, grease or unapproved surfaces which may harbour bacteria or corrosion byproduct. The catch should also be protected from crushing by placing it in shelves at a maximum depth of 90 cm; or in holds equipped with RSW or slush ice.

Protect the catch from physical damage by avoiding the use of forks. Pumps and shovels must be used in a manner that minimizes damage. Walking, trampling upon and all other forms of rough handling of the catch must be avoided to inhibit body tissue discoloration and autolytic spoilage.

Temperature of the fish is the single most important factor influencing keeping quality. Therefore, all vessels should be capable of chilling the catch below 4°C whether it is by using ice, slush ice or RSW systems.

The inferior quality of gillnet-caught fish was addressed in a 1987 study by M.D. Huynh. Her findings showed that better quality fish could be obtained by improved vessel design and equipment (net hauling rollers, etc.), proper handling and chilled storage of the catch. The seiners in southwestern Nova Scotia are currently better equipped for providing the processor with a good quality product. Gillnetters are capable of being more size selective, thus more uniformly mature roe and better product yield is possible.

If regulations are adhered to, these attributes of gillnetters plus the smaller volumes of catch could result in a higher quality product for the roe fishery.

Unloading, Handling, Holding and Transporting

The catch must be further protected from loss of freshness throughout unloading, handling, holding and transportation activities. The regulations concerning these activities as stipulated by DFO are presented in Appendix II.

As with on-board handling techniques, the critical points are to limit the introduction of bacteria, minimize the autolytic or chemical spoilage process and protect the catch from physical damage.

Other physical aspects to consider, specific to the roe fishery, are to avoid the release of the eggs, prevent breakage of the roe and avoid staining the roe with blood.

A variety of pumps are currently utilized in the roe fishery. These pumps must be used according to manufacturers' recommendations to minimize physical damage to the fish. Unloading manually must comply with regulations prohibiting the use of forks. Complaints by representatives of Japanese industry often focused on extensive trucking of fish in inappropriate containers, which rendered the fish unsuitable for processing. When trucking is necessary, extreme care must be taken and the distance travelled minimized to maintain fresh fish quality.

Atlantic Canadian processors, in recent years, have initiated improvements to their mode of transport of herring to processing facilities.

Maintaining a chilled condition (less than 4°C) while minimizing physical damage to the fish prior to and during transport can be facilitated by using ice correctly, covering the product adequately, and spacing the fish properly within the container (e.g. 1 m intervals unless slush ice is used). Icing (at an ice to fish ratio of 1:3 parts), chilled water systems or slush ice (a mixture of ice and seawater) are acceptable means of maintaining product temperature of 4°C and lower. When using a slush ice mixture it is imperative to note that adding excess salt will depress the freezing point of the solution thus risking slow freezing of the fish. A 10 per cent (saturated brine) solution has a freezing point of -1.5°C and this level of salt should be the maximum.

Other considerations for the processor include minimizing the introduction of spoilage-inducing bacteria or contaminants to the product by complying with the regulations regarding approved water supply, disposal of offal, and refuse and sanitation practices with respect to equipment and unloading sites.

In-plant Processing

Retaining the fresh condition of the fish must continue within the plant. Canadian processing plants are subject to federal inspections of their facilities and water supply. When these regulations are adhered to the plants are in an acceptable sanitary condition.

Upon arrival at the plant, the herring must be kept chilled (less than 4°C) until it is processed. Many plants have found a slush ice mixture (seawater, crushed ice) to be an effective coolant.

Handling methods, conveyor belts and chutes on the processing line should be designed to minimize damage. Drop points for the lifts and chutes should be minimized as well.

Immediately upon extraction, the herring roe must be frozen. The extracted roe is vulnerable to chemical changes associated with oxidative rancidity. Halting the exposure of the product to oxygen by covering it in "cello" (1.25 mil polyethylene) or plastic wrap inhibits oxidation as does maintaining a chilled temperature. The extracted roe is also prone to physical damage and its transportation should be avoided. At present, extracted roe is at times boxed, then trucked to a plant with plate freezer capabilities. During trucking the product is exposed to elevated temperatures and motion damage.

Exceeding production capacity of the processing plant results in large percentages of the day's catch remaining in cold storage prior to processing. Excessive quantities of fish are prone to mishandling because of the haste associated with running the backlogs of fish through the processing line, which can result in further physical damage to the fish.

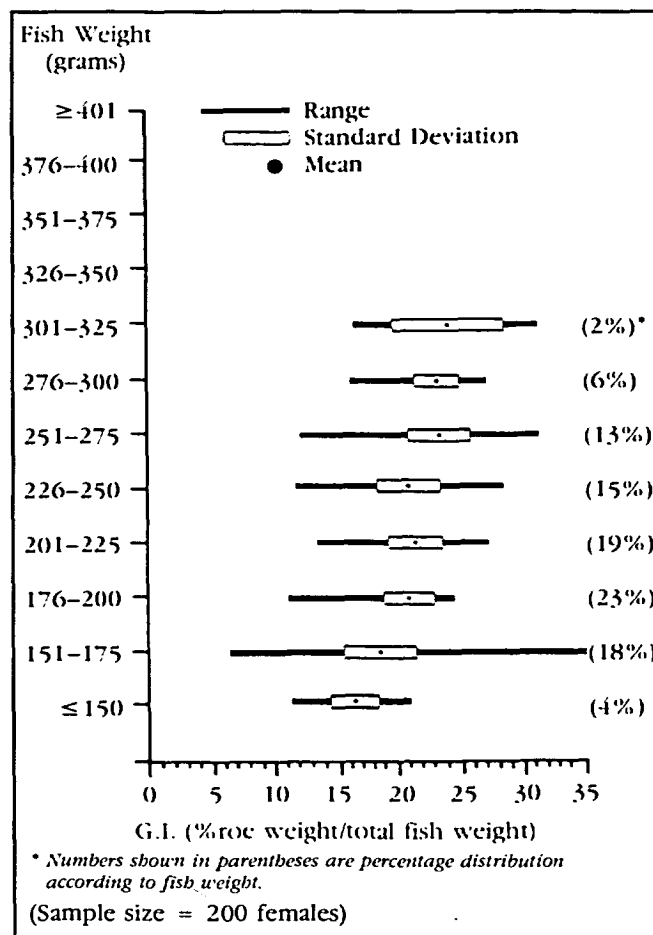
Packages should allow for rapid packing by the workers. Larger packages (9 kg or more) require longer packing time and thus the product remains at ambient temperature longer. The acceptability of packaging will be based on a joint decision between the Atlantic Canadian processor and the Japanese buyer.

7 Size

The small size of the Bay of Fundy roe in 1987 presented problems to the Japanese processor. Consumers prefer packages of 25 g for ajitsuke kazunoko. During the 1986 and 1987 season, an increasingly higher percentage of roe from the Bay of Fundy had a unit size of 10 g or less. According to representatives of Kyoshoku Co. Ltd., Hokkaido Plant, this decrease in size made it difficult for Bay of Fundy processors to package Grade 2 roe. Niigata Reizo Co. Ltd. reported a decrease in the average size of Bay of Fundy whole fish from 240–250 g to 180–200 g. Figure 2 depicts the Gonosomatic Index (i.e., percentage roe weight/total fish weight) for herring from Trinity, Nova Scotia. A total roe weight of 19 g (9.5 g per unit) can be calculated for fish in this size range according to M.D. Huynh's data for this region.

Figure 2

Gonosomatic Index in Female Herring Collected in Trinity, Nova Scotia



Source: Huynh, M.D., Factors Affecting the Quality of Atlantic Herring Roe, Vancouver, B.C., Research, 1987.

The Atlantic Canadian processors have indicated that the decrease in size was isolated to the Trinity ledge region. During the 1988 season the average fish size substantially increased because fishermen no longer concentrated their efforts on this particular region. Harvesting of smaller fish is more prevalent in the seiner fishery when the net is pulled shut too quickly. The gillnet fishery has the advantage of being more size selective. In areas such as the St. Lawrence fishery where gillnets predominate there has been no perceived reduction in the size of the product.

Increased competition between fishermen, processors and Japanese trade companies may also have some impact on the decreasing size. Small size may be overlooked as the competitiveness for the resource increases.

It is the inherent characteristic of Atlantic Canadian herring to vary greatly in length within individual populations. Thus, obtaining a completely uniform roe size is unlikely.

8 Sorting Practices

Gift pack ajitsuke kazunoko is generally made from Atlantic Canadian Grade 2 roe, and ajitsuke kazunoko for household and institutional usage is generally made from Grade 3. The size of the roe may also have implications on regional preference in Japan (e.g., Hokkaido shows preference for the larger roe size). The lower grades are utilized in marinated and other lower value products. Off-grade herring roe is of limited, if any value, to the Japanese processor. In recent years the per cent of offgrade roe present in Atlantic Canadian herring roe product has significantly increased, predominantly as a result of increased competition amongst Japanese importers. This high percentage of immature, spent and pencil roe, when present, makes the Canadian product less attractive. Hokuei Shokai Co. Ltd. reported 20 per cent offgrade in Atlantic Canadian roe depending on the source; Niigata Reizo Co. Ltd. exhibited a sample of Grade 3 roe that had approximately 30 per cent offgrade (i.e., sponge and pencil). These figures vary considerably depending upon the source of the roe and the individual Japanese processor. Actual data on annual increases of per cent offgrade within Atlantic Canadian herring roe are not available.

Non-uniformity in grades is also a problem. Japanese industry representatives confirmed observations made by K.A. Watson that little difference exists between packages of Atlantic Canadian roe labelled Grade 2 or Grade 3. The Japanese industry is concerned with this lack of definition. When a Japanese processor purchases Atlantic Canadian Grade 2 roe it anticipates that a certain percentage (depending on the practice of the Japanese company) will go to the more lucrative gift pack market (e.g., 30 per cent of Atlantic Canadian Grade 2 and 8 per cent of Grade 3 is processed as gift roe according to a representative of Kasei Foods Co. Ltd.). If the product labelled Grade 2 is in reality only suitable for the "daily usage" packages, profits to the company suffer.

Atlantic Canadian grades are assigned in the plants through negotiation with trade company representatives. Standards can also vary greatly from plant to plant. Japanese technicians working in Atlantic Canadian plants may change their grading requirements as a result of market forces, competitors' prices, etc. In recent years the number of importers of herring roe has significantly increased resulting in increased competition amongst the Japanese companies.

The nature of the trade deals struck between Japanese importers and Atlantic Canadian herring roe processors may not be conducive to defining grade standards. For example, a contract may call for specified quantities of Grade 2 or Grade 3 roe. This contract may be adhered to, whether or not the actual grade is in evidence. Honma Suisan Ltd. representatives reported a 30 per cent increase in Atlantic Canadian Grade 2 roe imports. However, this was a result of labelling practices since actual Grade 2 volumes have reportedly decreased due to quality deterioration over recent years.

The Japanese processor may pay the importer 17-30 per cent more for Atlantic Canadian Grade 2 roe than for Grade 3 (according to representatives from Honma Suisan Co. Ltd.). A representative from Kaneshime Shokuhin Co. Ltd. indicated the price spread between his company's institutional package and gift package was 40 per cent. These figures are approximations only since they are strongly influenced by market conditions, season, quality of raw material and competition from other processors. The current practice being used by some trade companies, such as Hanwa Co. Ltd., is to mix Grades 2 and 3 in the same pack. To the Japanese processor, this further complicates the situation.

Since roe products are for export only and not eaten by Canadians, seasonal plant workers in the Atlantic region probably have not developed a thorough understanding of the important characteristics to be observed when processing roe.

During periods of over-extended plant capacity, Japanese importers report that workers in Atlantic Canada appear to fill the packages hurriedly, thus not devoting enough care to the quality of the roe placed in the boxes.

Improving sorting practices may be approached from two standpoints: (1) increased supervision and training of the workers, or (2) greater quality control of the raw material. The former is a difficult undertaking due to human resource limitations and the seasonal nature of the industry. The latter may be a more rewarding approach if it is kept simple. In Chapter 12, the introduction of simple standards are further discussed as a means of controlling the quality of the raw material. The establishment of minimal quality standards by Atlantic Canadian processors is preferable to relying upon marketing forces to control the industries standards or lack thereof.

9 The Freezing Process

Inadequate freezing techniques result in inferior textural qualities (sponge roe). Other symptoms may include roe deformity and breakage. This section deals with what causes sponge roe and recommends packaging and freezing techniques.

Sponge Roe

To the Japanese consumer, the most important characteristic of herring roe is its crunchy texture. If the roe is improperly processed sponge roe develops. Sponge roe is soft and when squeezed during subjective evaluation, releases water.

The key to the presence of sponginess in roe is ice crystal development during the freezing process (Huynh, 1982). The size, number and the location of ice crystals influence the textural quality of the product. Ice crystals develop in herring roe at between -1°C and -5°C . If this range is passed through quickly the moisture within the roe will freeze into many small ice crystals, which pose no threat to the quality of the product. When the range is passed slowly (as in dull or slow freezing) fewer, very large ice crystals develop. The increased diameter of the crystals may rupture the cells of the roe, thus creating sponge roe.

Freshness of the product also plays a role in the incidence of sponge roe. In fresh roe the individual cells are more durable and can withstand better the development of larger ice crystals. If freshness is lost, then even very rapid freezing may rupture the fragile cells.

Packaging

The method and care with which the roe is placed in the package is of considerable importance since any deformities incurred by the roe during freezing cannot be repaired after thawing. The following recommendations are targeted at improving the packaging method utilized prior to freezing:

- Properly align the roe. Place the roe vein side down in straight lines to inhibit bending.
- Wrap roe in a cello sheet within the package. Do not use wax paper as it adheres to the roe surface and is difficult to remove. The cello sheet is necessary to prevent air from entering through the cardboard package.
- Avoid transport of extracted roe prior to freezing. Transferring the extracted roe to the plate freezing facilities not only causes freshness problems, breakage and egg seepage but also causes the fresh roe to shift and slide. The resulting bends and twists in the roe are frozen into shape and upon thawing cannot be corrected. Ideally the Japanese industry requires a uniform package size, one that is thin enough to promote fast freezing, yet not so thin as to promote shattering of the product during transport. Though a uniform package was requested, the Japanese industry representatives exhibited various opinions on the desirable unit size. Package size and specifications should therefore remain negotiable between individual Canadian processors and their importers.

Freezing Techniques

The following recommendations are intended as suggestions to improve the freezing process used for the roe packages.

- Use a plate freezer; blast freezers cannot freeze the herring roe at a rate sufficient to avoid the development of sponge roe.
- Use relatively thin packages as they freeze more quickly and thus avoid the development of sponge roe. Heat transfer is roughly proportional to the square of the thickness of the product. Reducing thickness is a more effective means of reducing freezing time than changing the board weights of the package in an attempt to alter insulating properties.

- Avoid freezing problems caused by exceeding processing capacity. Reducing the freezing time within the plate freezer to maximize the number of lots processed results in ineffective freezing.
- Avoid excessive pressure on the roe packages. The plate freezer may apply excessive force to the surface of the roe thus twisting and bending the layers of roe, causing breakage, egg seepage and formation of deformed and waved roe. Japanese processors identified this as a particular problem in Atlantic Canadian roe because of its inherently soft nature. The use of a reflective pressure frame within the freezer plates may alleviate the excessive pressure without hindering freezer capabilities. These frames may be constructed of metal or wood.
- Place the product in the plate freezer until its core temperature reaches -20°C (usually four hours), although actual time to reach a core temperature of -20°C will depend upon the initial temperature of the product, package thickness, plate freezer efficiency and capabilities.

10 Other Quality Concerns

An additional quality concern in Japan is the proportion of spent roe at the time of harvest. Harvesting the herring during the peak of their maturity benefits all aspects of the roe fishery. The herring populations should be sampled prior to harvest to ensure that the per cent of mature roe falls within an acceptable range.

The Japan Marine Products Importers Association recommended a 70 per cent mature roe restriction on the fishery; that is, after the roe has reached a level of 30 per cent spent roe, the harvest should cease. The acceptable ratio of mature to spent roe currently remains a joint decision of the fishermen and Canadian processor.

Blood staining of the roe was also discussed, although the processors did not regard it as a major concern. The Japanese have suggested staining indicates the stage of roe maturity, lack of freshness of the fish, a sign of stress during catch, or that mechanical pressure has been exerted upon the fish. Bloody roe requires additional rinsing stages in Japan, therefore adding to processing costs. For excessively bloody roe, when discolouration remains even after extensive rinsing and bleaching, the value of the end product is lowered.

11 Quality Comparison of Atlantic Canadian Herring Roe with Herring Roe from Other Countries

Market and quality concerns play an important role in the choices made by Japanese industry. The former is usually of predominant concern to the Japanese importers and includes price levels, quantities available and the timing of the season.

The latter, quality concerns, are the subject of this study and will therefore be addressed in detail with reference to the various supplier countries. The following section summarizes the opinions expressed by various sectors of the Japanese herring roe industry.

Pacific Roe

Pacific herring roe, which includes roe from British Columbia, Alaska and San Francisco is used primarily for shio kazunoko. The roe from these fisheries exhibit the textural characteristics and appearance required for this lucrative traditional product. The roe's inherent qualities are most similar to the traditional Japanese herring roe, the fishery which collapsed in the 1950s. The crunchiness, pleasing yellow colour, size and full shape are ideal for shio kazunoko products. The offgrades of the Pacific roe are occasionally used in ajitsuke kazunoko production.

Pacific roe is subject to strict handling and grading standards. The nature and quality of the roe creates a barrier to significant competition from Atlantic Canadian sources.

Irish Roe

Irish roe, like Atlantic Canadian roe, is imported frozen and is used primarily in the production of ajitsuke kazunoko. Because of their similarities in texture and appearance, Irish roe competes directly with the Atlantic Canadian roe.

Negative aspects of the Irish herring roe fishery include the lack of continuity of supply. The unstable nature of the Irish resource causes price fluctuations and concern over availability of product.

The herring parasite *anisakis simplex* is causing increasing concern among processors as its frequency of occurrence increases. During the 1988 processing year considerable time and effort was spent by Japanese plant workers removing, with the aid of tweezers, this unsightly worm which clings to the outer membrane of the roe. Following removal of the parasite, and assuming the roe is virtually undamaged it can be placed in the appropriate grade and processed in the usual manner. Only under conditions of severe infestation does this parasite appear in the flesh and roe membrane. *Post mortem* migration by the worm into the herring's flesh and roe is possible if fish are not properly chilled prior to processing. *Anisakis simplex* has now been identified in large numbers in Irish, Dutch and Scottish herring.

Herring populations from Irish waters are reported by the Japanese to be more resistant to damage as a result of rough handling or inadequate chilling than the softer Atlantic Canadian fish. Some companies (Niigata Reizo Co. Ltd. and Yamatsu Reizo Co. Ltd.) emphasized inherent quality differences such as firmer texture, larger egg size, larger space between eggs, and appearance in Irish roe. Japanese processors pay more for Irish roe (approx. \$13 per kg of Grade 2) than for Atlantic Canadian roe (approx. \$11 per kg of Grade 2).

The Irish fishery takes place during the cold season from October to February. The cooler temperatures and smaller daily production levels are said to result in a superior freshness of Irish roe. (However, a report prepared by Momokama Foods Inc. reported a diminished reputation of Irish roe because of the small size and lack of freshness of 1987 production lots. In spite of the cooler seasonal temperatures, loss of freshness appears to be a result of improper handling and transporting conditions, according to company representatives.)

The longer harvesting season in Ireland may also contribute to a more experienced work force, which has greater expertise at sorting the roe. Japanese processors report lower incidences of sponge, immature or spent roe in the product they receive from Ireland.

Reportedly, in previous years, a greater percentage of Irish roe was utilized in the more lucrative gift pack ajitsuke kazunoko maximizing profits to the Japanese processor. One processor (Yamatsu Reizo Shokuhin Co. Ltd.) indicated they are now marketing a "meso" (soybean) flavoured product made specifically from Irish roe which will command a higher price than their existing product line of seasoned roe.

Dutch Roe

Roe from the Netherlands arrives in Japan as a salted product and is used in both the shio and ajitsuke kazunoko products, depending upon individual preferences of Japanese processors.

Negative aspects of Dutch herring roe include a higher incidence of sponge roe in the salted product arriving in Japan. By regulation all Dutch roe is blast frozen on board freezer trawlers or immediately before processing. Blast freezing of the whole fish often results in a slow freezing process contributing to the development of sponge roe.

Freezing regulations were instituted in response to the high incidence of the parasite *anisakis simplex* present in the herring populations in Dutch waters.

The instability of supply at times may be responsible for price fluctuations making Dutch roe undesirable to some Japanese processors.

The Dutch herring roe, which is processed into salted roe, is considered superior to the Atlantic Canadian product because it is frozen while still in the fish body cavity as opposed to after its extraction from the fish. In this way, the roe maintains the natural shape of the body cavity which gives it a fine shape. Blast freezing the whole fish is the first stage of preparing the semi-processed salted product. Herring roe from Atlantic Canada is plate frozen upon extraction and subsequently takes on the shape of the box in which it is frozen.

As with Irish roe, Dutch roe is also considered to be inherently firmer than Atlantic Canadian roe by some Japanese processors. Reasons for this perception may include a larger egg size, lower moisture content and improved freshness of the raw material. Superior freshness would result from on-board freezing of the whole fish immediately after harvesting. Also the occurrence of cooler air temperatures during the Dutch herring roe season is conducive to maintaining freshness.

The Dutch product reportedly exhibits more uniform grade standards than the Atlantic Canadian product. This uniformity may reflect the greater ease with which a semi-processed product can be graded. There may also be less pressure exerted by the representative Japanese technicians to pack grades according to market pressures.

Others

Japanese importers are always searching for a steady supply of herring roe. Currently roe is also being purchased from Scotland and Norway, and to a lesser extent, from several other countries as indicated in Table 7.

Comparisons within Atlantic Canada

The Atlantic Canadian herring roe industry is divided into two regions, the north, or Gulf of St. Lawrence fishery, and the south, or Bay of Fundy fishery. In general, the Japanese industry values the firmness of roe from the various producing regions

Table 7

Imports of Herring Roe (Frozen) by Country of Origin

Country	1983	1984	1985 (tonnes)	1986	1987
Canada	1 493	2 919	4 652	5 271	7 332
Ireland	169	245	228	639	1 830
United Kingdom	0	0	1	36	84
Denmark	5	15	47	33	0
United States	2	4	19	16	177
Netherlands	6	24	25	15	99
Poland	0	0	3	14	5
F.R.G.	0	0	89	9	27
Finland	40	12	25	8	5
Sweden	1	2	0	6	0
German Dem. Rep.	0	0	0	0	12
Thailand	0	0	0	4	0
France	0	0	10	0	0
Norway	0	8	7	0	0
Iceland	0	0	18	0	0
Trinidad	0	0	63	0	0
Republic of Korea	0	0	1	0	60
Total	1 716	3 229	5 188	6 051	9 631

Source: ASI Intech Research Inc., Study of the Flavoured Herring Roe Market in Japan, Tokyo, 1988.

Scottish roe, like Irish and Atlantic Canadian roe, is shipped to Japan in frozen blocks. The quality is perceived to be superior to Atlantic Canadian roe for the same reasons as given for Irish roe. However, the instability of the resource also limits its potential for development.

Norwegian roe is not popular with Japanese processors because of its reported inferior textural qualities. The roe is said to be "rubbery" and difficult to chew.

in the following descending order of preference: Vancouver, southern Alaska, North Bristol Bay (San Francisco), Europe, southern Atlantic Canada and northern Atlantic Canada.

Comments received from Japanese industry representatives on the quality of southern Atlantic Canadian roe included reference to slightly superior textural qualities as well as sorting capabilities when compared to northern Atlantic Canadian herring roe products. These generalizations are obviously not applicable to all plants in the northern and southern regions of the Atlantic Canadian fishery since quality standards vary greatly within and between regions. Concern was also expressed over what appeared to be a trend indicating a decrease in the size of herring from Nova Scotia.

Specific information on average sizes of herring from various parts of Atlantic Canada has implications for inconsistencies in grades within the Atlantic Canadian product. According to a representative of Daiyoshi Takeshima Suisan Co. Ltd., the largest average herring size is from Newfoundland (300–450 g). New Brunswick (Gulf region) and Gaspé herring are inconsistent in size ranging from 250 g to 350 g. The spring harvest from Shediac, New Brunswick is of adequate size (210 g) and shape, more so than the remainder of the New Brunswick fishery. Herring from the waters around Prince Edward Island are consistently large with a minimal variance between 270 g and 280 g. Nova Scotia (Bay of Fundy) roe is the smallest especially in the Trinity ledge region as noted previously in Chapter 7 (170–220 g). The difference in size of herring for each location complicates unification of grade standards throughout the region.

12 Grading Concerns

The lack of uniform grading standards inhibits the further development of the Atlantic Canadian roe industry. The grades currently imposed are subject to frequent alterations during the season due to market pressures, availability of stock, and contract requirements as perceived by the Japanese technicians responsible for grading the product.

This lack of uniformity and a perceived deterioration of even minimal quality standards in Atlantic Canada are the principal quality problems as expressed by representatives of Japanese industry. They see this deterioration as due to:

- *Competition amongst Japanese importers* — Niigata Reizo Co. Ltd. representatives stated there are now 20 importers/traders dealing in Atlantic Canadian roe and many of the newcomers are not familiar with the quality needs of the Japanese processors. With more importers wanting to access the same resource there is a greater emphasis on quantity rather than quality.
- *Establishment of block trade deals* — The amount of each herring roe grade to be produced and sold to the importer is established along with capelin, lobster, crab or any other designated fish products prior to the onset of the season. These deals create a less favourable environment for addressing quality issues.
- *Increased number of Atlantic processors* — With more processors there is greater competition for the same resource and less supervision by the Japanese companies familiar with the product.
- *Increased quantities of product* — With increasing production comes the greater possibility of inferior handling practices and exceeding production capabilities.

Discussions with individual Japanese processing companies as well as the Hokkaido Processing Fishing Products Co-operative Federation revealed that the importers do not always act in the best interests of the processor or industry requirements.

The Hokkaido Processing Federation respectfully indicated that, over the years, ineffectual technology transfer from trade companies to Atlantic Canadian processors had led to inferior quality product due to poor handling, sorting and processing techniques. Japanese processors indicated a desire for stronger communications with the Atlantic Canadian industry, which they believe would foster better development of the industry in both countries. Following the establishment of dialogue, the processors hope that the Atlantic Canadian industry would then look to establishing recommended handling and processing methods, and grade specifications. The federation has recommended a technology transfer program and requested that a group representing the Atlantic Canadian companies undertake a mission to Japan with the objective of establishing industry standards, improving communication and increasing production.

In an attempt to initiate discussions about minimal grade standards, inquiries were made with representatives of Japanese trade and processing companies. Each of these Japanese trade companies and processors agreed that minimal standards would greatly assist the herring roe industry in both countries.

Any standards must be initiated and agreed to by the Atlantic Canadian industry as a whole; if they are not observed by all, they most likely will be observed by none. To help develop the standards, the Japanese industry may be enlisted to provide guidelines relating to criteria that are important to processors and consumers.

The Japan Marine Products Importers Association (JMPIA) has established guidelines for their member countries (See Table 8). Members of the association providing direct input included Kyokoyu Co. Ltd., Nomura Trading Co. Ltd., Schooner Trading Corp., Nichirei Corp., Tokyo Seafoods Ltd., Nippon Suisan Kaisha Ltd., Hanwa Co. Ltd., Mitsubishi Corp. and Taiyo Fisheries Co. Ltd. The criteria for the standards relate to fish and roe size, per cent roe yield, maturity and freshness. The association recommended that the trade agreement established between a Canadian herring roe packer and a Japanese importer should set the grading and packaging specifications and recommend the desired freezing process.

Table 8

Japan Marine Products Importers Association Guidelines for Minimal Quality Standards of Atlantic Canadian Roe

Criteria	Standard
Average Fish Weight	200 g
Roe Weight	10 g per section
% Roe Yield	Minimum of 7% roe yield by weight at catch point
Maturity	Remove immature roe
Freshness	Process fish within same day as catch

JMPIA stressed the need for Canadian industry to respond, whether positively or negatively, to this proposed method of controlling the quality of the raw material.

Many individual processors (some of whom are also traders) recommended guidelines for standards of Atlantic Canadian roe. Virtually all of the processors commented on the meaningless grades that are currently being used in Atlantic Canada. The grade system must remain simple to be effective. Accordingly, the strict standards now utilized in the higher value shio kazunoko industry on Pacific roe would not be a valid approach in the ajitsuke kazunoko industry.

The Hokkaido Processing Fishing Products Co-operative Federation perceived that the importers, JMPIA, had recommended standards too basic for the needs of the Japanese processors. This federation consists of all the Hokkaido herring roe processors.

Following discussions with Canadian industry representatives it was possible to merge the requirements of Japanese industry with a practical Canadian perspective on minimum quality standards for herring roe. Table 9 depicts recommended minimum quality standards for Grade 2 and 3 herring roe from Atlantic Canada. The acceptability of these proposed standards remains to be gauged by both Canadian and Japanese industry.

Table 9

Recommended Minimum Quality Standards for Grade 2 and Grade 3 Atlantic Canadian Herring Roe

Criteria	Minimum Quality Standard
Shape	50% full shape
Maturity	Fully mature
Minimum Weight	10 g
Bloodstaining	Not excessive

Grading Discussions During Fall Mission

A mission to Japan in the fall of 1988 established a dialogue between Atlantic Canadian processors and Japanese industry representatives. Discussions targeted at developing industry standards were held with Japanese processing representatives and members of JMPIA. The processing representatives indicated a need for improving existing quality standards; however, they hesitated to commit themselves because of pricing concerns and their reluctance to interfere with traditional Japanese trade links.

The meetings with JMPIA provided a method of approach for Canadian and Japanese industry to discuss grading concerns. From these meetings the following points emerged:

- JMPIA will identify and report on quality concerns to the Atlantic Canadian industry. The association recommends that plant processors implement immediate low-cost steps to ensure that concerns regarding handling and product freshness are met.
- The Canadian industry representatives expressed a preparedness to examine minimum quality standards and to continue dialogue regarding these standards with Japanese industry.

13 Review of Ajitsuke Kazunoko Product and Process

Ajitsuke kazunoko is made from both salted and frozen herring roe. Japan imports significantly more frozen herring roe from Atlantic Canada for ajitsuke kazunoko production than from any other country.

The most popular flavours of ajitsuke kazunoko include "shoyu" or soy sauce (light and dark) and "mentai fumi" or hot chili pepper. Other flavours include Japanese mayonnaise, "mirin" or (sweet sake), skipjack and chinese vegetables.

The product is generally found in 80 g, 300 g, 500 g and 2 kg (institutional size) packages. The price of the flavoured roe to the consumer is approximately half that of the more traditional shio kazunoko at ¥500-¥700 per 100 g (approximately \$40.00 to \$55.00 per kg). (ASI Intech, 1988.) Because of its relatively low price, ajitsuke kazunoko is rapidly becoming a staple seafood within many areas of Japan.

Gift pack ajitsuke kazunoko is made primarily from the largest, full-shaped roe sections (Atlantic Canadian Grade 2). This product is attractively packaged, as per Japanese custom, making it suitable for gift-giving during the New Year's season. The sales for gift pack ajitsuke kazunoko are in fact limited to the festive season. Ajitsuke kazunoko products can be frozen prior to distribution without affecting textural qualities.

Year-round distribution of ajitsuke kazunoko is targeted for consumption on a regular basis and utilizes smaller and broken pieces of Atlantic Canadian roe. However, during high-demand periods, larger pieces of roe may be broken to meet this demand.

Japanese processors utilize individual methods of processing ajitsuke kazunoko. The following describes the standard processing stages from a frozen block of roe:

- Defrost in 5 per cent salt (w/v) for 12 hours.
- Wash in 5 per cent, 7 per cent then 10 per cent salt (w/v) for 12 hours each.
- Cure in 20 per cent salt solution (w/v) for two days.
- Grade according to size, shape and texture.
- Desalt in freshwater, changing water four times over a 12- to 20-hour period.
- Add flavour by soaking in seasoning solution overnight.
- Package.

In addition, some processors bleach the washed and cured roe by using a hydrogen peroxide soak which is subsequently removed from the roe by enzymes.

When utilizing salted roe, the roe is desalted before adding the various flavours, negating the need for the preliminary processing stages.

14 Further Processing of Atlantic Canadian Roe

Problems with exceeding production capacity could be alleviated by freezing whole fish and processing into a salted roe product at a later date. Further processing of Atlantic Canadian roe promotes retention of the desirable shape of the body cavity and should improve textural qualities of the roe. This method is being utilized for Pacific and Dutch herring roe.

The majority of Japanese trade companies and processors indicated that salting Atlantic Canadian roe would not be advisable because of the increased cost to Atlantic Canadian processors, possible loss of flavours due to salting and larger Japanese import duty imposed on salted (12 per cent duty) rather than frozen (5 per cent duty) goods. A few of the processing companies did express interest in a value-added product being produced by Canada but the deciding factor will be price.

Prior to embarking upon production of a salted roe product, Canadian processors would benefit from establishing a direct link with a Japanese processing company interested in purchasing the product. However, the complex organization of the Japanese industry presents a barrier to the introduction of semi-processed products. Inability to gain direct access to the Japanese processor potentially interested in the semi-processed product, has continually frustrated marketing attempts thus far.

15 Ajitsuke Kazunoko: Future Prospects

Japanese trading companies and processors indicate that they expect strong growth in the ajitsuke kazunoko market in the future. The product is currently being processed in snack packs that are appealing to Japanese youth and the availability of ajitsuke kazunoko year round is stimulating more consumer interest. To this end, Japanese processors plan to launch additional promotional campaigns in conjunction with Atlantic Canadian processors.

The resource instability and presence of the herring parasite in the European roe should strengthen the Japanese demand for Atlantic Canadian roe.

The decrease in supply of Alaskan pollock roe available this year is going to have a subsequent impact on the ajitsuke kazunoko industry according to a fisheries products representative for Nippon Suisan Kaisha Ltd. The limited shelf life of ajitsuke kazunoko has discouraged large distribution in southern Japan in previous years because processing plants are located only in northern Japan. The traditional southern processors of Alaskan pollock are targeting production of ajitsuke kazunoko as their new major product to replace the rapidly decreasing pollock roe supplies. The establishment of processors in southern Japan is expected to have a dramatic impact on the consumption levels of ajitsuke kazunoko in Japan.

The Japan Fisheries Market Report (September 1988) developed by the Canadian Embassy in Tokyo indicates that frozen roe prices were less in 1987 than in previous years and with the smaller volumes imported (6 000-7 000 MT), there may be a limited supply.

Extending the shelf life of the product, establishing new product variations and undertaking product promotion should lead to increased market development for ajitsuke kazunoko.

16 1988 Fall Mission and Future Directions

In November 1988, representatives of the Atlantic Canadian industry met with Japanese industry representatives. They developed the following proposed strategy for consideration by the industry at large and targeted at improving the quality and marketing opportunities for Atlantic Canadian herring roe:

- *The Atlantic Canadian Herring Roe Committee* — This newly established group would spearhead recommendations and communicate with Japanese industry.
- *Education and awareness* — A program aimed at improving quality would include seminars to introduce improved handling and processing techniques and subsequent training programs for plant workers, fishermen, etc.
- *Minimum Quality Standards* — Canadian industry expressed a preparedness to examine minimum quality standards and to continue the dialogue established with Japanese industry. Canadian industry could possibly determine a minimum quality standard below which products would not be sold. Japanese importers could also refuse to purchase goods not meeting minimum standards.
- *Market Research* — A market study could be undertaken to determine the market forces that influence herring roe consumption levels in Japan.
- *Promotional Campaign* — Subject to market research, a promotional campaign could be initiated incorporating Canadian processors and the Japanese retail sector.
- *New Product Development* — Canadian industry would benefit from exploring the development of new added value products. Freezing the end products is not detrimental to the textural qualities, therefore, frozen distribution to Japan may be possible. Products could include ajitsuke kazunoko; "roe on kelp," etc. Development work on chemical additives to improve roe firmness is also recommended.

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Appendix I

Fishing Vessel Certification Requirements

Fish Inspection Regulations, Schedule III (Items 1 to 9, 15 and 16) Department of Fisheries and Oceans, Ottawa, Canada.

Protection of Catch

- Item 1: Areas where fish and ice are stored shall:
- a) have covers to protect the fish from the sun and weather;
 - b) be provided with drainage to effectively remove ice melt water and ensure that fish and ice do not come into contact with bilge water and other contamination; and
 - c) where it is necessary to prevent physical damage to the fish, be divided into pens which shall be shelved vertically at intervals of 90 cm or less.

Construction of Storage Areas

- Item 2: Subject to item 3, fish and storage areas shall be of non-absorbent, non-corrodible materials, other than wood, and so constructed as to preclude physical damage to the fish and facilitate cleaning and any surfaces that contact fish shall be smooth and free from cracks and crevices.
- Item 3: In the case of vessels built prior to September 15, 1982 and vessels having no below deck storage areas, built-in fish and ice storage areas shall be so constructed as to preclude physical damage to the fish and may be of wood, if the surfaces are smooth, free from cracks and crevices and coated with a durable, light coloured paint or coating of a type approved by the Minister.
- Item 4: Boxes for fish other than live shellfish shall be of smooth non-absorbent, non-corrodible material other than wood, free from cracks and crevices, and so constructed as to provide drainage and protect the fish from damage by crushing when the boxes are stacked.

Construction of Bulkheads

- Item 5: Fresh fish storage areas shall be separated from engine compartments and other heated areas of a vessel by watertight insulated bulkheads and wall surfaces. Bulkheads and deckheads in frozen storage areas of a vessel shall be well insulated.

Fish Handling Equipment and Practices

- Item 6: Fish handling equipment such as chutes, conveyors, fish washers, tables and utensils shall be of smooth non-absorbent, non-corrodible material, other than wood, free from cracks and crevices and so constructed as to facilitate cleaning.
- Item 7: Forks, pumps, tools or other equipment and practices that pierce, tear or otherwise damage or contaminate the edible portion of fish shall not be used.

Preservation of Catch

- Item 8: Fish, while on board a vessel used for fishing or transporting fish, shall be:
- a) preserved by the use of finely divided ice, sufficient to reduce and hold the temperature at 4°C or lower, and such ice shall be made from water from a source approved by a fish inspection laboratory; or
 - b) preserved by such other methods as the Minister may approve.
- Item 9: Where chilled water systems are installed on a vessel, such systems shall be of materials approved by the Minister, be constructed to facilitate proper cleaning and be capable of holding fish at -1°C.

Sanitation

- Item 15: At least once daily, fish receiving areas and all equipment, containers and utensils used in the handling of fish on board a vessel shall be thoroughly cleaned with water from a source approved by a fish inspection laboratory and disinfected.
- Item 16: Following the discharge of fish from a vessel, all equipment and utensils used in the handling of fish and the storage areas, chilled water system, fish containers, penboards and shelfboards shall be forthwith thoroughly cleaned with water from a source approved by a fish inspection laboratory and disinfected.

Appendix II

Unloading, Handling, Holding and Transportation Requirements

Fish Inspection Regulations, Schedule V, Department of Fisheries and Oceans, Ottawa, Canada.

Fish Handling Equipment and Practices

- Item 1: Forks, pumps, tools or other equipment and practices that pierce, tear or otherwise damage or contaminate the edible portion of fish shall not be used.
- Item 2: Fish handling equipment such as chutes, conveyors, fish washers, tables and utensils shall be of smooth non-absorbent, non-corrodible material, other than wood, free from cracks and crevices and so constructed as to facilitate cleaning.

Construction of Storage Areas

- Item 3: a) Fish shall be transported in covered containers approved by the Minister or enclosed vehicle bodies.
b) The contact surfaces of fish storage areas in vehicles and of containers used for transporting fish shall be smooth, free from cracks and crevices and made of non-corrodible material.
- Item 4: a) The containers and vehicle bodies used to hold or transport fish shall be filled to a level no higher than 60 cm (as recommended for herring) of its depth.
b) The body of a vehicle used for transporting fish in bulk shall be divided at intervals of 1 m along its length.

Preservation of Fish

- Item 5: a) Fish held prior to being transported shall be iced or chilled after unloading from a vessel and be protected from the sun and weather and from contamination.
b) Fish shall be iced or chilled while being transported.

Water Supply

- Item 6: Water used for unloading, washing or transporting fish shall be clean and obtained from a source approved by a fish inspection laboratory.

Offal and Refuse Disposal

- Item 7: Offal and other refuse shall be disposed of in a manner satisfactory to an inspector.

Sanitation

- Item 8: Areas where fish is landed or handled and all surfaces which come in contact with fish during unloading, handling, holding and transportation shall be maintained in a clean and sanitary condition.

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