

WORKING PAPER

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BELLY FLAPS AND BITS FROM HERRING

A background report authored by
Innovation Norway employees

Belly flaps and bits from herring:
A background report authored by Innovation Norway
employees

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28. August, 2013

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Introduction

Møreforsking Marin in cooperation with The Norwegian Seafood Research Fund (FHF) and two Norwegian herring producers - Grøntvedt Pelagic AS and Fosnavaag Seafood AS - are developing an innovative project aimed at better and more profitable utilization of belly flaps and "bits and pieces" from Atlantic herring (Norwegian spring-spawning herring) for human consumption.

The project's main goal is to achieve profitable utilization of belly flaps and "bits and pieces" from Atlantic herring for human consumption.

Møreforsking Marin requested the assistance of Innovation Norway (IN) in their market surveys, product test and market development of by-products from Atlantic herring for human consumption. Identification of the market potential will be carried out in several markets, but in the first phase of the project in Russia, Poland, Korea, China and Turkey.

The main target for IN offices abroad was identification of market potential of the below listed by-products from machine filleting:

1. Belly flaps
2. Marinated bits and pieces, without skin and bone
3. Mince (from belly)

Anticipated results of the project:

- New knowledge about the market opportunities for by-product (residual products).
- Establishment of relations between Norwegian producers and fish processing industry in selected target markets.
- Increased utilization of resources and value creation in the Norwegian pelagic industry.
- Development of new consumer products of herring.

We have the pleasure of presenting you with the Phase 1 of the project:

Identification of market potential for herring by-products in Russia, Poland, Korea, China and Turkey

Our consultants responsible for marine markets have also identified different companies and potential project partners interested in participating in the next part of the project.

Surveys are based on the market questionnaire and interviews with different industry stakeholders. We have also used our networks and all available desk research, professional publications and analyses.

Editorial remarks

This working paper is comprised of five interim reports authored by Innovation Norway employees, one for each respective country. Møreforsking Marin has compiled the five reports into this working paper. Only minor modifications are made.

1. Poland

Poland is one of the largest markets for Norwegian seafood in Central Europe. The export of fish and seafood makes up around 30% of the total export value from Norway to Poland, and it is a very important business sector. In 2011 the volume of import from Norway reached 135 thousand tonnes and the value amounted to 3.5 billion NOK. Norway is still the main supplier of fish and fish products to Poland.

Polish fish processing, due to decreasing Baltic and deep-sea fisheries, is mainly based on imported raw material. Pelagic species are next to salmon the most imported fish. In 2010 Poland imported 96.9 thousand tonnes of herring (9 % increase from 2009), mainly fillets. In 2011 imports of herring is falling slightly and reached ca. 95.000 tonnes. Last year the Norwegian share of the total herring imports to Poland decreased down to 27% (previously 31%). Iceland takes higher percentage. In 2012 we can observe continued decrease of export volume from Norway, mainly as an impact of price increase.

Norwegian exports

Norwegian export of herring to Poland declined from 31 000 tonnes in 2010 to 24 000 tonnes in 2011. In the first 4 months of 2012 exports of herring decreased by 2000 tonnes and amounts to 7000 tonnes. Exports of fillets decreased by 3 000 tonnes to 4 000 tonnes. Average prices for herring were significantly higher in the last season than in the two seasons before.

Norwegian herring exports to Poland, 2007-2011 (product weight, tonnes)

COUNTRY	2007	2008	2009	2010	2011
NORWAY	35 959	37 390	36 326	31 473	24 122
NORWAY % of total	38%	39%	41%	31%	27%
ICELAND	20 796	19 757	22 515	31 947	24 200
Total	95 095	97 026	88 874	96 626	95 567

Source: Norwegian Seafood Council

Herring imports to Poland by country, 2007-2010 (product weight, tonnes)

COUNTRY	2007	2008	2009	2010	2010/2009
NORWAY	35 959	37 390	36 492	29 598	-19%
NORWAY % of total	38%	39%	41%	31%	-10%
ICELAND	20 796	19 757	22 515	24 947	11%
ICELAND % of total	22%	20%	25%	26%	0%
DENMARK	17 253	20 179	10 542	10 409	-1%
GERMANY	7 068	12 214	19 092	20 203	6%
FAROE ISLANDS	2 488	663	2 409	3 373	40%
SWEDEN	3 365	1 627	1 853	2 788	50%
NETHERLANDS	1 288	1 580	1 101	2 001	82%
IRELAND	1 990	1 516	240	1 723	619%
LATVIA	66	24		1 332	-
UNITED KINGDOM	2 878	1 450	932	802	-14%
OTHERS	514	1 524	593	1 068	80%
Total	95 095	97 026	88 874	96 626	9%

Source: MIR (Sea Fisheries Institute, Gdynia, Poland)

Norwegian exports of herring to Poland by products 2009-2011

Herring Products	Norwegian exports of herring to Poland			Price NOK			Price USD		
	Volume of sales in 1000 kg								
	2009	2010	2011	2009	2010	2011	2009	2010	2011
Frozen filets	30 089	26 019	20 907	7.77	7.67	12.73	1.31	1.29	2.25
Rund Frozen	5 591	4 923	2 794	4.77	4.49	7.03	0.77	0.75	1.26
Prepared / preserved herring	642	530	419	12.05	12.34	12.51	1.97	2.05	2.22
Grand Total	36 326	31 473	24 122	7.39	7.26	12.07	1.24	1.22	2.13

Source: Norwegian Seafood Council, EUROSTAT

Consumption

Consumption of herring product in the Polish market is estimated at around 126 000 tonnes. Consumption measured in live weight/per capita increased from 2009 regularly and came up to 2.93 kg / capita in 2010.

The frequency of herring consumption depends on age. The highest rate in the target 50 + years, the lowest rate in the target from 18 to 29 years. The majority of the consumers are eating herring at home and often in family relationships, party, with friends, etc. Poland with its 38.6 million inhabitants and still a low level of fish consumption is a very promising market. Structural changes together with investment in infrastructure have contributed to higher economic growth, higher living standard and greater purchasing power in the longer term.

Product variations available in the market

The most demanded herring sizes on the Polish market are:

Frozen fillets, high cut: 30-50, 40-70, 50-80

Frozen flaps: 10-16, 6-10.

Fat content: 14-17 %

Usage of marinated semi product, imported basically from Germany and Denmark, is growing frequently since 2006. Almost 1/4 of all imported herring is prepared, preserved and frozen in vacuum packaging.

How is herring processed and used in the local market (short product description).

Herring consumption is very traditional and strongly implemented into Polish cuisine and cuisine customs. It is an essential part of Polish culture. Herring is perceived as one of the basic food products, traditional, familiar and originally Polish. Main consumption occasions are: celebration, company of friends, picnic, as appetizer. Herring is an emotionally loaded product. Polish consumers indicate Herring as a good starter for a party (special form called caps – rolled on picks). In the communist time herring was the only starter at restaurants with „Japanese variant” as the icon of Polish cuisine – described by sociologists, film directors etc.

Herring is connected with religious customs – it is a must for Christmas Eve as well as on Fridays. The majority of consumers use fillets as the most convenient herring format. Polish consumers like traditional flavours, but are also looking for innovations, new flavours, new packaging. The Polish market offers herring both as traditional, old-fashioned fish (Rollmops, Bismarck, Matjes etc) and highly sophisticated for younger peoples. Majority of consumers of matjes and marinated herring are second lifers and 40% of them are older than 50. Young consumers care for new products benefits: small packs, mild and sophisticated taste, health and wellness aspects. Young consumers show interest in sauce and cream herring products.

Important purchasing criteria:

- easy-to-use and attractive pack design
- herring appearance
- health aspect
- new dressing
- usage occasions

Chilled fish products are the most important product group of Polish fish processing industry. Almost 100 companies manufacture nearly 150 thousand tonnes of marinated, salted and smoked products, of them:

- 92 thous. t. marinated
- 24.5 thous. t. gourmet products
- 19.5 thous. t. salted herring

Sales of chilled herring-based products remained stable in the years 2009-2011 but domestic consumption was lower due to higher prices of imported fish (Source: Sea Fisheries Institute – MIR)

Polish companies produce about 200 variants of herring products in some countless packaging options.

For to face the growing competition many large producers as Lisner, Seko, Contimax deliver to several retailers a huge amount of extremely varied and creative products. All big international hypermarket chains are looking for manufacturer of private label product so Polish companies in addition to development of own brands, are competing on long-term contracts for Makro, Lidl, Aldi, Tesco and many others. Some private brand as retail chain “Biedronka” in Poland, belonging to Jerónimo Martins SGPS, SA - Portuguese company (Pingo Doce) sells premium products as private label in discount stores. They ask for quality for very low price, which does not correspond with the rising prices for pelagic raw materials. Prices and orders are negotiated twice a year and no one cares from where the manufacturer will take the raw material. If the products are not delivered, huge penalties await termination of the agreement. Biedronka has more than 1,900 stores and 10 distribution centres on Polish territory. The company employs more than 36,000 Polish employees. In Portugal, the JM Group operates three chains of hypermarkets and supermarkets, as well as warehouses and manufacturing facilities.

Productions of herring can be divided depending on the method of processing, packaging, flavors, sauces, shelf life etc.

The main products are:

- Salted herring
 - Canned
 - preserved
- Marinated herring in various sauces

- Canned
- Preserved
- Smoked herring
 - Canned
 - Preserved
- Herring salads
- Herrings in pickled salsa sauces
- Herrings in pickled sauces
- Herrings in oil
- Herrings in vinegar
- Herrings in cream
- Herrings in aspic
- Herring gourmet food

All these products occur differently packed in plastic trays, plastic tubes, jars, buckets, etc.

How many companies use herring in their production?

Poland is becoming a centre for the fish processing industry and up to now many western companies have established production units in Poland (Espersen, Homann-Lisner, Mills, King Oscar-Rieber, Royal Greenland). Polish processors are also benefitting from lower labour costs, large internal market, dynamic business environment, good infrastructure and small distance to the most important European markets. Fish processing is one of the fastest developing branches of agro-food sector but profitability is rather low. Polish processors are exporting a large amount of final fish product (mainly processed herring, smoked salmon and white fish fillets) to the EU-markets.

Since Poland joined the European Union a rapid growth in the turnover in foreign fish trade has been noted. In 2011 there were record exports of herring in the history. The total herring exports reached 67.7 tonnes (45 000 in 2010) worth 124.4 million euro and increased by 30% in volume, and by 40% in value. The greatest increase is noted in the case of smoked fish (salmon, trout) and fish preserves (herring). Almost 90% of exports land on the markets of the EU – Germany (59 thou. tonnes), Denmark, Great Britain and the Czech Republic. The following fish play a significant role in the export market: salmon and herring products as well as such Baltic fish as cod and sprat. As mentioned above 100 companies manufacture nearly 150 thousand tonnes of marinated, salted and smoked products.

Utilization of by-product

The by-products from herring are mostly sold to fishmeal/feed companies. Poland is a small supplier for such products as the industry demand are covered by imports of fillets. Some herring processing plants use worse quality of fillets, broken fillets or fish damaged in the transport, for production of cheap fish product, mostly canned, where all fish ingredients are minced.

Not special marked for herring by-products, but fish waste and fish mince begins to be more and more demanded and the prices are growing. Few years ago manufacturers need to pay for waste handling. At the beginning of 2000 the prices for fish waste was approx. 0.20 PLN/ kg, and now it is 0.70 PLN/ kg.

The Polish companies are interested in testing of samples but they expect low prices. Estimated price should be lower than price for Baltic herring. Baltic herring (whole fresh) price in August 2012: 1.95 – 2.50 PLN.

What products can be developed from these residues?

Canned products, salads and fish ingredient in fish spread, fish burger

Polish traditional consumers are “keen” on whole fillets in the herring products, but young generation prefer herring in cream salads and in different sauces. Because the fish are becoming more expensive, their share in readymade product became smaller and smaller. Herring has a very specific taste and flavour, difficult to substitute, so chipper alternative for the common used fillets can be interested for the industry.

Market potential for belly flaps, bits and pieces and mince

By-products from herring are not widely used in the Polish market today. But based on the interviews with different processors, herring belly and b&p might be an alternative raw material for some canned products, salads and fish ingredient in many traditional Polish fish products. Traditionally the period between October and April is a high season for seafood consumption in Poland (Christmas, New Year and Carnivals events, Eastern).

Most preferred fat content in Poland 14-17%. The most demanded herring sizes on the Polish market are:

Frozen fillets, high cut: 30-50, 40-70, 50-80

Frozen flaps: 10-16, 6-10.

There is no specification for herring by-products.

There is a lot of already developed and produced product as fish spread, herring salads etc. Could be interesting to develop something healthy and easy to eat for young consumers e.g. fishcake, herring burger. Maybe mix with other pelagic fish.

Frozen is the most common product. When it comes to mince the companies prefer production in own factory.

The Polish companies have a low price expectation for the by-products and therefore interested in developing co-operation.

In Poland there are a huge salmon and cod processing industry. Salmon and Baltic cod are fileted and the by-products are processed frequently in the same companies.

For example producers of fresh and smoked salmon are selling so-called smoked salmon belly for sushi and for other consumption. Smoked tiny pieces of salmon meat are used for salads and are very popular as ingredients in a dish called tartar. These products are sold in fish counters and in the hypermarkets.

Salmon heads and other ingredients are sold to manufacturers of feed for pets, or fur animals for instance mink. Exported from Poland to Denmark, Germany, Russia

Price 1.25-1.50 EUR/kg

Mince from white fish are cheaper approx. price: 0.70 PLN/kg

Fish are valuable and expensive component of the diet. Cod and salmon cuts was in many years used for human consumption in form of minced meat, pieces of meat used in salads, sauces, and soups.

Cod and white fish are used more by the processing industry for production of fish fingers, pastes, fish nuggets, fish burger etc.

Polish Baltic herring catches are still limited. In 2011 domestic herring supply amounted to 29.9 thousand tonnes (an increase by 21%) Even those, Baltic herring is much smaller than NVG herring, so there is proportionately less by-products available on the market and demand for such products for human consumption is for the time being not well developed.

2. Turkey

Norway is an important market for Turkey in terms of seafood sector. First of all, the EFTA agreement secures no custom duties for Norwegian Seafood to Turkey whereas Turkish companies pay high duties for most other suppliers of seafood, such as the EU countries. On the other hand the total fishing ban between April 15th and September 1st, lead Turkish players to look for import alternatives. At the same time the growing economy, population of 72 million people, 30 million foreign tourists each year and developing retail sector are the triggering factors of Norwegian Seafood to Turkey.

Norwegian export to Turkey per year

Row Labels	Quantity in tons			Value 1000 NOK		
	2009	2010	2011	2009	2010	2011
Mackerel	17 984	25 932	19 205	140 929	200 558	207 880
Salmon	2 848	3 267	4 497	91 086	129 775	146 722
Saithe	2 661	2 553	1 897	49 642	62 145	52 184
Herring	2 065	1 408	807	10 314	9 670	7 911
Trout	286	195	196	9 654	7 606	7 776
Haddock	60	28	126	1 510	711	3 580
Cod	82	12	42	2 303	466	1 482
Prawns	36	21	35	1 817	1 097	1 954
Capelin	58	33	26	311	178	107
Turbot		29	24		2 348	1 894

Consumer habits in Turkey

In Turkey there is more consumption of fresh seafood in comparison to processed fish and frozen products. Most popular species are:

- Anchovy, sardines, some other pelagic fish species; marinated, salted, smoked
- Trout; filleted and smoked
- Mackerel; filleted
- Salmon, swordfish; smoked
- Tuna; canned (very important of the industry)

Even though there is a tradition for fresh fish among Turkish people, changes in Turkish living habits and the development of the modern retailing improve the fishing industry. The companies started to introduce new and different product alternatives such as breaded products, portion packs, ready-made products, MAP-Products and so on.

As a result of these changes, the demand and consumption of processed fish products will increase more and more in the future.

Market for Seafood

Pelagic fish has a strong position in Turkey. The most popular species are anchovy, horse mackerel, sardines, bonito, and bluefish.

- Anchovy is the most popular fish
 - Consumed grilled, fried, marinated, canned
- Horse mackerel is sold both in traditional and modern retailing
- Mackerel is mainly imported from Norway, very well known in Turkish market
- Herring is more related to tourism sector
 - Almost all the imports from Norway go to the southern part of Turkey to be served for tourist groups in all-inclusive concept hotels.

Whitefish is also popular among Turkish people. The preference of wild-caught sea bass, sea bream is very high. On the other hand farmed sea bass and sea bream are sold through whole year. Turbot and whiting are also traditionally important marine species in Turkey. Local turbot has a prestigious status but could be substitute with Norwegian halibut or turbot. There is a considerable interest for monkfish as well.

For the red fish species, there is a long tradition for farming of rainbow trout. Trout is around 1,5 kg and popular all over the country. It is consumed as grilled, fried and smoked both in house consumption and HoReCa. The other alternative for red fish is salmon in Turkey. Salmon entered the Turkish market in 1993 and demanded more and more each year. Salmon mainly marketed as fresh, filleted, smoked, and salted. The increasing trend of sushi preference creates a growth potential for salmon consumption.

Seafood distribution to Turkey

Turkey forms the outer border of Europe against Asia. The country is accessible by sea, road and air transport from Norway depending on product, price, importer requirements etc.

Seafood transport is easy to transport frozen fish. The transportation takes approximately 23-28 days. Price wise sea transportation is also favourable. Mainly foreign trade is concentrated in 3 areas; Istanbul, Izmir, Mersin and around 60% of the container traffic to and from Turkey controlled by Istanbul. This is followed by Izmir and Mersin. Over the last years Black Sea ports also strengthened their position.

Road transport is targeting the fresh fish from Norway. It takes app. 4 days from Oslo to Istanbul by truck. The common followed route is Oslo-Padborg-Istanbul.

By means of air transport, very smaller amounts are sent to Turkey. It is too expensive for larger amounts and the limited direct flight options and loading capacity makes this transportation type even harder. Air transport is mainly used for transportation of live seafood etc.

Laws and regulations

Exports of seafood to Turkey might be complicated due to lack of knowledge in case of changes but practice in custom clearance and veterinary controls will ease the process. Therefore it should be underlined that all the procedures and formalities must be followed to the smallest detail and the relations with importers who can handle the practical barriers should be well taken care.

All licenses, registrations and inspections of food safety, import and export control check in Turkey done by the Ministry of Agriculture and Rural Affairs.

“Instructions for the implementation of the import of live, fresh, chilled and frozen fish products” should be followed for the products with customs tariff numbers 03.01, 03.02, 03.03, 03.04, 03.05, 03.06, 03.07, 16.04 and 16.05. For these products also a control document is required.

Imports of foods, products and articles that come into contact with food products is founded on the Communiqué No. 39 (Communiqué for approval by the control document for the import of food, products and articles that come into contact with foodstuffs, and on inspection procedures for imports).

Market situation for herring in Turkey

Total imports of herring in 2010 was 1 708 tons whereas the 82% were imported from Norway (According to Turkish Statistics).

Statistical positions by the custom tariff and name of commodities	Quantity (kg)	Value - TL	Value - USD
3024000000 - Herrings fresh, chilled	51 000	97 472	64 770
3035100000 - Herrings (Clupea harengus, Clupea pallasii), frozen	437 180	494 697	329 299
30419970000 - Herring fillets, fresh/chilled	389 504	724 963	469 956
30429750000 - Herrings fillets frozen	683 315	1 382 309	908 336
30499230000 - Herrings frozen	145 780	323 413	209 525
30351000000 - Herrings frozen	950	3 580	2 275
30429750000 - Herrings fillets frozen	420	3 123	2 060
Total	1 708 149	3 029 557	1 986 221

Herring in Turkish market:

- Perceived as «fish with bones»
- Imported mainly as frozen
- Knowledge about herring among Turkish people are relatively low
- Consumption mainly in touristic areas / for tourism sector
- Consumed mainly as grilled
- No production for by-products in Turkey.
- Some herring products in a few retailers and IKEA stores

There are very few products available in Turkish market. The herring products such as matjes herring, mustard sauce herring or marinated herring with dill could be found in IKEA stores and these products are directly imported. The only production of herring in Turkey is herring salad and smoked herring. But the consumption is limited.

By-products in Turkey

By-products from herring are not used in Turkish market for today. But based on the interviews herring can, herring breaded product (should be tried first), marinated products are suggested. It should be underlined that companies have a low price expectation for the by-products and therefore interested in developing new products and creating market possibilities. On the other hand experience sharing, product suggestions will be welcomed by companies. It is also stated that since

herring is not very common in Turkish market but very close to Turkish taste, through good communication, the project will bring many possibilities.

Based on the feedback from the companies there is definitely potential for by-products of herring. Turkey is a huge and growing market also in terms of seafood. The companies would like to come together with the producers to discuss the possibilities.

3. Korea

In Korea, herring is widely available and is one of the favourite fishes regarded as abundant and cheap. Total catches of herring in coastal waters was 12,000=>28,000=>45,000=>37,000=>25,000 tons during last 5 years, very fluctuated in its production.

Korea import herring from many countries. Norwegian herring is available in the Korean market; its export reached 1,500 – 2,000 tons in the 80s and 90s, the 3rd largest supplier for Korea. Russia is the biggest supplier of herring, but Norwegian herring are more desired by the importers due to the fact that better taste, than that of Canadian and Russian. However, herring import has decreased very much recently.

Herring market itself is dwindled down due to decreasing demand in the Korean market as changes in consumer patterns, focusing more on high-quality seafood products.

The most popular use of herring in Korea:

- Grilled Korean eats rice together with many different side dishes. Seafood is the most traditional food source in Korea, fish being one of items consumed on a daily basis. Grilled herring is very enjoyed at home in the past, but recently it is only served at cheap restaurants.
- Jo-rim Fresh herring gutted cut into 2-3 pieces, and it is slowly cooked in a soy and red chilli sauce, and braised until the sauce has reduced.
- Raw fish Raw fish eating have been the preferred choice among Korean consumers due to its taste and healthy aspects. Herring is one of the consumed fishes eaten raw among Koreans.
- Kwa-me-gi Cold-dry herring in traditional way. It is mostly used for small-sized herring only during winter season.
- Herring roe Roe is used traditionally for food; it is salted, seasoned and fermented.

Based on these eating habits, most preferred herring is the fresh whole round.

The types of herring found on the Korean market are fresh and frozen. Herring caught in a season are sold mostly in fresh, but herring imported is the frozen which is thawed and then sold as a fresh product in the market.

There is no existing market for herring and its by-products in any processed type presently in Korea.

It is hard to find any company who is currently processing herring, however, interviews has been selected as follows, to find the market potential:

- Importers who has business with Norwegian seafood suppliers. Korean fishery industry has declined in its catches and Korea needs more seafood resources. Korean importers are looking to exploit more and new possible resources from Norway.

Some of importers are selected for a new business proposal of Norwegian herring by-products, as they have market knowledge and are well connected to industry networks. However, most of them mentioned it is difficult to suggest any idea on business potential for herring by-product. Because there is no uses of only belly flap, bits and pieces from any fishes in Korea. The marketability of new products is not considered to be optimistic due to market uncertainty.

- Processors who buy Norwegian mackerel frozen or processed
Some of the Korean processors imported Norwegian mackerel and processed to salted fillet. It has satisfied new trend and demand of Korean consumers, and made a big hit in Korea. In 2011, Norway is the fourth largest supplier for mackerel in Korea (actually second largest in terms of domestic consumption).

From this success one of the mackerel importers is willing to find any other possible business opportunity of Norwegian herring, and Norwegian herring can be processed as 'ready-to-cook' product. They are interested in herring fillet salted from Norway, and it should be processed as follows: whole round herring is cut through the belly from head to tail, gutted, removed head, tail and bones. And it is seasoned with saline water, then quick freeze it and pack individually in an airtight bag.

Other processor expressed they are interested for the waste meat from herring, which can be processed to herring can, croquette in Korea. They would like to get the sample with price quotation for the product possibility.

- Fish cake producers
Fish cake is widely used and very much enjoyed in Korea, it has a big market.

There are 5-6 major big producers and approx. 150 small-sized producers in Korea. When they produce fish cake, they buy "surimi (minced fish)" as raw material. Herring minced might be possible for fish cake as raw material.

Utilization of by-product

There are many types of can product, made from Tuna, Mackerel, Saury, Sardine, Whelk, and shells. All are very popular and used widely. All of canned products are using whole fish cut, no product available using fish waste in the Korean market. However, by-products can be considered to use for can products at a cheap price for some of the South Asia countries, not for Korean market.

Croquette is small bread crumbed fried food roll, usually mashed potatoes or ground meat (beef, chicken), fish/shellfish are used as main ingredients. Herring by-products can be used for croquette.

Surimi, minced fish is used as raw material for fish cake. And it is typically made from Pollack, Hairtail, Hake, Croaker, Sea Bream, and actually all white meat fishes can be used. Big producers in Korea use mostly Pollack and Hairtail surimi and mix with other fishes imported from South Asia, such as Vietnam, China, Indonesia and Malaysia. Pollack and Hairtail are two species that Koreans likes very much, but the supply is not enough and the price goes up. Russia, Canada and USA are well-established suppliers of pollack surimi.

Herring waste meat including belly flaps and bits and pieces can be utilized for surimi. One of the big producers tested herring for a possible use to produce fish cake, as Herring is regarded as health fish. And followings are comments from the fish cake producers:

It has some challenges to use herring as raw material for fish cake.

- Herring is not white meat fish, the colour of herring surimi is a bit dark brown.
- Herring has strong fishy smell.
- High labour cost in Norway to be considered.
Price is very important factor.
- If Norway can ensure enough by-products from herring to supply to Korea fish cake producer? Korean fish cake producers are big buyer and need a big volume with steady supply.

But, if Norway can develop herring surimi which meets to Korean requirement of meat colour and fish smell, Korean fish cake producers are interested in Norwegian herring surimi and it can create a new market in Korea.

About 10 companies are interviewed to identify the possible business opportunity for the Norwegian herring by-products. And based on their feedback and market challenges, Korean consumer preference, there is little chance to find 'obvious demand' in the Korean market for Norwegian herring by-products.

However, one processor expressed their interests to use herring by-products and process to herring can and croquette. They do not think it is for domestic consumption, considering Korean's recent consumption trend, it will be exported to South Asia countries where herring is still popular at a cheap price. The company has their own processing facility and has sales channels for the export to South Asia countries.

Whether herring by-product will be suitable for canned products and will fit into consumer's taste have not been tested or proved yet, so it is hard to indicate the product specification, such as size, fat content, season, price, quantity and etc.

However, Korean importers consider the import of surimi with following points, based on the existing purchasing patterns.

- No seasonal variations for herring surimi.
- Price:
Herring surimi should be lower than US\$ 1.00/kg in frozen.

"Itoyori surimi" - minced white fish particularly from South Asia countries, it might be the potential competitor for herring surimi. The price is around US\$ 2.00/kg for high grade and US\$ 1.20~1.30/kg for low grade.

Other by-products in the Korean market:

As mentioned there is no products using herring by-products or similar in Korea. However, fish by-products are used as food for human consumption, by-products from Cod and Pollack are highly consumed in Korea and available at the market. Particularly by-products like head, milt, roe, and stomachs from Cod are very popular and used for fish soup traditionally.

Since Cod and Pollack catch is decreasing, the supply of by-products is also decreasing in Korea. Large amount of by-products from Cod and Pollack are imported for the domestic consumption mainly from Russia, USA and partly from Norway.

Suggestion

Based on facts and findings from the Korean market, it is not so positive for product opportunities of Norwegian herring by-products, however many of industry experts during the interview mentioned the possibility of herring surimi for fish cake.

It is very interesting comment and Norway can consider herring by-products for a possible use of herring surimi for Asian market. Fish cake is consumed in most of Asian countries. Although it is made from white fishes, herring can be used if Norway meets to the challenges. Norway can contact other Asian countries to learn their knowledges and experiences, who are producing surimi currently.

It is fair to say the project aim seeking the possible utilization of Norwegian herring by-products is interesting and Korea can be the candidate country in line with product potential of herring surimi. Innovation Norway Korea office can assist for further development.

4. Russia

Herring is traditionally one of the most popular and affordable fish species in Russia. According to the official statistics Russia consumes 40% of the world's catch volumes of herring. Average consumption of herring in Russia is balancing around 4.2 kg per capita during the period 2009-2011 (in 2009 it was 4.7, in 2011 – 3.7 kg/capita).

Potential capacity of Russian herring market is 550-600 000 tons per annum, where the share of the import is about 450 000 tons, the rest 115 000 tons of fresh frozen herring were imported (mostly from Norway).

Over the past 3 years export of Russian herring increased 3 times and reached the volume of 165 000 tons. The main consumer is China, which purchase accounts almost 78% during 2011.

During first 5 months of 2012 the situation on the local herring market was worsened by the dramatic increase of export (up to 99%) from the total Russian herring catch volumes to South-East Asia.

In addition, herring deficit on the Russian market caused also by the reduction of quotas in the Atlantic region.

Norway is one of the main supplier of frozen herring products to Russia (mostly round frozen and flaps, less mince and roe). The sharp decline in Norwegian catching volumes coursed reduction of herring export to Russia and increase of FCA prices. In 2011 the Norwegian supply of frozen herring to Russia declined almost 25%.

Russia purchased from Norway almost 112 000-115 000 tons in 2011 (*different sources give different figures*): 78 000 tons of round frozen herring, 4 tons of fresh herring, 33 600 tons of herring flaps/butterfly fillets), 15 000 tons from Iceland and couple of tons from other suppliers.

Herring in Russia refers to a low-cost and socially important food products. For the past 10 years until 2011 the wholesale herring price practically was not affected by the growth.

Russian wholesale prices for herring began to rise since 2011. Many Russian fish processors stopped buying herring in large volumes for stock; they take small volumes for current needs only.

Wholesale price range in August 2012 for winter 2011-spring 2012 herring of size 200-300 g is still the same as before 38-39 Rubles/kg (6.78-6.96 NOK/kg), but there are almost no offers for such product recently on the market. Herring 300+ goes for 56-57 Rubles/kg (9.3-9.5 NOK/kg), 350+ for 62-64 Rubles/kg (10.3-10.6 NOK/kg), 400+ from Faroe Islands – goes for 69-73 Rubles (11.5-12.2 NOK/kg). Market demand after summer time has revived but offers for above mentioned sizes are few.

Russian pacific herring is also popular in Russia not less than Atlantic herring. Nevertheless, Russian processors prefer to use Atlantic herring of Norwegian origin as raw material due to the minimum wastes: wastes from pacific herring are usually up to 15%, from Atlantic herring of Russian origin – 5-7%, Atlantic herring of Norwegian origin – 1%).

The catch of spring spawning herring in Russian Far East is not interesting for catching companies due to low profitability caused by a short catching period (15-20 days), lack of enough on-board processing and storage capacities and taxation problems, almost no free processing capacity on-shore.

How herring is processed in Russia

Fresh herring is a "rare guest" at stores. Herring is traditionally presented on the Russian market as round slightly salted in plastic barrels, in big metal 1-1,5-2 kg jars, semi-preserved fillets or bits/portions in different brines, canned, also as a culinary products: cold and hot smoked round herring head on, herring butter, chopped herring spread "Forshmak". Few companies from southern Russian regions have even started production of dried herring fillets.

Since herring is a major traditional fish on the table of each family, the demand of herring products is stably high. Therefore every fish processing plant has a herring department in place. There are hundreds of smaller and bigger fish processing plants so far working in Russia, which are actually difficult to calculate. Large enterprises like Russian Sea, Meridian, ROK-1, Marina, Baltiysky Bereg, Vichunai keep nicely paid technologists in staffs who are constantly working on new recipes of herring products for the purpose to compete on the market.

Herring processing business was always VERY profitable in Russia before recent dramatic increase of the wholesale price. Margins of the local processor were always not lower than 40%. Retailers usually add 40-45%. Fisherman and wholesaler of frozen herring are those whose margins are the smallest – 10% each, nevertheless they make big turnover in volumes.

Utilization of by-product:

Utilization of fish wastes is not a big problem for Russian fish processing factories. Russian Fishing vessels mills wastes and simply through them overboard back to the sea. Some of them produce low quality fish mill and fish oil. On-shore processing factories either sell wastes to fish mills or to fur farms, poultry and pig farms.

Modern fish processing factories invest into establishing culinary departments at their facilities for waste processing purposes. According to few big market players, fish by-products sector is actually not big enough yet in Russia. Market demand and offer of fish by-products are in a balance currently, as they say, meaning that any fish processing factory is capable to utilize or process own fish wastes into products for human consumption without any problem and there is no necessity for such a factory to buy additional by-products volumes overseas.

However, there are other opinions on the market showing an interest to better quality by-products provided by foreign suppliers, which are nicely graded and treated than those produced in Russia (remember the historical case with salmon belly flaps). So, other opinions state that recent deficit and high price situation on the herring market will sooner or later lead Russian fish processors to searching of new herring raw material with suitable price and quality.

Market potential for belly flaps, bits and pieces and mince

Russia produces, exports and also imports in total around 27 000 tons of fish by-products for average price around \$1/kg.

Russia is one of the first country-importer which decided to import salmon wastes from Norway and other countries suppliers, having salmon processing. At the very beginning, prices for salmon belly flaps were less than 1\$ (the first offer 10 years ago was \$0.20-\$0.45 per kg). Russian fish importer Sky-F was the first company which imported salmon belly-flaps to Russia to try the market.

Very quickly Russian processing industry considered salmon belly flaps as a very interesting product price wise as a raw material for production of dried fish snack to beer. Currently dried salmon belly-flaps are considered by 70-75% of consumers (mostly men) as a premium quality snack to beer and 25-30% of consumers (woman and children) as a delicacy snack. Russian mass market of "snacks to beer" demands to keep the average retail price per pack equivalent to the price of half bottle of beer.

Herring belly flaps could be considered as one of the good raw material for production of dried snacks to beer due to cheaper price in comparison with salmon belly flaps.

As for marinated bits & pieces, this could be interesting for processing companies also in terms of saving costs on production process of semi-preserved herring which is still very popular in Russia and has a big market share. Due to non-standard sizes of bits & pieces, it could be used only in low priced market segment mostly on Russian regional market (Kaliningrad, Samara, Novosibirsk, Omsk, Tomsk etc.).

There is one problem in import of marinated bits & pieces to Russia – the customs clearance. This product belongs to Customs code 03052000 - liver, roe and milt of fish dried, smoked or in a salt brine – requiring 20% import tax and 18% VAT. Russian importers have to convince customs authorities to consider this product as not a ready-made product but as a product for further processing, and to include it to group 3 with maximum customs tariff 10%. The problem can be solved if bits & pieces are supplied as frozen in brine block like other frozen fish, for example.

Canning factories from Kaliningrad showed an interest to marinated herring bits & pieces. They need more information about the product: fat and salt and acid content, the average size of bits & pieces, marinate composition including aging additives, etc.

According to most of the companies-interviewers the price for herring belly flaps is to be less or about \$1/kg otherwise it makes no sense financially for Russian companies to deal with.

The price indication for Frozen/marinated herring bits and pieces and herring mince they didn't comment due to necessity first to see and try samples of products offered by Norwegian companies.

Other questions - relevant for in-depth interviews in the next phase of the project:

Cod, capelin, pike roe processed in roe spread are also present on the Russian market and brings good income to processing companies. One of the first company which introduced roe spread to the Russian market was Norwegian company Mills, which accustomed Russian consumers to such a product and created a new market trend. Unfortunately Mills didn't manage to stay on the market for a long time. Soon one of the Belorussian producers Santa Impex offered the same product to the Russian market via its trader in Moscow Santa Bremor.

Currently cod, capelin, pike roe is a very common product on the Russian market. Herring roe canned is quite new to the market. Dried salted herring is offered in some sushi restaurants, which are many in 13 big cities of Russia (in Moscow we have them more than 2,500). Russian fish processors recently offer different kinds of processed herring roe canned, semi-preserved (in brine).

Herring milt as a separate product is not present on the Russian market at all. Sets of smoked cod cheeks and heads are one of the delicacy products (used as a snack to beer) for Russian regions mostly, however not that expensive for consumers.

5. China

Considering almost 1.4 billion population number and its basic demand on food in general, its fast growing demand on high quality protein resources, and the serious concern on food safety issue, this market need all kind of nutrition, health and safe food from all over the world. The yearly seafood production fishing and farming by Chinese companies is around 52 million tons per year. In addition, China imports seafood from other countries including Norway. According to China Customs, Russia is the main herring fish supplier to China. In 2009, 2010 and 2011, the trading herring fish quantities from Russia to China were roughly 40,000 tons, 85,000 tons and 134,000 tons respectively. During the same years, the herring fish figures from Norway to China were 750 tons, 1,000 tons and 450 tons respectively (Statistics Norway were 1,208 tons, 1,079 tons and 2,181 tons respectively).

During 1980s – 2000s, good quality herring fish fillet and herring roe products were mainly processed in China for mostly Japanese market, and small quantity for domestic market in China. Very poor quality herring fish, after removing roe, were mostly sold as food to countryside markets in China at very low price. Since later of 2000s, with economic growth and individual income increase, Japanese sushi restaurants have been keeping increasing in whole China. A new market trend shows more and more good quality herring products are actually sold in domestic market in China.

Herring fish by-products used as food are not commonly visible in this market. However, fish by-products used as food are quite popular developed into many different kind of food. And this fact gives herring fish by-products opportunity to test this market. Same as many other species fish by-products, it takes time to develop market and consumer acceptable proper food products and to identify & to select correct business partners to cooperate with.




A special tariff tentatively for the year 2012 on imported Atlantic herring fish is 2%. VAT is 13% on it as raw material (non-processed). Normally, tariff on imported fish by products is in accordance to the same species of fish.

Chinese quarantine authority has been keeping updating regulation on imported food including seafood. It is important to keep contact to Mattilsynet in Norway to get the latest updated status about this issue before starting practical business.

Product variants available in the market: e.g. round, fillet, butterfly fillets, bits and pieces, mince, others.

Herring products available in Chinese market		Notes
Whole round herring fish	With roe	Roe is main product
		Fish after removing roe is sold in low price mainly in rural market
	Without roe	Producing fillets
Fillet	One piece	Frozen or prepared/marinated in vinegar; Mainly export to Japan, or
	Butterfly	Some sold to Japanese style restaurants in China
Bits, pieces, mince	Mixture	<ul style="list-style-type: none"> • Mostly supplied by herring filleting plants or companies in China; • Mostly sold to fishmeal and/or feed companies • Some are used for producing canned products • Some are used for producing Sushi roll
Canned	Good quality meat, but bits, pieces, mince	<ul style="list-style-type: none"> • Few local companies and China-Japan joint venture companies are producing canned herring food • Some companies import canned herring from Germany and Netherland
	Low quality meat, fillet after removing roe	
Roe	Salted	Mainly export to Japan; Some sold to Japanese style restaurants in China
Roe & fillet	Sushi	Mainly export to Japan; Some sold to Japanese style restaurants in China

How is herring processed and utilized in the domestic market (short product description).

Herring processed and utilized in China	Description
 <p>Sushi, herring fillet & herring roe</p>	<ul style="list-style-type: none"> • Mainly export to Japan; • Some sold to Japanese style restaurants in China
 <p>Herring roe, salted</p>	<ul style="list-style-type: none"> • Mainly export to Japan; • Some sold to Japanese style restaurants in China
 <p>Herring roll, herring meat wrapped by kelp</p>	<ul style="list-style-type: none"> • Mainly export to Japan; • Some sold to Japanese style restaurants in China

 <p>Local company produced canned herring</p>	<ul style="list-style-type: none"> • Local Chinese seafood processing company produced canned herring; • Mainly sold in domestic market in China
 <p>China-Japan joint venture company produced canned herring</p>	<ul style="list-style-type: none"> • Local Chinese seafood processing company produced canned herring; • Mainly sold in domestic market in China
 <p>Imported canned herring</p>	<ul style="list-style-type: none"> • Imported canned herring, originally produced by Rugen, a German company • There are 4-5 other imported canned herring brands, originally produced in other countries; • At present, the total amount of imported canned herring in China is still very small.

How many companies use herring in their production?

In China, this is a hard question, because of countless number of companies, untransparent information and unstable business.

There are many seafood processing companies and food processing companies use herring in their products shown as above. There are also many seafood processing company that produce fish balls for hot-pot type food, might use herring by-products. However, this information is not transparent and not available to public.

Many companies mentioned as above dealing herring business from time to time, depending on various reasons, such as annual and seasonal quantity & price, competition from other pelagic species, global, domestic and even company's economic situation, quarantine and/or political issues, etc. Those companies are not stable being in the market. Historically, China imports frozen whole round herring fish (Atlantic herring and Pacific herring) mainly from Russia. When Russian herring fishing quota is decreasing, China increases imports of herring fish from other countries, such as the Netherlands, USA, Canada, and Norway.

(Note: The Customs data about the imported & exported herring fish is not free but available provided by the Chinese State Customs.)

A very rough estimation could be 20-30 seafood processing companies are producing herring products in China. Those companies mainly located in northeast coastal area, Dalian, Yantai & Weihai and Qingdao in China. Other 10-20 seafood or food processing companies may use herring by-products to produce fish balls products.

(Note: This rough estimation is provided by Innovation Norway Beijing, based on knowledge about marine industry in China.)

Utilization of by-product(based on 5 interviews):

- How are by-products from herring being used today? Give examples.
 - Fishmeal and feed mainly
 - Vinegar-prepared herring fillet/slice for sushi food
 - Kelp rolls (herring fillet wrapped by kelp)
 - Canned food
 - Fish balls/dumpling
 - Dried fish floss
 - Fish sausage
- Is there a market for such products existing already?

Herring fillet - processing companies in China should have similar by-products but they mix and sell everything together.

Market for above mentioned products already exists. However in case of individual consumer, it is not possible to trace the sources of raw materials. And it is hard to know what kind of fish, how much fish meat or its by-products and what species of fish or its by-products are used in their products mentioned as above.

- Are by-products from herring currently being used for human consumption? If so, what kind of products?

Products examples mentioned as above are currently being used for human consumption. This confirmed Chinese herring processing companies. However once more, it is hard to trace raw materials.

- Who request belly-flabs, mince and bits and pieces? Price levels of such products?

Companies producing above food products request these products.

Price of such products is normally low, for instance, 3,200–3,500 RMB per ton, offered by herring processing plant in China.

- Which products can be developed from these remnants?

Except those mentioned cases, snacks food and dried soup bag are possible as well.

- The proportion (percentage) of by-products used for human consumption?

Basically, everything is possible to be developed into food products. And it depends on what you want to produce.

Market potential for belly flaps, bits and pieces and mince

- What is your opinion about market potential for belly flaps, bits and pieces, and mince from belly flaps?

Fish resource surrounding Chinese coast has been keeping reducing since 1980s. It is obvious that China has been keeping importing more and more seafood from all over the world, including both expensive species and low price raw materials. So, the market potential for herring by-products is clearly positive and it is supposed to be big.

On the other hand, the image of herring fish in China is low price seafood. Businessmen and consumers expect low price of its by-products in logical thinking.

- Could it be seasonal variations in the sales of by-products from herring?

No seasonal variation for fishmeal and feed business;
It might be seasonal variation for food products, depended on what kind of food products developed by/from herring by-products.

- Are there any specifications on how the by-products should be processed and packed in Norway prior to delivery?

10-20 kg, in block, frozen

Considering the high fat content, vacuum packing might be preferred considering shelf life. It is preferred if belly flaps can be placed neatly. However, if it increases cost too much, normal frozen in block should be acceptable.

- What about the product specifications for the products of remnant materials: size, fat content, season?

Some companies prefer to have it above 3 cm (width), high fat content
Others comment it is depended on what kind of food products developed by/from these fish by-products. Companies need to study it and to have conclusions or decisions afterwards.

- What products can be developed from the belly flaps, bits and pieces, and mince?
 - Vinegar-prepared herring fillet/slice for sushi food
 - Kelp-herring rolls (herring fillet wrapped by kelp)
 - Canned food
 - Fish balls/dumpling
 - Dried fish floss
 - Fish sausage
 - Marinated and dried belly flaps seafood as snacks food
 - Dried soup bag
- Would you prefer frozen or marinated belly flaps and bits and pieces?

Frozen raw material might be the first priority considering quality, cost, higher tariff on any processed products than raw material, local taste adjustment, etc.

- Do you see potential in canning such by-products as belly flaps, bits and pieces, and mince?

Yes, it is possible.

Some Chinese-Japanese joint venture companies and some local Chinese companies are producing tomato marinated canned herring products. It is possible to study of using herring by-products for the same/similar products.

- Does your company have processing capabilities to implement such production?

All the 5 interviewed companies for this project have seafood/food processing capabilities to implement such production in China.

The seafood processing industry in China has been well established in terms of both production capacity and hygiene standard. Holding various certificates approved by countries and professional global organizations, seafood processing companies match to international food safety standards and export large quantity processed seafood to global market actively, since middle of 1980s.

- Acceptable price level for belly flaps, bits and pieces, and mince (frozen and marinated)?

Price of such products is normally low, for instance, 3,200–3,500 RMB per ton, offered by herring processing plant in China.

Again, the image of herring fish in China is low price seafood. Businessmen and consumers expect low price of its by-products.

- What quantities are necessary in order for this to be attractive for your company?

All the 5 interviewed companies have no clear answer about this question. One proposal is to start from testing by small quantity.

The question about the quantity is depended on practical trial business and later commercial business if it proves a positive market demand.

- Do you have suggestions about how belly flaps, bits and pieces, and mince could be used innovatively in the food industry?
 - Vinegar-prepared herring fillet/slice for sushi food
 - Kelp-herring rolls (herring fillet wrapped by kelp)
 - Canned food
 - Fish balls/dumpling
 - Dried fish floss
 - Fish sausage
 - Snacks food
 - Dried soup bag
 - Hot-Pot

Other questions - relevant for in-depth interviews in the next phase of the project (IN Beijing)

Chinese fish market has very few similar by-products from pelagic fish species. Pelagic fish fishing in Chinese coastal areas are small and mainly sold and consumed in whole-round. Very small sized fish are produced into canned products, for instance, local mackerel, anchovy, etc. Imported pelagic fish, such as mackerel and herring fish are mostly processed into fillets and be re-exported to Japan. Herring fish roe are normally processed for re-exported to Japan. The left low quality herring fish meat is mostly sold to countryside market at low price. The wastes in the seafood processing plants are mostly sold to fishmeal/feed companies in China.

Some herring fish processing plants that producing fine food, try to sell similar herring by-products, small piece of belly flaps and/or bits & pieces. It is common mixed with fish bone, head and tail sold

in bulk to fishmeal or feed companies. Sometime, belly flaps, slices, fillet trimmings are selected and sold to seafood processing companies that producing Sushi food, fish sausage, dried fish floss, fish balls, etc.

Chinese fish market has many similar by-products produced by various local and imported farmed fish species. The total production of each farmed fish species is normally big. Local farmed fish are carp, tilapia, freshwater perch, catfish, etc. Imported fish are pangasius, salmon, etc.

In addition, imported Greenland halibut fish head, salmon fish head and local farmed carp fish head are popular used as food.

In whole China, fish bone, tail, fin, stomach and swimming bladder products, etc., are widely and popularly be used as food.

Referring to photos as above, most local and imported farmed fish by-products are frozen in block, 20 kg wrapped in plastic bag and packed in carton box.

Some fish pectoral fin, fish stomach and swimming bladder products are frozen and packed in plastic bag, with or without company's logo and/or brand, 1-2 kg per bag.

Some fish bone, fish stomach and swimming bladder are produced into dried products, packed in sack.

When and in which situations are the by-products from fish consumed, and how are they prepared?

Fish by-products are mostly consumed during normal days in ordinary restaurants and common families. Considering its low price, fish by-products foods are NOT for holidays and any other special celebration days.

The ways of cooking are various, pan-fried, Chinese fried, deep fried, steamed, grilled, barbecued, roasted, hot-pot, soup, sushi, canned, etc.

Where are the by-products from fish sold today (domestic market or export, which part of the value chain)?

Fish by-products for food are sold in domestic market in China, almost no export.

(Note: Herring fish roe products, salted or marinated and mixed with herring fillet sashimi, are popularly exported to Japan, and connected to many Japanese seafood companies.)

This business mostly connects importers professionally dealing fish, pig, cattle and poultry by-products, wholesalers, retailers, and seafood processing companies.

Markets are wholesale markets for frozen products, local wet (agricultural products) markets or morning markets, frozen section in common supermarkets.



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