EVALUATION OF PROBLEMS AND POSSIBILITIES OF INDUSTRIAL FISH UTILISATION FOR HUMAN CONSUMPTION

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Abctract. *Fish caught by Lithuanian Baltic Sea fishermen is used for industrial purposes to a relatively large proportion – 60–80 percent of the total volume versus 25–30 percent on the global level. There is no fully developed fishmeal industry in Lithuania, so industrial fish species are disposed of at foreign markets. The first sale prices for fish used for human consumption are higher. It is considered that saling sprats and herrings for human consumption would increase fishermen's income, create an additional profit and value added. The purpose of the study was to determine the economic reasons why a large portion of Lithuanian landings of Baltic Sea pelagic fish species are used for industrial purposes. The study has shown that the main reasons are unstable, seasonal supply of sorted and good quality raw material and the lack of production sales markets. The authors have investigated the problem and proposed possibilities to increase the use of industrial fish for human consumption in Lithuania.*

Key words: *fishery, human consumption, fish supply*

Introduction

During the period 2003–2007, catches of sprat and Baltic herring accounted for 55% in 2003 and totalled 87% in 2007. The cod resources in the Baltic Sea were decreasing in the period between 2004 and 2007, while the sprat resources and quotas were growing rapidly. From 2004 to 2007, the initial sprat fishing quota increased by 20% and that of herring by 26%. For a long time, Lithuania hardly fulfilled fishing quotas of these fish species: only 20% of the initial herring quota and 35% of the sprat quota were reached in 2005. Such a poor fulfilment is related to the lack of the market and to the fact that the Lithuanian Baltic sea fleet is aimed at cod fishing.

In 2007, indicators for sprat and herring quotas were the best: 93% of the established herring quota and 87% of the sprat quota were met in Lithuania. The Lithuanian processing industry processes only a small share of sprat and herring into products for human

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consumption, and the largest share of fish is landed in Denmark and processed into fish oil and fish-meal, mainly for animal forage.

One of the goals of the National Strategic Plan of the Lithuanian Fisheries Sector for 2007–2013 is to better meet the fishing quotas for little-used fish species and to process this catch into products for human consumption.

The goal of this research was to analyse the economic expedience and potential market demands for fish products from little-used fish species for human consumption.

The objectives of the research were as follows:

1. To identify products that might be produced from little-used fish species.
2. To analyse the potential market needs and economic expedience of manufacturing.

Information sources. The research was based on the data of the Department of Fisheries under the Ministry of Agriculture of the Republic of Lithuania and the Food and Agriculture Organization (FAO) of the United Nations. The opinion survey of producers and traders of fish products was carried out to define their attitude towards the opportunities to process less-used fish species and to sell the products on the market.

1. Fish species little-used for human consumption and their importance to the global fisheries sector

The FAO data show that over the past 20 years the world catches of industrial (or feed) fish have amounted to around 20–25 million tonnes per year, i.e. about 25–30% of the total amount of world fish catches. Besides, fish processing industry waste makes up to over 4 million tonnes per year, which is used for the production of fish meal and fish oil. In his study, Shepherd[1] indicates that most often small short-lived pelagic fish species such as Peruvian anchovy (6.2 million tonnes in 2003 were used for industrial purposes) followed by blue whiting (2.4 million tonnes) and Japanese anchovy (2.1 million tonnes) are used for industrial processing. The populations of such fish are fast growing and less vulnerable to overfishing. However, they are important for other fishes of higher value, i.e. predators that are important as part of the ecosystem and part of human food.

According to the FAO data, over the past 20 years the production of fish meal and fish oil have fluctuated between 6.2 and 7.4 million tonnes and between 1.0 and 1.7 million tonnes, respectively, except the years 1992 and 1998 when due to hurricanes a large part of small fish populations were destroyed. This overall stability of production and supply does not reflect the considerable changes that have occurred due to the changed demand structure. Fish meal and fish oil are used in animal and aquaculture enterprises. Due to the rapid growth of the aquaculture sector in the world, the demand for fish meal and oil also goes up rapidly. Previously, fish meal was used to feed animals, but at present it is

[1] C. J. Shepherd, I. H. Pike, S. M. Barlow (2005). Sustainable feed resources of marine origin. Presented at Aquaculture Europe 2005, European Aquaculture Society Special publications No. 35, June 2005, pp. 59–66.

increasingly used in the aquaculture sector. Fish oil, which was formerly used largely for bakery products and production of margarines, now finds its place in aquaculture as well. Only small amounts of fish oil go to human consumption as fish oil capsules and food additives.

Figure 1 shows the dynamics of the demand for and production of fish meal.

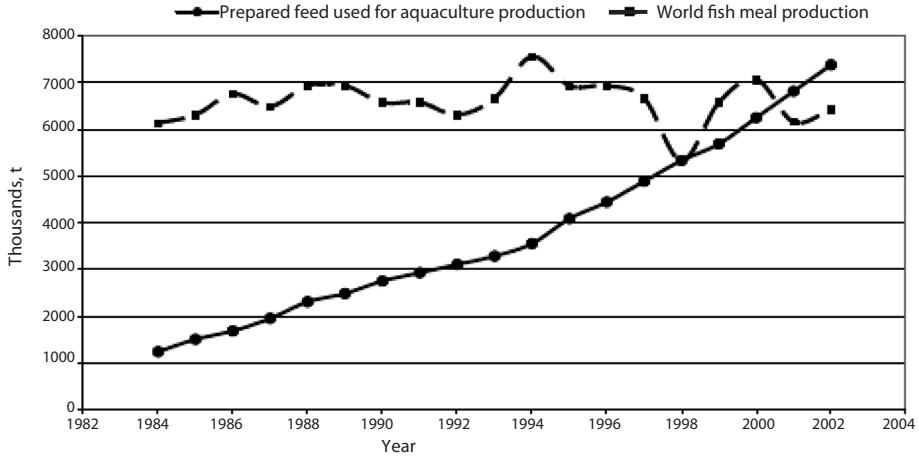

FIG. 1. **The demand and production of fish meal in 1982–2004**

Source: C. J. Shepherd, I. H. Pike, S. M. Barlow (2005). Sustainable feed resources of marine origin. Presented at Aquaculture Europe 2005, European Aquaculture Society Special publications No. 35, June 2005, pp. 59–66.

Following the estimation of Tacon (2005), nearly 2.94 million tonnes of fish meal and 0.80 million tonnes of fish oil were used in the aquaculture sector (i.e. 53% and 87% of the total production, respectively) in 2003. It is notable that the majority of these products are used to feed salmonids, the production of which went up 3.7 times starting with the year 1990 (from 0.6 to 2.1 million tonnes in 2006[2]). According to Tacon (2004), the share of wild fish in salmon feeds is likely to decrease from 25–30% to 8% due to its substitution for vegetable oils by 2010. Lately, there has been a growing interest in fuel of vegetable origin. The production of this fuel requires vegetable oils; however, their resources are scarce. For this reason, in the authors' opinion, the demand for fish oil in the aquaculture sector and in the meat industry might remain stable or increase.

Shepherd (2005) indicates that in Europe the main species of feed fish are as follows: capelin, blue whiting, sand eel, sprat and Baltic herring. According to this author, sprat could be used for human consumption, but at present sprat is mainly used for the produc-

[2] FAO Fisheries and Aquaculture Information and Statistics Service. 2008. Aquaculture production 1950–2006. FISHSTAT Plus–Universal software for fishery statistical time series [online or CD-ROM]. Food and Agriculture Organization of the United Nations. Available at: http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp

tion of fish meal, while Baltic herring is mainly used for human food, and small fish and waste might be processed into fish oil.

2. Strategic objectives and tasks in Lithuania

The National Strategic Plan of the Lithuanian Fisheries Sector for 2007–2013 indicates the following strengths of the fish processing industry and marketing: a developed network of modern fish processing enterprises that meet EU quality requirements, a high technology level in some fish processing enterprises and a good quality of products, effective marketing on the international markets and an increasing export of fish products as well as the financial potential of large-scale enterprises to invest into the production. The Strategic Plan also refers to a number of weaknesses such as underdeveloped processing of Baltic sea small pelagic fish, production of canned fish and its marketing, insufficient cooperation and association of small producers unable to protect their interests and to compete on the market, a lack of fresh and good quality raw fish and the assortment of products that fails to fully satisfy the market needs.

The National Strategic Plan of the Lithuanian Fisheries Sector for 2007–2013 indicates that the key goal of the fish processing industry and marketing is the strengthening of competitiveness, promotion of a more effective marketing and supply of good quality products to consumers. To reach this goal, the following objectives have to be implemented: to encourage the implementation of new technologies and the introduction of new products, to improve the quality of fishery products, to encourage the competition, to enrich the assortment of fishery products, to improve working and hygiene conditions in the processing enterprises, to reduce the negative impact on the environment, to increase the competitiveness of micro- and small-scale enterprises, to develop the processing of little-used fish species, to encourage the search of new markets and to improve the marketing measures, and to encourage the creation of new working places.

3. The supply of little-used fish species in Lithuania

Annual catches of Lithuanian fishing enterprises in the Baltic Sea are equal to nearly 10–27 thousand tonnes of fish, i.e. to 20–36% of the total demand for processing enterprises (the demand is 50–75 thousand t). Only minimal amounts of fish caught in the Atlantic Ocean are supplied for the processing to the Lithuanian fish industry. Therefore, Lithuanian fish processing enterprises produce fishery products from the imported frozen raw fish. In Lithuania, fish products meant for non-human consumption and waste are used for animal feeds and fish-meal. But the production of fish-meal is underdeveloped yet. Usually raw fish for the production of fish-meal is landed in foreign ports.

Until 2007, only less than 50% the fishing quotas for sprat and Baltic herring in the Baltic Sea were reached. The fishing business was mainly concentrated on the cod, the fishing fleet had no vessels for fishing small pelagic fish, and the price of these fish spe-

cies did not satisfy fishermen. After the price of and demand for fish-meal in the world went up, the vessels for pelagic fishery were equipped and the quotas for sprat and Baltic herring were met by 90% and 93%, respectively, in 2007. But the major amount of sprat was landed in Denmark and used for fish meal production.

As the FAO data indicate, over the past 20 years Lithuanian fishermen concentrated on cod and Baltic herring fishing (Figs. 2, 3).

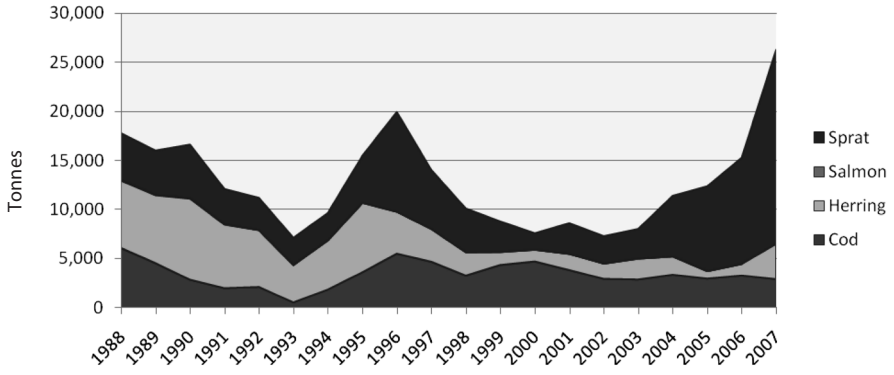

FIG. 2. **Catches (tonnes) of cod, herring, salmon and sprat in the Baltic Sea in 1988–2007**

Source: FAO Fisheries and Aquaculture Information and Statistics Service. 2008. Capture production 1950–2006. FISHSTAT Plus-Universal software for fishery statistical time series [online or CD-ROM]. Food and Agriculture Organization of the United Nations. Available at: http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp

In 2006, the amount of sprat caught by the Lithuanian fishermen accounted for 60% of the total fish catches, while in 2007 this indicator reached 70%. However, the income from sprat (in 2007 prices) made up only 1/3 in the total income (Fig. 3).

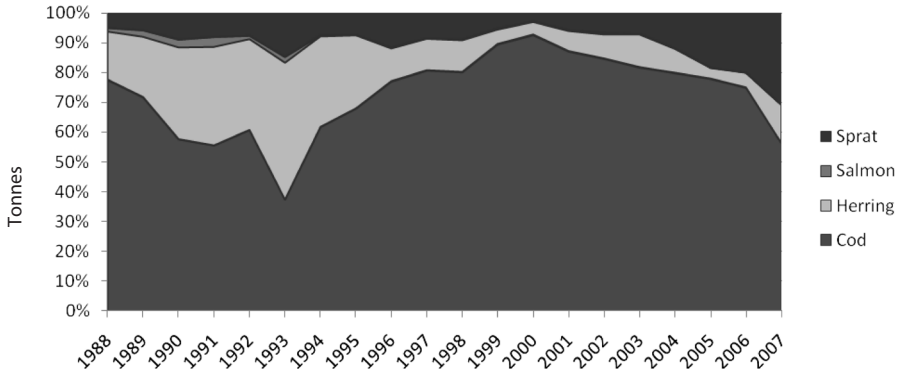

FIG. 3. **The income (%) structure from the catches in the Baltic Sea by fish species in 1988–2007 (in 2007 prices)** [3]

[3] Cod – 5.04 Lt/kg; Baltic herring – 0.94 Lt/kg; salmon – 9.78 Lt/kg, sprat – 0.41 Lt/kg.

At present, the Registry of Animal Food Handling Entities Holding Veterinary Approval Number (http://vetlt1.vet.lt/vepras/) holds 52 entities (42 enterprises, 10 fishing vessels) that have the licence to produce, store and supply fishery products to local, Russian and EU single markets. All the 52 entities have the licence to produce, store and supply fishery products to the EU and 12 to the Russian markets.

Every year, Lithuanian fishing enterprises supply only about 10–14 thousand tonnes of fish to fish processing enterprises, therefore, the fishery products are mainly produced from the imported frozen fish. In 2007, Lithuania imported 90,8 thousand tonnes of fish and fish products, the value of which amounted to 613,1 million Litas, or by about 16% more compared to 2006.

The exported amounts of fish products in 2007 went up mainly due to the increased catches and landings of sprat in Denmark. In comparison to 2006, in 2007 the amounts of export increased by 16.54% or from 86 to 100.2 thousand tonnes, while the value of export went up only by 9% or from 561,8 to 613,1 million Litas. The amount of fresh and chilled sprat exported and mainly landed in Denmark increased from 10,5 to 18,0 thousand tonnes and accounted for more than 50% of the increase in the total export amount. The export price of sprat went up nearly by 23% or from 0.45 to 0.56 Lt/kg.

Lithuanian fish processing enterprises mostly process frozen raw fish. Only a few species of fish (cod, Baltic herring, sprat, and flounder) are fished in the Baltic Sea. Due to seasonal and unstable fishing and not fully fulfilled fishing quotas, Lithuanian fishermen are not able to maintain a steady supply of fresh raw fish to the processing industry. Considering the fact that the processing of small pelagic fish in Lithuania is underdeveloped, it is foreseen to support the recognised Lithuanian producers' organisations, the fish processing enterprises that establish new capacities and technologies for the processing of small pelagic fish into fishery products.

The first sale price

The experience of foreign countries shows that the first sale price of sprat and Baltic herring sold for human consumption is higher than those for industrial purposes. According to the Eurostat data, in 2006 the price of Baltic herring for food in European countries was 14–144% higher than the price of herring for industrial purposes. The gap between the prices of herring for food and for industrial purposes was largest in Finland, where it equalled 144% (Fig. 4). The fact that fishes for human consumption are sold after sorting them according to size standards may be seen as one of the reasons for higher first selling prices. The average first sale price of Baltic herring on the Lithuanian market reached 940 Litas in 2007. The average landing price in Poland in 2006 was 1048 Lt/t, i. e. more than 10% higher than in Lithuania in 2007. In 2007, the income of Lithuanian fishermen from herring amounted to nearly 3,3 million Litas, but it could have reach about 4,0 million Litas, or about 20% more, in case the quota of 3874 t had been fulfilled and the price had been by 10% higher.

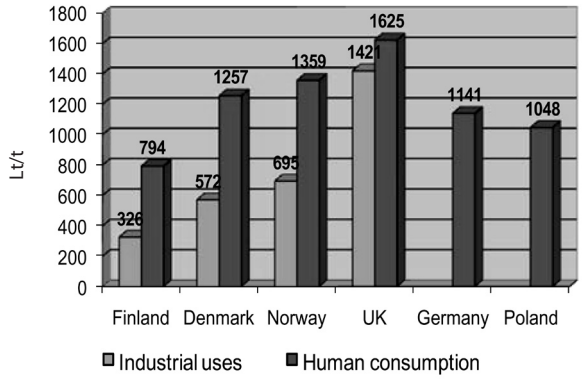

Fig. 4. **Average price of Baltic herring in European countries by kind of use in 2006**

In 2006, the average price of sprat used for human consumption in different countries was from 7% to nearly 5 times higher than the price of sprat for industrial uses (Fig. 5). In 2007, the average first sale price of sprat in Lithuania reached 410 Lt/t, i. e. it was nearly 20% lower than the price of sprat for industrial uses in Denmark. The income of Lithuanian fishermen from the sales of sprat reached about 8,1 million Litas in 2007; the largest amounts were sold to the Danish companies for industrial uses. If sprat had been sold for human consumption, i.e. the price had been 7% higher, and the sprat fishing quota had been fully met, the income of Lithuanian fishermen could have reach 9,7 million Litas or would have been by 1,6 million Litas higher. Moreover, the fish processing industry could have created additional value added.

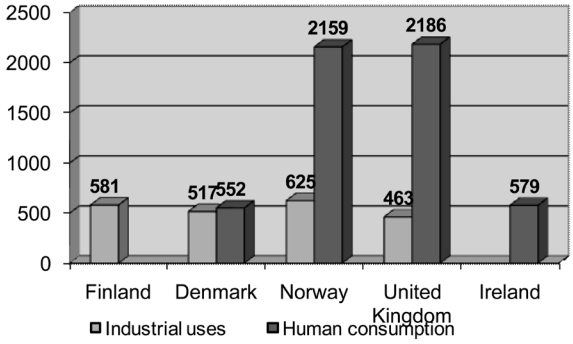

FIG. 5. **The average price of sprat in European countries by kind of use in 2006**

The analysis shows that first sale prices of fish for human consumption are higher; therefore, it is supposed that the sales of sprat and Baltic herring for human consumption might increase the income of fishermen, create additional profit and value added. However, to use sprat for human consumption, a steady supply of raw fishes, necessary capacities for the processing and a market for final products should be developed in Lithuania.

4. Assortment of fish products and available market niches

The major share of fish products is sold in supermarkets. In order to assess the assortment of fish products by way of preparation and presentation, the information about the types of fish products that were sold in the largest supermarkets ("Maxima", "IKI", "Rimi") was collected. The number of different fish products in supermarkets ranged from 217 to 601.

Table 1. **Assortment of fishery products by way of preparation**

Type of product	Lithuanian products (units)	Foreign products (units)
Live fish, crayfish, other	0–3	0
Chilled fish products	17–27	0–1
Frozen fish products	0–15	9–68
Salted and marinated fish products	44–98	14–18
Smoked fish products	13–61	0–2
Dried fish products	3–10	0–12
Ready-to-serve fish products (salad, etc.)	21–115	11–77
Canned fish	13–15	23–81

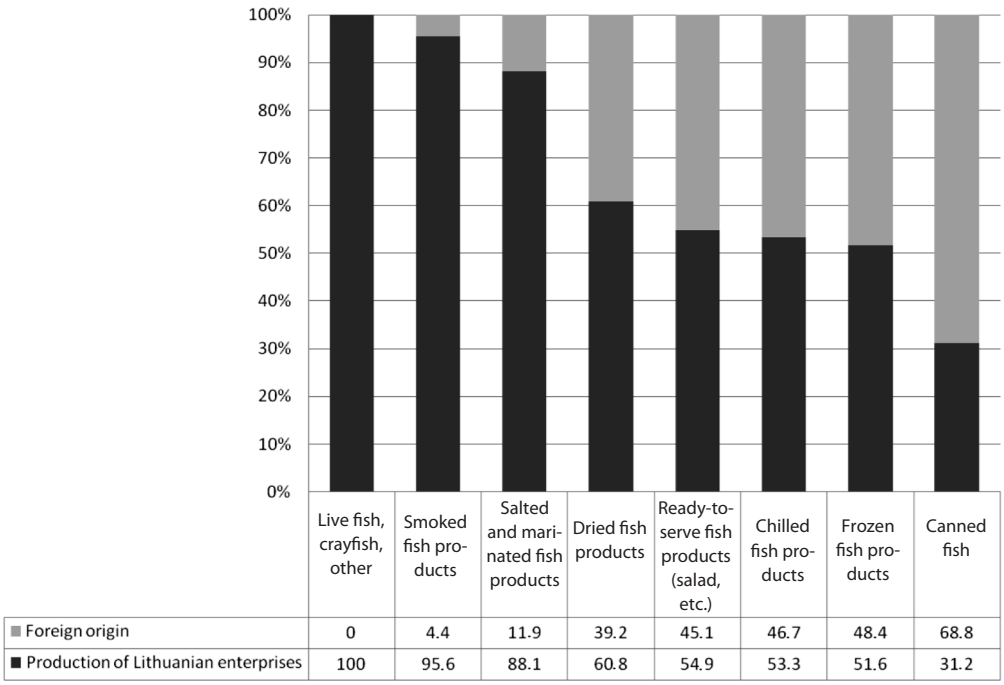

FIG. 6. **Origin of fish products sold in supermarkets**

The results of the research showed that the assortment of live fish was the poorest, the largest share of chilled fish were Lithuanian products, while frozen products were mainly imported (Table 1, Fig. 6). Lithuanian products also dominated among salted, marinated and smoked fish products. Lithuanian and foreign products accounted for a nearly equal proportion in the group of dried fish products. The majority of ready-to-serve products were produced in Lithuania. However, the largest part of canned fish products was produced in foreign countries. This fact indicates that the Lithuanian processing industry does not use all its potential or is not competitive with foreign producers.

In Lithuania and foreign countries, considerable attention has lately been paid to cultural traditions and the national heritage. The national heritage, both in traditional crafts and culinary, is an important part of Lithuanian ethnic culture. To ensure the state protection of national heritage products, to preserve the accumulated experience of traditional crafts and national heritage products as an integral part of ethnic culture and to adapt them to the present needs, the Seimas of the Republic of Lithuania adopted the Law on Products of the National Heritage No. X-1207 on 26 June 2007. The aim of this law is to ensure the state protection of national heritage products, to preserve and disseminate the accumulated experience of traditional crafts and the culinary heritage.

On 2 September 2008, Order No. 3D-481 of the Minister of Agriculture approved the classification of traditional crafts and the procedure of their classification. Since the old times Lithuanian fishermen have been engaged in fishing business in the Curonian Lagoon and the Baltic Sea. Traditionally, a lot of fishermen used to live on the sea shore, and their main income source came from resources of the sea. Therefore, a traditional fisherman was recognised as a traditional Lithuanian craftsman. The key fish species that Lithuanian fishermen used to fish in the Baltic Sea as far back as the beginning of the last century included cod, salmon, Baltic herring and sprat. Fish of these species was smoked, salted or fried, and different other products were made.

Nowadays, the most popular products from sprat include canned smoked sprat in oil and sprat paste. In Lithuania, there are a few enterprises that have facilities to produce these products.

The supply of salted sprat, salted or marinated sprat fillet to the retail market is insufficient. These products are likely to be popular on the domestic market. Similar products are popular in Estonia and Poland.

As mentioned above, the assortment of Lithuanian canned fish is relatively poor. Sprat and Baltic herring might be processed into the following types of canned fish:

- smoked sprat in oil,
- sprat in own juice,
- sprat in tomato sauce,
- Baltic herring in own juice,
- Baltic herring in tomato sauce,
- smoked Baltic herring,
- other.

To identify the needs of consumers, an opinion survey of fish processors and traders was carried out, with the focus on issues related to the market needs.

5. The analysis of market needs

To determine the market needs for sprat and herring products, a survey of processing enterprises and traders was carried out. The aim of the survey was to analyse the opinion of producers and traders concerning the potential production and sales of sprat and herring products.

The survey was based on data of the questionnaires designed in cooperation with specialists of the Fish Market Regulation Division of the Department of Fisheries under the Ministry of Agriculture. The questionnaire forms were sent to 30 fish processing enterprises, and 9 (nearly 30%) were sent back with comprehensive answers. The respondents produce 28% of the total output of the fish industry and 32% of the total value. They employ 20% of the total number of employees of the fish processing industry.

The opinion of the respondent fish processors and traders is different as concerns the possibilities to sell products of little-used fish species in the market (Fig. 7). The majority of respondents-traders think that the appropriate sales promotion measures might increase the sales and consumption of the above-mentioned products. Meanwhile, the respondents-processors are mostly oriented towards foreign markets and think that the products of little-used fish species might not have the demand.

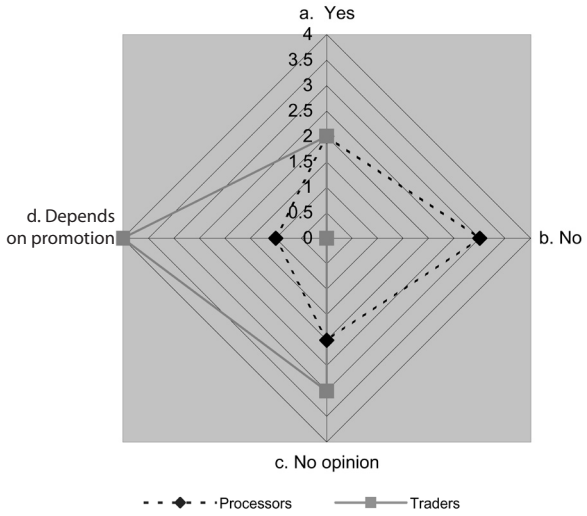

FIG. 7. **Results of answers to the question:**
In your opinion, might products of little-used fish species be in demand on the market?

The demand for sprat and Baltic herring is assessed differently (Fig. 8). Fish processors think that herring has an advantage over sprat on the Lithuanian market. Four

respondents – fish processors think that the possibilities for selling herring on the Lithuanian market are good, and only two respondents have the same opinion about sprat. According to the opinion of five respondents, the possibilities to sell sprat on the market are poor, and four respondents think that the possibilities to sell herring are poor.

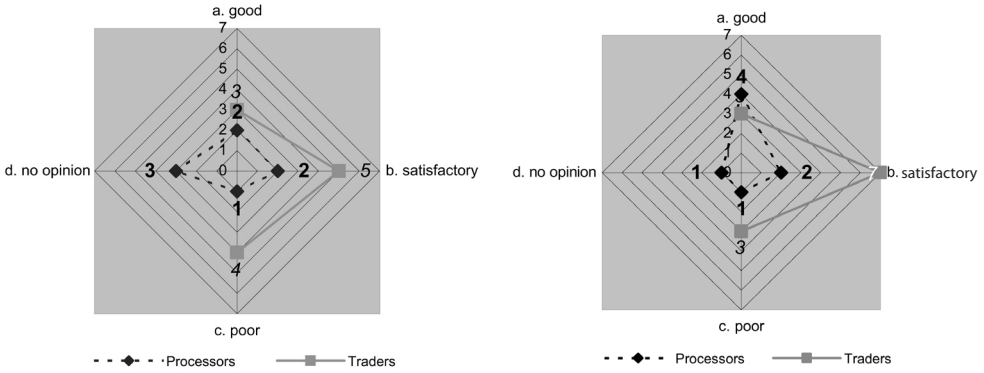

FIG. 8. **Results of answers to the question: What is your opinion about the possibilities to sell sprat and Baltic herring products on the Lithuanian market?**

The production is closely related to the raw material. Therefore, it was necessary to identify the main raw fish sources that fish processing enterprises and traders have access to. The results showed that most of traders sell fish caught in the Baltic Sea and its coastal zone, while fish caught by Lithuanian fishermen in other world oceans is sold only by three traders and processed by four respondent fish processing enterprises (Fig. 9).

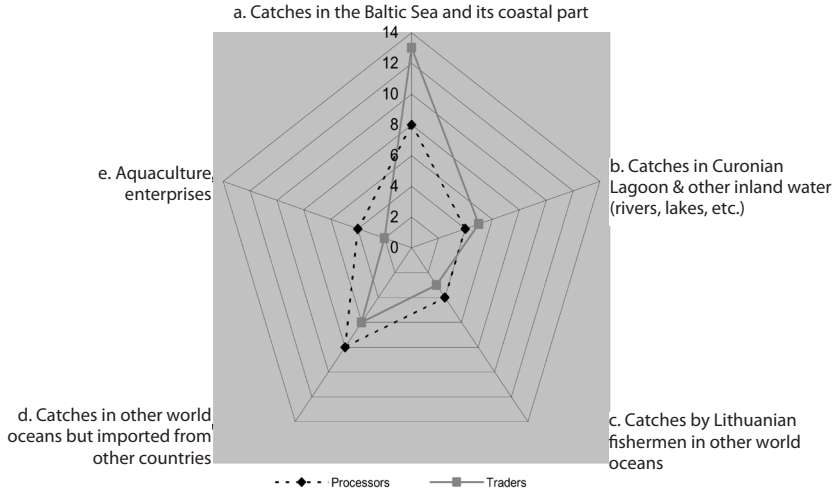

FIG. 9. **Results of the answers to the question: What kind of fish do you buy?**

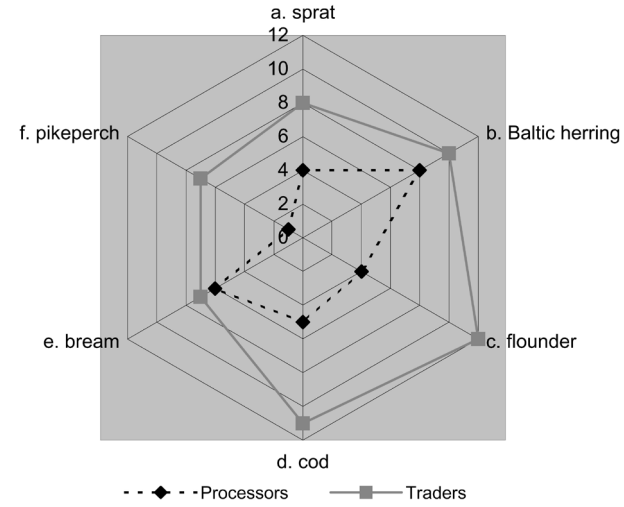

FIG. 10. **Results of the answers to the question: Which fish species do you buy?**

The majority of respondents sell cod and flounder as well as other fish species (Fig. 10) and four of eight respondents – fish processors buy sprat and herring; however, the respondents indicate that the supply of fish for primary sale in Lithuania is insufficient.

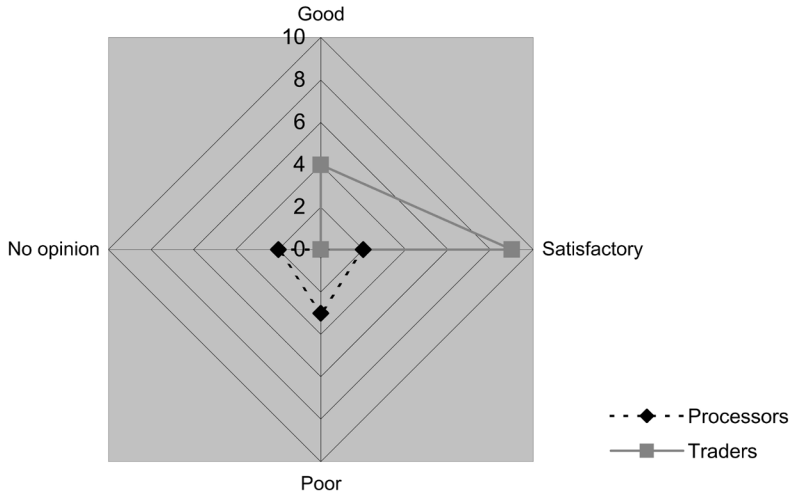

Fig. 11. **Results of the answers to the question: How do you assess the supply of local Rfish for primary sale?**

To produce fish products from fish caught by the Lithuanian fishing fleet, it is necessary to ensure a steady supply of raw fish. The majority of respondents-processors think that the supply of locally caught fish is poor. According to some processors, the supply

of local fish on the primary sale market is very poor or is less than the potential demand. Also, it is indicated that the supplied fish is not always fresh or sorted enough. Sometimes Baltic herring and smelt have unwanted fish caught as by-catch, and fishermen have no suitable storage conditions to ensure the necessary quality.

Expediency of production and the price of products

In 2008, the sprat fishing quota in the Baltic Sea allocated for Lithuania amounted to 22,8 thousand tonnes. According to the data of the Department of Statistics, in the beginning of 2008 the population in Lithuania was 3,366 millions. To consume the total sprat quota for food, the average per capita consumption of sprat should be 6.8 kg per year. It is estimated that at present the per capita consumption of fish is 12–18 kg per year. Thus, only foreign markets could help to use part of the sprat quota for human consumption.

To assess the readiness of fish processing enterprises to produce products from Baltic herring and sprat, a questionnaire for fish processors and traders was prepared, which included questions related to the production of the above-mentioned products. The majority of the respondents have already had the experience in the production of products from Baltic herring and sprat: five respondents tried to process sprat, and almost all the respondents (8 of 9) have had experience in processing herring. Even now, some of these enterprises have industrial capacities that could be used for the production of sprat and herring products: nine respondent enterprises could process nearly 2,4 thousand tonnes of Baltic herring and sprat, i.e. about 10% of the quota. Fish processors could sell sprat at the primary sale price from 0.48 to 1.4 Lt/kg and Baltic herring from 0.9 to 1.6 Lt/kg (without VAT). The primary sale prices depend on fish quality, freshness and sort.

In the opinion of respondents, the processing costs of sprat might be from 500 to 2500 Lt/t. The processing costs are directly dependent on the processing level. The costs of fish cooling and salting might reach 500–1000 Lt/t, while smoking and canning are pricier and may range from 2000 to 2500 Lt/t. Depending on these costs and investment depreciation, the values of final products were estimated (Table 2).

TABLE 2. **Calculation of production costs and prices of sprat and Baltic herring products, Lt/t**

	Sprat		Baltic herring	
	cooling / salting	canning	cooling / salting	canning
Raw fish	600	600	1000	1000
Processing	750	2500	750	1200
Depreciation	600	2000	600	2000
Other costs	195	510	235	420
Total costs	2145	5610	2585	4620
Processor profit, 15%	379	990	456	815
VAT, 18%	454	1188	547	978
Wholesale price per 1 tonne	2978	7788	3589	6414
Wholesale price per 1 kg	2.98	7.79	3.59	6.41

The processing of fish by salting and canning were chosen because of different production costs. Salted products of sprat and Baltic herring are the final products with production costs lower than those of other types of processing. Meanwhile, canning requires much more investment, and the production costs are higher. The costs of salting and canning also might be considered as the minimal and maximal processing costs of the analysed fish species.

Discussion

According to the FAO data, over the past 20 years the world catches of industrial (or feed) fish amounted to about 25–30% of the total of world fish catches, while Lithuanian fishermen's catches of industrial fish comprise 60–80% of the total catch. Fish suitable for fishmeal production is landed in foreign ports, because Lithuania lacks fishmeal producing capacities. Due to the seasonal and unstable fishing Lithuanian fishermen cannot ensure a stable supply of fresh raw material for producing enterprises. The supply of local fish for processing is assessed as poor by producers. Some of them note that the supply of local fish for the first selling is below the demand or there is no such supply at all. The producers note that fish offered by fishermen is often not sorted or is of a bad quality because they lack suitable conditions for storing their catch in vessels. The analyses showed that first selling prices of fish for human consumption are much higher than for industrial use. Therefore, the authors are of the opinion that selling sprat and Baltic herring for human consumption can increase the income of fishermen, create additional profit and surplus value in Lithuania. Adequate capacities for fish production should be established, and an additional market for fish products should be found in order to use sprat for human food. Only a foreign market can provide a possibility to use part of sprat catch for human food production. Steady supply should be assured when producing fish products from raw fish material supplied by the Lithuanian fishing fleet. One fishing enterprise dominates according to sprat and Baltic herring catches (70–90% of total catch) in Lithuania, whereas the rest of sprat and herring is caught by 7–8 enterprises. The authors think that a more realistic scenario for a steady and qualitative raw fish material supply should include modernisation of vessels by installing special refrigeration systems in vessel holds. At present, the dominant enterprises are not able to sell such huge quantities of sprat for fish product producers because of the lack of market. The European Fisheries Fund may allocate funds for vessel modernisation; however, about 60% of all project budget should be contributed from the fishing enterprises. That is the reason why vessel modernisation possibilities are of least interest to fishermen.

Conclusions

The analysis has shown that the primary sale prices of fish for human consumption in Europe are higher than in Lithuania; therefore, it is supposed that sales of sprat and Bal-

tic herring for human consumption might increase the income of fishermen and create an additional profit and value added. However, it is necessary to have sufficient capacities and facilities to process fish of these species and the market for sales in order to use sprat for human consumption in Lithuania.

In 2008, the sprat fishing quota in the Baltic Sea allocated for Lithuania was 22,8 thousand tonnes. According to the data of the Department of Statistics, in the beginning of 2008 the population in Lithuania was 3,366 millions. To consume the total sprat quota for food, the average per capita consumption of sprat should be 6.8 kg per year. It is estimated that at present the per capita consumption of fish is 12–18 kg per year. Thus, only foreign markets could help to use part of the sprat quota for human consumption.

The Lithuanian processing industry that makes canned fish products does not use all its potential or is not competitive with foreign producers.

The majority of processing enterprises-respondents have already had experience in the production of products from Baltic herring and sprat. As many as five of them have tried to process sprat and almost all of them (8 of 9) have processed herrings. At present, nine respondent enterprises have capacities to process nearly 2,4 thousand tonnes of Baltic herring and sprat for human consumption, i.e. for about 10% of the set quota.

The respondents – fish processors and traders – are of different opinion about the possibilities to sell products of little-used fish species for human consumption. In the opinion of traders, a proper promotion of products might increase the sales and consumption of the above-mentioned products. However, Lithuanian processors are mainly oriented towards foreign markets and think that products from little-used fish species would not be marketable.

To produce fish products from fish caught by the Lithuanian fishing fleet, it is necessary to ensure the steady supply of raw fish. The majority of respondents-processors think that a supply of locally caught fish is insufficient. In the opinion of some processors, the supply of local fish on the primary sale market is very poor or is less than the potential demand. It is also indicated that not always the supplied fish is fresh or appropriately sorted, and sometimes Baltic herring and smelt have unwanted fish as by-catch, and fishermen have no suitable storage conditions to ensure the necessary quality.

It is possible to offer salted sprat and sprat fillet for human consumption since the supply of these products is limited in Lithuania. Besides, the assortment of Lithuanian canned fish in supermarkets is very poor. Since sprat and Baltic herring are recognised as objects of the culinary heritage, the possibilities to supply and sell delicacy fish products made according to old recipes on the market deserve a more thorough analysis.

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