

**Fisheries management in coastal waters of the Baltic Sea
AQUAFIMA results of the Szczecin Lagoon, Vistula Lagoon, Curonian Lagoon and Gulf of Riga**



**Editors:
N. Stybel & M. Skor**

Coastline Reports

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More information about AQUAFIMA can be found on the project website: www.aquafima.eu.



Imprint

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Aquaculture facility in Norway (Photo: Franziska Stoll)

Fishermen in the harbour of Lauterbach (Photo: Stefanie Maack)

Juvenile sea trout (Photo: Fisch und Umwelt e.V.)



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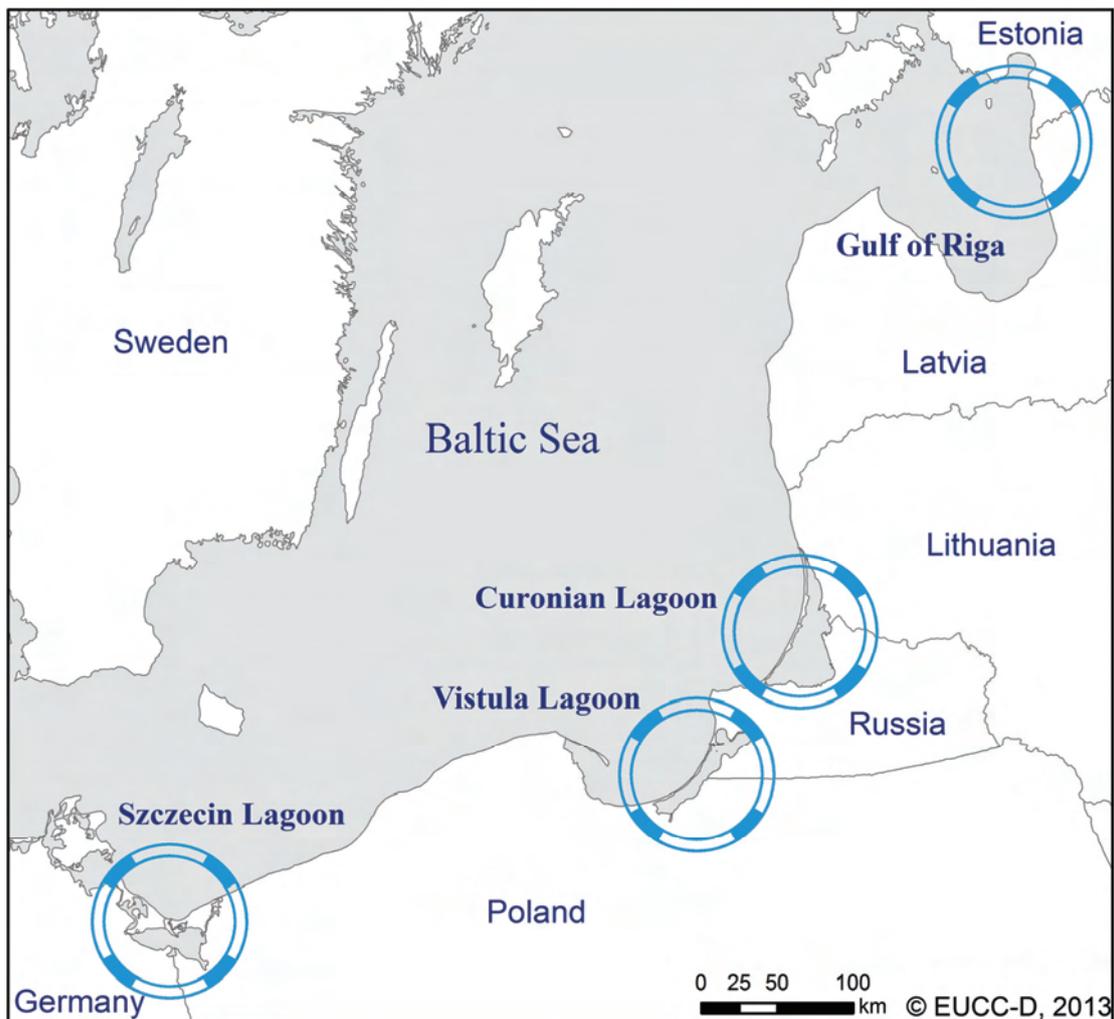
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Preface

Since fisheries management and control often have not been effective in the past, alternative approaches using linkages between fishery and aquaculture can help to identify and develop new management options for the sustainable coastal fisheries management in the Baltic Sea Region (BSR). Stocking and restocking activities and mussel cultivation are examples of an ecosystem-friendly approach to maintain natural stocks and their sustainable use.

Based on four cross-border case study areas the current status of an area-based fisheries management in coastal waters of the BSR have been analysed and lessons learned have been compiled.

The case study analyses contain the following steps: data compilation of fish populations, stocking activities and aquaculture, analyses of legal fishery rules, responsibilities and cross-border cooperation, as well as SWOT analyses of the current cross-border fisheries management. The results show that information and cross-border cooperation have to be improved as a basis for common fisheries management structures and agreements.



Location of the AQUAFIMA case study areas (map: A. Hiller)

Project Partners

State Development Cooperation Mecklenburg-Vorpommern – Germany (Lead Partner)

Rostock Business and Technology Development GmbH – Germany

University of Rostock – Germany

EUCC – The Coastal Union Germany – Germany

University of Klaipeda – Lithuania

Environmental Development Association – Latvia

Ministry of Environmental Protection and Regional Development – Latvia

Norwegian Seafood Centre – Norway

Estonian University of Life Science – Estonia

Eurofish – Denmark

Green Federation GAJA – Poland

Associated Partners

Kaliningrad State Technical University – Russia

Association Fish & Environment – Germany

External Project Coordination Office

REM • Consult – Germany

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Fisheries management in the Szczecin Lagoon

Nardine Stybel¹, Kornelia Kleißler¹, Norbert Schulz² & Piotr Gruszka³

¹EUCC – The Coastal Union Germany

²Fisch & Umwelt e.V.

³National Marine Fisheries Research Institute, Research Station in Świnoujście

Abstract

The Szczecin Lagoon is divided into a German and a Polish part that are managed independently. Fishery in Poland and Germany is regulated by laws containing regulations of closed season, minimum catching size, spawning and fish protection areas as well as regulations for the use of fishing gear. Both countries collect regularly data of their landed fish but an exchange of data besides the scientific level does not exist. The three mostly caught species are roach, bream and perch. Other important target species are pikeperch and Baltic whitefish. Neither Poland nor Germany undertakes the attempt of aquaculture in the lagoon. Environmental conditions are the main reason. However, in Germany Baltic whitefish is restocked, as are various fish species in Poland. In addition, scientific research of the cultivation of zebra mussels for water quality improvement takes place on the German side. Communication and cooperation between the two countries is low. A cross-border workshop organized within AQUAFIMA has shown that on both sides the demand for the implementation of a common cross-border and sustainable fishery and aquaculture management does exist.

1 Introduction

1.1 Szczecin Lagoon

The Szczecin Lagoon (Stettiner or Oder Haff in German, Zalew Szczeciński in Polish) is about 687 km² and consists of two shallow and tidal-free basins: in the west the German Kleines Haff (“Small Lagoon”) with 277 km² and in the east the Polish Wielki Zalew (“Large Lagoon”) with 419 km² (60 % of the total area). The water volume of the Kleines Haff is 1 km³. The Wielki Zalew has a water volume of 1.6 km³. The mean water depth in the Szczecin Lagoon is 3.8 m. The catchment area of the Szczecin Lagoon is 129,591 km². 91.5 % of the total inflow takes place via the river Oder/Odra having a flow of 17 km³ per year. The other tributaries are the river Peene (0.76 km³/a), the Uecker (0.186 km³) and the Zarow (0.144 km³) as well as Gowienica, Wolczenica and Świniec. This large supply of freshwater results in an estuarine character of the lagoon. Through the high nutrients loads of the tributary waters the lagoon is highly eutrophic. The compensation depth or the limit of algal growth is between 0.4 m and 0.8 m. Therefore, the macrophytes grow basically along the shoreline (Schulz 2013).

The Szczecin Lagoon is nearly separated from the Baltic Sea by the islands of Usedom/Uznam and Wolin. 70 % of the water discharge to the Baltic happens through the 16 km long and 10.5 m deep Świna and the Piast Canal. The remnant discharge takes place via Peenestrom and Dziwna (15 % each) (Stavenhagen 2006). The residence time of the water masses in the Szczecin Lagoon is between 35 and 75 days (Löser & Sekścińska 2005). There is an alternation of inflow and outflow events in the lagoon, especially during winter and spring. Exchange of water masses depends on differences in the water level in the lagoon, river Oder and Baltic Sea as well as wind direction and wind force. The high freshwater discharge and rather small exchange with the Baltic Sea lead to a low salinity in the Szczecin Lagoon. Besides seasonal changes of the salinity, with higher values during winter and lower

in summer, a spatial gradient of salinity can be observed as well. The salinity decreases from North to South because of the freshwater inflow from the tributaries, mainly the river Odra/Oder. Depending on exchange with the Baltic Sea and freshwater inflow the annual salinity in the Szczecin Lagoon fluctuates: the long-term winter salinity average is 2.4 psu, in summer the salinity is 0.8 psu (Löser & Sekścińska 2005). The Szczecin Lagoon is a highly variable ecosystem controlled by physical factors, such as salinity, water exchange, temperature, ice cover, and wind force and direction. The number and distribution of marine species varies with the brackish water supply from the Baltic Sea. Significant changes in the ecosystem may affect fish reproduction, which is essential for economically important species (Schulz 2013, Stavenhagen 2006).



Figure 1: Landscape of the coastal area of the Szczecin Lagoon (source: Nardine Stybel/ EUCC-D 2011)

1.2 Description of cross-border area

Since the end of the Second World War, the Szczecin Lagoon forms the border between Germany and Poland. After the reunification of Germany the Szczecin Lagoon was part of the 489 km long German section of the EU external border. The sea border there has a length of 22 km and as mentioned before divides the lagoon into the Kleines Haff and the Wielki Zalew. It runs nearly in north-south direction from the Baltic Sea, west from Świnoujście to the southern shore of the Neuwarper/ Nowowarpnieńskie Lake (Mały Rocznik Statystyczny Polski 2012).

On 1st May 2004 Poland became a member of the EU. Thus, the border changed from an external border to an EU-border. With Poland joining the Schengen area in 2007, the border between Poland and Germany became an open border which simplifies the economic exchange and the travel between both countries (Löser & Sekścińska 2005).

2 Fishery

2.1 Ecological aspects

The three most important target species in Germany and Poland based on data from 1995 to 2011 are roach *Rutilus rutilus*, bream *Abramis brama* and perch *Perca fluviatilis*. Nearly 90 % of the total catches in tonnes per year (t/a) belong to these three species. Due to their retail price other economically important species are pikeperch *Sander lucioperca* and whitefish *Coregonus maraena*. In the Wielki Zalew the catch yield is higher than in the Kleines Haff. Because of the larger area of this side of the lagoon, the productivity and the fishery intensity are higher. The annual average (from

1995 to 2011) shows that Poland caught 2310.8 t/a, whereas Germany caught 465.7 t/a. The average yield per area unit for Germany and Poland in this period was 16.8 kg/ha and 55.15 kg/ha, respectively (Figure 2). Besides the difference in the surface area, better food availability, spawning conditions and hydrographical characteristics, like water depth, shoreline and tributaries, result in better conditions for fish stocks of the Wielki Zalew.

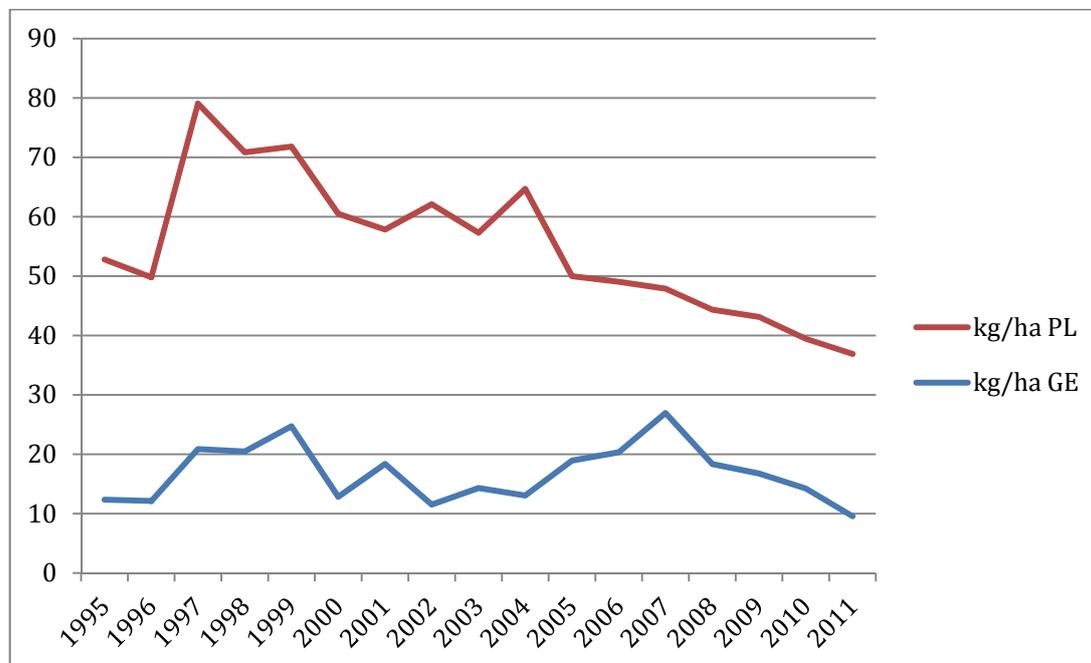


Figure 2: Catch yield (kg/ha) in the Kleines Haff and Wielki Zalew (data from 1995-2011)

Schulz (2013) points out that a reduced catch does not indicate a decreasing stock. Other factors, such as number of fishermen, price level, commercial outlet or climatic changes, i.e. less ice drift, warmer water, can also have impacts on the fishing intensity. Reliable data for these assumptions are missing as the sizes of the current fish populations in the Szczecin Lagoon are unknown.

In Poland, a drastic reduction of the yearly catch from 1999 to 2011 took place: it was reduced by half. For 2004 the small peak is due to the fact that the number of fishermen was decreasing and catching quotas were introduced. In Germany, the yearly catches from 1995 to 2011 are nearly constant with annual variations. The total yearly catch per fishermen must have increased as the total number of fishermen in the Kleines Haff decreased (LALLF 2013a).

Table 1: Minimum landing size in Germany and Poland (after: §4, KüFVO M-V and Zarządzenie Nr 1 OIRM w Szczecinie z dnia 25 maja 2011 r., respectively)

Fish species	Germany	Poland
roach <i>Rutilus rutilus</i>		20 cm
bream <i>Abramis brama</i>		40 cm
perch <i>Perca fluviatilis</i>	20 cm	17 cm
pikeperch <i>Sander lucioperca</i> , [syn. <i>Stizostedion lucioperca</i>]	40 cm	45 cm
whitefish <i>Coregonus maraena</i>	40 cm	40 cm
trout <i>Salmo trutta</i>	45 cm	50 cm
eel <i>Anguilla anguilla</i>	50 cm	50 cm
pike <i>Esox lucius</i>	50 cm	45 cm
salmon <i>Salmo salar</i>	60 cm	60 cm

There are big differences between Poland and Germany in the minimum landing size (from mouth to the end of the tail fin) of some target fish species (Table 1). In Germany, there is no minimum size for roach and bream which are the most fished species in the German part of the lagoon. But the German authorities and research institutes assume that the stock is sufficiently large. More important are the differences in minimum landing sizes for perch and pikeperch, fish species with a high economic value and they should be adjusted. Polish fishermen can catch perch smaller than 20 cm because the stock is larger in the Polish part of the lagoon than in the Kleines Haff, where the minimum landing size for perch is 20 cm. Thus, in Germany the species is given a chance for one more spawning event than in Poland. The Polish fishermen refer to a compensation effect and do not see any reasons to raise their minimum landing size for perch. The minimum landing size for pikeperch is five centimeters smaller in Germany than in Poland (40 cm and 45 cm, respectively). A rise in the minimum catching size would lead to an extreme economic loss. Both countries have their reasons for the minimum landing size and see no reason for an adjustment.



Figure 3: Typical fishing boat of the Szczecin Lagoon (Mönkebude) (source: EUCC-D/IKZM Oder 2005)

Poland and Germany have defined closed seasons, when fishing of certain species in the whole respective part of the Lagoon is banned (Table 2). The closed seasons for most of the fish species are quite similar, so that they are well protected in the lagoon during these periods. The largest differences exist in the closed season for eel and whitefish. As a result of completely different eel management programs in both countries, the closed season for eel fishing in Germany is in winter (1st December to 28th February), whereas in Poland it is during summer (15th June to 15th July). Whitefish has no closed season in Germany, so the time for fishing of this species there is two month longer than in Poland. But the stock of whitefish in the German part of the Szczecin Lagoon is decreasing, so the state authority of Mecklenburg-Vorpommern is planning to reintroduce a closed season in the new coastal fisheries decree probably for the season 2014.

Table 2: Closed seasons for fishing of different fish species in Germany and Poland (after: § 5 KüFVO M-V, 2006; Zarządzenie Nr 1 OIRM w Szczecinie z dnia 25 maja 2011 r., respectively.)

Fish species	Germany	Poland
eel	1 st December – 28 th February	15 th June – 15 th July
pike	1 st March – 30 th April	1 st March – 5 th May
salmon	15 th September – 14 th December	25 th September – 15 th November
trout	15 th September – 14 th December	25 th September – 15 th November
whitefish	none	20 th October – 15 th December
pikeperch	23 th April – 22 th May	4 to 6 weeks between 5 th April – 25 th May*

*) the exact dates are announced each year by RSFI (OIRM) in Szczecin

In addition to closed seasons fish and spawning protection areas exist. In these areas fishery is prohibited temporarily or permanently (Figure 4). There are two *fish protection areas* in Germany: in the “Usedomer Kehle” fishing is banned all-year around and at the river Zarow fishing is prohibited from 1st August to 28th February. In *spawning protection areas* fishing is prohibited between 1st April and 31st May. In Germany there are four spawning protection areas: Göschenbrinksfläche, Anklamer Fähre, Borkenhagen and Lake Usedom (§11 & §12, KüFVO M-V). By announcement fishing can also be forbidden in overwintering areas. On the Polish side there is a vast number of areas which are closed for fishing during periods indicated in the regulations issued by RSFI. Permanently closed areas are e.g. in the vicinity of some estuaries, Lake Wicko Male and adjacent areas in the Lake Wicko Wielkie (part of the Wolinski National Park). Furthermore, there is a time restriction for using specific types of gear.

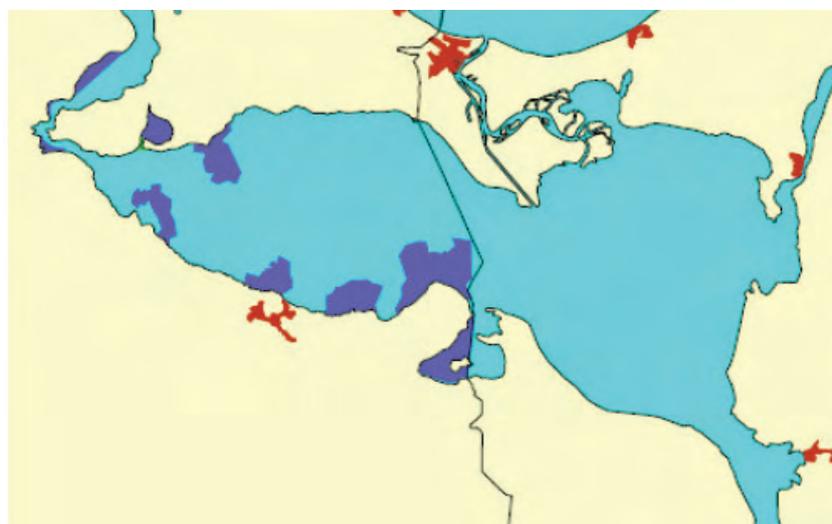


Figure 4: Overview about spawning and fish protection areas of the German part of the Szczecin Lagoon, clockwise: Świnoujście, Międzyzdroje, Wolin, Stepnica, and Ueckermünde (based on Stavenhagen 2006)

Moreover, there are technical restrictions, such as mesh size, net length, and number of gear, that regulate the sustainable use of the fish resource. Table 3 shows the minimum mesh size for different fish species in the Baltic Sea from Germany and Poland. It shows that the minimum mesh sizes in Poland are sometimes significantly smaller than in Germany. That means that they catch fishes which are passing through the meshes in Germany. On the other side, Germany has no minimum mesh size

for bream and roach which are the most caught species in the Szczecin Lagoon. Furthermore, there is no minimum mesh size for whitefish in Germany. Fishes that are smaller than the minimum landing size must be returned to the sea. Such a return can be dangerous for some species, especially for whitefish.

Table 3: Minimum mesh size in Germany and Poland (§ 15, KüFVO M-V; Zarządzenie Nr 4 Okręgowego Inspektora Rybołówstwa Morskiego w Szczecinie z dnia 20 października 2004 r) * this mesh size is applied in set gillnets used for fishing perch and roach, other set gillnets must have a mesh side not shorter than 50 mm; ** that is a minimum mesh size (again mesh side) allowed in fyke nets with a selective screen used on the Polish side of the Lagoon

Fish species	Germany	Polish internal waters
perch	70 mm	30 mm*
cod	110 mm	
pike	100 mm	
herring	32 mm	
salmon	157 mm	
trout	120 mm	
flatfish	120 mm	
pikeperch	90 mm	
fyke nets and eel baskets	25 mm	10 mm**
bream		
whitefish		
rainbow trout		
roach		30 mm*

The space between the fishing gear and the length of nets in the German part of the lagoon is restricted by the “Küstenfischereiverordnung MV” (inshore fisheries regulation of Mecklenburg-Western Pomerania - KüFVO M-V). Per person a maximum of 100 m gillnet, eight eel baskets and 100 hooks on the long line is permitted.

In Poland, a greater quantity of fishing gear types can be used. These are different kinds of seines, set longlines, set gillnets and trammel nets, and traps (only fyke nets) (Zarządzenie Nr 1 OIRM w Szczecinie z dnia 25 maja 2011 r.), gillnets and fyke nets are the most commonly used in the Wielki Zalew.

2.2 Economic aspects

The fishery district in the German Part of the Szczecin Lagoon reaches from the Polish border to the train bridge Zecherin, including Lake Warpe and Lake Usedom, as well as the lower Uecker to the Ueckermünde Bridge, from the lower Zarow to the Grambin Bridge and from the lower Peene to the train bridge Anklam. The important landing ports are in Ueckermünde, Mönkebude, Altwarp, Kamminke and the town of Usedom (Schabelon 2007). In the Wielki Zalew seven landing ports for fish exist. Figure 5 shows the landing ports Lubin (Lübin), Wolin (Wollin), Stepnica (Stepenitz), Trzebież (Ziegenort), Nowe Warpno (Neuwarp), Świnoujście-Karsibór (Swinemünde-Kaseburg), Świnoujście-Przytór (Swinemünde-Pritter) and the number of fishing boats registered for these ports.

In Germany 80 fishermen are involved in the AQUAFIMA case study area. A fisherman owns the boat and normally other family members can use it as well. 34 of the fishermen are full time (professional) fishermen, 9 are non-commercial and additionally there are 37 hobby fishermen. After Schulz (2013) the German fishermen think that the intensity of fishery is reasonable (stock situation, expense) and that the lagoon cannot withstand more fishermen and/or more fishing gear. In Poland there is another system: ship owners own one or several ships and numerous fishermen use them.

There are 126 ship owners (2012) and 370 full time fishermen (2007) in the Polish part of the lagoon. On average 2.9 fishermen share a boat in Poland. In addition, 290 persons (mostly family members) work on land for the fishery and depend on it. Data on part time fishermen are not available in Poland.

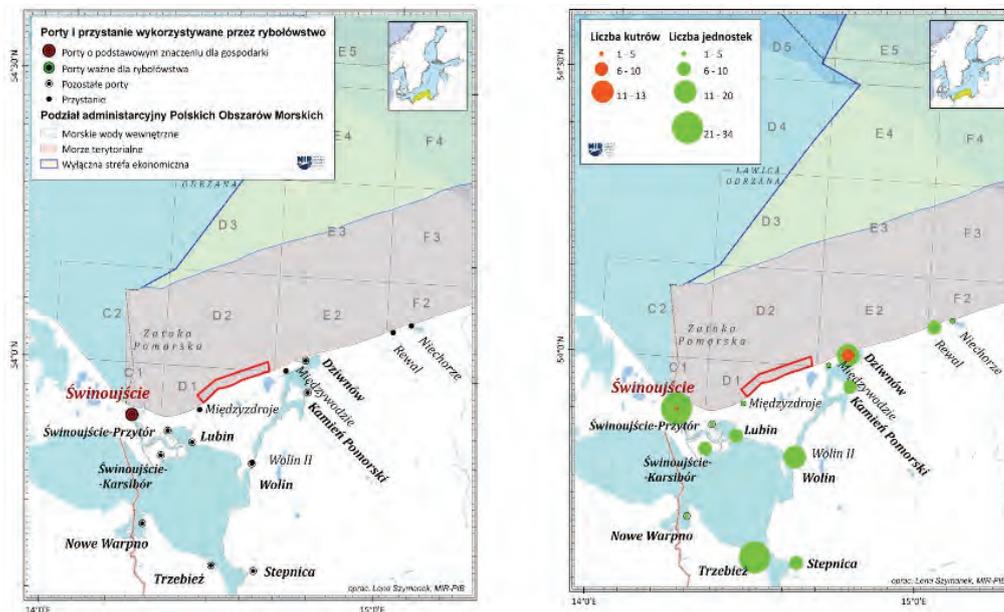


Figure 5: Landing ports in the Polish part of the Szczecin Lagoon; left: fishing harbours and seaports, right: numbers of boats (source: NMFRI)

Similar problems occur in both countries: fishermen are overaged and the next generation is not interested in being a fisherman. Reasons are hard work, less profit and high maintenance costs as well as decreased fish stocks. In Germany there are also problems or restrictions by the employer's liability insurance association that prevent people from being a fisherman. The lack of the next generation of fishermen will lead to a disappearance of the traditional fishery in coastal areas of the Baltic Sea. Moreover, a loss of jobs on land which depend on the fisheries industry is to be feared.

The technical and area restrictions (fisheries rules) are controlled by the local authorities. The German fishermen have to fill out a form of all monthly catches for the state fish landing statistic. Every vessel needs its own form that shows the result of the monthly fishing activity at the latest five day after the new month has started. Violation of the rule is an offense, and can lead to a fine (§ 24 & § 25, KüFVO M-V). The actually fishing effort like the hours at sea is not controlled in Germany.

In Poland the fishing effort is controlled. The numbers of fishing gear of a given type cannot exceed a certain level set by RSFI, e.g. for fyke nets the upper limit is 1883 and for set gillnets 3591 (Zarządzenie Nr 1/2008 OIRM w Szczecinie z dnia 15 kwietnia 2008 r.)

The fishing areas depend on the experience of the fishermen, but there are no specific fishing areas which could be named in Germany. The fishermen mostly try to catch their fishes close to their homeport because of the high fuel costs. Another common fishery area is the coastal zone up to three meter water depth. In Poland there are no special places, but the best-known fishing areas around the case study area are Lake Dąbie, Roztoka Odrzańska, Szczecin Lagoon, Lake Wicko, River Old Świna, River Dziwna, Kamień Lagoon, Lake Nowe Warpno.

Besides technical, spatial and temporal restrictions resulting from the rules for fishermen, a socio-economical problem exists. The professional fishery is expensive and the average yearly yield is low. In addition to annual costs for the vessel, fuel, berth for the ship, insurance and spare parts which cost

a minimum of 10 % up to 25 % of the original boat price the fishermen have to pay a yearly fee to use their fishing gear.

Example Kleines Haff (German part of the Szczecin Lagoon)

The maximum length of bottom-set gillnets allowed in the area is 65,000 m according to the “Küstenfischereiverordnung MV” (inshore fisheries regulation of Mecklenburg-Western Pomerania). In reality, however, 66,200 m of gillnets have been licensed in 2013. Considering the length of 100 m of bottom-set nets permitted per recreational fisherman, i.e. 3.7 km of nets, and an estimated 1.0 km of net length permitted for each of the 9 non-commercial fishermen, in theory only about 1.5 to 1.6 km remain for each of the 34 professional fishermen. This value varies, since not every professional fisherman has applied for his/her historically calculated net length due to the fact that every metre of bottom-set net requires a fee of 0.02 EUR per calendar year to be paid. In addition, 3,000 eel traps are permitted in the lagoon, while only 1,206 have been licensed in 2013 (and 1,112 in 2012), for each of which an annual fee of 0.50 EUR needs to be paid.

Some fishermen operate stationary pound net close to the shore. As their historically allocated positions are not used throughout the year, however, an average number of 20 chamber traps can be estimated to be in part-time use.

Active fishing gear, for example trawls, are prohibited in the German part of the Szczecin Lagoon.

The 34 professional fishermen have 56 vessels in use, while the 9 non-commercial fishermen use 10 boats. Vessel lengths can be seen in Figure 6.

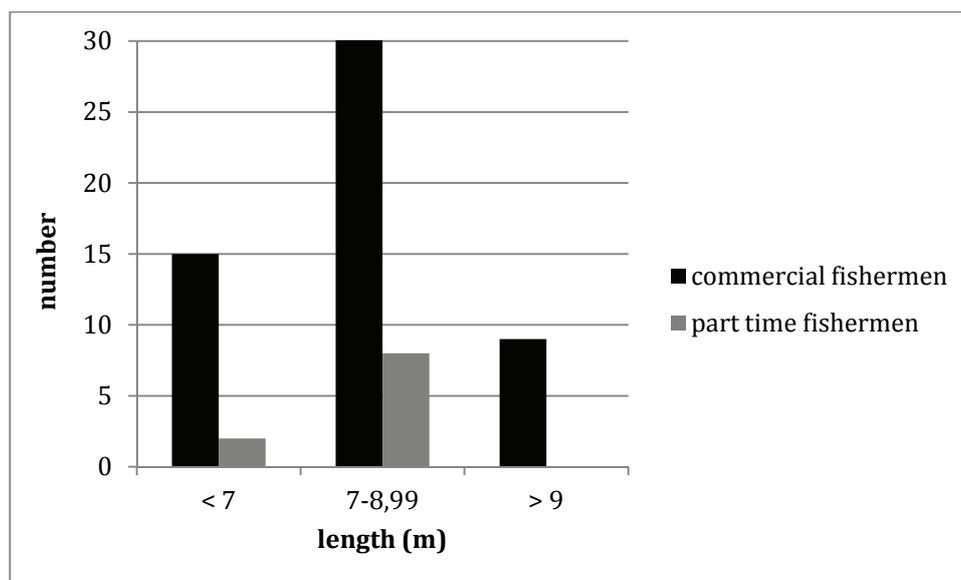


Figure 6: Number and length of fishing boats in the German part of the Szczecin Lagoon

After four years of steadily declining catches, greater catches were finally obtained again in 2012, resulting in a mean annual yield of 17.4 kg/ha. It is assumed that a predominant part of the 472 t of the total catch in 2012 were caught by professional fishermen (Figure 7). This corresponds to a mean annual catch of 11 t per fishing enterprise and a mean daily catch of approximately 50 to 60 kg.

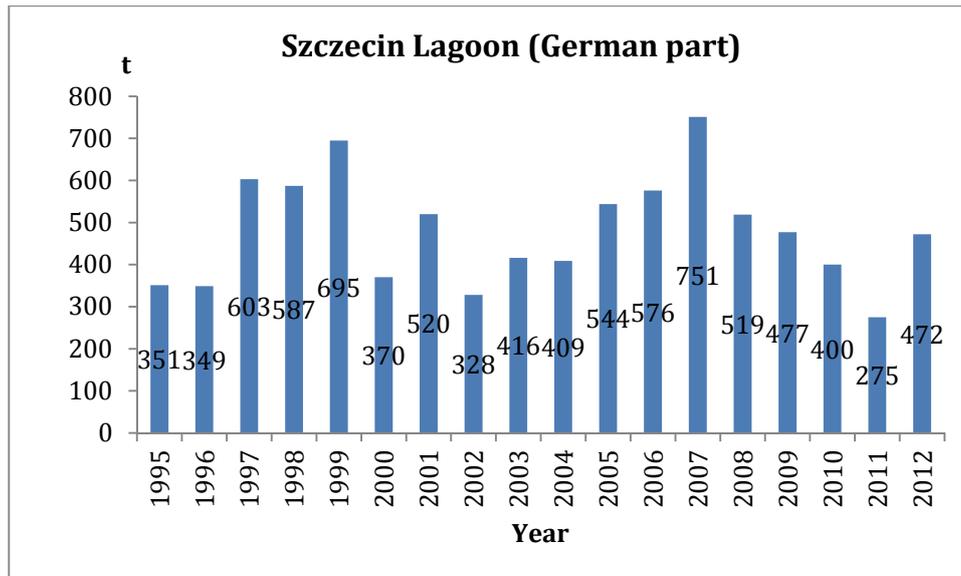


Figure 7: Total catch (t) in the Szczecin Lagoon, 1995-2012.

According to the report “Testnetzbetrieb Küstenfischerei – Spezialauswertung Mecklenburg-Vorpommern für das Jahr 2010 mit Vergleichen zu 2008 und 2009” and based on catch yields, the following mean profits for professional fisheries in the Little Szczecin Lagoon can be derived (Table 4):

Table 4: Mean profits of professional fisheries in the Little Szczecin Lagoon

Year	Mean profits in EUR
2008	12,730
2009	7,857
2010	18,481

Assuming that a skilled German worker has an average net annual income of 20,000 EUR, it becomes apparent that the profitability of fishing enterprises is highly critical and that in fact their existence cannot be secured from catch revenues alone. Obviously there are enormous differences amongst the enterprises as well as alternative income opportunities that, however, cannot be evaluated.

The profit situation also depends on the fishing vessels: According to the fisheries control office in Ueckermünde, responsible for recording the fish catches in the Kleines Haff, vessels with a length of 7 to 9 m gained a profit of 16,939 EUR in 2010, while fishing boats longer than 9 m earned 20,177 EUR in the same year.

The Federal Office of Agriculture and Food BLE published the landing statistic for whole Germany and for the individual states. In Mecklenburg-Vorpommern the State Office for Agriculture, Food Security and Fisheries (LALLF) published a landing statistic for the individual fisheries district (Table 5). The European Fisheries Fund (EFF, 2007) mentioned that the economic situation of the Baltic fish businesses are tense because of the few target species and the temporal and spatial fishing restrictions.

Table 5: Landing statistic based on data from BLE and LALLF-MV in 2012

	Landing quantitative in t	Share in landing quantitative Total % (Germany/MV)	Yield 1000 €	Share in Yield Total % (Germany/MV)
Mecklenburg-Vorpommern	-	-	-	-
Kleine Hochsee- und Küstenfischerei	19,485.6	27.4	12,503.8	10.4
Szczecin Lagoon (German Part)	472.3	2.4	303.1	2.4

2.3 Fishing areas and gear

Gillnets and fyke nets are passive catching methods which are sustainable (e.g. minor damage of the sea floor). In Germany passive fishing is the traditional catching method. In the German part of the Szczecin Lagoon a total number of 65,000 m gillnets, 3,000 eel baskets and 20,000 hooks (§ 14 KüFVO M-V) are permitted. Figures 8 and 9 show the sites of fyke nets in the Szczecin Lagoon based on data from 2002 and 2011.

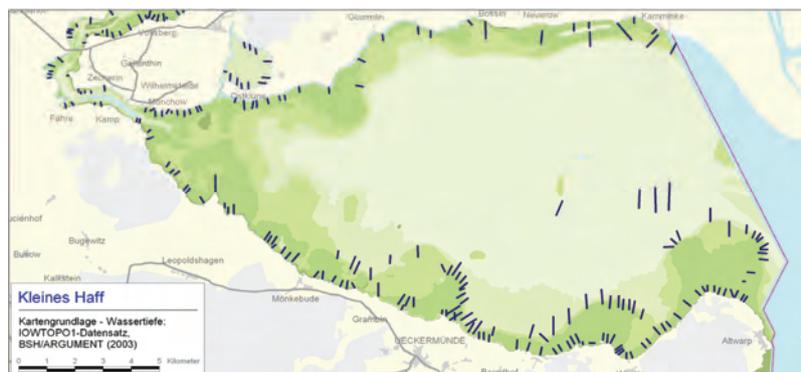


Figure 8: Fyke net sites in the German Part of the Szczecin Lagoon in 2002 (Schabelon, 2007)

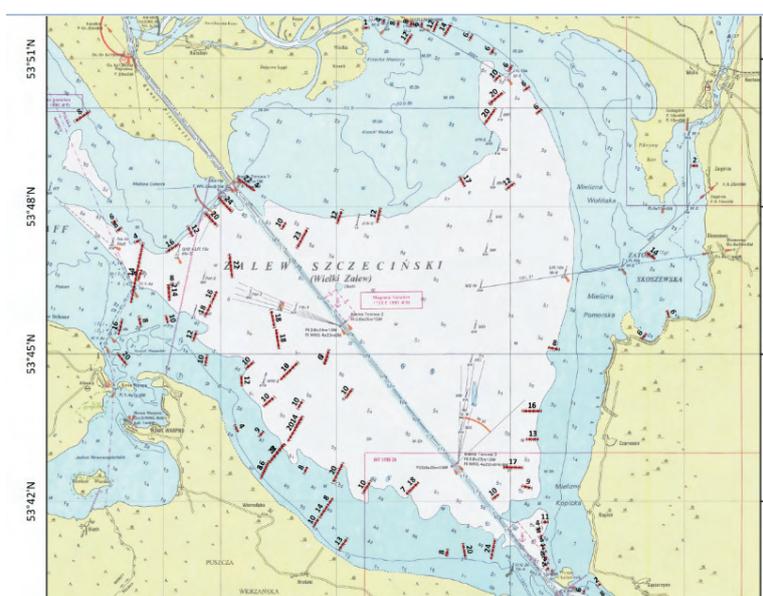


Figure 9: Fyke net sites in the Polish Part of the Szczecin Lagoon in 2011; numbers of maximum allowed fyke nets on given sites are indicated (source: NMFRI)

In Poland the fishery administration (in the case of the Szczecin Lagoon, the Regional Marine Fisheries Inspector in Szczecin) decides on request of the fishermen or the ship owner how many fishing gears are allowed to be used on the boat. In 2011 a EU program aimed at supporting small scale fisheries started. Most ship owners gave up their licenses to use active gear, deleting them from the register of fishing vessels for at least five years. This has led to an increase in the use of passive fishing gear since 2012.

3 Aquaculture

3.1 Description of aquaculture in the region

There is currently no aquaculture activity in the Szczecin Lagoon. The University of Greifswald has installed a first research cultivation plant for zebra mussels (*Dreissena polymorpha*) in the Lake Usedom. The aim is to analyze how effectively zebra mussels can be used to improve water quality. Due to their filtering ability they are able to clean the water improving its transparency. Information about this scientific idea is given by Stybel et al. (2009) and Schernewski et al. (2012).

In Poland commercial (private owned) and experimental, mostly academically based aquaculture facilities (coast-based or in the catchment area of the lagoon - Department of Aquaculture of the West Pomeranian Technological University) exist. Furthermore, there are restocking facilities in the catchment area run by the PZW (Polish Angling Association) and facilities of the university outside the study area – at Lake Miedwie – for restocking whitefish.

Schulz (2013) mentioned that environmental conditions may prohibit aquaculture in the Baltic Sea. The risk for the ecosystem and the environment is too high, especially when fish cage cultivation would be realised. Possible unforeseeable consequences are e.g. eutrophication and oxygen depletion. Even mussel aquaculture affects different biotic factors as well as physico-chemical and socio-economic aspects (Stybel 2013). Schulz (2013) suggests that the integrated multi-trophic aquaculture (IMTA), the common cultivation of fish, mussel and underwater plants, could be a sustainable way to produce aquatic species without environmental risks.

3.2 Importance of stocking and restocking

In the German part of the lagoon stocking has environmental as well as commercial purposes, e.g. up to 400.000 juveniles and 1 million larvae of Baltic whitefish are stocked annually. Moreover, Baltic sturgeon is stocked in the River Oder and its tributaries with access to the lagoon. If funding from EU would be available stocking of other endangered species could be carried out.

In Poland, a large amount of different fish species are restocked (Table 6). Poland releases fry, larvae and young fish in the lower Odra. This has mainly commercial reasons as the high level of restocking in Poland creates new jobs in the restocking facilities located in the catchment area. Moreover, many anglers are involved in stocking activities. The Polish Angler Association (PZW) is an important producer of stocking material. In 2009, the PZW has stocked 30 fish species of different age groups in quantities of 1,600 t. In addition, the PZW bought 301 million young fishes and larvae of different species. The money source (PLN 32.8 millions = € 7.63 millions annually) is the anglers' contributions.

Experiences in restocking Baltic whitefish have shown that stocking can compensate the natural loss of egg and larvae that occurs during their early development. But to stabilize and increase the wild spawning stock and the natural recruitment, a long term stocking and a sustainable management are required. As whitefish is an economically important species, this should be realized on both sides of the lagoon including a common season closed for whitefish fishing. Currently such closed season functions just on the Polish side (20th October – 15th December).

Table 6: Mean annual values of restocking material in the Lower Odra (source: PZW data 2006-2011, except* 2011 only, ** 2009 only)

Fish species	Restocking material
commercial purpose:	
eel (<i>Anguilla anguilla</i>)	20 kg + 560,000* (fry)
pike (<i>Esox lucius</i>)	900,000 (hatch)
pikeperch (<i>Sander lucioperca</i>)	100,000 (summer fry)
tench (<i>Tinca tinca</i>)	ca. 200 kg
common dace (<i>Leuciscus leuciscus</i>)	50,000 (autumn fry)
ide (<i>L. idus</i>)	70,000 (autumn fry)
asp (<i>L. aspius</i>)	50,000 (autumn fry)
wels catfish (<i>Silurus glanis</i>)	2,000 (autumn fry)
burbot (<i>Lota lota</i>)	3,000,000 (hatch)
sea trout (<i>Salmon trutta trutta</i>)	50,000 + 10,000* (smolts)
atlantic salmon (<i>Salmon salar</i>)	10,000 (smolts)+13,252*(smolts)+110,500*(fry)
whitefish (<i>Coregonus maraena</i>)	950,000 (1,200,000**) (hatch)
Environmental preservation	
atlantic sturgeon (<i>Acipenser oxyrinhus</i>)	186 (1+fry, > 17 cm)
vimba (<i>Vimba vimba</i>)	23,000 (autumn fry) + 556,800*

3.3 Future Plans and scientific initiatives

There are no future plans for aquaculture development in the lagoon. But stocking and restocking of different fish species will be important in future. If funding would be available the stocking of endangered species (besides Atlantic sturgeon) could be carried out in future. Depending on the outcome of the first scientific research plant in the Lake Usedom further cultivation of zebra mussels could be implemented in the lagoon to improve water quality and to strengthen the regional attractiveness. Further scientific research on stock development has been carried out by the Fishery Institute Rostock on the German side (Institut für Fischerei Rostock, Landesforschungsanstalt für Landwirtschaft und Fischerei MV (LFA MV)) and by three institutions in Poland: National Marine Fisheries Research Institute, Faculty of Food Technology and Fisheries of the West Pomeranian Technological University and Department of General Zoology of the Szczecin University. A study on the fisheries in the Szczecin Lagoon and its significance for functioning of the coastal communes was recently completed by Malkowska (2009). Further research in the field of fish migrations, breeding of valuable fish species and the efficiency of stocking is undertaken by the PZW.

4 Management aspects

4.1 Management of fishery

For fishing in both countries a fishing license is obligatory. In Germany, a new fisherman applies for a license without time limitation. The permit is issued after passing a fishing license examination. The fishing permit is issued by the upper Fisheries Department. Fishermen can lose their license just by gross violation, but in the first instance they have to pay a fee up to € 75,000 (§ 25, KüFVO M-V). In Poland the ship owners are required to possess a fishing license issued by the ministry responsible for fisheries and a special fishing permit for each vessel. For this permit they have to apply annually to the Regional Sea Fisheries Inspector in Szczecin. The contrary implementation of rules may lead to a suspension and/or denying issuing a special fishing permit for the next period.

4.2 Responsibilities for fishery in the Szczecin Lagoon

There are a lot of institutions and authorities in both countries which are responsible for fishery on different levels in the case study area. They are listed in the Annex.

4.3 Legal aspects

The legal aspects are presented in Table 1 of the Annex. The most important laws for the German part of the case study area are the State Fisheries Act Mecklenburg-Vorpommern and the Coastal Fisheries Decree Mecklenburg-Vorpommern (KüFVO M-V). This will be renewed in 2014 with little changes for the case study area, such as the reintroduction of a closed season for whitefish. The Fisheries Act, the Act of Fishing Market and Financial Support for Fisheries and the Act on Support of Sustainable Development of Fishing Sector using European Fisheries Fund are the basic laws regulating fisheries in Poland. The Regional Sea Fisheries Inspector in Szczecin represents fisheries administration on the Wielki Zalew and adjacent water bodies.

5 Area based management

5.1 Definition and regional status

Based on Neal (2007) the area-based-management for fisheries aims to conserve and rebuild fish (and mussel) stocks in its natural borders through developing a regionalized regulatory structure that takes into account local biological and economic factors. This includes measures of control to smaller, more local and responsive political bodies, thus creating more effective and long-lasting conservation of the resource. This is supported by fishermen, scientists, environmental groups and the local government that are working together. Prerequisites for a successful area-based management of fishery resources are: effective exclusion of other parties, science-based ecological information, habitat protection for the local fish. Following this definition an area-based fishery management is not fully developed in the Szczecin Lagoon. There are single aspects that are realized: closed seasons, protected areas for spawning and nursery, regional regulations addressing the kind and numbers of fishing gears. As the Szczecin Lagoon is a cross-border area these regulations should be similar for both sides. To ensure a more sustainable and future oriented development of the traditional fishery sector of the lagoon a cross-border management body should be implemented. This could form the basis for regular communication and a common development of regional, cross-border regulations.

5.2 SWOT-Analysis of the management of fishery and aquaculture in the Szczecin Lagoon

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> Long-term documentation of the yearly catch per fish species and country (data: 1995-2011) legal definition of minimum catch size legal definition of closed season, fish and spawning protection areas legal definition of permanently and temporally restricted areas for fishing Regulation of mesh size, number of fishing gear per person, allowed fishing gear Poland: definition of catch quotas use of passive fishing gear: gillnets, longlines, fyke nets knowing of landing ports and fleet size EU: Common Fisheries policy Poland: control of fishing effort→EU-regulation federal authorities design state fishing laws federal authorities control the quality of landed fish, monitor the national quotas Germany: KüFVO M-V- Specific state law for the Baltic Sea Region national and/or federal funding to support fishermen commercial stocking support natural fish stock and local catch quotas as the consequences of aquaculture in the Baltic Sea are unknown, aquaculture is not operated there Federal research institutes collect data and do research on various topics of fishery, biology, marine ecology etc. Germany: state research institute studies on ecological, sustainable and competitive aquaculture research on mussel cultivation, fish migrations marketing through production organizations 	<ul style="list-style-type: none"> sensitive ecosystem: changes of salinity, water exchange, temperature, ice cover, wind, wind direction influenced reproduction impact of cormorants unknown how large the individual fish species stock is differences between PL and DE in minimum landing size of perch and pikeperch eel management plan shows completely different closed seasons Germany: no control of fishing effort Germany: no catching quotas for the Szczecin Lagoon complex system of contact partners/ authorities on different levels complex system of EU-laws, federal and national laws only members of producer organization can benefit from the EU support system only for gross violation loss of license no cross-border institutions and management bodies less communication between the countries no sustainable stocking of whitefish in Germany (result of whitefish stocking in Poland expected: 2014/2015) no next generation of fishermen, disappearing of traditional Baltic sea fishery poor economic status of fishermen 	<ul style="list-style-type: none"> lesser ice cover increase the possibility of mussel farming research on <i>Dreissena polymorpha</i> research approach: IMTA Integrated multi-trophic Aquaculture try to design the stocking/restocking more sustainable generous funding enable stocking of endangered species whitefish: reintroduction of closed season with the support of EU-funding creation of a common sustainable management strengthening cooperation between both countries 	<ul style="list-style-type: none"> changes of environmental conditions could lead to changes in fish species, fish stock, biodiversity etc. decrease in stocks further growth of the cormorant population possible fishing ban in nature conservation areas, gillnets a risk for seabird and sturgeon collapse of fishing industry as the next generation of fishermen is missing EU-funding policy: no funding for a common sustainable management

5.3 Cross-border cooperation and exchange

In February 2013, EUCC-Germany organized in the framework of the two projects ARTWEI and AQUAFIMA a cross-border workshop in Ueckermuende (German part of the Szczecin Lagoon) with the topic „Fishery aspects at the Szczecin Lagoon“. 50 participants from Germany and Poland exchanged their knowledge and experiences of all kind of fishery management. Main issues were the current status of fish species and populations, stocking and restocking measures as well as possibilities for water quality improvement and linkages to the fishery. Participants came from research institutions, fishery authorities and fishermen associations. The discussions supported with simultaneous translation have shown that there is a high demand for regular communication and cross-border exchange of information. Especially stocking and restocking events and measures as well as closed seasons should be discussed regularly and coordinated in a cross-border way to stabilize the stocks. This would help to ensure a sustainable use on both sides of the lagoon in future. The idea of the cultivation of zebra mussels as a tool for water quality improvement was also introduced to the fishery sector. A bilingual questionnaire about pros and cons of zebra mussel cultivation was filled by the participants. The results will help to understand local interests by the fishery sector. More information of the workshop and the presentations can be found under: <http://www.eucc-d.de/workshop-aktuelle-fischereiaspekte-im-stettiner-haff.html>



Figure 10: Impressions of the cross-border fishery workshop in the framework of ARTWEI and AQUAFIMA (source: EUCC-Germany)

6 Lessons learned and outlook

The improvement of the fishery management in the Szczecin Lagoon may lead to stabilization of economically important stocks and to strengthen the fishery tradition of Germany and Poland. The reintroduction of a closed season for whitefish in Germany is therefore an important prerequisite. The further research on mussel cultivation in the lagoon as a tool for water quality improvement can help to develop best-practice approaches to be implemented in a larger scale with high effectiveness. The fishery sector should be involved in further discussion processes, especially to find compromises in spatial planning, e.g. of mussel cultivation plants. The farming of zebra mussels could be a potential source of income in the future once they become more commercially important.

A further aspect of research could be the integrated multi-trophic aquaculture combining algae, mussels and fish. Fish aquaculture is negatively perceived in both countries because of environmental problems and will not be implemented in medium term.

On a long term basis the fishery has to be in line with other uses, such as nature conservation; but another seasonal or spatial prohibition could be economical unfavorable for fishermen.

The creation of a joint fishery management body in the Szczecin Lagoon would strengthen the relationship between Poland and Germany and will simplify the cooperation and communication between the individual authorities, research institutions and fishermen.

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- Zarządzenie Nr 1 Okręgowego Inspektora Rybołówstwa Morskiego w Szczecinie z dnia 15 kwietnia 2008 r. zmieniające zarządzenie w sprawie szczegółowego sposobu wykonywania rybołówstwa morskiego na morskich wodach wewnętrznych. (Dz. Urz. Woj. Zachodniopomorskiego Nr 44, poz. 941)
- Zarządzenie Nr 1 Okręgowego Inspektora Rybołówstwa Morskiego w Szczecinie z dnia 25 maja 2011 r. w sprawie określenia wymiarów i okresów ochronnych organizmów morskich (Dz. Urz. Woj. Zachodniopomorskiego Nr 682, poz. 1210)

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Address

Nardine Stybel
EUCC – The Coastal Union Germany, c/o Baltic Sea Research Institute Warnemuende
Seestrasse 15
18119 Rostock, Germany

stybel@eucc-d.de

ANNEX

1. Fisheries related laws and regulations

Germany

State fisheries Act Mecklenburg-Vorpommern:

lalf.de/fileadmin/media/PDF/fischer/3_Gesetze/MV_2005_FG_2013__2_.pdf

Inshore fisheries regulation of Mecklenburg-Western Pomerania – KüFVO MV of 28 November 2006:
www.landesrecht-mv.de/jportal/portal/page/bsmvprod.psm1?showdoccase=1&doc.id=jlr-K%C3%BCFischVMV2006pP1&doc.part=X&doc.origin=bs

Poland

National laws regulating fisheries:

Fisheries Act: www.bip.orm.szczecin.pl/ustawy/ustawa_o_rybolowstwie_20061220.pdf

Act on fishing market and financial support for fisheries:

www.bip.orm.szczecin.pl/ustawy/ustawa_o_rynku.pdf

Act on support of sustainable development of fishing sector using European Fisheries Fund:

www.bip.orm.szczecin.pl/ustawy/ustawa_o_wspieraniu_sektora_rybackiego.pdf

Current regional law regulating fisheries in the Szczecin Lagoon:

Zarządzenie Nr 4 Okręgowego Inspektora Rybołówstwa Morskiego w Szczecinie z dnia 20 października 2004 r. w sprawie szczegółowego sposobu wykonywania rybołówstwa morskiego na morskich wodach wewnętrznych (Dz. Urz. Woj. Zachodniopomorskiego Nr 82, poz. 1437)

Zarządzenie Nr 1 Okręgowego Inspektora Rybołówstwa Morskiego w Szczecinie z dnia 15 kwietnia 2008 r. zmieniające zarządzenie w sprawie szczegółowego sposobu wykonywania rybołówstwa morskiego na morskich wodach wewnętrznych. (Dz. Urz. Woj. Zachodniopomorskiego Nr 44, poz. 941)

Zarządzenie Nr 1 Okręgowego Inspektora Rybołówstwa Morskiego w Szczecinie z dnia 25 maja 2011 r. w sprawie określenia wymiarów i okresów ochronnych organizmów morskich (Dz. Urz. Woj. Zachodniopomorskiego Nr 682, poz. 1210)

2. Important contacts for fisheries management in the Szczecin Lagoon

Germany

Institut für Fischerei der LFA

Carsten Kühn
Fischerweg 408
18069 Rostock

Poland**Uniwersytet Szczeciński/
Szczecin University:**

Professor Józef Domagała
Dr Agnieszka Malkowska

**Zachodniopomorski Uniwersytet Technologiczny w Szczecinie
Wydział Nauk o Żywności i rybołówstwa/
West Pomeranian University of Technology in Szczecin
Faculty of food science and fishery**

Professor Krzysztof Formicki
Dr Jacek Sadowski
Professor Wawrzyniec Wawrzyniak
(www.zut.edu.pl/index.php?id=6980)

**Morski Instytut Rybacki –
Państwowy Instytut Badawczy/ National Marine Fisheries Research Institute**

Dr Wojciech Pelczarski
Dr Iwona Psuty

Responsibilities for fisheries management of the Szczecin Lagoon

General Directorate of Fisheries			
	Function and linked laws	Poland	Function and linked laws
<ul style="list-style-type: none"> Common fisheries policy (CFP) - refers to all fishing activities, the farming of aquatic resources as well as the processing and commercialization of fishery products Priorities of the CFP are conservation and management of marine resources, fisheries relations to and agreements with non-member states and international organizations, structural measures and the common market organization for fishery and aquaculture products (European Commission) VO (EG) Nr. 88/98; geändert durch die VO (EG) Nr. 1520/98; geändert durch die VO (EG) Nr. 812/2004 VO (EG) Nr. 27/2005 VO(EG) Nr. 2371/2 	<ul style="list-style-type: none"> fisheries policy preventive consumer protection, quality management as well as environmentally and animal friendly production Marine Fisheries Act (SeeFischG) Marine Fisheries Decree (SeefiV) Fisheries Act for the State of Mecklenburg-Vorpommern (FischG) 	<p>Ministry of Agriculture and Rural Development (Ministerstwo Rolnictwa i Rozwoju Wsi; Departament Rybołówstwa) ul. Wspólna 30, 00-930 Warszawa Tel: +48 22/6231471</p>	<ul style="list-style-type: none"> development of: sea and coastal fishery inland fishery and aquaculture fisheries market regulation participation of Poland in the preparation of European Common law regarding food security, fishery etc. Fisheries Act (USTAWA O RYBOŁÓWSTWIE Dziennik Ustaw Nr 62z 2004 r., poz. 574, z późn. zmianami) Act on support of sustainable development of fishing sector using European Fisheries Fund (Uwaga od redakcji: Późniejsze zmiany do ustawy odnoszą się do przepisów pominiętych)
<p>Federal Ministry of Food, Agriculture and Consumer Protection (Bundesministerium Ernährung, Landwirtschaft und für Verbraucherschutz (BMELV)) Wilhelmstr. 54, 10117 Berlin Tel: +49-30/2006-0 Rochusstr. 1, 53123 Bonn Tel: +49-228/529-0</p>	<ul style="list-style-type: none"> implementation of the common fish market regulation management and monitoring of the national quotas creation of a list of fish species trade names operated three fishery protection vessels and three fishery research boats in behalf of the BMELV 	<p>Agency for Restructuring and Modernization of Agriculture (Agencja Restrukturyzacji i Modernizacji Rolnictwa) (ARiMR) Al. Jana Pawła II 70, 00-175 Warszawa Tel.: +4800380084</p>	<ul style="list-style-type: none"> processing the funding of fisheries implementation of instruments co-financed from the European Union budget and provides aid from national funds (ARiMA) Act on fishing market and financial support for fisheries
<p>Federal Office of Agriculture and Food (Bundesamt für Landwirtschaft und Ernährung) Haubachstr. 86, 22765 Hamburg</p>			

<p>State Ministry of Agriculture, Environment and Consumer Protection Mecklenburg-Vorpommern (Landesministerium für Landwirtschaft, Umwelt und Verbrauchersicherheit Mecklenburg-Vorpommern), Department 5 Dr. Dayen, Referat 560 Gerhard Martin Paulshöher Weg 1, 19061 Schwerin</p>	<ul style="list-style-type: none"> ➤ legislative and administrative tasks in the field of fisheries in the state of Mecklenburg-Vorpommern ➤ Inshore fisheries regulation of Mecklenburg-Western Pomerania (KüFVO M-V) 	<p>Regional Sea Fisheries Inspector in Szczecin (Okręgowy Inspektor Rybołówstwa Morskiego w Szczecinie, OIRM) ul. Starzyńskiego 8, 70-506 Szczecin Tel.: +48-91-4322550</p>	<p>(USTAWA z dnia 22 stycznia 2004 r. o organizacji rynku rybnego i pomocy finansowej w gospodarce rybnej - art.8 (Dziennik Ustaw Nr 34, poz. 291, z późn. zmianami)</p> <ul style="list-style-type: none"> ➤ management of fish stocks in Polish Marine Areas west of the meridian 15°23'14" (including the Szczecin Lagoon as a part of marine internal waters) ➤ Ensure the inspection and control ➤ monitoring of the fish landing ➤ special fishing permits
<p>Tierfelder Straße 18, 18059 Rostock Abteilung Fischerei Am Bahnhof 1, 18119 Rostock</p>	<ul style="list-style-type: none"> ➤ fishing licenses ➤ local decisions-maker: fisheries supervisor Fischereiaufseher/ Fischereimeister) 	<p>Sea Fisheries Inspectors in Swinoujście, Szczecin, Trzebież, Wolin, (Inspektorzy Rybołówstwa Morskiego w Swinoujściu, Szczecinie, Trzebieży, Wolinie,) (IRM) Inspektor Rybołówstwa Morskiego w Swinoujściu, ul. Duńska 17 72-600 Swinoujście, Tel/Fax: +48 91/8889988</p> <p>Inspektor Rybołówstwa Morskiego w Szczecinie ul. Starzyńskiego 8, 70-506 Szczecin Tel.: +48 91/4322551</p> <p>Inspektor Rybołówstwa Morskiego w Wolinie ul. Niedamira 22, 72-510 Wolin Tel.: +48 91/32624 66</p> <p>Inspektor Rybołówstwa Morskiego w Trzebieży ul. Portowa 5B, 72-020 Trzebież Szcz. Tel.: +48 91/3128700</p>	<ul style="list-style-type: none"> ➤ realization of inspection and control in the Szczecin Lagoon

<p>State Offices for Agriculture and the Environment Altentreptow (Staatliche Ämter für Landwirtschaft und Umwelt Altentreptow) Brunnenstraße 6, 17087 Altentreptow Postfach 1569, 17081 Altentreptow Tel: 0049 3961/261245</p>	<p>This fishery authority has only competences in inland fishers and aquaculture Implementation and monitoring of inland fisheries regulation Represent the interests of fisheries in inland</p>	<p>National Marine Fisheries Research Institute (Morski Instytut Rybacki – Państwowy Instytut Badawczy) ul. Kółłataja 1, 81-332 Gdynia Tel: +48 58/62017-28</p>	<p>Under the supervision of the Ministry of Agriculture and Rural Development Research areas are fisheries biology, fisheries oceanography and marine ecology, fisheries process engineering and fisheries responsible for the collection of economic data on sea fisheries</p>
<p>Johann Heinrich von Thünen-Institute Federal Research Institute for Rural Areas, Forestry and Fisheries, Institute of Baltic Sea Fisheries (Johann Heinrich von Thünen-Institut Bundesforschungsinstitut für Ländliche Räume, Wald und Fischerei, Institut für Ostseefischerei) Alter Hafen Süd 2, 18069 Rostock Tel: +49 381/8116101</p>	<p>provide the scientific basis for sustainable utilization of fisheries resources in the Baltic Sea study the population dynamics of the important fish species in the Baltic Sea collection of biological data for international databases</p>	<p>Polish Angling Association (Polski Związek Wędkarski) Hard 42, 00-831 Warsaw Tel: +48 226208966 Protection Team and water development (Zespół Ochrony i Zagospodarowania Wód) Tel: +48 226205088</p>	<p>Largest producer of stocking material The scientific PAA Research: Funded research papers in the field of fish fauna of rivers; the study of fish migration, the development of biotechnology breeding of valuable fish species, the study of factors affecting the efficiency of stocking.</p>
<p>State Research Institute for Agriculture and Fisheries Mecklenburg-Vorpommern, Institute of Fisheries (Landesforschungsanstalt für Landwirtschaft und Fischerei Mecklenburg-Vorpommern, Institut für Fischerei) Fischerweg 408, 18069 Rostock Tel: +49 381/811-0</p>	<p>studies on the design of an ecologically sustainable and competitive aquaculture fish farming in fresh and brackish water technological process optimization in fresh and brackish water Studies on the preservation and improvement of fishing profitability of inland and coastal waters as a basis for a sustainable and ecologically-oriented fishing management fishery biological and socio-economic aspects technical and technological aspects</p>	<p>National Association of boats and coastal fishing Mecklenburg-Vorpommern (Landesverband der Kutter- und Küstenfischer Mecklenburg-Vorpommern e.V.)</p>	<p>represents the interests of fisheries distribution of fish quotas among individual companies</p>

<p>Hafenstraße 12f, 18546 Sassnitz Tel: 0049 38392/66486</p>		<p>National Angling Association Mecklenburg-Vorpommern e. V. (Landesanglerverband Mecklenburg-Vorpommern e. V.) Siedlung 18a, 19065 Görslow</p>	<p>Fishermen's Association of the Szczecin and Kamień Lagoon, and Lake Dąbie (Zrzeszenie Rybaków Zalewów Szczecińskiego, Kamińskiego i Jeziora Dąbie) ul. Kopernika 8, 72-020 Trzebież</p>	
<p>Producers organization fishing cooperative „Haffküste“ Ueckermünde (Fischereigenossenschaft e.G. „Haffküste“ Ueckermünde Producers organization “Usedom Fisch” e.G. (Erzeugerorganisation Usedom Fisch e. G.)</p>	<ul style="list-style-type: none"> ➤ Legally recognized Association for Nature Conservation ➤ Interest representation for the preservation and protection of possibilities and conditions for the exercise of expertly and cherish friendly fishing ➤ Hege of the fish population 	<ul style="list-style-type: none"> ➤ measures for the rational use of fish resources ➤ Improvement of sales conditions, for example Implementation of fisheries plans ➤ Membership is essential to receive funds from the EU for the final and temporary closure ➤ Producer organizations serve producers (whether they catch fish and / or cultivate) and allow them a cooperation of management of their resources from an economic and ecological point. ➤ Create an annual work program (marketing strategy) 	<p>Local Fisheries Group "Szczecin Lagoon" (Lokalna Grupa Rybacka „Zalew Szczeciński) ul. Dworcowa 4, 72-602 Świnoujście</p>	



Fisheries Management in the Vistula Lagoon

Przemysław Śmietana¹, Sergey Shibaev², Aneta Kozłowska³, Jakub Skorupski³

¹University of Szczecin, Faculty of Biology, Department of Ecology and Environment Protection, Szczecin, Poland

²Kaliningrad State Technical University Faculty of Bioresources and Nature Management, Department of Ichthyology and Ecology, Kaliningrad, Russia

³Green Federation GAJA, Poland

Abstract

The report contains an analysis of the fisheries management in the cross-border waters of the Vistula Lagoon. Geographical and biological conditions are described as environmental basis for the management conducted here by Poland and Russia. On the basis of data on the variability of the size of catches of dominant fish species, the policy of stocking and the legal basis for the functioning of the fishery was determined with a SWOT analysis. Summarized results indicate directions of joint cross-border actions to implement the principles of sustainable fishing around the waters of the Vistula Lagoon.

1 Introduction

The Vistula Lagoon is a brackish water basin in the Baltic Sea roughly 91 km long, 10 to 19 km wide, and up to 5.2 m deep, separated from Gdańsk Bay by the Vistula Spit. The lagoon is a mouth of a few branches of the Vistula River, notably the Nogat, and the Pregolya River. It is connected to Gdańsk Bay by the Strait of Baltiysk. The Poland–Russia border runs across the lagoon. Localities on the lagoon include Kaliningrad, Baltiysk, and Primorsk in Russia's Kaliningrad Oblast and Elbląg, Tolkmicko, Frombork, Krynica Morska in Poland. Vistula Lagoon connects to the Baltic Sea by a narrow channel located in the Russian part of the basin (Strait Pilawa or Baltiysk Strait (Балтийский пролив)). After heavy storms marine water enters the lagoon through this channel. Salinity decreases with distance from the city Baltiysk, located in the immediate vicinity of the Strait Pilawski: in the area of the strait it is on average 5.5 PSU, while near Krynica Maritime it is about 2.2 PSU. The Vistula Lagoon is characterized by very rapid changes in water level of up to 1.5 m in a day, that are caused by strong winds. The coastal zone of the sea bottom reaches a width of several hundred meters during low water levels. The most important breeding areas for birds can be found in Gdańsk Bay.

The Vistula Lagoon is a highly productive water body and a very important coastal fishing area in the southern Baltic. The maximum catch occurred in 1950 with more than 19,000 t. During more than 50 years, fisheries in the lagoon have been based on bilateral regulations by Poland and Russia. During this period, the surrounding countries Poland and Russia (Kaliningrad) were transformed from centrally so called planned economies with fixed prices to free market systems.

The transboundary nature of the lagoon, which is divided between an EU and a non-EU country, complicates effective management of the area. The most important environmental problem is the progressive eutrophication of the Lagoon, which inhibits the development of tourism and recreation. There is a need for both countries to identify synergies (and possible linkages) between climate change and the socio-economic development. This will enable the efficient management and assess the future capacity of the lagoon environment in relation to limiting the discharge of pollutants, especially nutrients.

Vistula Lagoon – a complex aquatic ecosystem, subjected to strong anthropogenic pressure. Contamination of the Vistula Lagoon is due to a number of point sources. Pregel River, which flows into the bay, takes up the run-off of almost all the major cities in the Kaliningrad region including the city of Kaliningrad.

For decades the Vistula Lagoon was treated as part of an especially important military area which was the Kaliningrad Region, so to bother about environment quality had minor importance. Kaliningrad and Elbląg have provided enormous amounts of wastewater over the years, which only partially (mostly those from the former Königsberg) were “flushed” through the Pilawa Strait tides. At the end of the 20th century the biogenous input was about 200 t of total phosphorus and 6,500 t of total nitrogen annually. As a result of anthropogenic pollution by organic substances, there has been a massive growth of indicator species for β - α -mesosaprobic conditions during some periods.

That changed in the 1990s, when the research project Mantra East, and Montransat were conducted. An important aspect in these years was to build an efficient sewage treatment plant for Kaliningrad. In simple terms it can be said, comparing loads of nitrogen and phosphorus, that today half of the nitrogen and phosphorus come from tributaries, and the other half from historical accumulations in sediments. The Vistula Lagoon and its surroundings underwent a great transformation in recent years. More than a dozen modern sewage treatment plants were built and led to an improved water quality in the Lagoon.

1.2 Description of cross-border area

The Vistula Lagoon is shared by two countries: Poland (43.8 %) and Russia (56.2 %). Poland is EU member since May 1st 2004 but Russia is not, therefore they face different obligations with regard to water management of the lagoon drainage basin. Poland has to implement WFD and CFP but Russia does not have such obligation. The described situation may result in potential transboundary conflicts.

Crossing of water border between Poland and Russian in the Vistula Lagoon is limited due to some restriction in the Russian legislation. Poland wants to have an access by water ways similar to the existing terrestrial trans-border passages. Today, such advances are under negotiation.

Therefore, the Polish party is planning to build a channel crossing the Vistula spit near the village of Skowronki. Planned, before the relevant expertise and environmental impact assessments, the cost of construction of the canal with a length of 1,100 m and a width of 40 m at the bottom and 80 m at the surface is about 80 million euros. Deepening of the fairway and adapting it to the ships of the required tonnage through the port of Elbląg and the construction of special locks and bridges, increase the costs of investment to approximately 230 million euros. The project is analyzed in terms of a collision with conservation of Natura 2000 sites. The Polish side of the entire area of the Vistula Lagoon is a Special Protection Area for Birds “PLB280010 - Vistula Lagoon” and a special area of conservation of habitats “PLH280007 - Vistula Lagoon and the Vistula Spit”. Construction of the canal was initially planned to begin in 2009 and be completed in 2012, but in November 2009, in connection with the agreement with Russia, the Ministry of Infrastructure announced that the construction of the channel will begin in 2017.

Fishing of Russian fishermen on the Polish side and of Polish fishermen on the Russian side is not allowed. Due to the specific morphology of the lagoon and biology of fishes there is a different approach to fisheries of the countries. In particular, the Polish part is shallower and plays a role as spawning ground for many species. Even Baltic herring enters the lagoon from the Baltic Sea via the Baltiysk Strait. As a result, most of the young fishes live on the Polish side and determine the size structure of commercial catches there. On the other hand, the migration of herring via the Russian part gives some advantages for fishermen there. As a result, the total catch of Russia is about 78 %. The comparison of total catches in the Polish and Russian parts of the Vistula Lagoon is presented in Figure 2.

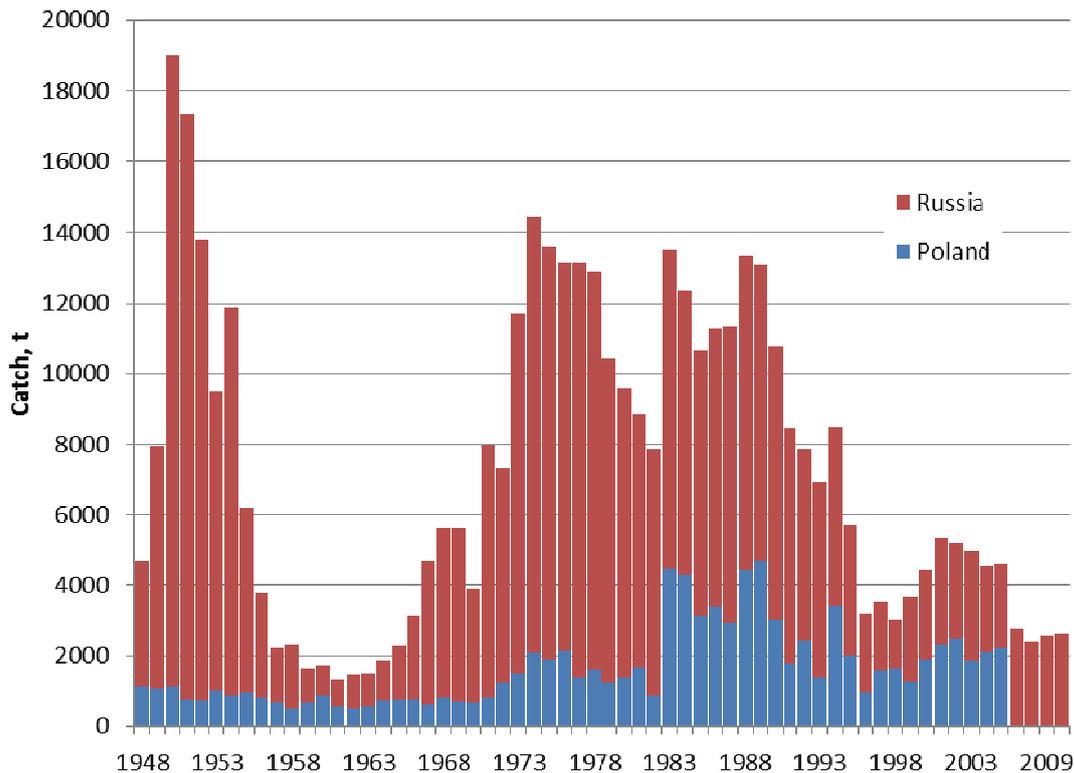


Figure 2: Changes in dynamics of total catch in Polish and Russian part of the Vistula Lagoon since 1948.

2 Fishery

2.1 Ecological aspects

The fish fauna of the Vistula Lagoon consists of 57 species (Khlopnikov at al, 1998). Because the lagoon consists of brackish water the composition of species includes freshwater species, marine species, anadromous and catadromous species (the edge effect).

Most important species for fisheries are following:

1. *Clupea harengus membras* (Linnaeus, 1761) – herring;
2. *Abramis brama* (Linnaeus, 1758) – bream;
3. *Sander lucioperca* (Linnaeus, 1758) – pikeperch;
4. *Perca fluviatilis* (Linnaeus, 1758) – perch
5. *Rutilus rutilus* (Linnaeus, 1758) – roach;
6. *Pelecus cultratus* (Linnaeus, 1758) – sabrefish;
7. *Anguilla anguilla* (Linnaeus, 1758) – eel.

Baltic herring is a species which lives in the pelagic zone of the Baltic Sea. Because of the bottom type of roe which needs to be stuck to bottom substrate during embryo development, herring comes to the shallow waters of the Vistula Lagoon every spring for spawning. This period is the only for commercial capture of this fish by means of pound-nets. Annual catch of herring varies widely from 17,000 t in 1950 down to 240 t in 1960. During last 15 years its catch gives about 79 % of total catch in the lagoon (Figure 3).

The role of other species of fish is much lower. Bream and pikeperch are caught by gillnets with a mesh size of 70 mm during autumn, winter and early spring. About 10 % of the total catch is bream and it varies between years from 120 up to 690 t (Ryabchun 2011). The catch proportion of pikeperch is about half that of bream – 5 % – and varies from 54 to 331 t per year.

The third group comprises smaller-sized species like roach and sabrefish. They are caught during spring and summer with bottom gillnets with a mesh size of 40 mm. The total catch of these species is not more than 5 %. Sabrefish is a quite new species which appeared after 1980 and became a target object of commercial fisheries (Figure 4).

Perch is a species that is a relatively important object of fishing in the Polish part of Vistula Lagoon. The total catch varies from 23.6 t to 108.9 t annually.

Changes in catch of perch from 2009 to 2011 against the background of the catch of other fish species is presented in Figure 5.

Catadromous eel was a very important fishing species in the 20th century. A maximum catch of 390 t was reached in 1980. Then the catch went down rapidly and nowadays eel gives only 1.3 % of the total catch. There is scientific opinion that the big catches of eel were a result of artificial releasing of glass eel in the period 1970-1990. The total number of release was 6-10 million glass eel (Feodorov 2003, Osadchy et al. 2005).

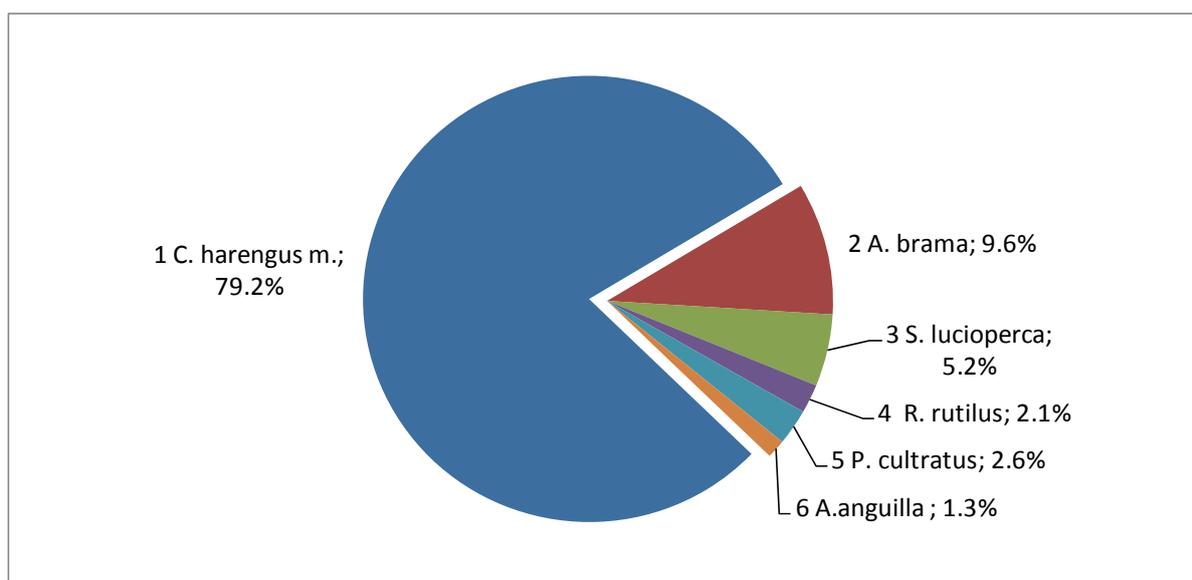


Figure 3: Fish-species composition of commercial catches in the Vistula Lagoon.

Fishery productivity of the Vistula Lagoon varies in a big range, but on average it is 93.7 kg/ha, in the Russian and Polish parts it was 132.3 kg/ha and 43.6 kg/ha, respectively. Because of the reorganization of the economy, both in Russia and Poland, the total productivity of the Vistula Lagoon went down and now is about 2,500-3,500 t (Figure 6 and 7).

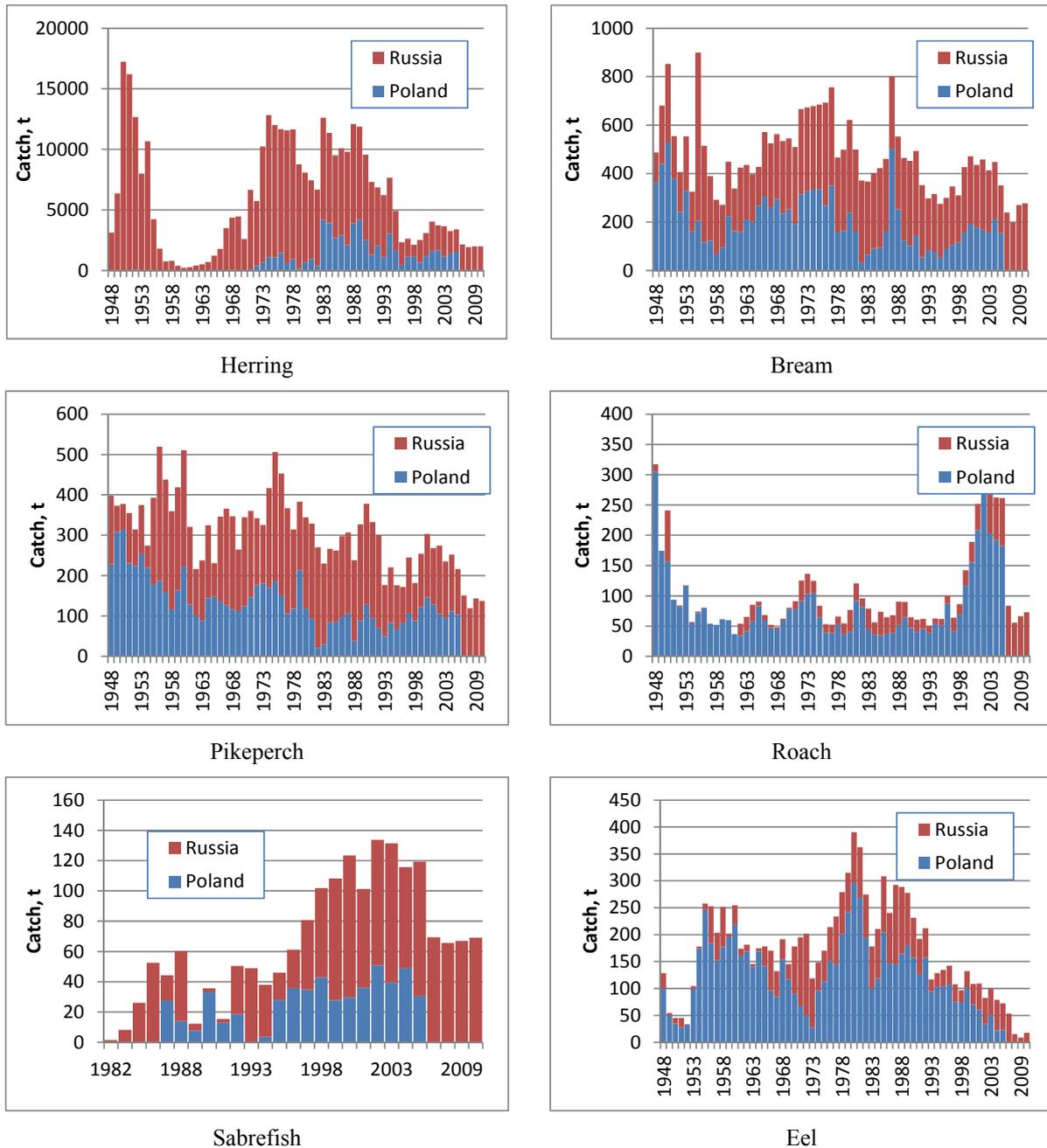


Figure 4: Comparison between Polish and Russian catches of main fishery species in the Vistula Lagoon.

During the last decades fishery activities and gears have been on a stable level and the total catch depended mostly on the dynamics of the level of recruitment which determines stock abundance. For freshwater species spawning conditions in the lagoon are normal and due to this the level of yield is similar between different years. The migration of herring into the lagoon is connected with the environment in the Baltic Sea and varies widely. Eel stock is in decline due to a lack of recruitment from the Sargasso Sea.

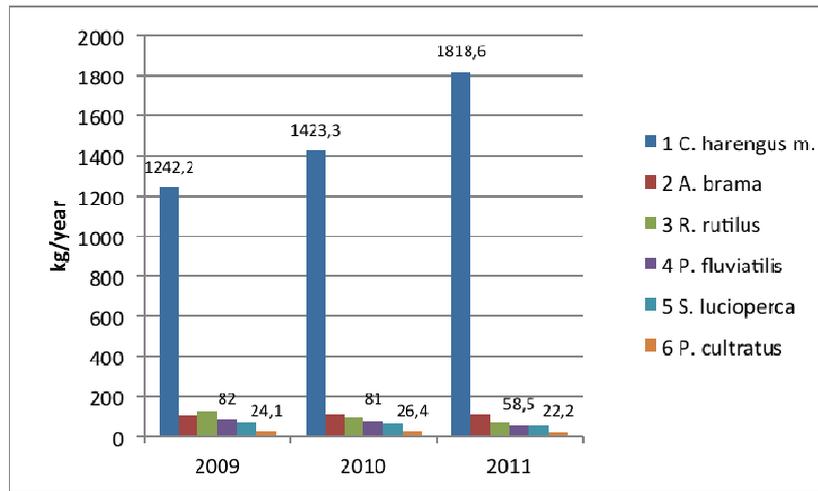


Figure 5: Dynamics of catches of main fishery species in the Polish part of the Vistula Lagoon between the years 2009 to 2011.

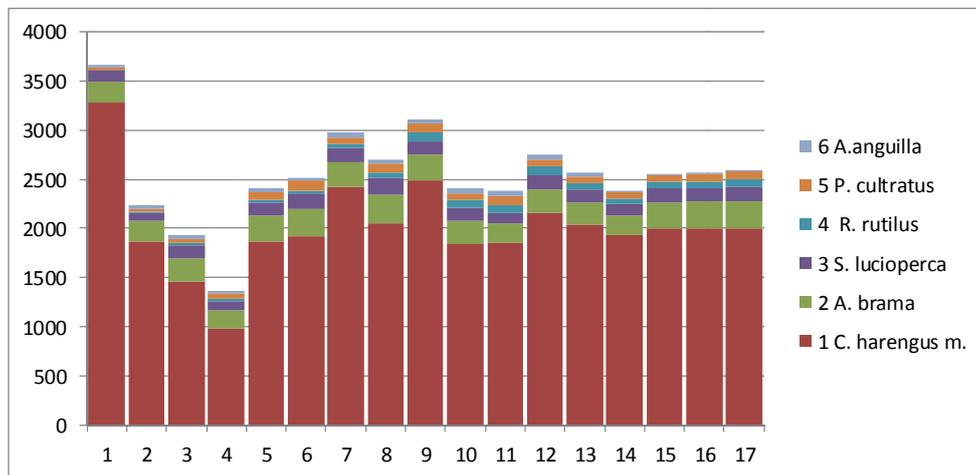


Figure 6: Dynamics of commercial catches and fish-species composition in the Vistula Lagoon.

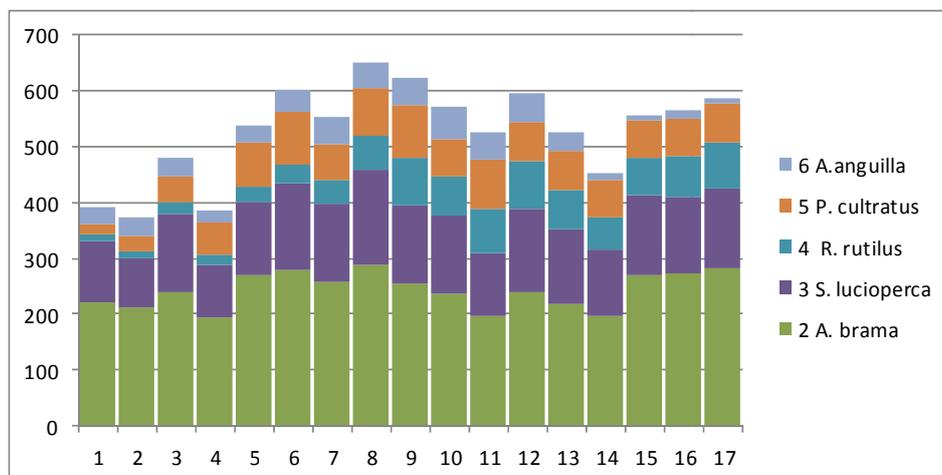


Figure 7: Dynamics of commercial catches and fish-species composition in the Vistula Lagoon (without herring).

2.2 Economic aspects

During the period until 2000 in Russia the only user of the lagoon was a fisheries collective farm with a total number of fishermen of about 150-200 with about 30-40 vessels. The transition of the Russian economy from planning based to market orientated has reduced the role of the fishery collective farm between 1990 and 2000 and caused the emergence of many small private enterprises. Nowadays, there are about 36 enterprises - ship-owners with more than 100 fishermen with full time employment. A license for anglers is not necessary. Fishery regulations are based on scientific estimation of the TAC (total allowable catch) for valuable species or the PC (possible catch) for non valuable species for every year. The TAC is divided into 10 types of quotas: commercial, coastal, scientific, educational, aquaculture, recreational, traditional, international waters, for non-residents in the EEZ, and freshwater. Each fishing company has a share of commercial quota fixed for 10 years and it can operate within this share. For every year a company applies for a fishing permission (license). A company has to report about its catch every 5 days.

In the Polish part of Vistula Lagoon 101 fishing boats operate (2013 Regional Sea Fishery Inspector in Gdynia). There are about 209 full time fishermen working on a regular basis. In recent years a growing interest of anglers fishing in the Vistula Lagoon is observed. Only one Inspectorate in Frombork in the 1980s was selling about 50 licenses per year. In the 1990s anglers already bought 100 licenses per year, in 2011 it was 700, and in 2012 already 920. In 2013 anglers bought already 600 licenses in the first half of the year.

2.3 Fishing gear and areas

Fishing exploitation of the Vistula Lagoon is mostly determined by the state of resources, therefore, the Polish and Russian fishing catches are determined by the use of similar methods. The rules are governed by the national law of each country. Besides of that the activities of entities such as the Joint Russian-Poland Fishery Commission or the Joint Baltic Sea Fishery Committee aim to unify rules for sustainable fisheries.

Generally, composition of fishing gear in the Vistula Lagoon depends on target fish species. Polish fishermen declare to use a greater variety of fishing gear.

There are five main gears which are used in specific times and areas:

1. fyke nets (FYK).
2. pot nets (FPO),
3. set gillnets (GNS),
4. trammel nets (GTR),
5. set hooks and lines (LLS).

However, generally Polish and Russians most often use similar methods and fishing gear. The most commonly used fishing gear with marked differences:

1. Bottom gillnet used for catching of bream and pikeperch; mesh size: Russia 70 mm; Poland 60 mm.
2. Bottom gillnet used for catching of roach, perch and sabrefish; mesh size: Russia 40 mm; Poland 36 mm.
3. Fyke net is targeted on eel, in spring bycatch of young pikeperch and bream can occur. In this case this type of fishing can be prohibited for some time; mesh size: Russia 14 mm; Poland 16 mm
4. Pound nets for catching herring in the spring (not later than the 31st May); mesh size; Russia 12 mm; Poland 16 mm.

Periods of prohibited fishing are also similar in both countries.

In the Russian part catching is prohibited from April, 20th until June, 20th in areas less than 2 km from shoreline with all gears excluding fyke nets for eel and traps for herring. On the Polish side this prohibition is applied for bream and pikeperch. It lasts from April 20th until June 10th and is valid in the entire lagoon.

Other more significant protective prohibitions of the Russian side are:

Prohibition of the use of gillnets with mesh size 70 mm and beach seines from April, 20th until August

Gear considered forbidden:

- trawls, seines and other towed gears;
- purse seines;
- towed drift nets;
- series of traps longer than 120 m with distance between series less than 100 m;
- series of bottom gillnets longer than 1000 m with distance between series less than 200 m.

Bycatch of fishes smaller than the minimal length is allowed to not more than 10 %

Bycatch of non target species is allowed to not more than 49 %.

Protected fish species in the Russian part of the lagoon are: salmon, vimba, whitefish.

In the Polish part of the lagoon are over 12 special areas of protection in which the partial or total ban on fishing is introduced. There are two corridors closed to fishing and the use of any type of gear is banned throughout the year. The northern corridor is 1500 m wide and extends from the Polish border to the Tolkmicko-Krynica Morska fairway. The southern corridor is 600 m wide and extends from the Polish border to the spawning grounds located in the coastal zone known as the Rózaniec spawning grounds. Protected areas are the mouths of the rivers.

15th August to 31th December is closed for fishing near river mouths. There are restricted times for fishing pikeperch and bream from 20th April to 10th June, and pike from 1st March to 30th April.

Total protection of fish species concerns: sturgeon, shad, twaite shad, sea lamprey and river lamprey. In order to protect the river lamprey in periods of spawning migration fishermen are obliged to use special selective sieves so that caught lampreys can escape from nets.

The restrictions regarding technical measures are published by the Regional Sea Fishery Inspector in Gdynia. The Regional Sea Fishery Inspector in Gdynia publishes also the number of vessels, maximum number of fishing gear per vessel, length of net sets and fyke nets, etc..

For Polish and Russian fishermen minimum landing sizes of some fish species are stated. The differences in these dimensions are presented in Table 1.

For pikeperch (walleye) and bream catch limits are set each year. Established in 2012, the total amount of the Vistula Lagoon fishing for these species are listed:

1. Bream 160 t
2. Pikeperch 100 t. The same quotas were established in 2013. This year's limit for one crew is set for about 2 t of bream and about 1.1 t of pikeperch.

Additionally, for protective reasons from 15th July to 13th September 2012, fishermen ceased fishing, then voluntarily joining the EU program in order to protect juveniles of these fish species. During the time when fishermen did not fish, compensation was paid. One crew could receive over 40 thousands zł (10 thousands euro) for 60 days of downtime.

In 2014 arrangements for protection plans in the Natura 2000 areas in the Vistula Lagoon will be implemented. Because of the necessity to reduce bird mortality caused by fishermen's nets further restrictions on fishing in the Polish part of the Vistula Lagoon are expected.

Russian data show that there are about 50 fishing sites on the coast that traditionally belong to the only Fishing Collective Farm. The other about 38 fishing companies have no access to that sites. This fact causes a conflict in spring during fishing of Baltic herring with pot nets. New fishing companies can only fish in the central part of Vistula Lagoon.

In Polish part about 80 fishermen crews operate. The fishery can be found across the whole Vistula Lagoon, there is no definite number of fishing sites. Most productive fishing sites are situated in border areas, along the Wysoczyzna Elbląska, along Nizina Warmińska and in the western region.

Table 1: Minimum landing sizes of some fish species (cm) in the Polish and Russian part of the Vistula Lagoon.

Species	Poland	Russia
Salmon	60	
Sea trout	50	
Eel	50	45
Pikeperch	46	46
Bream	35	35
Pike, burbot	45/30	50
Roach, perch	20/17	18
Sabrefish		32
Catfish	70	75
Vimba	30	28
White-fish	35	36
Herring	16	15

3 Aquaculture

3.1 Description of aquaculture in the region

The use of natural surface waters for aquaculture farms in Vistula Lagoon is hardly possible because of an overall lack of sites with suitable hydrological conditions and low salinity. In the Polish part such a type of agriculture is excluded and mostly forbidden due to environmental protection regulations. The fishery in the area of the Vistula Lagoon on the Polish side is expected to develop substantially towards the exploitation of natural resources.

Aquaculture in the Russian part of Vistula Lagoon has not been developed at all due to the fact that most of the important fish stocks are on high levels of reproduction and do not need artificial support. The only species which urgently demands restocking is the European eel. Russia has developed a national plan for artificial restocking of the Russian part of the Vistula Lagoon with glass eel. For this it is expected to install a big fish-breeding plant in Kaliningrad with federal money. Unfortunately the plan cannot be implemented due to a CITES ban on the export of glass eel outside the EU.

3.2 Importance of stocking and restocking

Historically, the most important restocking species was eel. In 1950-1980 the total catch of eel in the Vistula Lagoon was 390 t (Poland – 296 t, Russia – 94 t). This high production was reached by artificial yearly releasing of glass eel in the Polish part. Eel stocking was initiated in 1970 following a crucial decline in yield from natural recruitment, and stocking was successful in increasing eel abundance (Psuty 2010). Since 1995 the restocking has been cancelled, despite the poor natural recruitment of eel.

In the Polish part of the Vistula Lagoon by actions of the Polish Stocking Commission a systematic stocking is carried out with: eel, whitefish, wels, tench, pike.

For example in 2011 eel (*Anguilla anguilla*) was stocked with ca. 1700 kg fry, and in 2013 with ca. 4500 kg.

Additionally, every year Bauda river, Pasłęka river and Nogat river, which flow into the Vistula Lagoon are restocked by the Polish Anglers Association (PZW) in Elbląg.

In the year 2012:

Bauda: common dace (*Leuciscus leuciscus*) fry summer – 2,000 pieces, ide (*L. idus*) summer fry – 2,200 pieces, sea trout (*Salmo trutta m.trutta*) hatch – 8,000 pieces, brown trout (*Salmo trutta m. fario*) fry hatch – 9,000 pieces,

Pasłęka: common dace (*Leuciscus leuciscus*) fry summer – 16,700 pieces, asp (*Aspius aspius*) summer fry – 55,000 pieces ide (*L. idus*) summer fry – 39,300 pcs, pike (*Esox lucius*) hatch – 300,000 pieces, eel (*Anguilla anguilla*) fry – 3000 pieces, pikeperch (*Sander lucioperca*) fry summer – 50,000 pieces, sea trout (*Salmo trutta m.trutta*) hatch preying – 100,000 pieces, sea trout (*Salmo trutta m. trutta*) smolts – 2,500 pieces.

Nogat: burbot (*Lota lota*) hatch – 1,100,000 pieces, pike (*Esox lucius*), hatch preying – 2,000,000 pieces, ide (*L. idus*) summer fry – 150,000 pieces, asp (*Aspius aspius*) hatch preying – 1,100,000 pieces, asp (*Aspius aspius*) fry autumn – 188,000 pieces, tench (*Tinca tinca*) – ca. 400 kg, pikeperch (*Sander lucioperca*) fry summer – 300,000 pieces.

3.3 Future plans, scientific initiatives

The Vistula Lagoon is a very complicated knot of a variety of local, regional and global issues that largely depends on reliable information and the accuracy of predicting future scenarios related to the state of the natural environment. The ambitious goal of gathering a wide variety of data and information, and link them together in the form of a model founded the "implementation" of the project, supported by the Polish-Norwegian Research Fund "The environmental and spatial information as a basis for sustainable management of the Vistula Lagoon ecosystem," the acronym visla (PNRF 82-AI-01/07), conducted in 2008-2011.

The Vistula Lagoon is also monitored as part of the HELCOM Baltic Sea initiative.

It is worth mentioning the European Union project MANTRA that was carried out in previous years (1994-1996) by the Sea Fisheries Institute in Gdynia and the Atlantic Branch of the Institute of the Russian Academy of Sciences, Kaliningrad, which launched a series of initiatives for international research on these waters.

There are a few initiatives for Poland-Russia cooperation in the field of fishery and aquaculture:

- development of a trans boundary eel management plan for the basin of the Pregola river in the Vistula Lagoon;
- involvement of Russia in the implementation of the sturgeon reintroduction program of Poland;
- a good opportunity of cooperation might be a new cross-border cooperation program starting in 2014.

4 Management aspects

4.1 Management of fishery and aquaculture

The marine fisheries administration including the Minister responsible for fisheries and the Regional Marine Fisheries Inspectors regulate fisheries. They are both appointed and dismissed by the Minister responsible for fisheries, after obtaining the opinion of the local voivodships governor. The administration of marine fisheries is responsible for the territory and exclusive economic zone of the Republic of Poland. According to the legislation three Regional Inspectorates of Marine Fisheries (in Szczecin, Słupsk, and Gdynia) are established in Poland. The fishery in the Vistula Lagoon is administrated by the Inspectorate of Marine Fisheries in Frombork which is subjected to the Regional Inspectorate of Marine Fisheries in Gdynia.

Supervision of compliance with fisheries rules is conducted by the Regional Marine Fisheries Inspectors. Another task of the Regional Marine Fishery Inspector in Gdynia is to publish the number of vessels, maximum number of fishing gear per vessel, length of net sets and fyke nets etc..

Marine Fisheries Inspectors supervise fisheries in the field. Marine Fisheries Inspectors are authorized to take appropriate control activities.

They can control: identity documents, logbook, transport documents as well as documents to carry out sea fishing, etc. The inspectors also monitor the performance of fishing, fishing gear and marine organisms caught. Furthermore, they have the right to enter premises and to control ship, transport, storage, processing, and rooms that allow storage of marine organisms.

Fisheries Policy of the Russian Federation is defined in the Federal Law “On fisheries and protection of water bioresources” (2004). The meaning of protection of water bioresources refers to conservation of marine biological resources or restoration to the levels that can ensure the maximum sustainable yield (catch) of water bioresources and biological diversity, through the implementation of science-based measures for preservation, study, reproduction, management, rational use of marine resources and protection of their habitat.

To manage biological water resources in Russia is a very complex concept, including biological, fisheries and legislation matters. The structure of water bioresources can be described as shown in figure 8.

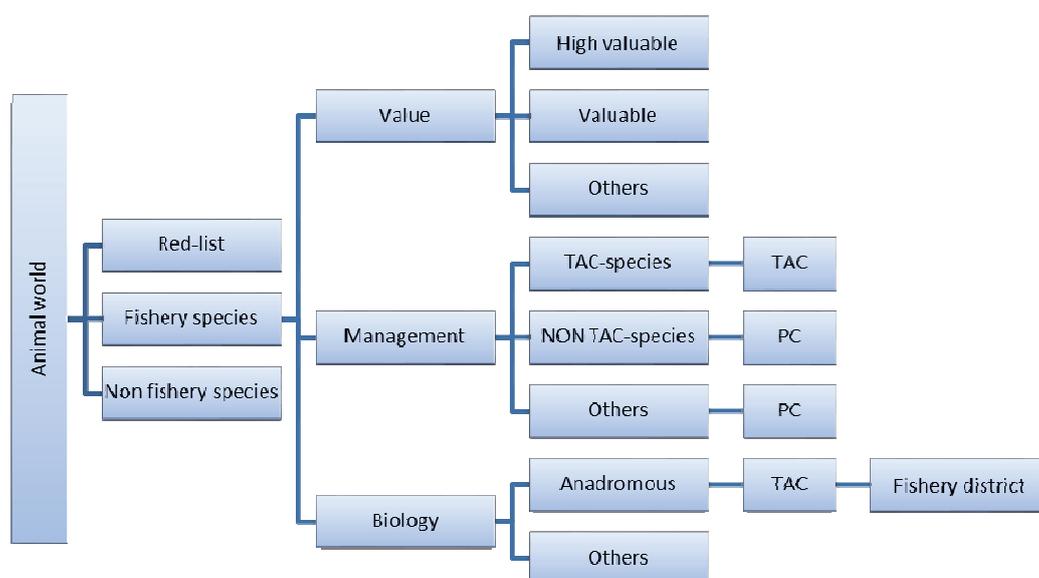


Figure 8: Structure of water bioresources according to Russian legislation.

Animal world – all living animals and plants. Use and protection are described in the Federal Law “On Animal World” (1995).

All living organisms can be split into three categories:

- species as objects for fishery
- non fishery species;
- protected red-list species – can be caught only for scientific purposes.

Fishery species then can be split into three categories:

- depending on value of species – high valuable (sturgeon), valuable (salmonids) and others. In correspondence to the value of a species water-bodies where they live can be of high, first and second category. There is a special ecological requirement for the protection of each water body category.

With respect to fishery management species can be:

- objects of fisheries for which the Total Allowable Catch (TAC) shall be estimated every year based on ecological expertise;
- objects of fisheries for which a simpler procedure is applicable – estimation of possible catch (PC) without ecological expertise;
- other species which exist as bycatch.

With respect to biology species can be:

- anadromous for which fishing is only allowed in fishing districts that belong to one owner;
- other species for which the management system that is described above is valid.

The structure and functions of fisheries management in the Russian Federation includes federal and regional levels and scientific support as well.

Federal level

The Ministry of Agriculture ensures the definition of fisheries policy;

The Federal Fisheries Agency (“Rosribolovstvo”) ensures legislative control of fisheries activities, monitoring and supervision of the use of water bioresources;

Territorial Branches of “Rosribolovstvo” ensure control and supervision of water bioresources at the level of fisheries basins. The Baltic Sea Region belongs to the West Fisheries Basin.

The West-Baltic Basin Agency for Reproduction of fish stocks is the responsible body for the implementation of the state programs for reproduction and improvement of fish habitat (melioration).

Regional fisheries regulations (rules) are developed for each fishery basin, which are approved by the Federal Fisheries Agency.

Regional level

The Agency for Fisheries and Fishing Industry Development of the Government of Kaliningrad Region ensures implementation of the fisheries policy at the regional level. The agency is responsible for the following tasks: concluding agreements with fishing organization for quota allocation, organizes auctions for distribution of fishing areas, develops and implements the regional programs.

The implementation of fisheries policy is carried out by development of state programs. Currently, the state program of the Russian Federation “Development of the Fishing Industry” (2013) is adopted. Two regional programs “The development of the coastal fisheries” and “The development of aquaculture” are implemented in the Kaliningrad region.

Fisheries science and research institutions execute state orders for the measurement of the total allowable catches (TAC) in the water bodies in Russia. All institutions are subordinate to the Federal Fisheries Agency. There are three fisheries research subdivisions with certain areas of responsibility in the Baltic Sea Region.

4.2 Responsibilities

The following state organizations are responsible for fisheries management and aquaculture development in the Russian part of the Vistula Lagoon.

- West-Baltic Territorial department of the Federal Agency for Fisheries – permitting, control. collection of fishery statistics, control on water environment. Chairmen Maxim Buduratsky. Kaliningrad, 236000, Kirova, 15.
- West-Baltic department for fish-breeding and organization of fishery – fish breeding, monitoring of fishing activity, protection and restoration of water environment. Chairmen Vladimir Lakashev, Kaliningrad, Morehodnaya, 4.
- Agency for fisheries and development of fishing sector of the Government of Kaliningrad oblast – promotion of fishing sector and aquaculture development, allocation of fishing sites, allocation of shares of quotas. 236000, Kaliningrad, Moskowsky prosp., 76.
- Atlantic Scientific Research Institute for the Fishery and Oceanology – monitoring of water bioresources in the lagoon, state of water environment, assessment of TAC, preparation of fisheries rules. 236000, Kaliningrad, Dmitria Donskogo street, 5.
- Kaliningrad State Technical University - monitoring of water bioresources in the catchment area of the lagoon, state of water environment, assessment of TAC, preparation of fisheries rules for rivers and lakes in the catchment area. 236000, Kaliningrad, Sovietsky prosp., 1.
- Kaliningrad Union of Fishing Collective Farms – association of fishermen responsible for lobbying of their interests on the federal and regional level.
- Baltic Scientific-Fishery Council – a council collecting representatives of local authority, scientific institutions, fishery companies, border guard and fishery organizations of Kaliningrad and Leningrad oblasts for development of fishery policy in the Baltic region.
- Federal Agency for Fishery in Ministry of agriculture (Moscow) – development and implementation of fishery policy and management.

The following state organizations and local fishermen groups are responsible for fisheries management and aquaculture development in the Russian part of the Vistula Lagoon.

- Departament Rybołówstwa w Ministerstwie Rolnictwa i Rozwoju Wsi, street Wspólna 30, 00-930 Warszawa, Fisheries Department in the Ministry of Agriculture and Rural Development,
- Okręgowy Inspektorat Rybołówstwa Morskiego w Gdyni, street Śląska 53/406, 81-304 Gdynia,
- Regional Inspectorate of Marine Fisheries in Gdynia,
- Inspektorat Rybołówstwa Morskiego we Fromborku,
- Inspectorate of Marine Fisheries in Frombork.

Fishermen who fish on the fishing grounds of the Vistula Lagoon are organized in local fisheries groups:

- Lokalna Grupa Rybacka “Zalew Wiślany”, Local Fisheries Group „Vistula Lagoon”, street Żeromskiego 14, 14-500 Braniewo.
- The Association of Fisherman in Tolkmicko. street Parkowa 25, 82-340 Tolkmicko. In order to protect the interests of fishermen and as a lobbying group in 2007.

4.3 Legal aspects

Russia

- Federal Law “On fisheries and protection of water biological resources”, 2004.
- Federaw Law “On aquaculture”, 2013.
- Fishery regulation for the West-Baltic fishing basin. 2012.

Poland

- Fisheries Act (Dziennik Ustaw Nr 62 z 2004r., poz. 574, z późniejszymi zmianami).
- Act on support of sustainable development of fishing sector using European Fisheries Fund from 3 April 2009 (Dziennik Ustaw Nr 72, poz. 619).
- Act on fishing market and financial support for fisheries from 22 January 2004 art.8 (Dziennik Ustaw Nr 34, poz. 291).

5 Area based management

Vistula Lagoon, because of its localization, has complicated conditions of management of living resources and their exploitation. Despite the relatively high productivity, fishing by fishermen from Poland and Russia show characteristics of competitive actions which can lead to occurring symptoms of over-exploitation. The sustainable management based on trans-border regulations has a special importance here.

Historical conditions and the related differences in the economic strategy pursued in both countries effect fisheries management on transboundary water body such as the Vistula Lagoon in different ways.

On the Polish side there is a predominance of regulations related to the unification of European Union law in this regard. In the Russian part of the Vistula Lagoon historical conditions during the former Soviet Union are tied to the operation of fisheries in the region.

5.1 Definition and regional status

Fishery grounds in the Polish part of the lagoon are generally available except for the protected areas that are excluded from fisheries. The distribution of fisheries between the fishermen is the result of years of tradition and arrangements in this regard.

In Russia, there are fishery districts where a company can conduct commercial and/or recreational fisheries. Most of them belong to fishing companies that have small quotas. However, 50 fishing sites on the coast traditionally belong to the only Fishing Collective Farm. The other 38 fishing companies have no access to these sites. This fact causes a conflict in spring during fishing of Baltic herring with pot nets. New fishing companies can only fish in the central part of Vistula Lagoon.

The redistribution of fishing districts is very urgent, but legislation for it has not been developed (Figure 9).

Aquaculture districts are areas where a company can provide artificial breeding of fishes, release them into the water and catch them for aquaculture. The law “On aquaculture” establishes a property right on released fishes.

This type of area management could be very useful for eel restocking in the Vistula Lagoon: a company which implements a restoration program in future will have the exclusive right to harvest the eel production.



Figure 9: Fishing districts established in the Russian part of the Vistula Lagoon

Application for a fishing license has to be submitted to the Fisheries Department in the Ministry of Agriculture and Rural Development through the Regional Sea Fishery Inspectorate in Gdynia, and a special fishing permit is issued by the Regional Sea Fishery Inspector in Gdynia.

The Minister responsible for fisheries:

1. the Regional Sea Fishery Inspector in Gdynia may suspend the license for a specified period of not more than six months, if the ship owner directed fishing of marine organisms during the closed season or in the protective circuit;
2. revoke the license, if:
 - a. the vessel was removed from the register of fishing vessels or
 - b. the operator has been convicted of an intentional crime committed by a fishing vessel, or the ship owner was punished in the previous two years for fishing for marine organisms during the closed season or in the protected area.

5.2 SWOT analysis

Strengths

Russia	Poland
<ul style="list-style-type: none"> • Strong fishery legislation • Governmental support of coastal fisheries • Governmental support of aquaculture and restocking • RU-PL coordination of TACs (TAC – total allowable catch) • Ecological expertise of TACs • RU-PL information exchange about fishery rules 	<ul style="list-style-type: none"> • Rich natural resources and landscape, which is dramatically different in the area of the Vistula Lagoon and its surroundings (one of the largest and most attractive Baltic Sea enclosures) and the area of the Vistula Spit, with wide beaches. There is also an attractive Elbląg Upland, richly structured and with woodlands at Vistula Lagoon and Lake Drużno. • A well-developed potential, industry, agriculture and tourism. Well-functioning, privatized companies with a large share of foreign capital • The fertile lands of Żuławy with a high valuation of agricultural space and water conditions, favorable conditions for an integrated and ecological farming (the production of high quality food) because of the relatively clean natural environment. • Location at the intersection of main roads and the reactivation of the seaport in Elbląg, having some importance in the freight transport and tourism. • Rich cultural heritage resources, including the world rank: Cutting Cathedral in Frombork, Elbląg Canal Museum "Stutthoff" at Stutthof, Old Town in Elbląg, including regional importance: many of the palaces and parks in small towns, Manor Park, the device rural communities. • The high probability of operational reserves of natural gas and crude oil (Frontier Exploration license area Poland). Proven reserves of mineral and thermal waters and peloids suitable for use in spas and table water production on the Vistula Spit (also in the area of Frombork). Proven reserves of peat and silt, to be used in therapy • Activity of local and regional municipalities, as reflected in the creation of associations of municipalities, the agreement on environmental protection and growth of economic revival, • Increasing the level of entrepreneurship of local municipalities. • Development of Higher Education • Caring for continuous upgrading of skills of human resources.

Weaknesses

Russia	Poland
<ul style="list-style-type: none"> • High level of centralization of fishery management • Pure management opportunity of regional authority • No fishing effort restriction • No coordination of scientific methods and approach • Lack of active gears usage • Not good integration of fisheries into coastal zone management • Lack of RU-PL on the level of fishermen and stakeholder 	<ul style="list-style-type: none"> • The occurrence of natural contradictions even at the junction of the natural environment and the intense economic development, anthropogenic processes, identified mainly in the form of flood hazard area Żuławy lagoon territories and municipalities • Major pollution of the Vistula Lagoon in coastal areas, fish spawning areas, the development of fisheries, significant contamination of the earth, illegal dumping. • A significant degradation of the cultural environment also expressed by undermining of spatial order (which results, among others: improperly rebuilding from the devastation of war, old town area), an aging over the years and unserviced housing in rural areas, building depreciation manor house which is in the use of the former state farms, discordant building of new housing clusters. • High unemployment and low income population, growth of negative social phenomena of a destructive nature. The emerging phenomenon of social depression rural high rates of population decline and population aging. • High need for renovation and modernization of transport infrastructure and technical support. Limitations resulting from the operation of transport systems. • A significant degree of uncertain power supply (an impediment to the creation of new businesses), a significant degree of under-investment in telecommunications infrastructure, lack of investment in the natural gas network, significant gaps in wastewater disposal (especially in the rural areas to the south and east side of the lagoon).

Opportunities

Russia	Poland
<ul style="list-style-type: none"> • Regional program “The development of the coastal fisheries” • Regional program “The development of aquaculture” • Cross-border cooperation programs • Development of eel program • Integration in field of sturgeon reintroduction 	<ul style="list-style-type: none"> • Favorable geopolitical situation is creating opportunities for multifaceted international cooperation in the Baltic Sea. • Local development policy region within the state regional policy and instruments of pre-accession policy in the future structure aimed at local development. • Geographical position, the position of the border, the development of cooperation with the Kaliningrad region and other regions of the countries of the Baltic Sea states. • International cooperation was initiated implemented on three main levels: first - based on international treaties and agreements on the government level, second - implemented by the provincial governors and provincial governments, third - implemented by municipalities and their compounds, as well as the institutions and bodies of economy. • Location in the pan-European system of determining the ecological relationships. General trends seen as an opportunity and at the same time an alternative opened up in the twenty-first century, of which the main elements are: the green belt around the Baltic and Scandinavian-Iberian route flights of birds. • Closeness to the Tri-City agglomeration and Kaliningrad region, the study area is within the range of large human potential impact: economic, scientific, cultural, and markets.

Threats

Russia	Poland
<ul style="list-style-type: none"> • Eel recruitment depletion • Changes of fish market requirements • Entering of Russia into WTO • Changing of fishery and environmental legislation • Project of channel building across Vistula Spit to the Baltic sea 	<ul style="list-style-type: none"> • Lack of stability of state policy in promoting regional development. • Overboarding pollution of surface waters of the Vistula Lagoon, which is a consequence of the loss of function of tourism in the eastern part of the Vistula Lagoon. • Barriers for economic and financial capital, a high degree of variability in financial regulations, limited financial capacity of municipalities and the development of local communities. • Poorly developed communication systems including: the waterways (no relevant parameters and the full availability of the road connecting the Vistula Lagoon) • Clogged waterway network (Ren - Odra - NOTEĆ - Wisła - Nogat), road wheel (do not undertake investments Elblag - limit state - unblock roads Kaliningrad - Elblag, with the border crossing in Grzechotki, which is the one link, the Via Hansa, between Hamburg - Szczecin - Gdansk - Elblag - Kaliningrad - Riga, insufficient other roads making up the system of national calls: especially Elblag - Malbork. • Transport policy of the state, the result of which is to eliminate railroad lines, neglected waterways system and greatly increased investment in maintenance of roads that due to the excessive load are in progressive degradation, which also has a negative impact on the environment. • Underinvestment in the supply of gas, especially on the Vistula Spit, an area that requires a change in the system of thermal power generation because of the natural beauty.

5.3 Cross-border cooperation and exchange

The first bilateral meeting at the ministerial level took place in 1952, and the first agreement concerning fishery gear issues, minimum mesh sizes, and fish landing size was issued. It was concluded that a ban on trawling with small mesh sizes should be implemented, since this threatened juvenile fish. At the next meeting, in 1958, the most important issue was determined to be keeping **pikeperch** and **breem** catches at the level of the 1957 landings. In 1960, it was decided that catch limits (TAC – total allowable catch) for these two species should be set at the level suggested by Polish and Russian scientists. It is of note that the scientific advice to the national administrations was sometimes incongruous, thus some regulations were created more with political aims than truly ecological ones in mind. Additionally, these catch limits were not founded on true modeling of stock sizes based on analytic methods such as VPA (virtual population analysis), but rather on the mean length and weight values of commercial catches as well as factors derived from Russian fall trawl surveys. Meetings were held every 2 years except between 1988 and 1993. During this period of rapid socioeconomic change in Poland, contact was suspended with the Russian Kaliningrad district

(following the collapse of the Soviet Union in 1992). A new treaty based on prior cooperation was signed in 1993, and it was agreed that the tradition of biannual meetings should be maintained.

For the development of cooperation in the field of water bioresources management in the Vistula Lagoon under the new political situation the governments of the Russian Federation and the Polish Republic signed an agreement in 1995. This agreement established the Joint Russian-Poland Fishery Commission. The commission organizes work session once a year and meetings of working groups for specific questions ones or several times a year. By the end of 2011, there had been 11 sessions of the joint commission. Main topics are discussed on the sessions: adaptation of quotas for some species, exchange of catch statistic etc..

During the last, the 12th session, 2012 in Warsaw these topics were discussed:

- information of changes in fishery management, legislation, structure of authority in partner states;
- exchange of catch statistics;
- adaptation of quotas for some common valuable species (bream, pikeperch, herring);
- harmonization of certain control measures for fishing;
- development of joint plans for management and stock restoration.

Another aspect of the cooperation was the organization of the Joint Baltic Sea Fishery Committee in 2010 for the purpose of efficient cooperation in the conservation and sustainable exploitation of aquatic biological resources. The parties exchanged information concerning legal regulation documents already available and being under preparation for fishery management in the Russian Federation and the European Union. The JBSFC discussed issues of importance for the bilateral cooperation of Russia and Poland, for example: the participation of Russia in the restocking eel program, rehabilitation of sturgeon in the transboundary rivers of Russia and Poland, development of a bilateral Russian-Polish eel management plan.

6 Lessons learned and outlook

The main lesson for fishermen in the Vistula Lagoon was the conclusion that resources are limited. Thus, sustainable fishery is the only option for the optimal management of resources at the international level.

The Vistula Lagoon is a transboundary water body and sustainable fisheries cannot exist without the constant interaction between the two countries - Russia and Poland.

Official platforms for interactions are:

- Joint Russian-Poland fishery commission;
- Joint Baltic Sea Fishery Committee.

Many aspects of this cooperation and joint management of the operation and protection of the resources require further refining.

These aspects include for example: overworking the system for reporting the size of catches and especially bycatches together, balancing efforts to the recovery of resources (investment funds associated with stocking), unification of nature protection activities in the Vistula Lagoon balanced in both countries associated with limiting fishing intensity.

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Address:

Aneta Kozłowska
Green Federation GAJA,
5 Lipca 45,
70-374 Szczecin, Poland

anetak@gajanet.pl



Fisheries management in the Curonian Lagoon

Tomas Zolubas¹, Antanas Kontautas¹ & Sergey Shibaev²

¹Klaipeda University, Lithuania,

²Kaliningrad State Technical University, Russian Federation

Abstract

The fisheries sector is an integral part of the Baltic Sea coastal regions and their economies. The fishery sector is traditionally important in terms of employment, social life and regional identity. But not all fish stocks are fished within their natural limits. The management of Baltic Sea stocks must be improved and alternatives such as aquaculture, restocking and stock enhancement should be taken into consideration. Stocking measures for recreational fisheries is one of the ways to attract tourists and help revitalize the fishery sector. Integrating aquaculture and fisheries management should improve a sustainable regional development in the Baltic Sea region. Area-based-management for fisheries aims to conserve and rebuild fish (and mussel) stocks within their natural borders through development of a regionalized regulatory structure that takes into account local biological and economic factors.

The focus of the case study is to find and to understand the linkage between fishery and aquaculture in the Lithuanian-Russian cross-border area – the Curonian Lagoon.

1 Introduction

1.1 Curonian Lagoon

The Curonian Lagoon is a shallow semi-enclosed and almost freshwater body which is located on the southeastern rim of the Baltic Sea. It is the largest Baltic Sea lagoon. The Curonian Lagoon is separated from the Baltic Sea by a narrow (0.5-4 km) sandy spit (Galkus & Jokšas 1997) having the surface area of 1,584 km² (Chervinskis 1959). Its basin area is 100,500 km². Total volume of water of the lagoon is approximately 6.2 km³. The lagoon is rather shallow - its average depth is only 3.8 m, maximum depth is 5 m. Isobaths of 3 m circumscribe more than 2/3 of the lagoon (Rainys 1978). The Nemunas river provides the main water inflow into the Curonian Lagoon, which discharges to the Baltic Sea. The Nemunas river brings 98 % of the total freshwater runoff (23 km³) and enters the lagoon in its central area, dividing the water body into different hydrological zones (Jurevičius 1959; Razinkovas et al. 2005). The Nemunas river delta with a maze of river branches, canals, polders and wetlands is protected as a wetland of international importance under the Ramsar convention and as a regional park. The Nemunas delta is important for migrating and breeding fish.

The Curonian Lagoon is a complex ecosystem with many interacting processes. It is an open system, influenced by the exchange of freshwater from the Nemunas and other smaller rivers and saline water of the Baltic Sea. Water salinity in the northern part of the lagoon may fluctuate between 0.1-7 PSU and representatives of marine, brackish and freshwater species live there. The lagoon itself is predominantly freshwater due to the discharge from the Nemunas and other smaller rivers. However, depending on wind direction, affecting brackish water inflow from the Baltic Sea, the salinity in the central and northern parts may episodically increase up to 5-6 PSU (Dailidienė & Davulienė 2007). Brackish water intrusions are most common during August to October when 70 % of the total annual input occurs (Pustelnikovas 1994).

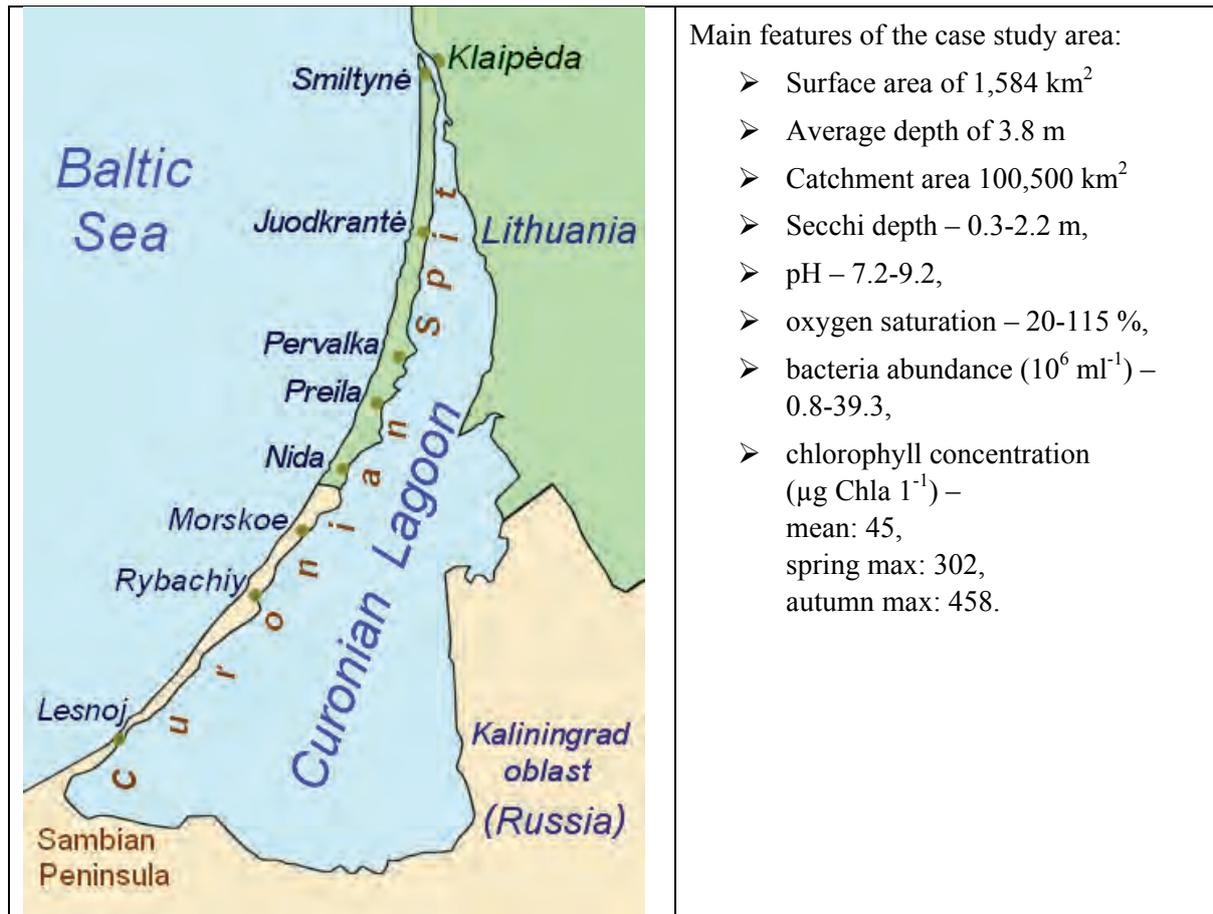


Figure 1: Main features of the case study area

A very small depth, active water dynamics and intensive sedimentation in the lagoon considerably affect the sediment distribution patterns and their changes over time. The dominant bottom substrates are sand, silt, and shell deposits. Mud only prevails in the southern part of the Curonian Lagoon, i.e. in the zone of intensive sedimentation (Trimonis *et al.* 2003). Due to the high substrate variability and the high freshwater input from the Nemunas River, the Curonian Lagoon belongs to one of the most macrozoobenthos diverse estuarine areas of the Baltic Sea (e.g. in comparison with Vistula Lagoon, Szczecin Lagoon, Boddens of Darß- Zingst) (Zettler & Daunys 2007 and references therein). The recent macrofauna inventory compiled for the littoral zone of the lagoon includes approximately 280 benthic species (Zettler & Daunys 2007). Salinity is the main factor determining benthic species distribution in the Curonian Lagoon (Daunys 2001). Benthic fauna in the strait area is a mixture of freshwater and euryhaline organisms, with a total of 49 benthic and nektobenthic species identified (Bubinas & Vaitonis 2003). The lagoon has been heavily polluted from a combination of shipping, military and industrial sources.

Due to pollution, overfishing, dam building and natural changes of the lagoon ecosystem during the last 100 years some fish species populations were violated and lost their role in fishing industry. For example, the catch of white-fish has declined from 100 t in 1934 down to zero, vimba from 265 in 1960 down to 3 t in 1994, eel from 482 t in 1966 down to 0.1 t, pike from 190 t in 1960 down to 10 t.

1.2 Description of the cross-border area

Two countries share the Curonian Lagoon: the Lithuanian Republic and the Russian Federation. The border between the two countries divides the lagoon into a smaller, northern part, in Lithuania (413 km²) and a bigger, southern part, in Russia (1,171 km²). The Curonian Lagoon siding Lithuania

occupies 413 km², an additional area of similar size can be flooded in the lower reaches of Nemunas river during spring.

Historically the Curonian Lagoon is divided into 3 parts:

- the northern part - transitory: where hydrodynamic is more active (corresponding to low residence times), due to sea-lagoon water exchange and to the river runoff (belongs to Lithuania),
- the middle part (Vidmarės) - intermediate: between transitory and stagnant (belongs to Lithuania and Russia),
- the southern part (Būduma) - stagnant or limnic: characterized by fine sediment and poor water renewal (belongs to Russia).

In the Republic of Lithuania and the Russian Federation Kaliningrad Oblast the Curonian Lagoon waters are of high fish productivity. Fishing of Lithuanian fishermen on the Russian side and Russian fishermen on the Lithuanian side is not allowed according to the law since the mid 1990s.

2 Fishery

2.1 Ecological aspects

The large water body, peculiar geological structure and geographical location of the Curonian Lagoon result in a large and multiple freshwater ichthyofauna complex, and a permanent or temporary habitat for migratory and marine fish species. As many as 58 fish species have been registered in the Curonian Lagoon, among them very rare species included in the Lithuanian and Russian Red Lists and protected, as well as fish species of importance for commercial fishery (Table 1).

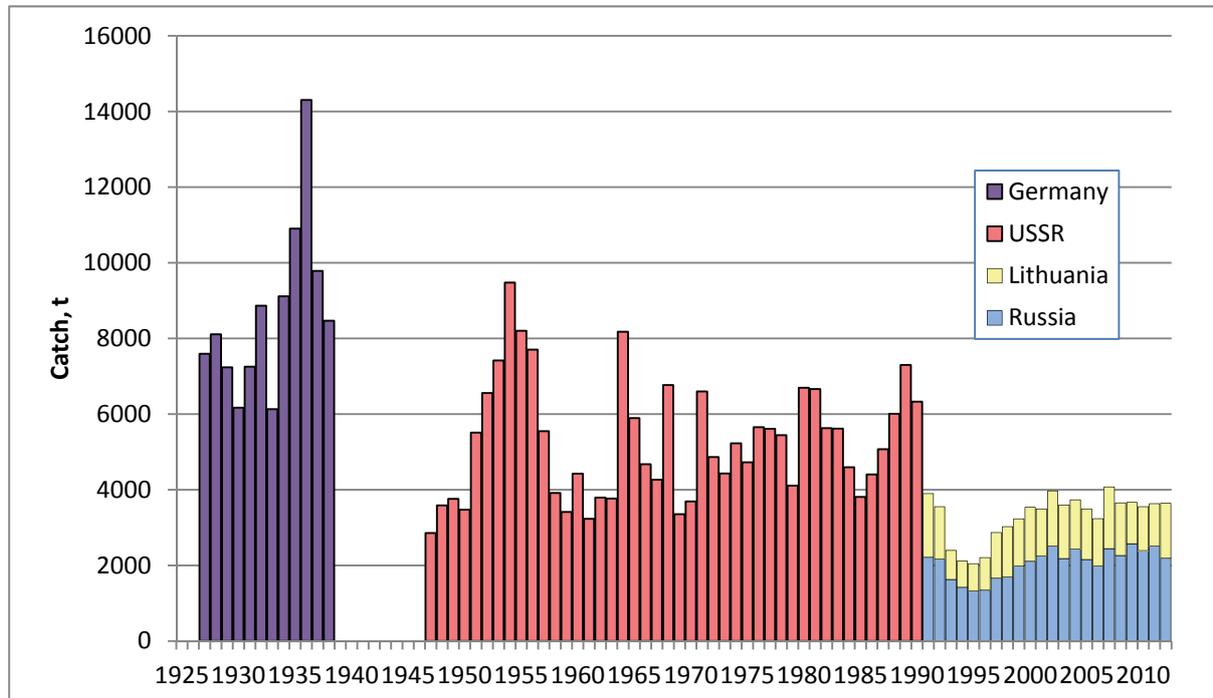


Figure 2: Dynamics of total catch of main species in the Curonian Lagoon.

The water body is fertilized by mineral and organic materials from the Nemunas river basin, therefore it typically has a huge abundance of zooplankton and zoobenthos – fish food organisms. In the Republic of Lithuania and the Russian Federation Kaliningrad Oblast frontier the Curonian Lagoon

waters are of high fish productivity. During pre-war years, in 1927-1938, when the average total catch was 51,6 kg/ha, the population part of short-cycle types – smelt, ruff, perch and roach – made even 92 %. While the catch of whitefish, pike, bream, sander and eel is only 4 %. In recent years fishing in the Curonian Lagoon has been quite intense. In current years the catches of Lithuanian fishermen in the Curonian Lagoon and the Lower Nemunas are 1.1-1.5 thousand t of various fish species, Kaliningrad fishermen catches are even greater (2.0-2.5 thousand t). 15-20 years ago in the Lithuanian part of the Curonian Lagoon commercial catches of fishes reached about 2 thousand t. The total catch in the Lithuanian part of the lagoon was 955 t, and in the Russian part 2,902 t in 2012. Since 1927 the maximum commercial catch of 14.3 thousand t was reached in 1936 and the minimum in 1995 – 2.0 thousand t. The long term average catch is about 5.2 thousand t (Figure 2). At present catches are in the stable low level.

Table 1: The most important species for fisheries are the following:

For Lithuanian fishermen	For Russian fishermen
<i>Sander lucioperca</i> (Linnaeus, 1758) – pikeperch;	<i>Sander lucioperca</i> (Linnaeus, 1758) – pikeperch;
<i>Abramis brama</i> (Linnaeus, 1758) – bream;	<i>Abramis brama</i> (Linnaeus, 1758) – bream;
<i>Rutilus rutilus</i> (Linnaeus, 1758) – roach;	<i>Rutilus rutilus</i> (Linnaeus, 1758) – roach;
<i>Vimba vimba</i> (Linnaeus, 1758) – vimba bream;	<i>Pelecus cultratus</i> (Linnaeus, 1758) – sabrefish;
<i>Osmerus eperlanus</i> (Linnaeus, 1758) – smelt;	<i>Osmerus eperlanus</i> (Linnaeus, 1758) – smelt;
<i>Perca fluviatilis</i> (Linnaeus, 1758) – perch.	<i>Perca fluviatilis</i> (Linnaeus, 1758) – perch.

Fish catches composition is provided in Figure 3, dynamics of the main fish species catches is provided in Figure 4 for both Lithuanian and Russian parts of the Curonian Lagoon.

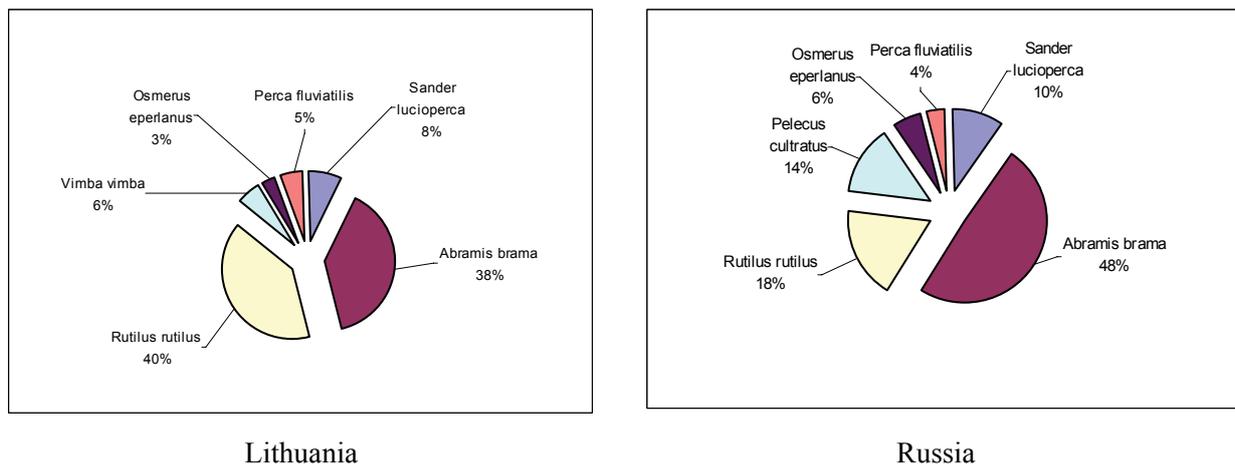


Figure 3: Fish species composition of commercial catches in the Curonian Lagoon.

The Curonian Lagoon fish community structure shows remarkable seasonal changes, associated with migrations of diadromous fish and lampreys and seasonal freshwater fish migrations to the sea (Ložys 2003). Fishes also migrate inside the Lagoon between the southern and the northern parts. The Curonian Lagoon, as other similar type estuaries, is very important not only as a feeding place for many freshwater or diadromous fishes, but also as a spawning and juveniles schooling habitat. Diadromous fishes migrate across the Lithuanian Curonian Lagoon part to spawn in the Nemunas river

basin. The Nemunas river delta is the most important spawning place for fishes in the Curonian Lagoon. It is one of the most productive water areas in Europe. In recent decades its commercial production was 36-40 kg/ha. Fishermen catch consists of about 20 commercial fish species. 60 % of catches consists of roaches and breams, 20 % of smelts and ruffs, and 20 % of other species, mostly pikeperch, perch and stickleback. At present about 70-80 % of the community consist of non-predatory fishes, while predators and migratory fishes comprise 10-15 % each. Though, recently the Curonian Lagoon fish resources are being exploited intensively, bigger changes neither in commercial, nor in experimental catch structure are noticed. Commercial catch structure changes could become possible only after constant stocking with valuable fish juveniles.

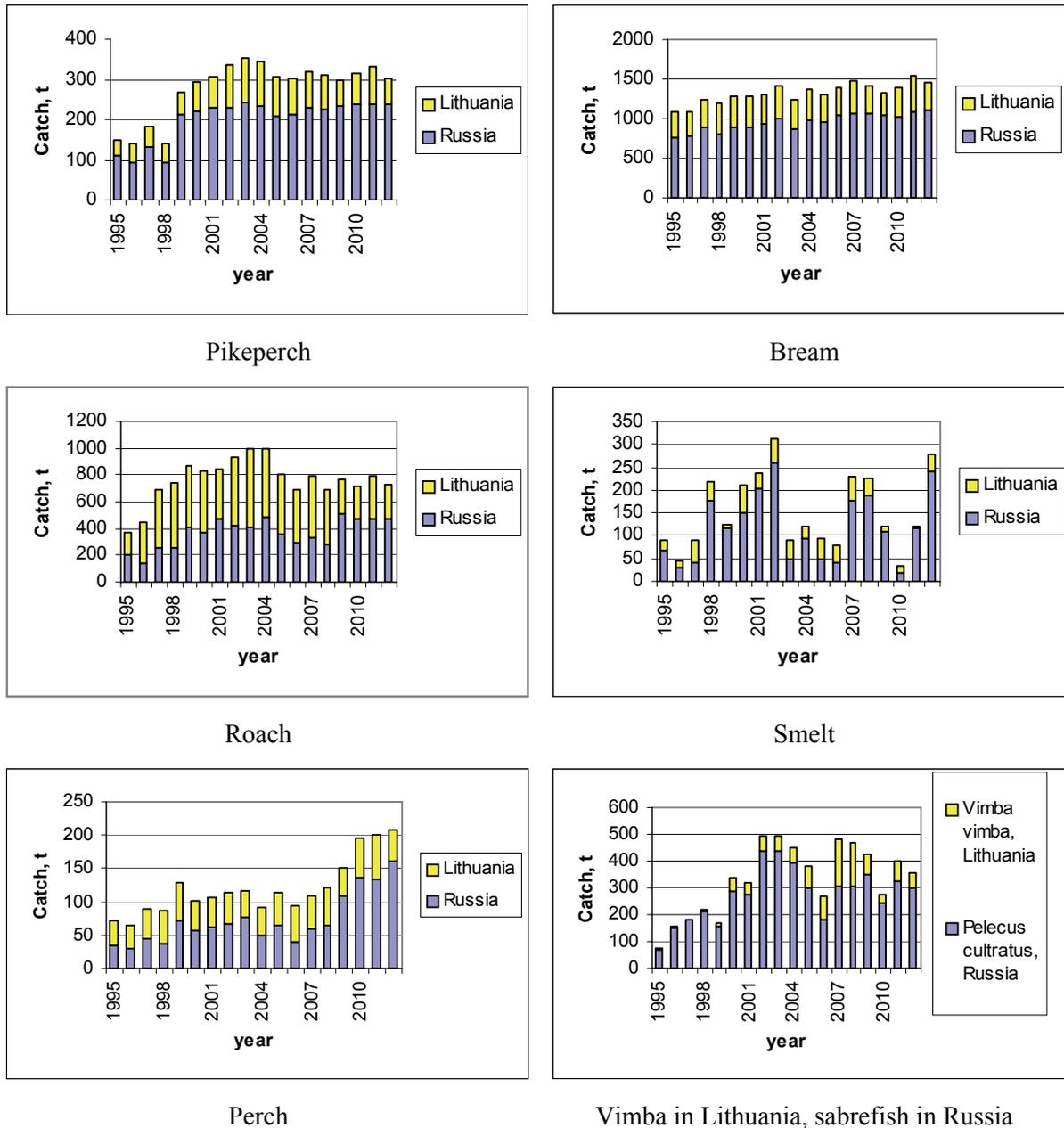


Figure 4: Dynamics of catches of main fish species in the Curonian Lagoon.

Recreational fishery

Long periods of prohibition of net fishing in spring and summer leave fishermen without work and income for long months, which is the period of high demand for recreational fisheries generated by 0.5 million Lithuanian anglers and holiday-makers. Without doubt, people should be able to use their skills and knowledge about fish until they find a new source of income. Such opportunity would be feasible if part of the fishermen could become specialists of recreational fisheries. Know-how of recreational fisheries and basic information about fisheries tourism should be relevant to businessmen of the fisheries sector who plan to pursue their operations. At least 80,000–100,000 amateur anglers may fish in the Curonian Lagoon and the lower Nemunas river every year, while the number may double during the cold winter suitable for fishing of smelt and perch. The intensification of amateur-recreational fisheries could have a negative effect on the catch and resources of predator fish species: pike, burbot, sheatfish, perch and pikeperch – in the coastal region because currently many anglers specialize on predatory fish. Therefore, the intensity of the angling mostly affects the numbers of predatory fish in the Curonian Lagoon and the lower Nemunas river. Recreational fishing business may be an alternative to earn money for fishermen, who withdraw from the commercial fishery.

On the Russian part of the Curonian Lagoon the most popular fish species for anglers are perch, roach, smelt, bream and pikeperch. The number of anglers coming to the lagoon depends on season: on wintertime weekends it can reach a few thousand per day. There is no daily limit of catch per person. Sometimes one angler can catch more than 100 kg of perch, but the average catch is about 0.5-2 kg.

2.2 Economic aspects

Fishery in the Curonian Lagoon is mostly a family business. The manual work dominates. In the same company very often people from the same family work. Resorts situated in the Curonian Spit are the main income resource in the summer time, because then smoked fish have the biggest demand and price. The majority of fishing boats are old, built 20 years ago. The Lithuanian fishermen catches during the period of 2000-2012 fluctuated between 1,000-1,400 t, Russian fishermen catches between 2,000-2,900 t. About 150 fishermen fish in the Lithuanian part and 200 fishermen in the Russian part of the Curonian Lagoon. From 2009 till 2012 the number of Lithuanian fishing companies decreased from 71 to 44. The main reason for the decrease in the number of fishing companies is that in 2009-2012 Lithuanian fishing companies used European Fisheries financial compensations for reorienting from commercial fishing businesses to recreational leisure fishing businesses. 21 fishing companies got financial support and 81 vessels withdrew from the fishing business. 6 fishing companies merged with others. On the Russian side quotas have been distributed to each company based on a historical approach for the period of 10 years. Due to this no big changes in the number of fishing companies and fishermen is possible and 36 fishing enterprises operated in the lagoon in 2012.

2.3 Fishing gears and areas

Fishing sites in the Curonian Lagoon

There are 31 fishing sites in the Lithuanian part of the Curonian Lagoon (Figure 5). Lithuanian fisherman must fish only in the sites, which are stated in the fishing license.

The most important sites for fishermen are:

- close to the Lithuanian-Russian border,
- along the Curonian spit,
- around the mouth of the river Nemunas (sites are mostly important during fish migration periods).

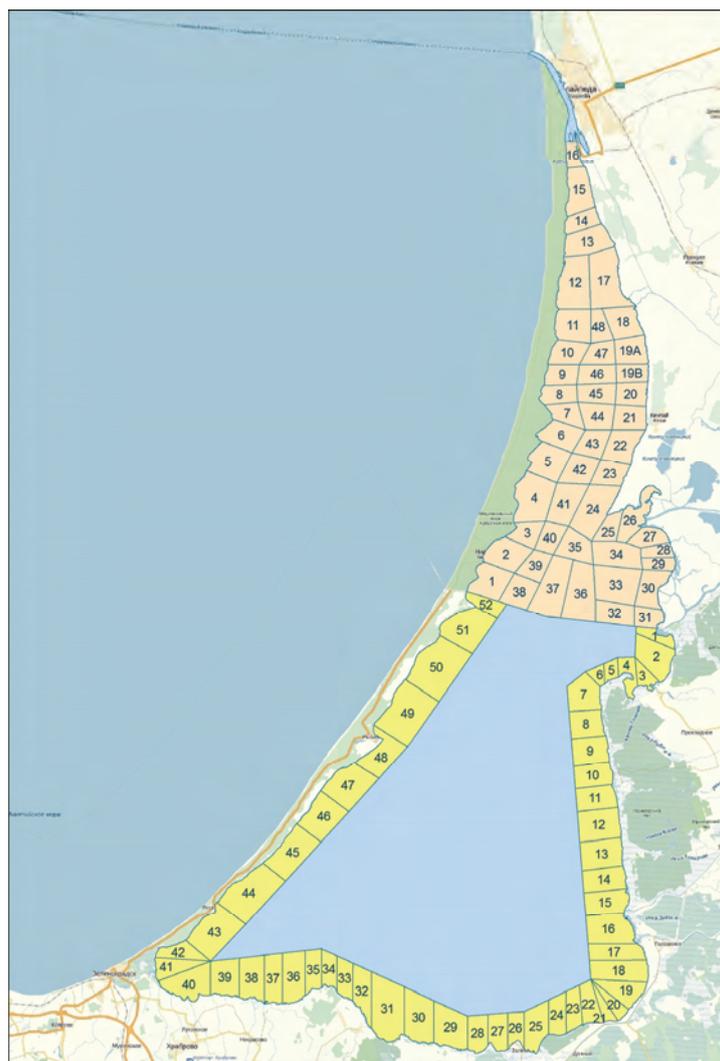


Figure 5: Fishing sites in the Lithuanian and Russian parts of the Curonian Lagoon.

There are 52 fishing sites on the Russian part of the Curonian Lagoon (Figure 5). They are remains from the Soviet period, but the status of the sites has not been clearly defined, yet. Most of them are distributed to the former Fishing Collective Farm, despite its decreasing role in the fisheries.

The mentioned fishing sites on the coast traditionally belong to the only Fishing Collective Farm. The other 36 fishing companies have no access to those sites. This fact causes some conflicts with new fishing companies.

Fishing gears

Fishermen of both countries use almost the same fishing gear types: gillnets (two types: 40-45 mm mesh size gillnets, 70-80 mm mesh size gillnets), trap-nets (five types: eel trap-net (some of them with special selective insert for juveniles bycatch decrease), smelt trap-net, lamprey trap-net, stickleback-ruffed trap-net, big mesh size trap-net), seines, long lines, drift nets. Selection of fishing gear in the Curonian Lagoon depends on the target fish species. There are four main gears, which are used in specific times and areas:

1. **70-80 mm mesh size gillnets** are used to catch bream and pikeperch in different places of the lagoon in the period from July till April;
2. **40-45 mm mesh size gillnets** are used to catch roach, perch, vimba and sabrefish. To target the latter species the net is not staked on the bottom, but in midwater position.

3. **trap-nets** (five types: eel trap-net (some of them have a selective insert), smelt trap-net, lamprey trap-net, stickleback-ruffe trap-net, big mesh size trap-net). Each trap-net differs from other types by a distinct trap-net construction and special mesh sizes in the wings and in the bags. Target species and adequate mesh size gives the fishing gear its name.
4. **seines** are used to catch smelt in spring during its spawning migration from the Baltic sea into the Curonian Lagoon and the river Nemunas (Figure 6).



Figure 6: Smelt is caught by a towed seine at night and landed (photos: Pavel Baranovski).

2.4. Restriction of fisheries

Different fishing ban periods and restricted areas are established for different fishing gears. The aim of restrictions is to guarantee free fish migrations and successful spawning. In some periods, fishing activities are restricted for all fishing gear types. Every fishing gear type has its own restriction period and/or area.

Restricted areas in the Curonian Lagoon

All year around fishing activity is prohibited in almost all Nemunas delta regional park waters, Kniapo bay; 14, 15, 16 fishing sites (Figure 5), Klaipėda Strait (Lithuania), the mouth of the river Nemunas and adjacent areas, the mouths of some important rivers for fish spawning (Russia).

Restricted periods and gear in the Lithuanian part of the Curonian Lagoon:

1. from 20th of April until 31st of August, 40-45 mm mesh size gillnets;
2. from 20th of April until 15th of July, 70-80 mm mesh size gillnets;
3. from 20th of April until 31st of August, beach seines;
4. from 20th of April until 15th of July, big mesh size trap-net;
5. from 20th of April until 1^h of December, smelt trap-net;
6. from 1st of November until 30th of April, eel trap-net;
7. from 15th of December until 15th of September, lamprey trap-net;
8. from 1st of January until 15th of October, drift nets;
9. from 1st of June until 1st of April, stickleback-ruffe trap-net;

10. from 1st of July to 31st of August fishing with gillnets is only allowed during the dark period of the day.

Restricted periods and gear in the Russian part of the Curonian Lagoon:

1. from 20th of April until 20th of June, in areas less than 2 km from shoreline by all gears excluding eel trap-nets and traps for herring;
2. from 20th of April until 20th of August, gillnets with mesh size 70 mm and beach seines;
3. from 20th of April until 31st of August, by all fishing gears, except targeting roach, perch, sabrefish.

Protected species:

All species of brown trout are included in the Lithuanian and Russian Red Lists. It is forbidden to target vimba, whitefish and twait shad, as well as smelt, when the fishes return after spawning (Lithuania). Salmon, vimba, and whitefish fishing are forbidden (Russia).

Forbidden gears:

- trawls, purse seines and other towed gears;
- towed seine, with lengths of more than 500 m;
- towed drift nets;
- drift nets, with a mesh size smaller than 70 mm (Lithuania);
- series of traps longer than 120 m with distances between series less than 100 m;
- series of bottom gillnets longer than 1,000 m with distances between series less than 200 m.

Minimum mesh size:

1. for seines, fyke nets and traps:
 - bream, pikeperch – 30 mm (Russia), bream, pikeperch, pike, burbot – 30-32 mm (Lithuania);
 - roach, perch, sabrefish – 20 mm;
 - smelt, ruff, stickleback, bleak, lamprey – 5 mm (Russia), - 5-10 mm (Lithuania);
 - herring – 12 mm;
 - eel – 14 mm (Russia), 18-20 mm (Lithuania),
2. for gillnets:
 - bream, pikeperch, pike, chub, catfish, burbot – 70 mm (Russia), 70-80 mm (Lithuania);
 - roach, perch, saber fish, tench, rudd, ide – 36 mm (Russia);
 - roach, perch, silver bream – 40-45 mm (Lithuania);
 - smelt, bleak – 16 mm (Russia);
 - smelt, herring – 16-20 mm (Lithuania).

Minimum landing size for fishes:

- eel – 45 cm;
- pikeperch – 46 cm;
- bream – 35 cm;
- pike, burbot, asp – 50 cm;
- tench – 30 cm;

- roach, perch – 18 cm;
- catfish – 75 cm;
- sabrefish – 32 cm;
- vimba – 28 cm (in the Lithuanian part of the Curonian Lagoon – 30 cm) ;
- whitefish – 36 cm.
- Not more than 10 % bycatch of undersized fish is allowed.
- Not more than 49 % bycatch of non-target species is allowed.

3 Aquaculture

3.1. Description of aquaculture in the region, importance of stocking and restocking

The artificial reproduction of water bioresources has a long history and was carried out with state funded budgets in the former Soviet Union in both countries. The transition period to the market economy demanded changes of the water bioresources management system and artificial reproduction due to: 1) implementation of a new legal framework; 2) change of ownership for hatcheries and breeding plants; 3) change in the system of financing; 4) introduction of new innovative technologies.

Reproduction is carried out with the aim to increase the number of commercial fish species and for the conservation of biological diversity. The process of artificial reproduction can be carried out in two forms:

- restocking – for preservation or restoration of biological diversity. Controlled by the Russian Federal and Lithuanian State authorities and supported by the funds of Federal and State budgets;
- stocking – for forming and increasing of commercial fish stocks. In Russia this system is close to “sea-ranching” and especially well developed in the Far East for stocking of salmon.

Currently artificial reproduction of aquatic biological resources in Russia is determined by the Federal Law "On fisheries and protection of water-bioresources" (2006-2012). Plans for artificial reproduction are approved annually for traditional commercial fish species. For example: in the Baltic Sea Region, more specifically in the Leningrad region - for salmon, whitefish and lamprey larvae; in the Kaliningrad region – for whitefish. Scientific support and environmental impact assessments are needed to add new objectives to the management plan. Prices for the reproduction at different stages of life cycle (eggs, larvae, fry, fingerlings) are set by the state. Artificial reproduction can be carried out by both state and private enterprises. To earn money with the breeding they have to submit a tender to the Federal Fishery Agency. The organizations, which get a contract, sign an agreement on releasing certain quantities and qualities of fish fry. Fisheries authorities control the process of the releasing of fish. General provisions for fisheries management in the fishery areas are defined in the Federal Law “On fisheries and protection of water-bioresources”, but the basic regulatory requirements are set in the current law "On Aquaculture" (2013).

The Federal Law “On Aquaculture” has been adapted in July, 2013. It gives new opportunities for development. The law establishes: main definitions concerning aquaculture, principles of state regulation of aquaculture, proprietary rights on aquaculture facilities and breeding fishes, governmental support of aquaculture, organization of aquaculture business.

The main problems of artificial reproduction are:

- Lack of manufactures to produce caviar. For most of the fish hatcheries in the Leningrad region it is impossible to catch the required number of fish in nature due to the low level of stocks, in particular salmon and sea trout.
- Lack of coordination and harmonization of restocking programs. Most of the water-bodies are cross-border areas, but the EU implements fisheries policies without coming to an agreement with

Russia. That reduces the efficiency of restocking efforts. For example, restocking in the Lithuanian basin of the river Šešupė may be inefficient, since a dam is built on the Russian territory of the river that could prevent the migration of eels to the Baltic Sea.

- Lack of technology exchange in aquaculture. Thus, the adoption of new technologies that could increase the efficiency of reproduction facilities in Russia is restrained.

Stocking/ restocking in Lithuania is determined by regulation of the Ministry of Agriculture and Environment “On rules of fish farming in the state water bodies.” (2013). The regulation sets rules for stocking/ restocking procedures in the state water bodies and establishes a list of minimal norms for fish and crayfish stocking/ restocking, describes the annual plans for the stocking/restocking processes in the state water bodies including preparation and confirmation. The regulation also describes the control of fish breeding and fish release to water bodies. The Minister of Agriculture has to approve the annual plan for stocking/ restocking, before it is issued. The Fisheries Service under the Ministry of Agriculture of the Lithuanian Republic implements the plan. The Fisheries Service has 7 separate divisions, which have facilities for breeding and growing fish. In 2011 the Fisheries Service bred and released 29, in 2012 30 millions of juvenile fish, 87 % of them burbot, pike, and pikeperch. One of these divisions’ aquaculture facilities is situated near the Curonian Lagoon, in the small city Rusne.

Aquaculture in the Curonian Lagoon region

Aquaculture in the Curonian Lagoon region is developed relatively weakly. Four aquaculture facilities are situated on Lithuanian and one on Russian territory.

The first aquaculture facility for stocking/ restocking purposes is located in Rusnė (Lithuania) and belongs to the governmental institution Pisciculture Division Rusnė Subdivision of Fisheries Service under the Ministry of Agriculture of the Republic of Lithuania. Address: Šyškrantės village, Rusnės parish, Šilutės District, LT- 99344, Lithuania. The facility produces: burbot, catfish, pike and juveniles of perch, eel, sturgeon, and brown trout for stocking (see Table 2).

The second aquaculture facility, an experimental whitefish breeding plant is situated on the Curonian Spit (Lesnoe village, Russia). It belongs to the governmental institution Zapbaltrybvod and was founded in 2010 for restocking of whitefish in accordance with the Russian State Program. Production: annual release 150,000 fingerlings with the weight up to 5 g.

Table 2: Quantities of juvenile fish (in thousands units) were released in the lower reaches of the river Nemunas and the Curonian Lagoon. Remarks: 0 – fish larva’s, 0p – juveniles until cannibalism phenomenon.

Year	Fish species			
	burbot	catfish	pikeperch	eel
2008	14,500 (0), 300 (0p)	-	300 (0p)	-
2009	14,000 (0), 1,500(0p)	-	-	-
2010	21,000 (0), 2,500 (0p)	3 (0p)	-	-
2011	-	-	810 (0p)	-
2012	-	-	620 (0p)	20 (0p)

The third facility for fish farming is located in Kintai town, it belongs to JSC "Kintai", address: Kintai town, Šilutė district LT-99358 Lithuania. JSC "Kintai". It has 600 ha water bodies for aquacultural purposes. The annual production is 300 t. 95 % of production consists of carps (for the market). Other production: pike, catfish, bream, grass carp (for the market and for stocking).

The fourth facility for fish farming is located in Rusne town, it belongs to JSC "Rusnės tvenkiniai", address: Šilutė district, Šilutė town, Lietuvininkų street. 33A. Status: liquidation process from 2004 until now.

The fifth facility for fish farming is located in the village Girkaliai, it belongs to JSC "Leteka", address: Artojų street 10, Girkalių village, Klaipėda district municipality. It is the most modern facility with a recirculation system for eel aquaculture. The annual company production reaches 60 t of eels for market purposes and 200,000 eel juveniles for releases. It was built with European Fisheries Fund support. The aquaculture facility started in 2013.

3.2. Future plans, scientific initiatives

The Russian new law "On aquaculture" (Jun, 2013) gives a new opportunity for aquaculture development in the Kaliningrad region. The Kaliningrad region specializes in aquaculture science, aquaculture education and receives support from regional authorities. A big aquaculture center is planned in the Kaliningrad area, with an estimated yearly production of juvenile fish of: vimba – 500 thousand, salmon – 3,7 million, sturgeon – 200 thousand.

A new common EU fisheries policy, the Lithuanian Fisheries fund for 2014-2020 and the principles set for fund use will become the main pillar for future plans and scientific initiatives in the region from Lithuanian side.

By seeking to protect and restock fish resources of the Curonian Lagoon the plans for protection and increase of fish resources should be developed. The regular monitoring of fishing, as well as the supervision of spawning grounds and migration routes in order to improve conditions of spawning and to ensure the protection of valuable fish species will be carried out. Among the efforts to increase the efficiency of fish restocking, more valuable and predatory fish species should be released. The restocking of fish resources is planned and organized in the Curonian Lagoon and in the lower reaches of the Nemunas river, and the status of fish resources is monitored. The close cooperation of both countries could improve implementation of mentioned plans.

SUBMARINER project

The project is funded by the Baltic Sea Region Programme 2007-2013. According to the EU Water Framework directive surface water has to be in a good ecological condition in the nearest future. The main ecological problem in the Curonian Lagoon is anthropogenic (of human origin) eutrophication. One of the ways to decrease the eutrophication could be the use of mollusc filters - *Dreissena polymorpha*. In a large central part of the Curonian lagoon (about 300 km²) in front of the Nemunas river mouth, natural *Dreissena* colonies grow. The creation of artificial biotopes for *Dreissena* could increase the power of its natural filter abilities. However, before starting actions, that might strongly affect the ecosystem, experiments should be done to find out more about *Dreissena*. With ecosystem modelling mollusc farming effects on energetic flows in the ecosystem can be calculated. At the moment, that kind of research is carried out by Klaipėda's University Coastal Research and Planning Institute. Outcomes of the research and the SUBMARINER project results could become one of the foundations for future mollusc aquaculture development in the Curonian Lagoon area.

4 Management aspects

4.1 Management of fishery and aquaculture

The development of fishery and fish protection in the Curonian Lagoon basin goes back to the 14th century. The rules published by the Prussian Government on January 30th, 1589, show considerable concern of local fishermen about the state of valuable fish resources. These rules indicated how to fish, sell the caught fish, and organize fish protection and environmental protection work of fishermeisters (the special kind of inspector) (Gaigalas 2001). In order to maintain and increase fish resources of the Curonian Lagoon the marked changes both in fish communities and in commercial resources and fishery of the past and recent years should be taken into account. The greatest emphasis in fish resources management is on the catches of the most valuable commercial fish species: bream, pikeperch and smelt. Recent information about small scale fishery management in coastal transitional waters was provided by Kontautas & Zolubas (2012).

Fisheries Policy in the Lithuanian Republic is defined in the Fisheries Law of the Republic of Lithuania, which regulates relations in the fishing, aquaculture, fish processing and market areas. The objectives of the law are to ensure sustainable exploitation of fish stocks, its conservation and replenishment, as well as to ensure fisheries control, taking into account the environmental and economic aspects, as well as fishermen's, fish farmers', processors' and consumers' views. The law is applicable to the land territory of the Republic of Lithuania, internal waters, territorial waters, the exclusive economic zone, as well as to the Lithuanian fishing vessels in the sea waters. Provisions of this law are in line with European Union legislation.

The law appoints institutions that execute state fisheries regulations in Lithuania: the Ministry of Agriculture is responsible for the Lithuanian Fisheries Policy and organises, coordinates and controls its implementation, it manages the state fisheries, and adopts the European Union Common Fisheries Policy. Furthermore, the Ministry organises, coordinates and controls the conservation of fish resources in the sea waters; the Ministry of Environment forms the fish stocks conservation and control policy in inland waters and organises, coordinates and controls its implementation, and carries out the state fisheries management in inland waters; the Ministry of Agriculture and the Ministry of the Environment organize, coordinate, control and replenish fish stocks, as well as carry out fisheries scientific research in the various water bodies under their jurisdiction. The Law lays down the fishing area user rights and obligations, as well as procedures for the issue of permits for the use in fishing areas.

The resource management and stocking measures in the state owned waters are carried out by the Ministry of Agriculture and the Ministry of Environment. The Fisheries Services under the Ministry of Agriculture, which owns 7 state aquaculture units, prepares annual state fish stocking plans in accordance with scientific recommendations and presents them to the Ministry of Environment for evaluation. Afterwards, the plan is harmonized between the institutions; the Minister of Agriculture confirms it.

Lithuanian universities educate biologists, ecologists and specialists for the fishery industry. The following universities offer education in aquaculture in Lithuania: Klaipėda University Vilnius University, Vilnius Pedagogical University, Vytautas Magnus University, Lithuanian Veterinary Academy, Lithuanian University of Agriculture.

The Fishery Policy of the Russian Federation is defined by the Federal Law "On fisheries and protection of water bioresources" (2004). Protection of water bioresources refers to the conservation of marine biological resources or the restoration to the levels that can ensure the maximum sustainable yield (catch) of water bioresources and biological diversity, through the implementation of science-based measures for preservation, study, reproduction, management, rational use of marine resources and protection of their habitat.

The structure and functions of fisheries management in the Russian Federation include federal and regional levels and scientific support as well.

Federal level

The Ministry of Agriculture ensures the definition of fisheries policy; the Federal Fisheries Agency (“Rosribolovstvo”) ensures legislative control of fisheries activities, monitoring and supervision of the use of water bioresources; Territorial Branches of “Rosribolovstvo” ensure control and supervision of water bioresources at the level of fisheries basin. The Baltic Sea Region belongs to the West Fisheries Basin. The West-Baltic Basin Agency for Reproduction of fish stocks is a responsible body for the implementation of the state programs for reproduction and improvement of fish habitat (melioration). Regional fisheries regulations (rules) are developed for each fishery basin, which are approved by the Federal Fisheries Agency

Regional level

The Agency for Fisheries and Fishing Industry Development of the Government of the Kaliningrad Region ensures implementation of the fisheries policy at the regional level. The agency is responsible for the following tasks: concluding agreements with fishing organization for quota allocation, organizing auctions for the distribution of fishing areas, develops and implements the regional programs. The implementation of fisheries policy is carried out by development of state programs. Currently, the state program of the Russian Federation “Development of the Fishing Industry” (2013) is adopted. There are two regional programs: “The development of the coastal fisheries” and “The development of aquaculture” are implemented in the Kaliningrad region. Fisheries science and research institutions execute the state order for the measurement of the total allowable catches (TAC) in the water-bodies in Russia. All institutions are subordinate to the Federal Fisheries Agency. There are two fisheries research subdivisions with certain areas of responsibility in the Baltic Sea Region:

Scientific support

Atlantic Research Institute of Fisheries and Oceanography (AtlantNIRO, Kaliningrad) Curonian and Vistula Lagoon, 26th sub-area of the Baltic Sea;

Kaliningrad State Technical University (KSTU), Kaliningrad) – inland waters of the Kaliningrad region;

The activities of these scientific research institutions are funded by the state on an annual basis for research and assessment of the state fish stocks and TAC.

Acquisition and loss of fishing license

In Lithuania, only companies have the right to fish that are registered in the list approved by the director of Fisheries Service under the Ministry of Agriculture of the Lithuanian Republic. The main principal of the list is that the number of fishing companies can decrease but not increase. A new company can enter the list only when another company was deleted from the list. A fishing company can be deleted from the list if it did not fish for more than two years or when it asked to be deleted from the list. The Fisheries Service allocates fishing quotas and the number of allowable fishing gear for companies. A fishing company cannot get quotas: if it was stopped because of infringement of fishing rules or law, if it did not pay for damage done on fish resources, if it did not provide data to administration according to the law requirements, or if it did not pay tax for fish resources restoration and protection. The company, which received the right to use a number of fishing gears and fishing quotas, can apply to the Ministry of Environment for a fishing permit.

In Russia, the fishery regulations are based on scientific estimations of the TAC (total allowable catch) for valuable species or the PC (possible catch) for non-valuable species every year. The TAC is divided into 10 types of quotas: commercial, coastal, scientific, educational, aquaculture, recreational, traditional, international waters, for non-residents in the EEZ, or freshwater. Each fishing company has a share of commercial quota fixed for 10 years and it can operate within this share. Every year a

company has to apply for a fishing permission (license). A company has to report about its catch every 5 days. To get permission any company has to fulfill requirements such as: ownership of a fishing vessel (for each permission), ownership of a share of a quota for commercial fishing, no tax arrears, no violations of fishing rules in the previous season. A company can lose a fishing permission in the following cases: violations of fishing rules more than twice per year, no reporting of catches, using less than 50 % of its quota during two years, no license for angle fishing.

Catch and fishing effort limitations in the Curonian Lagoon

Every year common pikeperch, bream, and smelt fishing quotas for the Curonian Lagoon are allocated to both countries by decision of the Joint Lithuanian-Russian Fishery Commission (Table 3).

In Lithuania there are 4 ways of fishing limitation:

1. Common pikeperch, bream, and smelt fishing quotas are allocated to Lithuania (Table 3).
2. The common pikeperch, bream, smelt Lithuanian fishing quotas are allocated to fishing companies.
3. Lithuania sets common fishing gear units for different gear types to be used in the Curonian Lagoon. One unit of gillnet is a gillnet of 75 m length. For example, in 2013 it was allowed to use: 1 unit of towed seine with a length of less than 500 m, 230 units of 40-45 mm mesh size gillnets, 360 units of 70-80 mm mesh size gillnets, 223 units of eel trap-nets with special selective insert, 41 units of big mesh size trap-nets, 32 units of lamprey trap-nets, 67 units of smelt trap-nets, 20 units of stickleback-ruffe trap-net, 2 units of drift nets. No limitations exist for gillnets targeting smelt and the number of hooks on longlines.
4. Concrete fishing gear units for different gear types are allocated to fishing companies. Fishing inspectors supervise the process. Fishing gear can be used for fishing if it is marked with a special badge. Fishing inspectors confiscate unmarked fishing gear. Kontautas (2009) evaluated the maximum units of fishing gear to be used in the Curonian Lagoon.

In Russia there are 3 ways of fishing limitation:

1. Common pikeperch, bream, smelt fishing quotas are allocated to Russia (Table 3) .
2. Quotas for valuable species (bream, pikeperch, roach, sabrefish) are allocated to companies. Each company can operate only within its quota.
3. Any company can get a permit for the possible catch of other species. All companies fish separately until the amount for the possible catch is reached. Then fishery stops. (Olympic system).

No limitation for fishing effort exists for the Russian side of the Curonian Lagoon.

Other limitation measures: mesh size, minimal commercial fish size, maximal undersize bycatch, maximal non-target bycatch, usage of some gears (trawls, beach seines), quota for each fish species, restricted areas, restricted periods.

Table 3: The preliminary common fish quotas for the Curonian Lagoon in 2014.

Fish species	The quotas of the Lithuanian Republic	The quotas of the Russian Federation	Total
Bream	1,150	480	1,630
Pikeperch	260	110	370
Smelt	300	470	770

4.2 Responsibilities

Information about institutions and organizations responsible for fisheries management, aquaculture and research in the Curonian Lagoon are provided in ANNEX II.

4.3 Legal aspects

The main legal aspects are provided in ANNEX III.

5 Area based management

The Curonian Lagoon is rich in natural resources. Lithuanian and Russian fisheries legislations are strict and detailed. The TAC system is implemented in both countries, and fishing effort restrictions are implemented in Lithuania. Governmental institutions support restocking of valuable and protected fish species. Scientists evaluate stocks and analyse the state of fish populations annually. On the downside, the waters of the Curonian Lagoon are highly polluted, fisheries management is highly centralized (especially in Russia), regional authorities have poor management opportunities, stocking efforts depend on public funds of different countries, relatively high levels of illegal fishing still exist. From a biological point of view: eel recruitment depletion has been observed during the last two decades, catches of valuable fish species decrease; high fishing pressure negatively affects the whitefish population, high levels of juvenile sturgeon bycatch in commercial fishery may be a main obstacle for stock restoration, the highly increased number of recreational fishermen negatively affect the predatory fish populations.

The Curonian Lagoon is a transboundary water body and sustainable fisheries cannot exist without constant interaction between the two countries Russia and Lithuania. There are official platforms for interactions such as:

- Joint Russian-Lithuanian Fishery Commission (JRLFC);
- Joint Baltic Sea Fishery Committee (JBSFC).

The JRLFC was established in 1999 according to the Lithuanian Republic and the Russian Federation government agreement for collaboration in fishing areas. Collaboration areas are: rational use of the Curonian Lagoon resources and its conservation, aquaculture development, exchange of information about fishing rules, scientific studies, and fish resource utilization. One of the main aims is to create common fishing rules to be applied in both parts of the Curonian Lagoon. These rules should establish common restrictions on fishing, fish species, fishing gear, fishing time and place. Sessions of the commission are held once a year, and prior to these, working groups can meet to prepare documents to be approved during a session. The annual sessions and working groups are held alternately in Russia and Lithuania.

Another cooperation was established in 2010 by the Joint Baltic Sea Fishery Committee (EU-RU) for the purpose of efficient cooperation in the conservation and sustainable exploitation of aquatic biological resources. The parties exchange information concerning legal regulation documents already available and under preparation for fishery management in the Russian Federation and the European Union. Except for issues related to the Baltic Sea during the sessions of JBSFC the issues of importance for the bilateral cooperation of Russia and Lithuania are discussed. For example: the participation of Russia in the restocking eel program, rehabilitation of sturgeon in the transboundary rivers of Russia and Lithuania, the development of a bilateral Lithuanian-Russian eel management plan.

The level of cooperation is good for the fishery management because of the regular exchange of information about the structure of fishery authorities and legislation, fishery statistics and the organization of the fisheries. There are joint measures for fishery regulation, which are compatible with national rules of both countries. TACs for the most important species are agreed upon during the

sessions of the Joint Russian-Lithuanian Fishery Commission every year. The decision of the JRLFC concerning TACs as international rule has priority and can be approved by the Federal Fishery Agency of Russia without ecological expertise by the Russian Ministry of Natural Resources. It has stated a transboundary activity in the field of restocking of eel and sturgeon, but a wider restock and aquaculture cooperation is needed.

SWOT analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> • the Curonian Lagoon is rich in natural resources, • considerable aquaculture experience in LT • strict and detailed fishery legislation, • TAC system, fishing effort restriction, • governmental support for local fishing communities, • governmental support for restocking of valuable and protected fish species, • annual stock analysis by scientists, • activity of Joint Lithuanian-Russian Fishery Commission and transboundary regulation of commercial fish catches, • LT-RU coordination of TACs, information exchange about fishing rules, research and catches. 	<ul style="list-style-type: none"> • the Curonian Lagoon is shared by an EU and a non-EU member state, • relatively high level of water pollution, • relatively high level of illegal fishing, • high level of centralization of fishery management, • poor management opportunity for regional authority, • no coordination of scientific methods and approach, • lack of LT-RU fishermen meetings, • weekly developed aquaculture in Kaliningrad region, • Russia cannot be a partner in most EU programs, like INTERREG, LIFE and others.
Opportunities	Threats
<ul style="list-style-type: none"> • established Joint Lithuanian-Russian Fishery Commission provides a political background for the cross-border action plans, • the Lithuanian Fisheries fund for 2014-2020 • Russian law “On aquaculture” (Jun, 2013) gives a new opportunity for aquaculture development in the Kaliningrad region, • cross-border cooperation programs, • development of LT-RU common eel management plan, • integration of RU into the Atlantic sturgeon reintroduction project, • LT-RU aquaculture experience exchange • innovations (mussel farming) in the lagoon • stocking/ restocking with juveniles eels and sturgeons. 	<ul style="list-style-type: none"> • eel recruitment depletion, • changes of fish market requirements, • changes of fishery and environmental legislation, • increased number of recreational fishermen can negatively affect predatory fish populations, • decrease of valuable fish catches, • stocking efforts depend public funds of different countries, • high fishing pressure is negatively affecting whitefish population, • high level of juvenile sturgeon bycatch in commercial fishery.

6 Lessons learned

The biggest problem for a common fisheries management in the Curonian Lagoon is that the lagoon is shared by an EU-member and a non-EU state. Countries implement different fisheries policies with sometimes relatively different aims. JBSFC and especially JRLFC are political instruments to define the common area-based management aims for the Curonian Lagoon. During 2005-2008 an INTERREG-TACIS project “Development of scientific-technical support for reproduction of fish stocks in transboundary waters of Lithuania and Russia (Trans-border Fish)” has been implemented together by Lithuanian and Russian specialists and gave a new impulse for the countries’ cooperation. The further organization of international projects with Russia can develop cooperation in the field of area-based management, but Russia cannot participate in most EU projects.

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Address

Tomas Zolubas
Klaipėda University
Faculty of Natural Sciences and Mathematics
Herkaus Manto str. 84
LT-92294, Klaipėda, Lithuania

tomas.zolubas@zuv.lt

ANNEX I

Lithuania (according to Vaikutis (2007, 2009))

Year	<i>Fish species</i>					
	<i>Sander lucioperca</i>	<i>Abramis brama</i>	<i>Rutilus rutilus</i>	<i>Vimba vimba</i>	<i>Osmerus eperlanus</i>	<i>Perca fluviatilis</i>
1995	37	305	161	3	23	39
1996	48	304	305	2	16	34
1997	48	350	434	3	46	43
1998	46	393	488	2	39	49
1999	52	383	449	11	10	57
2000	70	388	465	48	57	46
2001	79	380	374	40	34	45
2002	107	423	517	59	52	46
2003	108	370	585	53	40	40
2004	109	388	506	55	27	42
2005	101	354	442	76	45	51
2006	92	344	390	82	38	56
2007	89	411	456	178	52	50
2008	82	346	398	161	38	57
2009	67	290	261	73	11	43
2010	76	360	249	30	16	61
2011	94	439	314	73	3	67
2012	64	360	259	57	39	47

Russia

Year	<i>Fish species</i>					
	<i>Sander lucioperca</i>	<i>Abramis brama</i>	<i>Rutilus rutilus</i>	<i>Vimba vimba</i>	<i>Osmerus eperlanus</i>	<i>Perca fluviatilis</i>
1995	112	769	203	69	67	34
1996	94	782	141	152	29	30
1997	133	882	249	179	43	45
1998	93	804	254	215	178	38
1999	214	892	414	157	115	72
2000	223	899	368	290	152	56
2001	228	929	466	278	203	61
2002	230	999	418	436	259	67
2003	244	879	411	440	50	77
2004	235	987	489	394	93	49
2005	207	955	358	303	49	64
2006	212	1039	297	184	42	39
2007	230	1069	333	306	177	60
2008	227	1067	287	305	187	64
2009	232	1042	508	349	111	109
2010	239	1022	471	244	17	135
2011	238	1097	478	324	116	133
2012	238	1101	475	299	240	160

ANNEX II

THE MAIN RESPONSIBLE AUTHORITIES FOR FISHERIES MANAGEMENT IN THE CURONIAN LAGOON

Lithuania:

1. Fisheries Service under the Ministry of Agriculture of the Lithuanian Republic: responsible for fishing gear number limit and fishing quotas allocation to fishing companies. Fisheries Service certify list of fishing companies, which have the right to fish in the Curonian Lagoon. Fisheries Service is responsible for fish resources monitoring in the Baltic Sea. Director Vytautas Grušauskas, Lelevelio g.6. Adress: LT-01102 Vilnius, Lithuania, e-mail: Vytautas.Grusauskas@zuv.lt.
2. Ministry of Environment of the Lithuanian Republic: responsible for fishing rules in inland waters. Minister Gediminas Kazlauskas. Adress: A. Jakšto g. 4/9, LT-01105 Vilnius, Lithuania, e-mail: V.Mazuronis@am.lt.
3. Klaipėda Wildlife Protection Inspectorate of the Klaipėda Regional Environmental Protection Department under the Ministry of Environment of the Lithuanian Republic (Chief V. Marozas, e-mail: V.Marozas@klrd.am.lt) and Šilutė Wildlife Protection Inspectorate (S.Sudeikis@klrd.am.lt) of the Klaipėda Regional Environmental Protection Department under the Ministry of Environment of the Lithuanian Republic: responsible for fishing control in the Curonian Lagoon. The director of the Klaipėda Regional Environmental Protection Department under the Ministry of Environment of the Lithuanian Republic Andrius Kairys. Adress: Birutės g. 16, LT-91204 Klaipėda, Lithuania, e-mail: A.Kairys@klrd.am.lt.
4. Klaipėda University. Address: Herkaus Manto str. 84, Lt-92294, Klaipėda Lithuania. e-mail: antanas.kontautas@ku.lt; zita@corpi.ku.lt. Responsible for monitoring of biological resources, socio-economic aspects of fishery in the Curonian Lagoon.
5. Institute of Ecology of the Nature Research Centre, Address: Akademijos str. 2, LT-08412 Vilnius-21, Lithuania, e-mail: ekoi@ekoi.lt. Head of Institute of Ecology Sigitas Podėnas. Responsible for fish resources monitoring in inland waters.
6. Asociation of fishing companies „Lampetra“. Adress: Lietuvininkų g. 26-3, LT-99179 Šilutė, Lithuania, e-mail: info@lampetra.w3.lt. Chairman Sigita Jakūbauskienė. Reponsible for lobbying for their interests on the national and regional level.

Russia:

1. West-Baltic Territorial department of the Federal Agency for Fisheries – permit, control, collection of fishery statistics, control of water environment. Chairman Maxim Buduratsky. Kaliningrad, 236000, Kirova, 15
2. West-Baltic department for fish-breeding and organization of fishery – fish breeding, monitoring of fishing activity, protection and restoration of water environment. Chairman Vladimir Lakashev, Kaliningrad, Morehodnaya, 4.
3. Agency for fisheries and development of the fishing sector of the Government of the Kaliningrad oblast – promotion of fishing sector and aquaculture development, allocation of fishing sites, allocation of shares of quotas. 236000, Kaliningrad, Moskowsky prosp., 76.
4. Atlantic Scientific Research Institute for the Fishery and Oceanology – monitoring of water bioresources in the lagoon, state of water environment, assessment of TAC, preparation of fisheries rules. 236000, Kaliningrad, Dmitria Donskogo street, 5.

5. Kaliningrad State Technical University - monitoring of water bioresources in the catchment area of the lagoon, state of water environment, assessment of TAC, preparation of fisheries rules for rivers and lakes in the catchment area. 236000, Kaliningrad, Sovietsky prosp., 1.
6. Kaliningrad Union of Fishing Collective Farms – association of fishermen responsible for lobbying of their interests on the federal and regional level.
7. Baltic Scientific-Fishing Industrial Council – a council of representatives of local authorities, scientific institutions, fishery companies, border guard and fishery organizations of Kaliningrad and Leningrad oblasts for the development of fishery policy in the Baltic region.
8. Federal Agency for Fishery in the Ministry of Agriculture (Moscow) – development and implementation of fishery policy and management.

ANNEX III

THE MAIN LEGISLATIONS FOR FISHERIES MANAGEMENT IN THE CURONIAN LAGOON

THE LITHUANIAN REPUBLIC LEGISLATIONS:

Laws:

Law on Fisheries of the Republic of Lithuania,

Law on Amateur angling of the Republic of Lithuania.

Resolutions:

Resolution of the Government on Agreement of Republic of Lithuania and the Russian Federation on Cooperation in the field of fisheries approval.

Orders of the Minister of Agriculture of the Republic of Lithuania:

On the approval of inland fishing quota allocation rules,

On the approval of the list of fish stocks users which has right to fish in Curonian Lagoon and in the Kauno marios heap.

Orders of the Minister of Environment of the Republic of Lithuania

On Fishing logbooks issue and rules for logbook filling,

On rules of commercial fishing Lithuanian fisheries in inland water bodies,

On the approval of amateur fishing rules,

On the description of seal and gear marking procedure,

On the approval of the list of strictly protected animal, plant and fungi species in Republic of Lithuania,

On the commercial fishing limit in Curonian Lagoon in 2013.

RUSSIAN FEDERATION LEGISLATIONS

Laws:

Federal Law “On fisheries and water bioresources conservation” (issues 2004, 2008, 2011, 2012).

Federal Law “On aquaculture”, 2013.

Fisheries rules for the Western Fishery Basin (issues 2006, 2008, 2012, 2013)

Annual Orders of Federal Fishery Agency:

List of water biological resources related to objects of fisheries.

List of water biological resources, which set the total allowed catch.

On approval of the total allowable catch of water biological resources in inland waters.



Stybel & Skor (eds.):

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Fisheries management in the Gulf of Riga

G. Korņilovs, R. Medne, A. Timofejevs & D. Jeļisejevs

Ltd Baltic Consultations

with contributions of the Ministry of Environmental Protection and Regional Development

Abstract

The Gulf of Riga is a separate semi-enclosed ecosystem of the Baltic Sea, surrounded only by territories of Latvia and Estonia, therefore, also the fishery and fish restocking in the Gulf of Riga is performed only by Latvia and Estonia. In the Gulf of Riga the most profitable is the herring fishery that gives the highest catches both in the offshore and in the coastal fishery.

There are two main directions for fish farming in Latvia and Estonia: fish farming for consumption and fish breeding for fish restocking and reproduction in natural streams and lakes. In both countries the Restocking Program determines migratory and freshwater fish restocking in lakes and streams in the Central Baltic Sea (Latvia, Estonia), the Gulf of Riga (Latvia, Estonia) and the Gulf of Finland (Estonia).

Responsible for fishery management in the case study area are the Ministry of Agriculture in Latvia and the Ministry of Environment (fish as resource) and the Ministry of Agriculture (fish as food) in Estonia. Municipalities are responsible for the management of fish resources and the lease of fishing rights in the Baltic Sea coastal waters and in inland waters in both countries. However, the cooperation between the involved stakeholders is insufficient. In general, no significant barriers for cross-border cooperation were found. In order to facilitate increase in cooperation activities a number of legal acts still have to be reviewed and harmonised. Also the general EU strategy for the fishing industry presumes more cooperation and adaptation of local legal systems to the EU system in general.

1 Introduction

1.1 The Gulf of Riga

The Gulf of Riga is a separate semi-enclosed ecosystem of the Baltic Sea. The area of the Gulf of Riga is about 18,000 km². The Gulf of Riga is a rather shallow basin with an average depth below 40 m. The maximum depth is 67 m. The island of Saaremaa (Estonia) partially separates it from the rest of the Baltic Sea. The main exit out of the gulf is the Irbe Strait. The gulf is characterized by a low salinity of about 5 PSU and delimiting it from the Baltic Proper by a strong hydrological front in the Irbe Strait. The low salinity arises from the narrow straits connecting it with the Baltic Sea and from a significant freshwater inflow from the rivers entering the gulf. During the warm season, a strong thermocline separates the upper (> 15 °C) and deeper (< 6 °C) water layers. Surface water (0-10 m) temperature exceeds 10 °C from the third week of May until the end of September. The drainage area of the basin is about ten times larger than the surface area of the Gulf. Five relatively large rivers discharge into the Gulf. Notable cities in the gulf area include Riga, Pärnu, Jurmala and Kuressaare. The Gulf of Riga is a rather eutrophicated area of high productivity. The low salinity limits the residence of marine species in the Gulf of Riga. Therefore, Gulf of Riga herring is the dominant species in the gulf unlike in the Baltic Proper. There is a lack of abundant predators in the gulf since cod are met in the Gulf of Riga only in the periods when cod stock is on a very high level (last time in the early 1980s). There is no halocline in the Gulf of Riga. The temperature regime in the Gulf of Riga is more continental than in the Baltic Sea. On average in three of four winters the gulf is covered with

a permanent ice cover. However, due to the recent climate change, since the end of the 1980s the frequency of mild winters has much increased and there is no or only partial ice cover (Keruss & Sennikovs 1999, Berzins at al. 1998, ICES 2008).



Figure 1. : View of the beach in Sliteres National Park (source: Latvian Institute of Aquatic Ecology/ LIAE)

1.2 Description of cross-border area

The Gulf of Riga is surrounded only by the territories of Latvia and Estonia, accordingly, the fishery in the Gulf of Riga is performed only by Latvia and Estonia. The management of the fish resources in both countries is rather similar since many principles have remained from the Soviet Union times. The sea border has been determined in a treaty signed in 1995. The management of fish resources is mainly performed on the national basis. The exceptions are species for which the TAC (total allowable catch) is determined by the European Union. These species are Gulf of Riga herring and salmon. The TAC for the Gulf of Riga herring is divided into national quotas for Latvia and Estonia according to a permanent percentage key. The national quota of Latvia is divided into two parts. One part is reserved for the offshore fishery and the second part for the coastal fishery. The herring quota for the offshore fishery is distributed between fishing companies, while the herring coastal quota is not. The fishing authorities can stop herring coastal fishery if the quota is fulfilled. A similar procedure applies to the herring national quota in Estonia.

The salmon TAC is divided into national quotas for all Baltic Sea countries as it covers the salmon fishery in all of the Central Baltic Sea including the Gulf of Riga and the Gulf of Bothnia. The distribution of national quota to sub-regions of the Baltic Sea is performed on a national basis. The fishery for all other fish species is managed by limiting fishing gear.

2 Fishery

2.1 Ecological aspects (biological data, development of catch data)

The fishery in the Gulf of Riga can be divided in two parts. The bulk of the catches are taken in the offshore fishery or fishery that is taking place outside the coastal zone of the Gulf of Riga (beyond the depth of 20 m). Only one type of offshore fishery is allowed in the Gulf of Riga: herring targeted trawl fishery. The Gulf of Riga is inhabited by a sub-population of Baltic herring – Gulf of Riga herring (*Clupea harengus membras*) – a separate assessment and management unit of the Gulf of Riga (ICES

Sub-division 28.1). It is a slow-growing herring with one of the smallest lengths and weights at age in the Baltic and thus differs considerably from the neighboring herring stock in the Baltic Proper (Subdivisions 25-28.2, 29 & 32). The differences in otolith structure serve as a basis for discrimination of Baltic herring populations (ICES 2005). The stock does not migrate into the Baltic Proper; only a minor part of older herring leaves the gulf after the spawning season in the summer-autumn period but afterwards returns to the gulf. The extent of this migration depends on the stock size and the feeding conditions in the Gulf of Riga. In the 1970s and 1980s when the stock was on a low level the amount of migrating fishes was considered negligible. In the beginning of the 1990s when the stock size increased also the number of migrating fishes increased and the catches of Gulf of Riga herring outside the Gulf of Riga in Sub-division 28 were taken into account in the assessments.

Till the beginning of 2000 the trawl fishery was permanently performed by 70 Latvian and 5-10 Estonian vessels with 150-300 HP engines. A considerable increase (more than 270 %) in trawl catches of gulf herring was observed in Estonia in 2002-2003 and remained the same in 2004 but was substantially reduced in 2005-2012. The number of vessels in the Latvian trawl fleet is gradually decreasing due to scrapping and now the number is almost half that of 2005. A number of protection measures have been implemented by the authorities for the management of the Gulf of Riga herring fishery. The maximum number and engine power of trawl vessels operating in the Gulf of Riga is limited. Additionally, the summer closed season (from mid-June to September) in the Estonian part of the gulf and the 30-day ban for trawl fishery during the main spawning migrations of herring (April-May) in both Latvia and Estonia are implemented in the Gulf of Riga.



Figure 2: Estuary of the Daugava into the Riga Bay (source: Latvian Institute of Aquatic Ecology/ LIAE)

Herring is the dominating species in the Gulf of Riga and in comparison with the Baltic Sea there are no major predators and the abundance of sprat is rather low. The herring trawl fishery has a rather low bycatch of other species. The main bycatch species are sprat and smelt. Since sprat is also a TAC regulated species the bycatch quota of sprat is also annually set for the Gulf of Riga as a part of the total sprat annual national quota. The amount of smelt bycatch in the herring trawl fishery is not limited. The smelt catches in the herring trawl fishery are rather varying and seemingly depend on the market demand.

Herring is also caught in the coastal fishery. The fishery takes place during the spawning season in April-July and is conducted mainly with trap-nets. The trap-net fishery is aimed exclusively on spawning fishes. In Latvia the number of trap-nets is limited as well as the total herring catches in the coastal fishery. The number of trap-nets has been rather stable since the mid-1990s, but is decreasing since 2004. The relative importance of these two fisheries differs between Latvia and Estonia. From the total Latvian catches about 80-85 % are taken by trawls and 15-20 % by trap-nets. In Estonia the trap-net fishery is more important constituting about 70 % of the total catches while trawl catches make on average only 30 % of the total catches.

The state of the Gulf of Riga herring stock has been rather good since the beginning of the 1990s and the catches have been rather stable in the last 20 years (Figures 3 and 4) (ICES 2007).

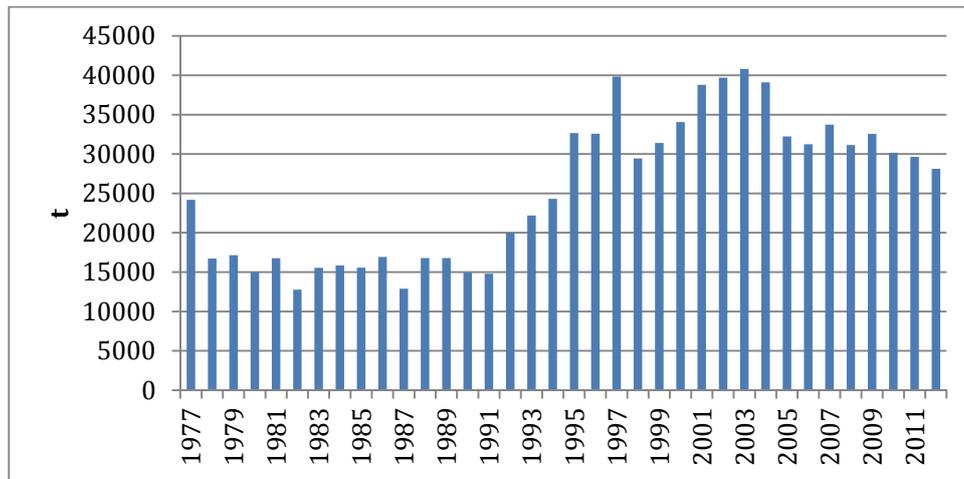


Figure 3: Total catches of the Gulf of Riga herring, (t).

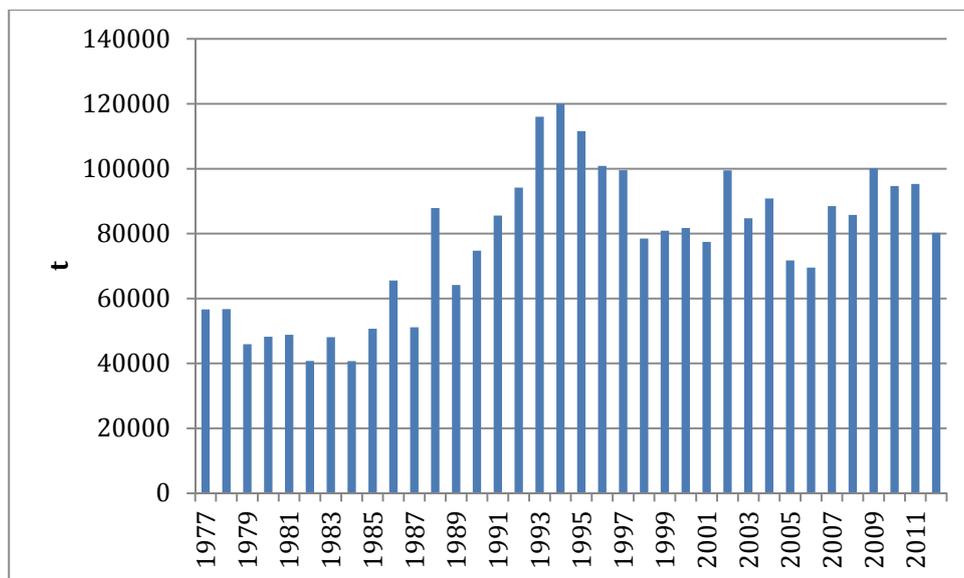


Figure 4: Spawning stock biomass of Gulf of Riga herring, (t).

Gulf of Riga herring is a species which catches are regulated by TAC (total allowable catch). The annual TAC is determined by the European Commission on the basis of scientific advice provided by the ICES (International Council for the Exploration of the Sea). The TAC is divided into national

quotas for Latvia and Estonia according to a permanent percentage key. The analytical assessment of Gulf or Riga herring is carried out in the ICES Baltic Fisheries Assessment Working Group (ICES 2013) and is based on biological data from the sampling of commercial trawl (monthly) and trap-net (weekly) catches by Estonia and Latvia, and on two ship surveys used for the calibration of the assessment (joint Latvian-Estonian hydro-acoustic survey in July), and on the effort (number of trap-nets) directed at the Gulf herring in the Estonian and Latvian trap-net fishery and the corresponding abundance of Gulf herring in trap-net catches.

As it was mentioned before the main part of the catches in the coastal fishery constitute herring, but there are also other fish species that are important in the coastal fishery (Table 1 and 2). The most important species in the coastal fishery are various freshwater and anadromous species that are caught in the coastal zone where they are met in the feeding season or some are even spawning due to low salinity in the coastal zone of the Gulf of Riga. The most important species in the coastal fishery are perch, pikeperch, bream, flounder, salmon and sea-trout. The fishery in the coastal zone is performed exclusively with static fishing gear like trap-nets, pound-nets, fyke nets and gillnets. The amount of catches in the coastal fishery, except for herring, is not regulated. The management of the fishery is based on the limitation of the number of fishing gear and on two closed seasons for fishing for the protection of spawning fish. In general the catches in this fishery show a decreasing trend. There are two apparent reasons for that. The market restrictions make this fishery not very profitable and due to this it does not attract the younger generation. The second reason is the increase of the abundance of the grey seal in the Gulf of Riga. Many fishermen are forced to stop the fishery because the catches are eaten or strongly damaged by the seals. It is especially prominent in the late summer and autumn seasons.

Table 1: The catches in the coastal zone of the Gulf of Riga by Estonia, t

Species/year	2011	2012
herring	7,609.2	6,238.2
perch	730.8	486.9
pikeperch	105.4	145.7
smelt	116.7	286.1
garfish	70.6	9.0
roach	53.3	50.1
vimba bream	44.9	48.0
other	129.9	135.0
Total	8,860.8	7,399.0

Table 2: The catches in the coastal zone of the Gulf of Riga by Latvia, t

Species/year	2010	2011	2012
herring	1,926.0	2,879.0	2,278.9
bream	55.0	33.2	29.1
perch	30.0	27.3	19.3
vimba bream	28.0	28.3	35.0
flounder	94.0	44.7	47.9
other	88.9	77.4	89.6
Total	2,221.9	3,089.9	2,499.8

2.2 Economic aspects

In the Gulf of Riga the most profitable is the herring fishery, it yields the highest catches both in the offshore and in the coastal fishery. The catches have been rather stable since the mid-1990s (Figure 5) due to a good state of the stock. Some diminishment in the last 3 years is connected with the transition period when according to Common Fishery Policy it is planned by 2015 to achieve the maximum sustainable yield fishing mortality (Fmsy) which is lower than the previously used precautionary approach fishing mortality (Fpa).

The fishing fleet in the offshore fishery of Latvia has much changed in recent years. With the help of the European Fisheries Fund part of the fishing fleet has been scrapped and the number of vessels has been diminished considerably (Table 3). The decrease of the number of vessels firstly has improved the technical condition of the fleet because mainly the oldest vessels were scrapped, and secondly it has balanced the capacity of the fleet with the available fish resources. It has definitely enlarged the available fishing quota for the remaining vessels thus increasing the income. From the biological point of view it improved the exploitation of the herring stock as the fishing mortality in recent years has approached the level that is recommended by the scientists. Evidently, in previous years (1999-2007) the high fish mortality was connected with significant amounts of unallocated catches (Figure 5) while now the available fishing quota ensures legal fishery all around year.

Table 3: The number of fishing vessels in Latvia in the Gulf of Riga in 2009 and 2012.

Year	Fishing place	Number of vessels
2009	Coastal	286
	Offshore	37
2012	Coastal	207
	Offshore	23

In the coastal fishery of the Gulf of Riga in Latvia the main income comes from the herring fishery as the catches of other species are rather low. According to the landings and average fish prices in 2012 around 78 % of the total income in coastal fishery was obtained with herring. Therefore, fishermen who are not fishing herring with trap-nets cannot ensure their financial existence with fishery as their only economical activity. Due to this, many fishermen have switched to the category of self-consumption fishermen who have the right to fish with one static fishing gear – pound-net, fyke net or gillnet of 100 m length. The self-consumption fishermen have no right to sell the caught fishes. Coastal fishery is a seasonal fishery because in winter the fishery is stopped due to ice coverage. Even in mild winters there is some ice in the coastal zone not allowing setting of the coastal static gears.

In Estonia the situation in coastal fishery is slightly different because herring is not the only important fish species but also perch. Since the catches of perch are rather high and the price for filleted perch is also substantial in some Estonian counties of the Gulf of Riga the income from perch fishery is even higher than from herring fishery. However, according to studies performed in Estonia only for 10 % of the coastal fishermen the fishery is the main source of income (such a study has not been performed in Latvia).

It should be noticed that both in Latvia and Estonia the commercial fishermen have to pay a yearly fee to use their fishing gear in the coastal fishery or for the fishing quota in the offshore fisheries.

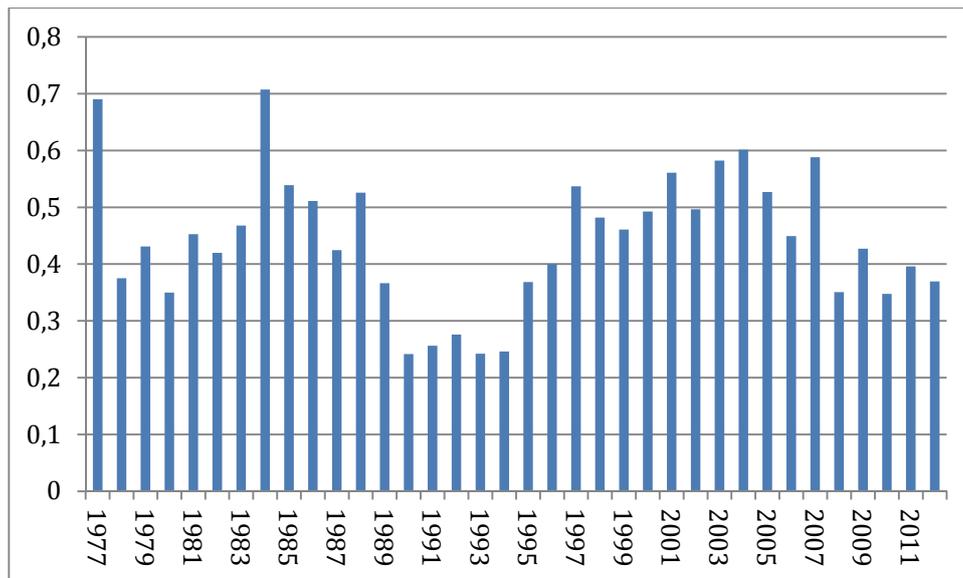


Figure 5: Fishing mortality of the Gulf of Riga herring ($F_{pa}=0.40$, $F_{msy}=0.35$).

2.3 Fishing gear and areas

In the offshore fishery only trawlers targeting herring are fishing in the Gulf of Riga. The trawlers mainly use pelagic trawl. The trawling is allowed only over the depth above 20 m or two nautical miles from the coast. The offshore fishery with gillnets in the Gulf of Riga is not performed.

In the coastal fishery only static gears are employed such as trap-nets, pound-nets, fyke nets and gillnets. The trap-nets are mainly used in the herring fishery during the herring spawning season in April-July. Usually the length of herring trap-net fishery is about 2.5 months and the beginning of it depends on the severity of the winter.

The number of fishing gears in the coastal fishery of Latvia is limited and it is determined by the Rules of the Council of Ministers for each of the coastal counties. They are reviewed annually but in general they have been rather stable since the end of 1990s. The coastal fishery in Estonia is managed similarly.

It is not allowed to use such fishing methods and gear which are prohibited or which are not designated in EU and Latvian laws. The parameters of the allowed fishing gears are described in the Rules of the Council of Ministers (No 296 of May 2nd, 2007). Besides, in Latvia there are two closed seasons for coastal fishery intended for the protection of spawning fish in spring (16th April-15th May) and of migrating anadromous species (1st October-15th November). During these closed seasons only specialized fisheries on herring, flounder and eelpout is allowed. Similar closed seasons are applied also in the coastal fishery of Estonia. It is not allowed to set fishing gear in the vicinity of river mouths. The size of the prohibited area is regulated for the biggest rivers entering the Gulf of Riga. Minimum landing size has been determined for several species like perch, pikeperch, pike, whitefish. The fishes with a lower size are discarded.

All fishermen have to record their fishing operations and catches in logbooks. In the offshore fishery the fishermen use standard EU logbooks while in the coastal fishery national logbooks are used. Also the self-consumption fishermen have to fill such logbooks. This system allows to obtain full information on the effort and landings in the coastal fishery. In many other countries coastal fishermen or small scale fisheries do not have to use logbooks, and therefore, it is necessary to perform special surveys to determine the impact of coastal fishery on the fish resources.

3 Aquaculture

3.1 Description of aquaculture in the region

There are two main directions for fish farming in Latvia and Estonia: fish farming for consumption and fish breeding for fish restocking and reproduction in natural streams and lakes (fish recourses reproduction).

The Latvian fisheries sector is governed and administered in general by the Ministry of Agriculture (in collaboration with other institutions). The Fishery Department is responsible for a wide range of tasks concerning general fisheries policy and its management in Latvia. The Institute of Food Safety, Animal Health and Environment “BIOR” is responsible for the implementation of the National Fish resources restocking program in Latvia.

In Estonia fisheries administration is divided between the Ministry of Agriculture (fish as food) and the Ministry of the Environment (fish as a natural resource). In both ministries there is a department responsible for fisheries regulation. In the Ministry of Environment, the Department of Fisheries Resources is in charge of restocking activities which are financed by the state, including the management of the state-owned Põlula Fish Rearing Centre. In the Ministry of Agriculture, the Department of Fishery Economics regulates fish processing and trade, including aquaculture.

In the aquaculture sector of Latvia there are 49 economically active enterprises (including state fish hatcheries) employing more than 300 people. Overall, the sector is mainly focused on carp breeding, but also some negligible amounts of trout, sturgeon and pike are produced for the market. At the moment there are some slow changes going on in the sector, reorienting from carp to other species (i.e. trout, African catfish) in Latvia (www.zm.gov.lv).

In Estonia there are 21 companies with 24 fish farms (year 2009) whose main or important activity is fish farming. Most of them have multiple production profiles, rearing simultaneously several species, producing at the same time fish for consumption, offering fishing tourism in put-and-take ponds and producing juveniles for the state restocking program. In most of these farms the main species is rainbow trout, in some others mainly carp. European crayfish *Astacus astacus* is cultivated in four farms, eel in only one, and two farms are specialized in growing fish for stocking purposes (Paaver, 2005). Recently, one farm specialized in sturgeon production in the warm cooling waters of a power plant.

There are no fish cage farms in the Gulf of Riga, neither in Latvia nor in Estonia.

There has been negative experience in the sea aquaculture in the past in Latvia. In the 1980s, near to Ragaciems in the Gulf of Riga some experiments were made with marine salty and warm geothermal mineral water for the use in aquaculture, mainly for the cultivation of rainbow trout during the winter season. Geothermal water salinity is around 5 PSU with a year-round constant temperature of about 13 °C. It is chloride-sodium salt water and inevitably contains sulphide, bromide, iron, manganese, sulfur and other undesirable substances in addition. The experiment failed, it caused not only fish metabolic and other disorders, but also led to the pollution of surface waters with various chemical elements and mineral salts.

In the 1980s, Latvia started to develop the production of rainbow trout in seawater of the Gulf of Riga using net cages (at the Kolka-Roja and near Carnikava coast). This type of trout cultivation was generally unsuccessful for several reasons:

1. cages were not sufficiently resistant against storms and waves,
2. wind caused dramatic changes in the cold deep water and warm coastal water inflow and outflow which stressed the fish,
3. trouts suffered from specific infectious diseases.

The latter two factors were also the cause of failure for a trout basin farm in Kaltene, where water was taken from Gulf of Riga shallow water areas (Mitans 2008).

Now, the Latvian government is planning to allow the establishment of cage fish farms in the Gulf of Riga in four places, using new rearing systems with new submersible cages, which are stable in storms. But only few places can be used for this aim. The gulf is shallow and a lot of conflict zones exist in the gulf: Natura 2000 territories, fishing grounds, shipping routes. The scientists of the institute BIOR consider, that the aquaculture enterprises can be established in the Gulf of Riga by using only environmentally friendly technologies, such as IMTA (integrated multi-trophic aquaculture) which combines, in the appropriate proportions, the cultivation of fed aquaculture species (e.g. finfish/ shrimp) with organic extractive aquaculture species (e.g. shellfish/ herbivorous fish) and inorganic extractive aquaculture species (e.g. seaweed) to create balanced systems for environmental sustainability (biomitigation), economic stability (product diversification and risk reduction) and social acceptability (better management practices).

The brackish water coastal sea is shallow, open to storms and covered by ice for a long period and there are very few suitable sites for large net cage farms or other types of mariculture, in Estonia and Latvia.

3.2 Importance of stocking and restocking

Restocking means producing juvenile fish in fish farms and releasing them into the natural waters with the aim of increasing their stock either to save endangered species or create a resource for fishermen and anglers.

There are governmental restocking programs in both countries that determine migratory and freshwater fish restocking in: lakes and streams, the Central Baltic Sea (Latvia, Estonia), the Gulf of Riga (Latvia, Estonia), and the Gulf of Finland (Estonia).

Many species of fish (salmon, eel, sea trout) are threatened because of over-exploitation or lack of suitable reproduction areas (Estonia) or habitats and their natural ability of reproduction is too low (Estonia, Latvia). In order to restore or reinforce their natural populations, fish are being stocked (Table 4).

The program is established in order to ensure the fish fry compensatory releases to lower the damage to fish resources caused by hydropower stations as well as to restore damages and losses caused by various human activities in public waters.

Five state-owned fish hatcheries: Tome, Dole, Pelci, Karli, and Brasla (which belong to the BIOR institute) and some private fish farms in Latvia, as well as the Õngu Fish Farm and state-owned Põlula Fish Farming Centre, and some other fish farms in Estonia are participating in the juvenile production for restocking. The location of these hatcheries is shown in Figures 6 and 7.

In relation to restocking activities it should be mentioned that respective European legislation has been initiated to protect fish species like eel and river lamprey. Latvia has already made several steps to improve the conditions for stocks of these species. The legislation regulating the fishery of these species and the measures to promote their restocking were elaborated.

Regarding a long time management plan for Baltic salmon, Latvia considers that further substantial discussion with member states, sector and other stake holders is necessary before the regulation can be adopted. The main problem for Latvia regarding this plan is that Latvia does not agree that artificial reproduction outside wild salmon rivers should be stopped. The biggest part in this artificial reproduction goes to reduce the damage to fish resources caused by Hydropower Stations and river ecosystems in the Daugava river.

In 2007 the following fish were released into Estonian waters (numbers of individuals): 317,800 reared eel juveniles (*Anguilla anguilla*); 100,400 one year old, 89,000 one year and 51,300 two year

old Atlantic salmon (*Salmo salar*); 17,400 one year old and 47,000 older sea trout (*Salmo trutta*); 10,000 juveniles of brown trout (*Salmo trutta fario*); 2,000 one year old pikeperch (*Sander lucioperca*), 1,100,000 larvae and 19,500 one year old pike (*Esox lucius*), 5,000 two year old tench (*Tinca tinca*), and 4,200 one year old and 14,900 older native freshwater crayfish (*Astacus astacus*). Over 85 % of the money spent for restocking is used to produce salmon and eel juveniles (Estonian Fisheries Strategy 2007–2013). There are four protected fish species in Estonia (Atlantic sturgeon, wels, grayling, asp) but these species are not covered by the restocking program.

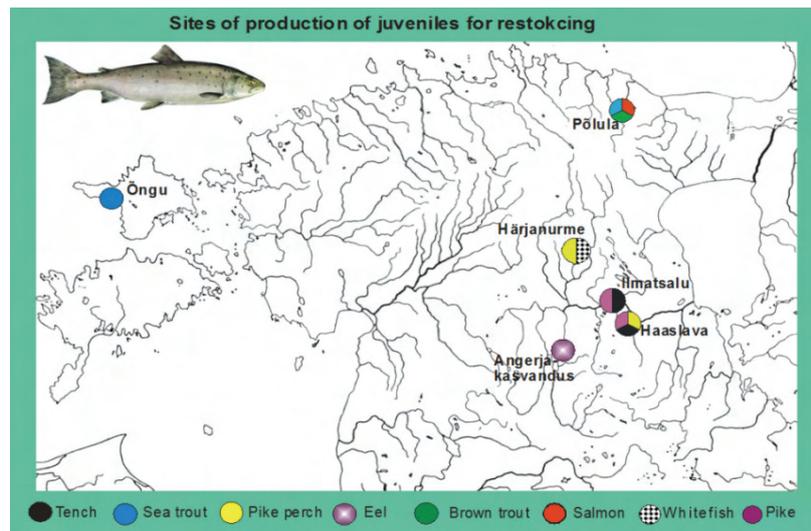


Figure 6: Sites of production of juveniles for restocking in Estonia (source: Tiit Paaver, *Eesti Maaülikool* www.eau.ee/~vl/.../fishfarmingandrestockinginestonia.ppt)

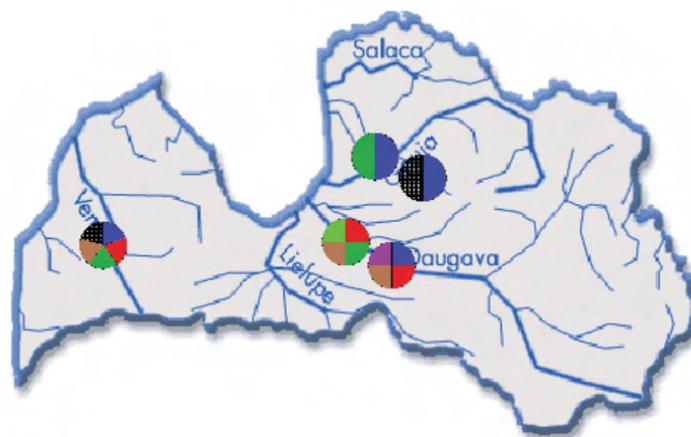


Figure 7: Sites of production of juveniles for migratory fish restocking in Latvia (red - salmon; dark green - lamprey, light green - vimba, blue - sea trout, brown - freshwater fish; purple- sturgeon; chequered- whitefish).

Table 4: Fish species released in lakes and rivers flowing into the Gulf of Riga (Year 2010-2012)

Waterbody, place of release	Fish species	Age	Number of fish		
			2010	2011	2012
Gauja basin (Amata)	Sea trout (<i>Salmo trutta</i>)	parr (1)		9 990	14 850
Gauja basin (Brasla)	Sea trout (<i>Salmo trutta</i>)	parr (1)		7 335	
Daugava	Salmon (<i>Salmo salar</i>)	parr (1)			15 150
		smolt (1)		208 444	765 129
	Sea trout (<i>Salmo trutta</i>)	smolt (1)		123 670	83 000
	Whitefish (<i>Coregonus lavaretus</i>)	parr (0+)		20 500	
	Vimba (<i>Vimba vimba</i>)	parr (0+)		33 100	
Gauja	Salmon (<i>Salmo salar</i>)	parr (0+)		33 600	
		parr (1)	83 800	92 000	20 000
		smolt (1)	28 000	90 400	8070
	Sea trout (<i>Salmo trutta</i>)	smolt (1)	46 880	82 097	97 606
		parr (1)	13 110		
	River lamprey (<i>Lampetra fluviatilis</i>)	fry	3 131 000	4 439 000	4 946 400
Whitefish (<i>Coregonus lavaretus</i>)	parr (0+)	24 500	20 500	12 180	
Ķīšezers	Pike perch (<i>Stizostedion lucioperca</i>)	parr (0+)	250 462	140 000	140 000
Lielā Jugla	Salmon (<i>Salmo salar</i>)	parr (0+)		126 000	
		parr (1)			18 900
	Sea trout (<i>Salmo trutta</i>)	parr (0+)		25 000	
	River lamprey (<i>Lampetra fluviatilis</i>)	fry		1 749 000	1 000 000
Lielupe	Salmon (<i>Salmo salar</i>)	parr (1)	130 194		
		smolt (1)		54 076	
	Pike (<i>Esox lucius</i>)	fry			
Mazā Jugla	River lamprey (<i>Lampetra fluviatilis</i>)	fry	4 988 000	1 746 000	3 929 000
	Salmon (<i>Salmo salar</i>)	parr (0+)		153 100	
		parr (1)			75 200
	Sea trout (<i>Salmo trutta</i>)	parr (0+)		25 000	
Palsa	Sea trout (<i>Salmo trutta</i>)	parr (0+)		30 000	
Gauja basin (Rauna)	Sea trout (<i>Salmo trutta</i>)	parr (1)		10 010	
Daugava	Pike perch (<i>Stizostedion lucioperca</i>)	parr (0+)	180 000		
	Vimba (<i>Vimba vimba</i>)	parr (0+)	738 600	471 200	415 000
	River lamprey (<i>Lampetra fluviatilis</i>)	fry		3 556 000	2 900 000
Strīķupe	Sea trout (<i>Salmo trutta</i>)	parr (1)	24 145		
Vizla	Sea trout (<i>Salmo trutta</i>)	parr (0+)		35 000	20 000

3.3 Future plans, scientific initiatives

Marine aquaculture in the past was not effective, but now some farmers plan to use new production technologies and want to develop marine aquaculture in the Gulf.

Territory required for molluscs (shellfish) and fish farming in the sea is determined individually for each application. Molluscs (shellfish) farms establishment is very complex and has been discussed extensively in the project BalticEcoMussel. Getting acquainted with the information produced by the project and discussing the situation with the Ministry of Agriculture, Fisheries Department officials procedure is as follows:

In order to obtain the establishment of sea mollusc farms interested parties must submit an application to the Environmental Protection and Regional Development Ministry, if its intention is an environmental measure, to the Ministry of Agriculture, if it is a planned economic activity.

The Ministry evaluates the possibility of developing the chosen activity in the selected area and organizes the competition.

In the harmonization process planned activities must be discussed with following institutions: the Institute of Food Safety, Animal Health and Environment (BIOR), the Nature Protection Board, and the Marine Administration.

Before obtaining a permission for establishing mollusc farms, the impact on the environment must be assessed.

The responsible ministry prepares a draft Cabinet Order, which is submitted to the Cabinet for decision. The Cabinet of Ministers issues a permit or license to use the sea area for specific activities.

A shellfish farm is registered as aquaculture animal farm; therefore the farm will be under regular food and veterinary service control.

If EU financial support is intended, molluscs (shellfish) farms can apply for recognition as aquaculture products manufacturer by the Rural Support Service.

According to the marine environment protection regulations and management plans for statutory shellfish farms, the permission to distribute equipment and navigational aids for offshore deployment and operation must be obtained, which is issued by the Latvian Maritime Administration for a maximum of 30 years; annual state fees must be paid and the installation of new navigational aids, or making changes to existing aids have to be authorized.

Research initiatives in the Gulf concentrate on reproductive success evaluation. In recent years salmon and sea trout smolt were marked with T-bar anchor tags. It should be noted that from 2011 to 2012 no tag was returned, however, in 2013 one Carlin-type tag was returned, originating from one of the fishes marked in 2008.

The anchor tag method for marking was chosen because of its low cost, but the efficiency is low and if no marks are returned in the next few years, the method will have failed. It should be noted that in the past three years, the budget did not provide funds to pay for returned marks, which generally decreases the number of returned marks.

It is desirable to change the marking method by selecting the Carlin-type tags and to provide funds to pay for returned marks and for a renewal payment mechanism. Carlin-type tags are used in all Baltic Sea countries, which mark salmon. The results are used for the assessment of salmon stocks in the ICES WGBAST (Assessment Working Group on Baltic Salmon and Trout). In order to fully participate in the evaluation of salmon population estimation and related issues, it is desirable to restart Latvia salmon tagging with Carlin tags. This type of tagging method is also used to mark sea trout.

Lamprey resources are restocked by reproducing and releasing lamprey larvae on penetration stage, it is a time when the yolk sack is absorbed, but the feeding has not started. The restocking plan provides 3.5 million lamprey larvae for an annual release, but that is not enough, because the survival of lamprey larvae according to research data is 0.1 % of the numbers released. Other solutions for

lamprey reproduction must be found. BIOR believes it would be appropriate to promote natural spawning lampreys, by increasing the quantity of lampreys spawning in the Gauja, Salaca, Riva and Venta rivers (upstream of barrages). Lamprey populations depend on their spawning success in rivers.

Lamprey catches in the Daugava River have been increasing in recent years, but the Daugava river has virtually no lamprey spawning places. Perhaps this is caused by the anthropogenic altered hydrological regime of the Daugava that impacts the lamprey spawning migration in the nearby Gauja. The hydrological regime in the Daugava attracts part of the migrating river lampreys from the Gauja. If this hypothesis corresponds to what is happening in real life, breeding lampreys have to be transported between the rivers.

In some rivers lampreys are unable to overcome the natural Venta fall or artificial barriers (Staičeles paper mill dam, etc.). ZI BIOR recommends experimental breeding lamprey transport to rivers and river sections with thoroughly known spawning and larval habitats. Monitoring of the implementation should be designed.

To compensate for the Daugava hydropower station's effect on the fish resources in 2011 to 2013, annual rearing and release of salmon, sea trout, vimba, perch, pike, lamprey and whitefish larvae and fry was performed in the Daugava basin watercourses.

The biological capacity of the Daugava river has been reduced by anthropogenic influence, so part of the fish is released in Lielupe basin watercourses.

The salmon population in the Daugava river has survived due to artificial restocking. But it is advisable to reduce release of one-summer juveniles and to cut the fat fin of all smolts, thus marking the released fish. Fat fin cutting is a laborious process and additional funding must be provided for it.

Fishermen's involvement in restocking processes is important in three stages: spawner catches, juvenile fish release and evaluation of the performance. Adult fishes are caught in natural waters to obtain fish eggs and milt. This work is done by professional fishermen who are trained to deal with artificial fish reproduction. The next step in the process of restocking, where fishermen are involved, is releasing juvenile fish. Larvae and fry are released in small portions in different places of the water body. Fishermen are involved in the release of salmon and sea trout. More fishermen's involvement is required in the evaluation of restocking efficiency and in the collection of fish tags. Some initiative is shown by fishermen organizations, but at the moment only in inland waters.

It is possible to involve fishermen more widely in the restocking of fish resources. The state grants funds from the "Fish Fund" for various fisheries activities including the reproduction of fish resources. These measures may apply to public bodies, local authorities, derived public persons and associations. Fishermen's associations and organizations, and municipalities with fishing companies can apply for fish stock supplementation in their territories.

Sea trout is one of the species that interest fishermen. Fish catches may be affected by the quantity of released smolts. Releasing sea trout smolts in estuaries will cause a rise of sea trout catches in the sea in a few years. Unfortunately, sea trout smolt production must be planned as at least triennial event: in the first year (October to December) eggs are obtained, in the second year (January to December) sea trout are grown and in the third year cultivated (January to May) and released (May) in estuaries. Such projects are already being successfully implemented.

4 Management aspects

4.1 Fishery management

4.1.1 Fishery management in Latvia

The fisheries administration in Latvia is the **Fisheries Department, Division of Fishing Management and Fish Resources of the Ministry of Agriculture**, which is responsible for overall management of the fisheries sector, quota management, sector development, strategies and legislation.

The Fisheries Department deals with issues related to fisheries science and restocking of fish resources, fish processing and trading issues, and represents Latvian fisheries interests in the various EU institutions and international organizations (FAO, NAFO, etc.).

The State Environment Service, Marine and Inland Waters Administration carries out fishing control in marine waters under Latvian jurisdiction, issues fishing licenses, operates a vessel monitoring satellite center and monitors fish landings at ports.

The Institute of Food Safety, Animal Health and Environment (BIOR) undertakes specific research on fish resources, and participates in internationally coordinated surveys, provides scientific background for the protection and rational use of fish resources in Latvian waters, and ensures implementation of the fisheries data collection program. Data are regularly collected on the composition of commercial catches, fishing effort and fisheries economics, as well as scientific surveys on hydrologic conditions, zooplankton, spawning grounds, ichthyoplankton, larvae and young fish abundance, hydroacoustics, size and distribution of the spawning stocks, feed, growth, maturation, research on aquaculture and artificial restocking.

In conformity with the EU Pre-accession Agreement, the Latvian fisheries are controlled on the basis of the fishing quota distribution principle that was in force before EU membership. Latvian vessels may fish all over the Baltic Sea outside the Russian fishing zone, the Gulf of Bothnia, the Gulf of Finland and the territorial waters of the EU Member States. Based on historical fishing rights, Latvia and Estonia have fishing rights in the Gulf of Riga.

The Council of Europe sets annual total allowable catches (TAC) for regulated fish species for all EU Member States, Latvia included.

Based on the national legislation, fishing permits are allocated to companies on the basis of historical fishing rights. The National Board of Fisheries allocates quotas to the vessels fishing outside coastal waters and controls their utilization. The companies are entitled to decide for themselves which vessels to use, and have to pay for the use of a fishing allocation (fishing rights lease).

The National Board of Fisheries regulates fishing effort in Latvia's EEZ through engine capacity, vessel tonnage and allowable days at sea.

Local municipalities are responsible for the management of fish resources and the lease of fishing rights in the Baltic Sea coastal waters and in inland waters.

The Union of Latvian Fish Processing Industry (ULFPI) is a public organization, in which the leading Latvian fish processing enterprises are united; their basic activity is the production of canned fish.

Permits for physical and legal persons to fish in the Gulf of Riga and coastal waters:

1. Special permit (license) for commercial fisheries: According to the Cabinet of Minister Regulation No 1015 (08.09.2009.) *Procedures for the Issue of Special Permits (Licenses) for Commercial Activities in Fishery and Payment of the State Fee for the Issue of Special Permits (Licenses)* the license for fishing in the sea and in the coastal waters is issued by the Ministry of Agriculture (Fisheries Department) for the undertaking registered in the commercial register; for inland waters

local municipalities issue licenses. A permit (license) is granted for five years, except in the cases referred to in Paragraphs 10 and 11 of these Regulations.

2. Commercial fishing lease agreement: It provides individual fishing quotas to fishermen, fishing gear or limits its quantity, if necessary, the fishing period or the number of fishing days are set. The Ministry of Agriculture (Fisheries Department) is responsible for offshore fishing lease agreements; local municipality are responsible for the coastal waters and inland waters. Such a license is valid for 1 to 5 years.
3. Fishing vessels of an overall length of 10 m or more need an additional authorization (special permit) for target fish species in the Baltic Sea or the Gulf of Riga, based on the lease of fishing rights annual report to certain limits and fishing vessels fishing in the approved list. This additional authorization (special permit) is needed by smaller fishing vessels, if such requirements are specified in the European Union laws and regulations in the fisheries sector that are directly applicable. This permit is issued by the Ministry of Agriculture.
4. Fishing license for fishing vessel: According to the Cabinet of Minister Regulation No 296 (02.05.2007.) *Industrial fishing rules in territorial and economic zone waters* after getting a special permit (license) fishermen should obtain the fishing license for fishing vessel which is issued by the Marine and Inland Waters Administration (State Environment Service) on a yearly basis (indicating the quantity of fishing gear and its type or the amount of catch). The fishing license for fishing vessel is issued only for vessels which are registered in the Latvian Fishing Fleet Register. This license grants the right to fish with commercial fishing gear at sea.
5. self-subsistence fishery: individuals have to be registered by the Marine and Inland Waters Administration (State Environmental Service).

The Ministry of Agriculture can withdraw a special permit (license) for commercial activities in fishery if the owner of the permit (license) infringed the requirements of the regulatory enactments regulating fishery or has suspended commercial activities in fishery more than twice during fishery in the sea and coastal waters within one year.

The State Environment Service (Marine and Inland Waters Administration) is entitled to suspend the use of a fishing permit (license) or cancel it in cases where violations occurred, draws up administrative reports and imposes administrative sanctions, seizes and confiscates fish and requests that the losses caused to fish resources be compensated, and executes other activities in accordance with the requirements of European Union legislation, amateur fishing – angling – regulations and industrial fishing regulations.

All the major marine fish resources are used according to the ICES scientific advice and the European Community sets quotas, and other National technical regulations for fishing activities. Two stocks in the Gulf of Riga are regulated by the European Community. Only Latvia and Estonia may fish in the Gulf of Riga. The quota for sprat is set for the whole Baltic Sea but Latvia is reserving a concrete amount of this quota to be used only in the Gulf of Riga. In coastal fisheries, along the coast of the Baltic Sea and the Gulf of Riga (in depths less than 20 meters, where no trawling is allowed), fishing is limited by the allocated number of gears.

There are two fishing limitation systems in Latvia:

1. TAC (Total allowable catch) principle used for the trawler fleet in the sea waters. Every year the Ministry of Agriculture sets the fishing limits for the individual fishing companies, taking into account the TAC limitations set in the European Council regulation fixing the fishing possibilities in the Baltic Sea and the effectiveness of the use of the fishing quotas of the fishing company in the previous year, in order to ensure the historical fishing rights to the fishing companies. The fishing possibilities can be transferred to another fisherman.
2. Effort limitation as limitation of the fishing gears used in the coastal waters (in depths less 20 m) regarding TAC limitations for the whole coastal fishery for particular fish species – herring, and

sprat. Every year the Ministry of Agriculture sets the fishing limits for the coastal water fisheries taking into account the TAC limitations set in the European Council regulation fixing the fishing possibilities in the Baltic Sea. At the same time there are regulations of Cabinet in force which sets the total amount of fishing gears to be used in the coastal fisheries divided by the coastal municipalities. At the moment when a TAC is used up, the Ministry of Agriculture stops fishing in that particular fishery. The fishing possibilities in the coastal waters cannot be transferred to another fisherman.

Although the provision of research and scientific advice related to fish resources in order to adjust fishing in Latvia has stable traditions with a perennial scientific data base and the necessary technical provision, in long-term perspective the human resource capacity should be strengthened in this field. To use biological and economic data efficiently for the administration needs of the sector, contributions are necessary to process data electronically and improve fisheries data exchange at an international management level.

Fishing control measures are organised on the national and international level, however, in this field it would be necessary to intensify fishing control in marine waters beyond offshore waters.

4.1.2 Fishery management in Estonia

The fisheries administration in Estonia is divided between the between the Ministry of Agriculture (fish as food) and the Ministry of Environment (fish as a natural resource). In both ministries a department is responsible for fisheries regulations.

In the Ministry of Environment the Department of Fish Resources is in charge of restocking activities which are financed by the state, including management of the state-owned Põlula Fish Rearing Centre.

In the Ministry of Agriculture the Department of Fishery Economics regulates fish processing and trade. This includes aquaculture.

The Estonian Fish Farmers Association, established in 1989, supports aquaculture, and does not operate as a producer organisation. It brings together different people: aquaculture producers, small-scale hobby farmers, scientists and government officials.

The main fishery management measures implemented in Estonia are:

- technical measures, including mesh size control, closed seasons and closed areas according to Council Regulation (EC) No 27/2005 of 22 December 2004 and national Fishery Rules;
- input controls, namely number of fishing days for NAFO and the Svalbard regulatory area for shrimp fishery;
- output controls, namely TAC limits for internationally regulated fish stocks, and transferable quotas according to the provisions of the Estonian Fishing Act; and
- economic incentives – fishing right fees.

The **Estonian Fishermen's Association**, **Estonian Sport Fishermen Federation** and **Estonian Fishery Association** (fish processors mainly) are actively involved in the co-management process (discussions on fishery management measures, amendment of laws and fishery rules, discussions on structural measures, the application of structural funds, etc.).

The Estonian Environmental Inspectorate (EEI) of the Ministry of Environment has overall responsibility for the Estonian fisheries control.

The main institution engaged in fisheries data collection and scientific advice formulation is the **Estonian Marine Institute of the University of Tartu**.

Department of Fish Farming of the Institute of Veterinary Medicine and Animal Science of the Estonian Agricultural University is studying the molecular genetics of salmonid fish, quality of

farmed fish, development of new and improved technology for production of new species in Estonia (sturgeon, crayfish, salmon).

A fisher's fishing permit grants the right to fish, except fishing for flounder, with commercial fishing gear at sea up to the 20-metre isobath. A fisher's fishing permit for the fishing of flounder grants the right to fish flounder at sea, irrespective of the depth of the sea. According to the Fishing Act, a fisherman is a natural person who catches fish themselves with commercial fishing gear. The number of persons accompanying a fisherman who is fishing is not limited. A fisher's fishing permit shall be issued to an undertaking registered in the commercial register.

A person who is registered in the commercial register as an undertaking and whose area of activity entered in the commercial register is fishing may fish with commercial fishing gear on the basis of a fishing permit on internal water bodies, on transboundary water bodies, at sea, in the exclusive economic zone (EEZ) of the Republic of Estonia, or outside national waters under the jurisdiction of the Republic of Estonia. Commercial fishing gear means loglines, gillnets and entangling nets, traps, seine nets and trawls. The right to fish commercially is granted by a fishing permit, which may be either the fishing permit of a fishing vessel or a fisherman's fishing permit. Commercial fishing permits are issued within the limits of the permitted annual quota allocation, number of fishing days, amount of fishing gear or number of fishing vessels for a specified term, but for not longer than one calendar year.

Licenses for the open-sea fishery i.e. trawling in waters deeper than 20 m are issued by the central fisheries administration in Tallinn, but licenses for Baltic coastal fishery and inland fishery are issued by counties separately.

The Minister of the Environment annually decides the total number of licenses and the distribution of licenses by gear types (for coastal and inland fishery) between counties.

Fishing permit for fishing vessel: the fishing permit of a fishing vessel grants the right to fish with commercial fishing gear at sea. The fishing permit of a fishing vessel may be issued to an undertaking registered in the commercial register regarding a fishing vessel in the legal possession thereof for which an Estonian certificate of a sea-going vessel or small craft and a fishing license have been issued.

A restricted fishing permit is refused if:

1. the applicant has more than one punishment in force for violation of fishing requirements;
2. the applicant submits false information in the application;
3. the applicant submits false information on fishing or fails to submit the information within the set term;
4. the applicant fails to pay the fee for the right to fish within the set term.

The provisions of the General Part of the Penal Code (2001) and of the Code of Misdemeanour Procedure (2002) apply to misdemeanors defined in the Fishery Act. Extra-judicial proceedings concerning misdemeanors under the Fishery Act shall be conducted by a police prefecture, the Border Guard Administration and the Environmental Inspectorate.

Main management measures in Estonia are volume quotas (TAC) in the Baltic open sea fisheries and gear quotas in the Baltic coastal fisheries. There is also numerous technical management measures employed in Estonian fisheries: minimum mesh sizes (for gillnets, fyke nets and trawl bags), closed areas and seasons, minimum landing sizes for fish and limits on bycatches. All Estonian fishing rights are fully transferable inside the country (i.e. between license owners).

Fishing capacities and the technical measures for the protection of fishery resources in the Baltic Sea and the waters are regulated by the Northwest Atlantic Fisheries Organisation (NAFO) and the North-East Atlantic Fisheries Commission (NEAFC), where vessels flying the flag of Estonia fish, are laid down in directly applicable EU regulations of the European Union. The same applies for other internationally regulated fish species.

4.2 Legal aspects

In **Latvia** there are about 168 normative acts and in **Estonia** about 319 normative acts that are mandatory for the fishery and aquaculture sector. The most important of them are listed in the ANNEX.

4.3 Responsibilities for fishery in the case study area

There are a lot of institutions and authorities in both countries which are responsible for fishery on different levels in the case study area (ANNEX, Table 1).

5 Area Based Management

The fish resources of the Gulf of Riga are used only by Latvia and Estonia. The peculiarities of the fish community in the Gulf of Riga determine the scope of shared management. As it was indicated before the dominating species in the Gulf of Riga is herring and the exploitation of the catches of this species is limited by annual TACs (total allowable catch), determined in the regulations of the European Commission. However, Latvia and Estonia have agreed on additional measures in the management of the herring stock. In spring during the herring spawning period both countries have one month long closed seasons for trawl fishery. This fishery restriction is not required by the EU regulations but has been agreed upon by both countries to diminish the fishery load during the spawning season. In Latvia this ban takes place from 12th May till 10th June, it can be shifted by two weeks taking into account the actual hydro-meteorological conditions. If Latvia or Estonia decides to shift the closed season it informs the neighbour country about this decision. One more common decision on the management of herring stock is the limitation of the number of fishing vessels and the engine power of the vessels targeting herring. This limitation has been introduced with the aim to restrict the increase of fishing capacity in herring fishery in the Gulf of Riga and to achieve balance between fishing capacity and the herring resources. In recent years due to scrapping of the fishing fleet in the frames of EU Fisheries fund this aim has been largely accomplished.

All other fish species of the Gulf of Riga are caught in the coastal fishery. These are mainly local stocks which are connected with certain river basins, therefore, shared management of these stocks is not necessary. This fishery is regulated by local management. Both in Estonia and Latvia this is mainly done by the limitation of the number of fishing gears and closed fishing periods which are aimed on protecting spawning fishes. In Estonia for some species also catch limits are used. Although shared management of these local stocks is not necessary the exchange of experience in this field would be much appreciated.



Figure 8: Coastal fisherman in Riga Bay (source: A. Mendriķe)

In recent years the cooperation between managing authorities of Latvia and Estonia has been organized within international structures of the European Union, e.g. BaltFish, an organisation arranging the meetings of fisheries directors of the Baltic Sea countries (except Russia). The aim of this organisation is the development of common positions for the management of fish resources in the Baltic Sea.

For more than ten years till 2008 annual meetings of Latvia and Estonia in the fisheries field took place. Representatives of fishing authorities, scientists, fishermen and control institutions participated in these meetings. During these meetings the above mentioned regulations of herring fishery were concluded. Fisheries scientists reported about the state of the main fish stocks and about the most significant research topics. Other significant issues in management, fishery and control were discussed. Probably these regular meetings ceased because of the increase of fisheries coordination promoted by the European Commission. In the last decade several Baltic international nongovernmental institutions have been established, like the Regional Advisory Committee (RAC), which unites the representatives of national fisheries organisations as well as various environmentalist organisations. The opinion of the RAC is taken into account by the European Commission when setting TACs and introducing new management measures. Although the international multi-lateral cooperation has much broadened in the recent years it does not exclude bilateral links between the neighboring countries. Evidently the Estonian-Latvian meetings on fisheries could be brought back to life. However, the contents of these meetings should be made less routine. These meetings could be organised more thematically, i.e. each meeting could have its specific topic which is important in the current situation. At present such topics could be the introduction of a discard ban, new common fisheries policies, the development of aquaculture and others.

SWOT analysis of the Gulf of Riga fishery and restocking programs

Strengths	Weaknesses
<ul style="list-style-type: none"> • There are similar systems of fish restocking • Experienced and highly educated specialists involved in fishery industry • Domestic species are used in restocking • Experience in rearing of anadromous species (salmon, sea trout) • Similar registration of fishery events, good knowledge of the landings by species and gear • Fishermen's involvement in the process of reproduction 	<ul style="list-style-type: none"> • Lack of knowledge in aquaculture sector for some stakeholders like fishermen etc. • Lack of educational programs for aquaculture (Latvia) • Insufficient cooperation in fish restocking • Poor involvement of fishermen in the management of fish resources • Unallocated catches
Opportunities	Threats
<ul style="list-style-type: none"> • Development of fishery in rivers • Broadening of cooperation in the management of fish resources • Development of cooperation between scientists and fishery sector • Involvement of fishermen in the assessment of fish resources • Involvement of fishermen in the development and conducting of restocking programs • Development of educational programs in aquaculture 	<ul style="list-style-type: none"> • Salmon reproduction ban in new EU salmon management plan • Environmental factors deterioration in the areas of reproduction. • Distribution and increase in abundance of Invasive species • Increase of restocking expenses • Changes in market competition and pricing structure from other areas.

6 Lessons learned

The cooperation between fisheries scientists of both countries has a long traditions. At present this cooperation mainly occurs in the working groups of the ICES (International Council for the Exploration of the Sea) which is responsible for the assessment of main fish stocks of the Baltic Sea, as well as in meetings devoted to the implementation of national fisheries data collection programs. The case of the Gulf of Riga herring is special because all the data necessary for the assessment of the stock are collected only by Latvia and Estonia. Therefore, it is not surprising that also the main scientific survey is performed jointly – hydro-acoustic survey in the Gulf of Riga. This survey is carried out since 1999. Certainly the scientific cooperation is very important, since credible assessment of the state of the stock creates a solid basis for the management of the fisheries.

Trust between stakeholders and fisheries managers plays a vital role in the future of the Common Fishery Policy. Without active collaboration between them, even the best-drafted regulations founded on the best-researched science, and supported by carefully targeted subsidies can achieve little. Consequently it can be concluded that policy is only as good as its implementation.

No cooperative fisheries management arrangement can survive without a sound institutional and organizational structure. Even if coastal States sharing a resource have the capability of managing fishery resources within their domestic waters effectively, one has no justification in assuming that, in the absence of cooperation, the resource management outcome would be “adequate”, that what we have referred to as the default option would be sufficient. Other than in exceptional cases, cooperation does matter. Moreover, cooperation is not to be seen, merely as a useful supplement to resource management by individual states. Rather, it is to be seen as a fundamental prerequisite for effective resource management.

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Address

Elina Lice
MEPRD – Ministry of Environmental Protection and Regional Development,
Peldu street 25, Riga, LV-1494, Latvia

Elina.lice@varam.gov.lv

ANNEX

Acts relevant for fishery and aquaculture

Latvia

- 1) Estonia; Latvia: Protocol to the Agreement between the Republic of Estonia and the Republic of Latvia on the Maritime Delimitation in the Gulf of Riga, the Strait of Irbe and the Baltic Sea, between the Prime Minister of the Republic of Estonia and the Minister President of the Republic of Latvia. 12 July 1996.**

Not later than one year after the Agreement between the Republic of Estonia and the Republic of Latvia on the delimitation of the maritime boundary in the Gulf of Riga, the Strait of Irbe and the Baltic Sea has entered into force, the Republic of Estonia shall undertake all duties relating to the maintenance of the buoys, the geographical coordinates of which are specified in this Agreement. The transfer of ownership of the buoys mentioned above shall be settled by the relevant authorities of the Republic of Estonia and the Republic of Latvia. Until the transfer of ownership and duties takes place, the maintenance of the buoys mentioned above shall be performed by the Republic of Latvia.

- 2) European Union; Latvia: Council Regulation (EC) No. 58/1999 laying down for 1999 certain measures for the conservation and management of fishery resources applicable to vessels flying the flag of Latvia. 18 December 1998.**

From 1 January to 31 December 1999, vessels flying the flag of Latvia are hereby authorized to fish for the species listed in Annex I, within the geographical and quantitative limits laid down therein and in accordance with this Regulation, in the 200-nautical-mile fishing zone of the Member States in the Baltic Sea. Fishing for cod shall be prohibited in the Baltic Sea, the Belts and the Sound from 1 July to 20 August 1999 inclusive. Fishing authorized under paragraph 1 shall be limited to those parts of the 200-nautical-mile fishing zone lying seawards of 12-nautical-miles from the baselines from which the fishing zones of Member States are measured and south of 59°30' North. Notwithstanding paragraph 1, unavoidable bycatches of a species for which no quota is established in a zone shall be permitted within the limits fixed in the conservation measures in force in the zone concerned. Vessels fishing within the quotas fixed in article 1 shall comply with the conservation and control measures and all other provisions governing fishing in the zone referred to in that article. Fishing under the quotas fixed in Article 1 shall be permitted only where a license and a special fishing permit have been issued by the Commission, on behalf of the Community, at the request of the Latvian authorities and in compliance with the conditions set out in Annexes II and III.

- 3) Cabinet of Minister Regulation No 296 (02.05.2007.) Industrial fishing rules in territorial and economic zone waters**
- 4) Cabinet of Minister Regulation No 295 (02.05.2007.) Industrial fishing rules in inland waters**
- 5) Cabinet of Minister Regulation No 503 (02.06.2009.) Rules for control and landing fish trade and transport facilities, warehouses and industrial premises**
- 6) Cabinet of Minister Regulation No. 1015 (08.09.2009.) Procedures for the Issue of Special Permits (Licenses) for Commercial Activities in Fishery and Payment of the State Fee for the Issue of Special Permits (Licenses)**
- 7) Cabinet of Minister Regulation No1375 (30.11.2009.) Rules for the industrial fishing limits and procedures for the use in coastal waters**
- 8) Cabinet of Minister Regulation No1374 (30.11.2009.) Rules for the industrial fishing limits and procedures for the use in inland waters**

9) Latvia: Regulation No. 42 of Riga Harbor. 9 March 2006.

This Regulation establishes the modalities of entry and safe navigation in the defined area of water of Riga Harbor. Positioning of fishing gear in the harborage must be coordinated with the harbor master. Fishing gear must be positioned at a distance of no less than 100 meters from the boundaries of the navigating channel with prior information of the harbor inspector. Fishing gear shall be marked.

10) Latvia: Fisheries Regulation. 10 January 2006.

This Fisheries Regulation establishes the modalities of artisanal fishing by natural persons in the inland water bodies and in marine fishing areas, underwater hunting, capture of crayfish and other aquatic invertebrates by authorized fishing gear.

11) Latvia: Harbor Law. 22 June 1994.

This Law regulates the functioning of harbor and management thereof. It shall be applicable to the seaports of Riga, Ventspils and Liepaja. Article 23 establishes that small seaports shall be considered defined land territory, part of internal water, including internal and external roadstead, navigation routes and harbor facilities used for fisheries and fish processing. Article 24 specifies that rent for works and facilities used for fisheries and fish processing must not exceed five percent of cadastre value of land.

12) Latvia: Cabinet Regulation No.85 of 2001 regarding monitoring fish landings and inspection of fish marketing and transport facilities, warehouses and processing premises. 27 February 2001.

This Regulation prescribes the procedures for monitoring fish landing and inspecting fish marketing and transport facilities, warehouses and processing premises. The implementation of this Regulation shall, in conformity with their competence, be controlled by the State Environment Administration and of regional environmental boards attached to the State Environment Inspection of the Ministry of Environmental Protection and Regional Development.

13) Latvia: Instruction No. 1 of the Ministry of Agriculture on documentation required for propagation of fish resources. 14 February 2001.

These instructions determine the drawing up of documentation regarding recording and release of fish with respect to the release of young fish into bodies of water, intended for the purposes of realisation of the State budget sub-program "Fish Resource Enhancement", augmentation of fish resources and compensation of losses.

14) Latvia: Cabinet Regulation No. 327 regarding restrictions on the use of drugs for animals. 19 September 2000.

This regulation determines restrictions on the use of drugs for animals. The State Veterinary Service shall monitor compliance with the present regulation.

15) Latvia: Cabinet Regulation No.251 of 1998 on the registration of aquaculture animal farms, certification of river basin zones, control of infectious aquaculture animal diseases on farms and in river basin zones, and requirements applicable to the placing of aquaculture animals on the market. 14 July 1998.

This Regulation determines the procedures for registration of farms and certification of river basin zones, infectious diseases of aquaculture animals and the control of such diseases on farms and in river basin zones, requirements which aquaculture animals and aquaculture products intended to be placed on the market shall conform with, and the division of the territory of Latvia into river basin zones in

order to maximally ensure the possibility of avoiding pollution because of migration of aquaculture animals.

16) Latvia: Cabinet Regulation No.89 of 1998 regarding hygiene requirements and criteria for freshness and size for production and placing on the market of fishery products. 17 March 1998.

This Regulation determines the hygiene requirements and the criteria regarding freshness and size for the acquisition and production of fishery products intended for human consumption on fishing vessels and factory vessels, in treatment establishments and placing on the market thereof.

17) Latvia: Cabinet Regulation No.55 of 1998 regarding commercial fishing in the territorial waters and exclusive economic zone of the Republic of Latvia and in the Gulf of Riga. 17 February 1998.

This Regulation prescribes the procedures by which foreign natural persons and legal persons conduct commercial fishing in the territorial waters and exclusive economic zone of the Republic of Latvia and in the Gulf of Riga, as well as prescribes the conditions for surveys and protection of commercial fish resources.

18) Latvia: Fishing Law. 12 April 1995.

This Law regulates the catching, utilization, research, conservation, enhancement and monitoring of fish resources in inland waters, territorial marine waters and exclusive economic zone of the Republic of Latvia. Catching of fish resources in international waters in which the Republic of Latvia has been allotted a catch quota, or in the waters of other states with which Latvia has concluded agreements on fisheries, shall be regulated by relevant international agreements to which the Republic of Latvia is party.

19) Latvia: Law on the continental shelf and the exclusive economic zone. 2 February 1993.

The continental shelf of the Republic of Latvia is the seabed and the depths below it in submarine regions adjacent to the seacoast of the Republic of Latvia but which are beyond the boundaries of the territorial sea and extend to the boundaries determined in Section 3 of this Law. The exclusive economic zone of the Republic of Latvia includes the waters of the Baltic Sea beyond the territorial sea boundaries and which extend to the boundaries determined in Section 3 of this Law. Section 3 establishes that the boundaries of the continental shelf of the Republic of Latvia and of the exclusive economic zone of the Republic of Latvia with the Republic of Estonia, the Republic of Lithuania and the Kingdom of Sweden shall conform to the international agreements entered into by the Republic of Latvia with the Republic of Estonia, the Republic of Lithuania and the Kingdom of Sweden.

20) Russian Federation; Latvia: Peaceful Agreement between Russia and Latvia. 11 August 1920.

The Parties have agreed that water abstraction from border rivers and lakes leading to the reduction of average water level therein shall be prohibited. The modalities of navigation and fisheries in the aforesaid rivers and lakes shall be regulated by a separate agreement on condition that only fishing methods ensuring inexhaustible management of fish stocks shall be authorized. (art. 4).

21) United States of America; Latvia: Fisheries of the United States Coast-Agreement Between the United States of America and Latvia. 8 April 1993.

The purpose of this Agreement is to promote effective conservation and rational management of fisheries off the United States Coast, to facilitate the rapid development of the United States Fishing Industry and to establish common understanding of the principles and procedures under which fishing by nationals of Latvia of living resources over which the US has sovereign rights may be conducted.

Latvia has joined the following international conventions in the field of fisheries:

- 22) **1973 Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and the Belts (Latvia joined on 10 September 1991);**
- 23) **1964 Convention on International Council for Exploration of the Sea (Latvia joined on 10 September 1991);**
- 24) **1977 Convention on future Multilateral Cooperation in the North-West Atlantic fisheries (Latvia joined on 3 June 1992);**
- 25) **1974 Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area (Latvia joined on 3 March 1994).**

Estonia

1) Law on the boundaries of the maritime tract, 10 March 1993

The present Law determines the "maritime tract" of Estonia, being the part of the marine area that borders with the mainland and which falls under the jurisdiction of the Republic. The bases for such determination are the Law of the Sea Conventions of Geneva of 1958 and New York of 1982. The "normal baseline" is defined as "an imaginary line which at low tide joins the points farthest from the shoreline of the mainland, islands, islets, rocks and single boulders". The coordinates of such baselines are specified in Schedule 1. The internal sea is the part of the sea between the normal baseline of the territorial sea and the shorelines. The coordinates of the boundary of the territorial sea of twelve nautical miles are specified in Schedule 2. The EEZ the maritime zone beyond and adjacent to the territorial sea whose outer limits are determined in coordination with neighbouring States. Coordinates of the boundary of the EEZ are specified in Schedule 3.

2) Agreement between the Russian Federation and the Republic of Estonia regarding the delimitation of sea area in the Gulf of Narva and in the Gulf of Finland, 18 May 2005

The Parties have agreed that delimitation line of the sea area between the Russian Federation and the Republic of Estonia shall be based on the median line traced so that at each point thereof shall be equidistant point from the nearest point of the maximum fall of the tide along the shoreline (including islands) of both states.

3) Agreement between the Government of the Republic of Finland and the Republic of Estonia on the Boundary of Maritime Zones in the Gulf of Finland and the Northern Baltic Sea, 1996

The Parties hereby agree on the delimitation of the continental shelf and the fishing zone of Finland and the economic zone of Estonia. The boundaries of these maritime zones shall be constituted by straight (geodetic) lines that connect points indicated in article 2. The course of the boundary has been designated on a map attached to the Agreement. The starting point of the boundary is a point in the east on which agreement will be reached with "the third State concerned".

4) Agreement between the Government of the Republic of Estonia, the Government of the Republic of Latvia and the Government of the Kingdom of Sweden on the Common Maritime Boundary Point in the Baltic Sea, 1997

The Parties agree that the straight geodetic line referred to in article 3 in the Agreement between the Republic of Latvia and the Republic of Estonia on the maritime delimitation in the Gulf of Riga, the Strait of Irbe and the Baltic Sea, signed at Tallinn on 12 July 1996, shall connect to the border of the exclusive economic zone and the continental shelf of the Kingdom of Sweden at the point with the following geographical coordinates: 58° 01,440'N 20° 23,775'E. The point is defined in the World Geodetic System 1984.

5) Agreement between the Government of the Republic of Estonia and the Republic of Latvia on the Maritime Delimitation in the Gulf of Riga, the Strait of Irbe and the Baltic Sea, 1996

The Parties hereby agree on the delimitation of the territorial seas, continental shelf and the exclusive economic zones in the Gulf of Riga, the Strait of Irbe and the Baltic Sea. The boundaries of maritime zones in the Gulf of Riga, the Strait of Irbe shall be constituted by straight (geodetic) lines that connect points indicated in article 2. The course of the boundary has been designated on a map attached to the Agreement. The boundary in the Baltic shall be defined in accordance with the formula laid down in article 3. Parties shall notify each other regarding changes in baselines and limits of their territorial seas or exclusive economic zones and disputes between the Parties shall be settled through consultations and negotiations or any other means of peaceful settlement provided for by international law (art.s 4 and 5).

6) Protocol to the Agreement between the Republic of Estonia and the Republic of Latvia on the Maritime Delimitation in the Gulf of Riga, the Strait of Irbe and the Baltic Sea, between the Prime Minister of the Republic of Estonia and the Minister President of the Republic of Latvia, 1996

Not later than one year after the Agreement between the Republic of Estonia and the Republic of Latvia on the delimitation of the maritime boundary in the Gulf of Riga, the Strait of Irbe and the Baltic Sea has entered into force, the Republic of Estonia shall undertake all duties relating to the maintenance of the buoys, the geographical coordinates of which are specified in this Agreement. The transfer of ownership of the buoys mentioned above shall be settled by the relevant authorities of the Republic of Estonia and the Republic of Latvia. Until the transfer of ownership and duties takes place, the maintenance of the buoys mentioned above shall be performed by the Republic of Latvia.

7) Agreement Between the Government of the Kingdom of Sweden and the Government of the Republic of Estonia on the Delimitation of the Maritime Zones in the Baltic Sea, 1998

The Parties hereby determine and delimitation the continental shelf and the exclusive economic zones of the two States in the Baltic Sea. The delimitation follows the straight lines (geodetic lines) connecting the points with the geographical coordinates referred to in Article 2.

8) Agreement between the Government of the Republic of Finland, the Government of the Republic of Estonia and the Government of the Kingdom of Sweden on the Common Maritime Boundary point in the Baltic Sea, 2001

The Parties hereby determine the point where the maritime boundaries of the three States in the Baltic Sea coincide, taking into account agreements concluded between the Parties on the delimitation of the continental shelf and of the fishery and exclusive economic zones in the Baltic Sea. The lines of delimitation shall be drawn as straight (geodetic) lines to a common point following specified geographical coordinates. Reference is made to prior bilateral agreements on fisheries and the delimitation of the Continental Shelf between the parties to this Agreement.

9) Agreement between the European Community and the Government of the Russian Federation on cooperation in fisheries and the conservation of the living marine resources in the Baltic Sea, 2009

The objective of this Agreement is to ensure a close cooperation between the European Community and the Russian Federation on the basis of the principle of equitable and mutual benefit for the purpose of conservation, sustainable exploitation and management of any straddling, associated and dependent stocks in the Baltic Sea. To this end, the Parties set out joint management measures which deal with Total Allowable Catches, long-term management plans, limitation of fishing effort and issue of fishing licenses.

10) Law on Ship Flag and registers of Ships Act, 1998 (as consolidated in 2002)

This Law regards sea-going vessels, inland vessels and small craft. Permanent unique fishing numbers shall be assigned to fishing vessels. The instructions for formation of fishing numbers of fishing vessels and for marking fishing numbers on vessels shall be established by the Minister of Transport and Communications. Upon registration, a permanent unique official number shall be assigned to a ship. The Law consists of II Parts sub-divided into Chapters. Part I (chapters 1-5) contains Law of Ship Flag. Chapter 1 concerns the issues of flying national flag of Republic of Estonia. Chapter 2 deals with papers of nationality. Chapter 3 concerns the issues of flying national flag of other state. Chapter 4 establishes the modalities of granting right to fly national flag of Republic of Estonia. Chapter 5 regards identification of ship. Part II (chapters 1-4) deals with registers of ships. Chapter 1 lays down general provisions. Chapter 2 regards ship register. Chapter 3 regards register of small craft. Chapter 4 regards register of bareboat chartered ships.

11) Fishery Regulation establishing measures for the conservation and management of fishing resources in the Estonian EEZ, 1994

This Regulation establishes measures for the conservation and management of fishery resources in the Exclusive Economic Zone of Estonia. The National Estonian Board of Fisheries shall be responsible for the fishery management in the Estonian EEZ and the issue of fishing licenses. Foreign fishing vessels may be allowed to fish in the EEZ on the basis of bilateral agreements with the Estonian Government. Further provisions concern: (a) the duties and responsibility of fishermen; (b) the restrictions on the use of certain fishing methods; (c) minimum sizes; (d) mesh size; (e) bycatch; (f) enforcement measures; (g) special conditions for trawl and Danish seines fishery. Article 11 establishes the periods during which the fishing for certain species, specifically indicated therein, is prohibited. Specific provisions regulate the fishing for salmon and sea trout.

12) Agreement between the European Community and the Government of the Russian Federation on cooperation in fisheries and the conservation of the living marine resources in the Baltic Sea, 2009

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14) The Food Act (2000)

Provides the basis for the handling of food and raw material for food for marketing purposes, the self-checking of a food business operator, and state supervision in order to ensure food safety and the

conformity of food to other requirements. Raw material for food and initial processing thereof includes also any natural product which is acquired by fishing.

15) Environmental Supervision Act (1997)

Supervision of fishing in waters outside the territorial jurisdiction of the Republic of Estonia is covered by the provisions of the Environmental Supervision Act. Supervision over fulfillment of the requirements of legislation regulating fishing and the conditions designated in a fishing permit, even in waters outside the direct jurisdiction of the Republic of Estonia, are exercised by the Ministry of the Environment.

16) Fishing rules, 1999

The procedure for fishing on all water bodies and the procedure for collecting aquatic plants determine: closed seasons for fishing, and prohibited areas; minimum fish sizes and the conditions for bycatch; restrictions on and requirements for fishing gear and methods; fishing gear types and specifications; requirements for marking fishing gear; and the method for calculating the proportion of Baltic herring and sprat in trawl catch.

17) The country is a party to the UN Law of the Sea Convention

18) The country is not a party to the FAO Compliance Agreement from 1993

19) The country is a party to the UN Fish Stocks Agreement from 1995

Latvia and Estonia as members of EU also must take into account following EU regulations in fishery sector:

1) Council Regulation 1006/2008

This Regulation lays down provisions governing the authorization for European Community fishing vessels to engage in fishing activities (i) in the waters under the sovereignty or jurisdiction of a third country in the framework of a fisheries agreement concluded between the European Community and that country; or (ii) in waters falling under the scope of conservation and management measures adopted in the framework of a regional fisheries management organization or similar arrangement to which the European Community is a contracting party or a non contracting cooperating Party. Moreover, this Regulation concerns the authorization for third country fishing vessels to engage in fishing activities in European Community waters. Details on reporting obligations are laid down as well.

2) Council Regulation (EC) No 2371/2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy, 20 December 2002

This Regulation lays down the Common Fisheries Policy, which covers conservation, management and exploitation of living aquatic resources, aquaculture, and the processing and marketing of fishery and aquaculture products where such activities are practiced on the territory of Member States or in Community waters or by Community fishing vessels or, without prejudice to the primary responsibility of the flag State, nationals of Member States.

3) Council Regulation (EC) No. 1224/2009

This Regulation establishes a European Community system for control, inspection and enforcement aimed at ensuring compliance with the rules of the common fisheries policy. These provisions apply to all activities covered by the common fisheries policy carried out on the territory of Member States or

in European Community waters or by European Community fishing vessels or, without prejudice to the primary responsibility of the flag Member State, by nationals of Member States. Specific rules are laid down as regards access to waters and resources, monitoring and control of the use of fishing opportunities.

4) Council Regulation (EC) No. 1098/2007 establishing a multiannual plan for the cod stocks in the Baltic Sea and the fisheries exploiting those stocks, amending Regulation (EEC) No. 2847/93 and repealing Regulation (EC) No. 779/97

This Regulation sets out a multiannual plan for the management of cod stocks and lays down provisions for fishing cod in the Baltic Sea. The plan aims at ensuring the sustainable exploitation of cod stocks by gradually reducing and maintaining the fishing mortality rates at levels no lower than those specified in article 4. Further provisions concern the procedure for establishing total allowable catches, as well as monitoring, inspection and surveillance.

5) Council Regulation (EC) No. 2187/2005 for the conservation of fishery resources through technical measures in the Baltic Sea, the Belts and the Sound, amending Regulation (EC) No. 1434/98 and repealing Regulation (EC) No. 88/98

The present Regulation establishes technical conservation measures applying to the taking and landing of fishery resources in the maritime waters under the sovereignty or jurisdiction of the Member States and situated in the geographical area specified in Annex I. The conservation measures refer to minimum mesh sizes, structure of permitted fishing gear, prohibited fishing gear, minimum landing size of fish and prohibited fishing areas.

6) Commission Regulation (EC) No 1281/2005 on the management of fishing licenses and the minimal information to be contained therein, 3 August 2005

In order to facilitate and ensure a homogeneous control of fishing activities, and in particular information on the license holder, the vessel, the fishing capacity and the fishing gear, the present Regulation lays down rules for the management of fishing licenses and establishes the minimum information to be contained in a fishing license.

7) Council Regulation (EC) No. 1005/2008

This Regulation sets out a European Community system to prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing. This system applies to all IUU fishing and associated activities carried out within the territory of Member States, within European Community waters, within maritime waters under the jurisdiction or sovereignty of third countries and on the high seas. These provisions include rules on inspections of third country fishing vessels in European Community member States ports, a catch certification scheme for importation and exportation of fishery products, as well as provisions on identification of fishing vessels engaged in IUU fishing.

8) Commission Regulation (EC) No. 1010/2009 laying down detailed rules for the implementation of Council Regulation (EC) No. 1005/2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing

This Regulation sets out detailed rules for implementing Council Regulation No. 1005/2008 establishing a European Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing. These rules cover in particular inspections of third country vessels in Member States ports, the catch certification scheme for importation and exportation of fishery products and sightings.

9) Commission Regulation (EC) No 2244/2003 laying down detailed provisions regarding satellite-based Vessel Monitoring Systems, 18 December 2003

The present Regulation lays down detailed rules for the operation by Member States of a satellite-based Vessel Monitoring System (VMS), as provided for in article 22(1)(b) and article 23(3) of Regulation (EC) No. 2371/2002.

10) Council Regulation (EC) No. 1224/2009

This Regulation establishes a European Community system for control, inspection and enforcement aimed at ensuring compliance with the rules of the common fisheries policy. These provisions apply to all activities covered by the common fisheries policy carried out on the territory of Member States or in European Community waters or by European Community fishing vessels or, without prejudice to the primary responsibility of the flag Member State, by nationals of Member States. Specific rules are laid down as regards access to waters and resources, monitoring and control of the use of fishing opportunities.

11) Commission Regulation (EC) No. 1010/2009

This Regulation sets out detailed rules for implementing Council Regulation No. 1005/2008 establishing a European Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing. These rules cover in particular inspections of third country vessels in Member States ports, the catch certification scheme for importation and exportation of fishery products and sightings.

12) Council Regulation (EC) No. 1098/2007 establishing a multiannual plan for the cod stocks in the Baltic Sea and the fisheries exploiting those stocks, amending Regulation (EEC) No. 2847/93 and repealing Regulation (EC) No. 779/97

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14) Council Regulation (EU) No. 23/2010 of 14 January 2010 Commission Regulation (EC) No 356/2005 laying down detailed rules for the marking and identification of passive fishing gear and beam trawls, 1 March 2005

The present Regulation lays down detailed rules governing the marking and identification of passive fishing gear and beam trawls. As regards the scope, these rules shall apply to vessels fishing in Community waters. However, they shall not apply within the 12 nautical miles measured from the baselines of the coastal Member States.

Table 1: Responsible authorities in the Gulf of Riga

General Directorate for Fisheries	
Common Fisheries Policy (CFP), which refer to all fishing activities, the farming of aquatic resources as well as the processing and commercialization of fishery products. The most important areas of action of the common fisheries policy are:	
<ul style="list-style-type: none"> ➤ laying down rules to ensure Europe's fisheries are sustainable and do not damage the marine environment; ➤ providing national authorities with the tools to enforce these rules and punish offenders; ➤ monitoring the size of the European fishing fleet and preventing it from expanding further; ➤ negotiating funding and technical support for initiatives that can make the industry more sustainable; ➤ helping producers, processors and distributors get a fair price for their produce and ensuring consumers can trust the seafood they eat; ➤ supporting the development of a dynamic EU aquaculture sector (fish, seafood and algae farms); ➤ funding scientific research and data collection, to ensure a sound basis for policy and decision making. 	
Latvia	Estonia
<p>Ministry of Agriculture of Latvia, Fisheries Department, Division of Fishing Management and Fish Resources</p> <p>Republikas laukums 2, Rīga, LV-1981, phone: +371 67323877, fax: 67334892, e-mail: zm@zm.gov.lv</p>	<p>Ministry of Agriculture, Fishery Economics Department, Laitn 39//Laitn 41, 15056 Tallinn, Estonia, phone: +372 625 6101, fax: +372 625 6200, e-mail: pm@agri.ee</p>
Functions	Functions
<ul style="list-style-type: none"> ➤ Development of fisheries policy and sector's strategy; ➤ elaboration of fisheries legislation, ➤ representation of sector interests and safeguarding of allocation of national quota at the international fisheries organisations, ➤ realisation of intergovernmental fisheries agreements, ➤ regulation and limitation of fishing activities and lease of fishing rights, ➤ organisation of fish product market, ➤ registration of fish buyers, ➤ maintenance of data base of fishing vessel register. 	<ul style="list-style-type: none"> ➤ deals with issues of aquaculture, fish production, processing and marketing of fish and fishery products, and fisheries-related structural policy. ➤ develops and implements fisheries policy for the fishing and fish processing industries ➤ economic development of the fisheries sector, which includes market organization system, implementing the structural and state aid, organizing the aquaculture sector, organizing commercial fishing, administering fishing permits and maintaining records on fishing. ➤ deals with issues of aquaculture, fish production, processing and marketing of fish and fishery products, and fisheries-related structural policy.
<p>The State Environment Service, Marine and Inland Waters Administration (under the competence of the Ministry of the Environmental Protection and</p>	<p>Estonian Environmental Inspectorate (EEI) of the Ministry of Environment, Milstrand Terminal, Randvere Tee 5, 74001 Viimsi Vald Harjumaa,</p>

<p>Regional Development), Voleru iela 2, Riga, LV-1007, phone: +371 67469664, fax: +371 67465888, e-mail: jrup@jrjup.vvd.gov.lv</p>	<p>waters of the EU member states and third countries; issues licenses and logbooks for fishing in Latvian marine and inland waters; ensures the functioning of fishing vessel monitoring system and fish landing control system in Latvian ports; approves contingency plans for ports, wharfs and terminals, and port waste management plans; collects, compiles and provides information on marine environment quality and use of natural resources in frames of its competency; carries out other duties stipulated in bylaws of MIWA.</p>	<p>ports. EEI is also responsible for the control of fisheries at sea. Fisheries Resources Department manages and adjusts: development and amending of the Fishing Act and its sub-acts; international fisheries cooperation; within its competence, the fisheries cooperation in view of accession to the EU (adoption of EU legislative acts, preparation of programs, etc.); scientific research of fish resources and reproduction; fishing-related accounting, fish protection and surveillance; fishing efforts and assessment of the use of resources, based on which the regular and special fishing permits are issued; limited fishing permits and permits for recreational fishing are issued by the County Environmental Departments; in cooperation with the County Environmental Departments, plans for and conducts surveys on implementation of Section 014,55, of the "Fishing Permit Fees" of the national budget; development of the specialised environmental program's subprogram for fisheries and ensures precise and sustainable use of the funds assigned to it.</p>	<p>Tallinn, Estonia, phone: +372 6 055 979, fax: +372 6 055 974, email: estonia@inspectorate.ee Ministry of the Environment, Fish Resources Department, Narva mnt 7a, 15172 Tallinn, Estonia, phone: (+372) 6262 802; fax: (+372) 6262 801, e-mail: keskkonnaministeerium@envir.ee</p>
<p>The Institute of Food Safety, Animal Health and Environment "BIOR" Lejupes Street-3, Riga LV-1076, Latvia</p>	<p>carry out scientific activities in food, veterinary, environmental and fisheries sectors and in other sectors of biology; provide an expertise, scientific substantiation and risk assessment for</p>	<p>fisheries data collection and scientific advice formulation The main purpose of the Marine Institute is research to enhance the knowledge and understanding of the</p>	<p>The Estonian Marine Institute, University of Tartu Mäealuse 14, 12618 Tallinn, Estonia phone: (+372) 6718 902</p>

<p>Phone: +371 67620513 Fax: +371 67620434 e-mail: bior@bior.gov.lv</p>	<p>sectoral development policy; ➤ implement execution of national data collection programs for fisheries sector, scientific activities and state monitoring needs in the field of food quality and safety; ➤ to implement projects to assess the risk in the field of food safety and animal infectious diseases; ➤ to carry out fishery inspections and provide scientific substantiation for environment-friendly, rational and sustainable management of fish resources in the inland and coastal waters of Latvian jurisdiction, territorial waters and waters of the economic zone of the Baltic Sea; ➤ to implement a state policy on reproductive capacity of fish stocks through the implementation of activities of the Fish Resources reproductive state program;</p>	<p>Marine sphere in Estonia and the Baltic Sea region. ➤ one of the biggest marine organizations in Estonia and contributes to research in several marine study fields. ➤ studying the molecular genetics of salmonid fish; ➤ quality of farmed fish; ➤ development of new and improved technology for production of new species in Estonia (sturgeon, crayfish, salmon); ➤ fish parasitology.</p>	<p>fax. (+372) 6718 900 e-mail: toomas.saat@ut.ee</p> <p>Fisheries Information Centre</p> <p>Department of Fish Farming of the Institute of Veterinary Medicine and Animal Science of the Estonian Agricultural University</p> <p>Kreutzwaldi 48, 51006 Tartu, Estonia Phone (+372) 731 3481 Fax: (+372) 731 3489 e-mail: tit.paaver@emu.ee</p>
<p>Union of Latvian Fish Processing Industries</p> <p>Atlantijas iela 15, Rīga, Latvia LV-1015, Telephone: +371 26364252 Fax: +371 67496401 E-mail: info@cannedfish.lv</p>	<p>The Union of Latvian Fish Processing Industry (ULFPI) is a public organization, in which the leading Latvian fish processing enterprises are united by the direction of basic activity — the production of canned fish. The task of the ULFPI is to promote the interest of its members in Latvia and abroad, with the purpose to achieve the best possible conditions for the development of the branch. The ULFPI is a member of the Employers' Confederation of Latvia, the Latvia Marketing Board and the Latvian Federation of Food Enterprises. The association is represented in the advisory board of the Latvia Fishing Industry and in several work groups of mediating institutions.</p> <p>➤ representation of sector interests ➤ influence the legislative and regulatory</p>	<p>Aims to promote fish farming in Estonia by means of information exchange, training etc. and to represent the interests of fish farmers in governmental institutions.</p>	<p>Estonian Fish Farmers' Association</p> <p>Kreutzwaldi 48 Tartu 51006 Phone (+372) 5275015 e-mail: carpio@hotmail.ee</p>
<p>Latvian Fisheries Association</p>	<p>➤ the development of cooperation with the members of the association and</p>		<p>Estonian Association of Fishery</p>

<p>Ganību dambis 24 D, cabinet no 608, Rīga, Latvia, LV-1005, phone: +371 67383197, e-mail: zv.flote@dtg.lv</p>	<p>preparation and adoption process, participate in the fisheries development and fish resources protection issues</p> <p>➤</p>	<p>with order professional associations, as well as with national and municipal associations, and associations in private law from Estonia and abroad. ➤ the promotion on members interests in governmental bodies and in authorities of the European Union; making proposals in view of improving the legislation ➤ gathering fishing information and analysis thereof, as well as rendering informational services ➤ arranging the presentations of the members production on exhibitions, fairs, liaison events, and competitions ➤ the analysis and evaluation of various commercial projects directly or indirectly related to fishery and fish processing, as well as of national and foreign aid programs, the representation of the members in those projects and programs ➤ the development of fishery policy in accordance with the fishery policy of the European Union</p>	<p>Peterburi tee 2F (Ülemiste Ärimaja IV korrus) 11415 Tallinn Phone (+372) 6221300 fax: (+372) 6221302 e-post: kalaliit@online.ee</p>
<p>Kurzeme Fishermen Association Melluzu prospects 66a-3, Jurmala, Latvia, LV-2008, phone/fax: +371 67351037, e-mail: apens@mail.elval.lv</p> <p>Latvian Fishermen Federation O.Kalpaka iela 92-25, Liepāja, Latvia, LV-3405, phone: +371 63486871, fax: +371 63486871, e-mail: federacija@apollo.lv</p>	<p>representation of sector interests ➤ influence the legislative and regulatory preparation and adoption process, ➤ participate in the fisheries development and fish resources protection issues</p> <p>➤ Latvian fishing traditions, ➤ industry development, ➤ promote public participation in fisheries management and governance in the Latvian law</p>	<p>The members of the cooperative hold 48% of the historical sprat-fishing rights issued in Estonia and 43% of the Baltic herring- fishing rights.</p> <p>The Estonian Fishermen's Association comprises 6 sections: distant-water fishery; Baltic cod fishery; open Baltic trawl fishery; coastal Baltic trawl fishery; Baltic coastal fishery; and the inland water fishery (Lakes Peipsi and Võrtsjärv).</p>	<p>Estonian Fishing Association Peterburi tee 2F 11415 Tallinn, Eesti Tel: +372 50 23 860 E-mail: info@estofish.ee</p> <p>Estonian Fishermen's Association Tuule 1A, 93816 Kuresaare, Estonia, phone: +372 50 23 860, fax: +372 45 44 082, email: undrest@hotmail.com andresvarik@hotmail.ee</p>

Local municipalities	responsible for the management of fish resources and the lease of fishing rights in the Baltic Sea coastal waters and in inland waters.	responsible for the management of fish resources and the lease of fishing rights in the Baltic Sea coastal waters and in inland waters.	Local municipalities
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