



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.

1.1 Vistula Lagoon

The Vistula Lagoon (Figure 1) is one of the largest transboundary lagoons in the Southern Baltic Sea. It is a shallow (average depth 2.7 m) coastal ecosystem. The Lagoon has an elongated shape, going from south-west to north-east, with a length of 91 km. The average width of the Lagoon is about 9 km, at the widest point 19 km. The surface area is 838 km², of which 473 km² belongs to Russia, and the remaining part to Poland. The length of the coastline is of about 270 km, and the volume of water in the Lagoon is about 2.3 km³. The average depth of the Lagoon is 2.7 m, and the maximum natural depth is 5.2 m close to the Baltiysk Strait.

The Vistula Lagoon is separated from the Baltic Sea by the Vistula Spit - a sand peninsula 55 km long. The Lagoon exchanges water with the sea through the Baltiysk Strait, which has a width of approximately 400 m, a length of two kilometres and an average depth of 8.8 m. Baltiysk Strait continues up to the harbour of Kaliningrad as a fairway (navigation channel) crossing the Lagoon. The channel is twice deeper than the largest natural depth in the Lagoon. Despite its relative narrowness, it plays an important role as a way of salt transport from the Gulf to the Lagoon.



Figure 1: Location of the Vistula Lagoon and main discharging rivers (according to Bielecka and Lewandowski, 2004).

With respect to salinity the Vistula Lagoon is a transitional area. The average salinity (1950-1965) for the eastern part of the Lagoon (spring-autumn) is 2.5-4.3 PSU, for the central part 3.9-5.0 PSU, and for the southern part 1.0-3.4 PSU. This diversity is a result of salt water inflows from the Baltic Sea that influence all aquatic areas of the Lagoon, including the mouth of the Pregola River. At the Baltiysk Strait salinity may reach 7 PSU.

The catchment area of the Vistula Lagoon is 23,871 km² and the average retention time is about 6-7 months. There are more than 20 rivers discharging directly to the Vistula Lagoon. Among them the most important are: Pregola, Elblag, Pasilka, Nogat, Prokhladnaya, Mamonovka, Bauda, Primorskaya and Szkarpawa (Figure 1). The main part of the annual freshwater inflow (40%) is coming from the Pregola River.

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.

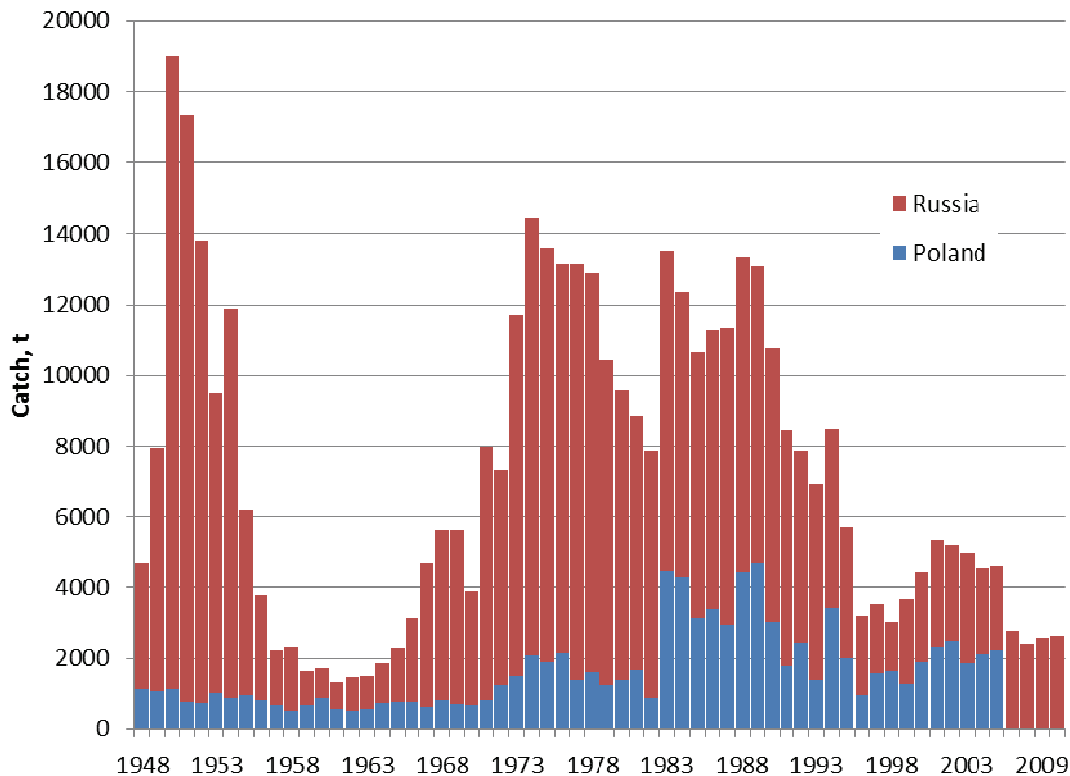


Figure 2: Changes in dynamics of total catch in Polish and Russian part of the Vistula Lagoon since 1948.

2 Fishery

2.1 Ecological aspects

The fish fauna of the Vistula Lagoon consists of 57 species (Khlopnikov et 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).

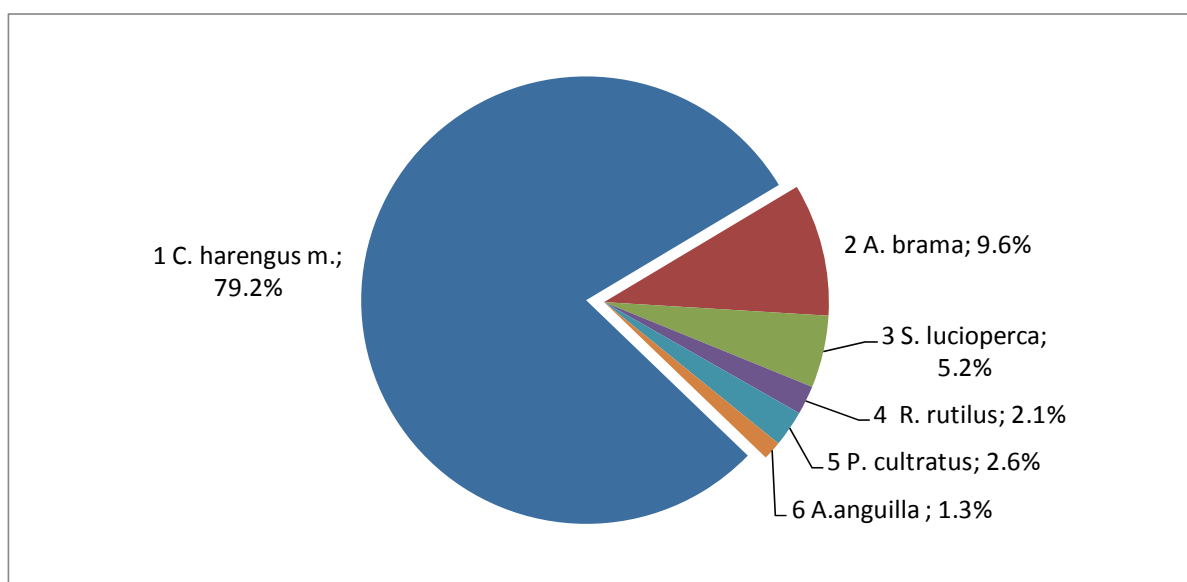


Figure 3: Fish-species composition of commercial catches in the Vistula Lagoon.

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).

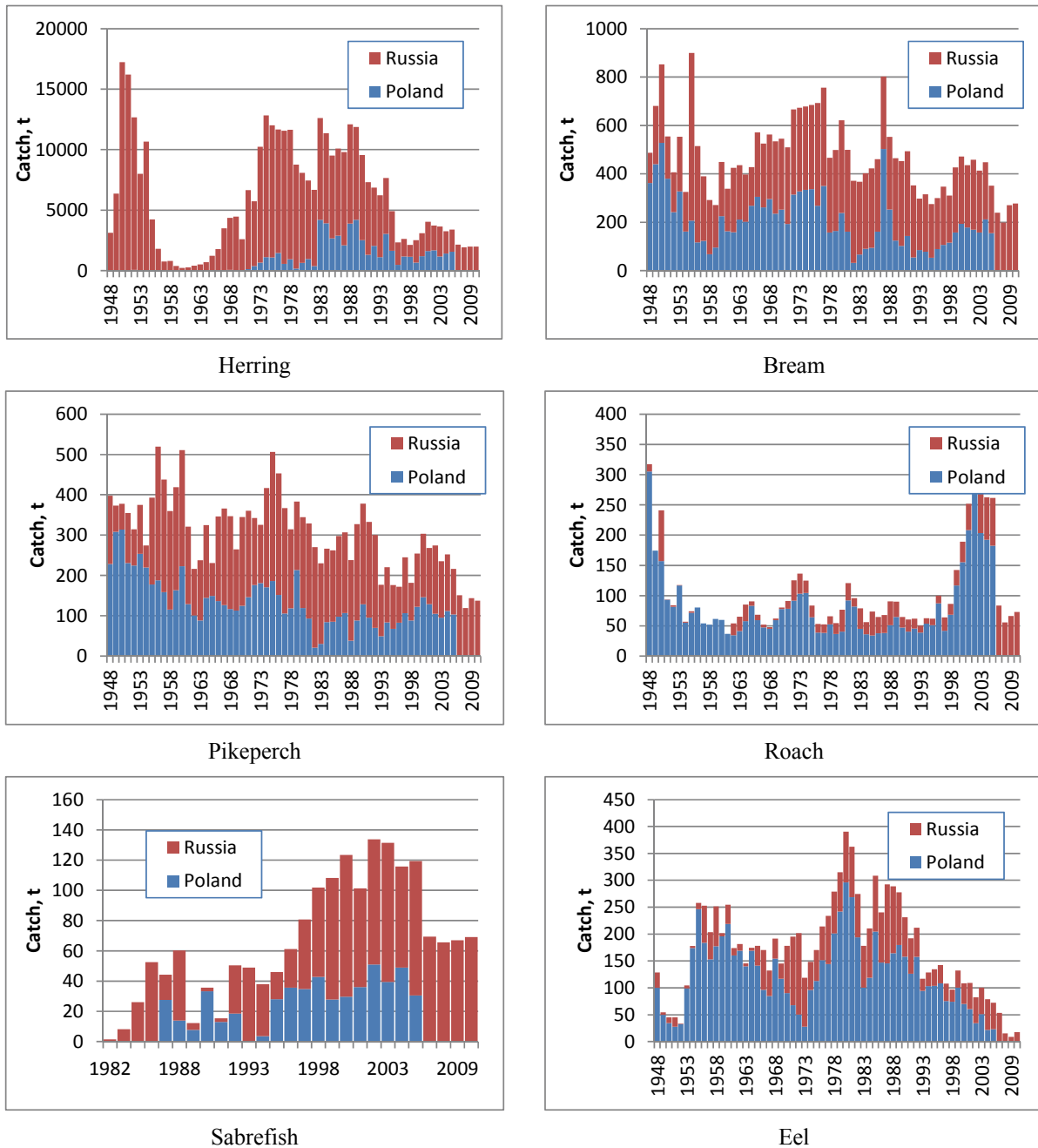


Figure 4: Comparison between Polish and Russian catches of main fishery species in the Vistula Lagoon.

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.

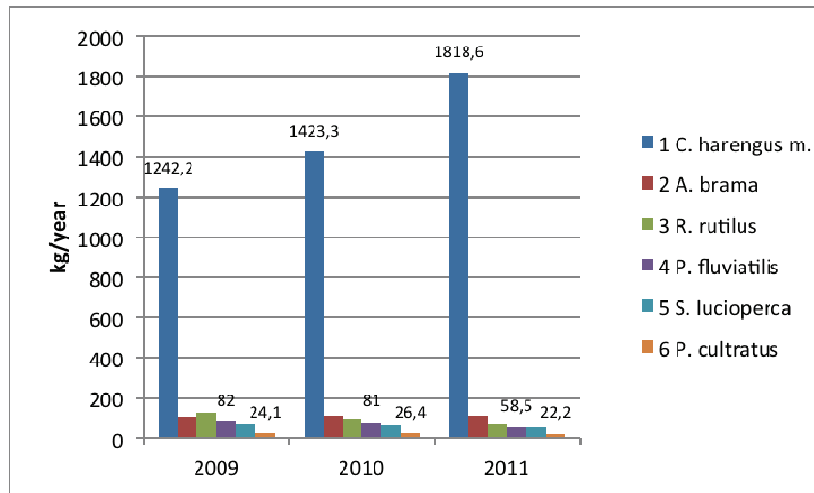


Figure 5: Dynamics of catches of main fishery species in the Polish part of the Vistula Lagoon between the years 2009 to 2011.

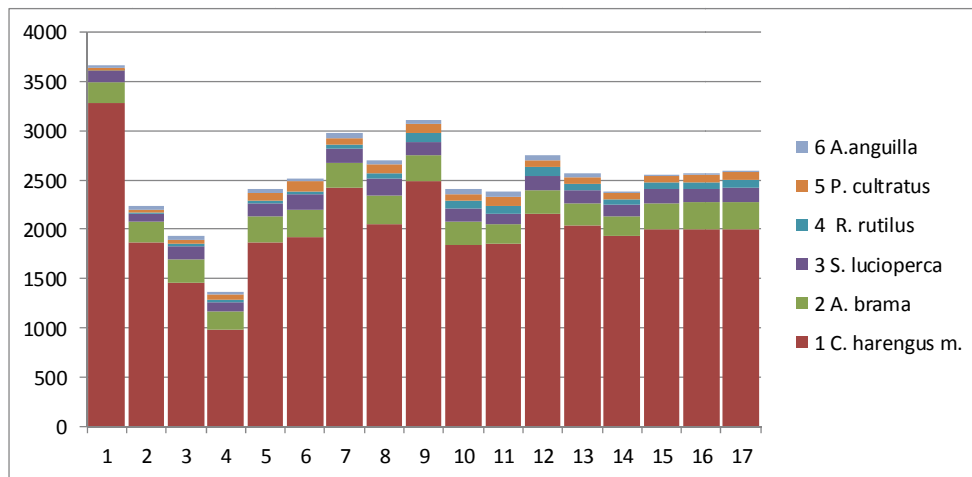


Figure 6: Dynamics of commercial catches and fish-species composition in the Vistula Lagoon.

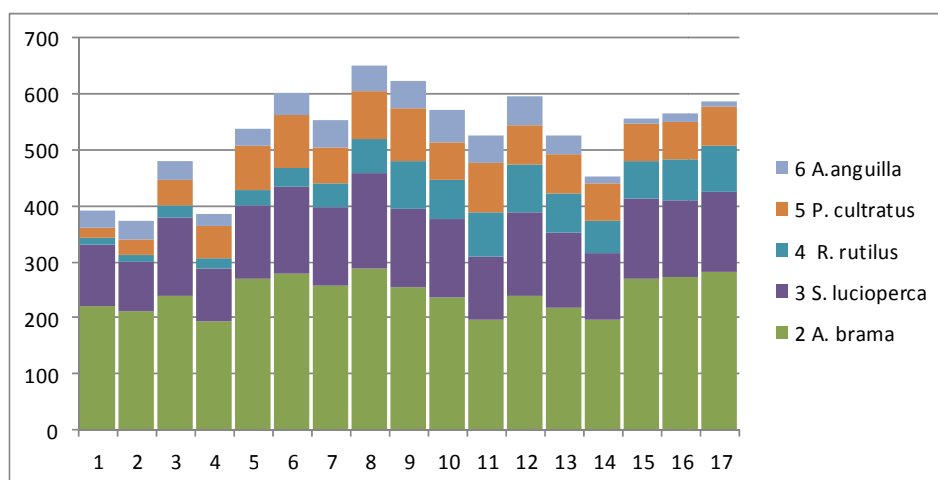


Figure 7: Dynamics of commercial catches and fish-species composition in the Vistula Lagoon (without herring).

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.

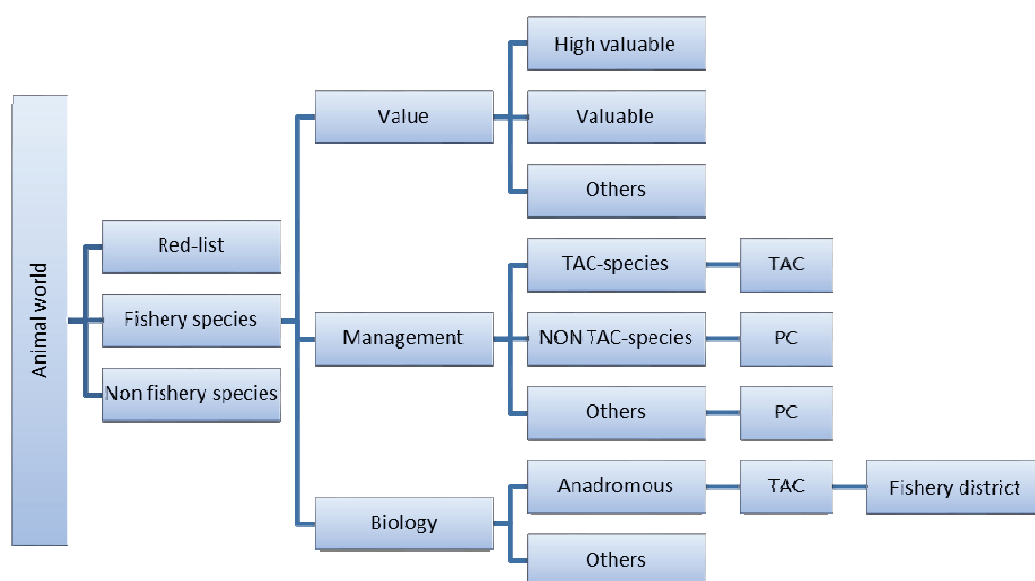


Figure 8: Structure of water bioresources according to Russian legislation.

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