Interreg Baltic Sea Region

Baltic Blue Growth

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

KURZEMES PLĀNOŠANAS REĢIONS

Assessment of Socioeconomic Aspects and Development Potential of Mussel Farming in Latvia

SIA Konsorts as author

Kurzeme Planning Region as contracting authority

Published: May 31, 2018

Contracting authority:

Kurzeme Planning Region
Reg. No 90002183562
Address: 12 Avotu Street, Saldus, LV-3801
Tel.: + 371 67331492
E-mail: pasts@kurzemesregions.lv
www.kurzemesregions.lv

Contractor:

SIA "Konsorts"
Reg. No. 40003209785
Address: Olivu Street 9, Riga, LV-1004
Tel.: + 371 67216793
E-mail: office@konsorts.lv
www.konsorts.lv

Assessment of Socioeconomic Aspects and Development Potential of Mussel Farming

K.Timofejevs

Board Member of SIA "Konsorts"

May, 2018

CONTENTS

INTRODUCTION 4

1 NUMBER OF PEOPLE EMPLOYED IN FISHERIES 5

2 AVERAGE ANNUAL WAGES AND SALARIES OF PEOPLE EMPLOYED IN FISHERIES 7

3 AMOUNT OF TAXES PAID IN FISHERIES 8

4 QUOTAS ALLOCATED TO FISHERIES 10

4.1 ALLOCATED FISHING QUOTAS IN THE BALTIC SEA AND THE GULF OF RIGA BEYOND THE COASTAL ZONE 10

4.1 ALLOCATED FISHING QUOTAS IN THE BALTIC SEA AND IN THE COASTAL AREA OF THE GULF OF RIGA 11

5 CATCH VOLUME 13

6 NUMBER OF REGISTERED FISHING BOATS AND VESSELS 19

6.1 FISHING IN THE BALTIC SEA AND THE GULF OF RIGA BEYOND THE COASTAL AREA 20

6.2 FISHING IN THE COASTAL AREA OF THE BALTIC SEA AND THE GULF OF RIGA 21

7 SOCIO-ECONOMIC ASPECTS OF MUSSEL FARMING AND THEIR ASSESSMENT 22

8 INTERACTION OF MUSSEL FARMING WITH OTHER SECTORS 24

9 CONCLUSIONS 25

Introduction

According to the agreement signed on March 23, 2018 between the Kurzeme Planning Region (Contracting authority) and SIA "Konsorts" (Contractor) the Contractor has prepared Assessment of Socioeconomic Aspects and Development Potential of Mussel Farming within framework of R031 project "Baltic Blue Growth – Initiation of full scale mussel farming in the Baltic Sea" co-financed by INTERREG Baltic Sea Region Transnational Cooperation Programme 2014-2020.

The following information is included in the assessment:

1. A summary of changes in the value of production of fishery products in Latvia during the period from 2011 to 2016, which, as far as possible, is supplemented with earlier data, including an assessment of the following indicators:

- the number of people employed in fisheries, singling out the city of Riga and the rest of Latvia;
- average annual salary per employed in fisheries;
- annual quotas for fisheries by years during the period;
- catch by years during the period;
- the amount of taxes paid in fishing in the years 2014 to 2016, based on available information;
- number of registered fishing boats and vessels by years during the period.

2. Potential socioeconomic aspects of mussel farming in Latvia are identified and assessed.

3. Interaction of mussel farming with other areas is described, including direct, indirect and intermediate effects.

1 Number of people employed in fisheries

According to the Ministry of Agriculture, in 2015, 652 people were employed in fisheries. During the reporting period from 2008 to 2015, there is a steady declining tendency in the number of fishermen, with a slight increase in 2013. In general, the number of people employed in sea fishery has decreased by ~45%, mostly due to fishing fleet balancing measures (See Figure 1).

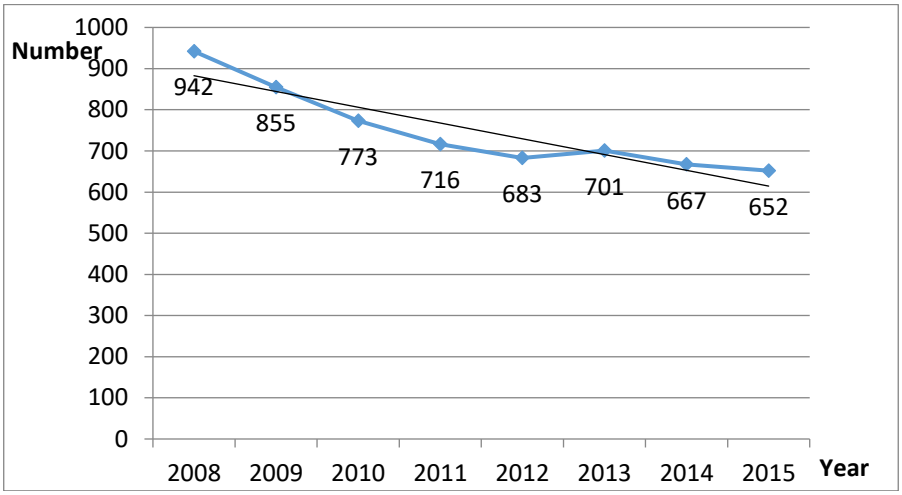
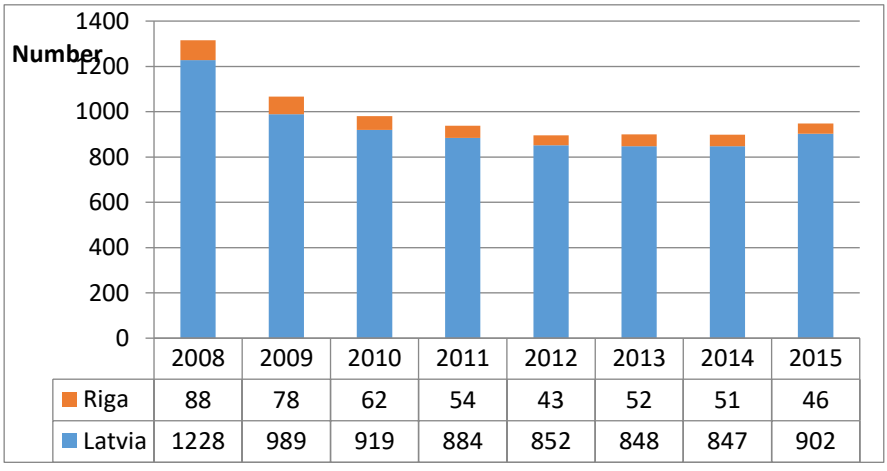


Figure 1. **Number of people employed in fisheries in Latvia, years 2008-2015**

Source: Ministry of Agriculture

Analysing the data of the Central Statistical Bureau, which differ from the data of the Ministry of Agriculture due to different data acquisition and calculation methods (CSB indicates that they have data on the average number of paid employees and other not-paid employees), it is seen that in 2015 the number of people employed in fisheries was larger, i.e., 902. According to CSB data in the reporting period until 2013-2014 the number of people employed in fisheries decreases by every year from 1228 people in 2008 to 847 people in 2014, or by 45%, while in 2015 the number has grown by 6.5% (see Figure 2). Looking at the data collected by the two institutions, it can be seen that the overall trends regarding changes in the number of employed people during the reporting period are similar.



	2008	2009	2010	2011	2012	2013	2014	2015
Riga	88	78	62	54	43	52	51	46
Latvia	1228	989	919	884	852	848	847	902

Figure 2. **Number of employed people in fisheries in Latvia, incl. Riga, years 2008-2015**

Source: CSB

It is seen in Figure 2 how many from the total number of people employed in fisheries have reported about themselves, those working in Riga account for just 5-8% of the total number of fishermen each year.

The impact of fishing fleet balancing measures on changes in the number of people employed in fisheries in 2014 was assessed by Latvia State Institute of Agrarian Economics (currently - Institute of Agricultural Resources and Economics) in the study "Fisheries Development in the Coastal Area of the Baltic Sea and the Gulf of Riga (inshore fishing)"[1], where opinion of people currently and formerly employed in inshore fishing of the Baltic Sea and the Gulf of Riga on availability and/or spending of the financing within framework of Fisheries Operational Programme 2007-2013, measure 101 "Permanent cessation of fishing activities" and measure 104 "Socio-economic measures" was found out during three focus group surveys and discussions.

Regarding the number of employees in all focus groups it was indicated that the number of active coastal fishermen has decreased significantly. In Pavilosta focus group it was mentioned that in 2014 only 15 active coastal fishermen have remained in Pavilosta, Vergale, Nica and Liepaja, of which only two might continue fishing activity in the near future, as the existing ones have already retired and there are no new fishermen who might come to their place. While from Ainazi to Liepupe in 2014 there were only 10 active coastal fishermen, as opposed to Estonia, where active coastal fishermen in each port were around 200.

The majority of the focus group participants indicated in the discussions that measure 101 of Fisheries Operational Programme 2007-2013 or scrapping of vessels, was a good and supportive measure during the crisis, when fish purchase prices fell, catch quotas gradually decreased, and a part of coastal fishermen wanted to stop their activities. However, after the end of this measure it has to be concluded that there are very few fishermen left on the coast and in general the measure has destroyed coastal fishing fleet.

80% of the lost coastal fishermen who lost their jobs as a result of scrapping of vessels were economically active, at working age. Of these fishermen aged 45-64 (47% of fishermen) who are at pre-retirement age are at a risk group. The information obtained in the focus group shows that not all coastal fishermen have managed to find a new job.

During discussions fishermen pointed out that government should urgently consider how to support and promote the desire of young fishermen to remain living in coastal regions and be engaged in coastal fishing, increase occupational prestige of fishermen and keep coastal fishing as one of national occupations. There is hardly any new fisherman who would be willing working in coastal fishing.

Participants of the discussion noted that only a part of the fishermen who have received compensation for losing job on the scrapped vessels continued working in the fisheries sector (after not having worked one year after the compensation), a part had switched to other activities - work in the fish processing company or in the field of tourism, earning money on the high seas, or on fishing and other (cargo, entertainment) vessels of other countries. However, it was pointed out that the compensation was too low to start a new business with it. There is a part of the former fishermen to whom compensation has helped to acquire new knowledge and retrain, and the new occupation is not related to coastal life.

Fishermen believe that historic coastal inhabitants - coastal fishermen as well as coastal fishing as an occupation disappear and they would like the coast to be identified as a historic fishermen's living and

[1] Study of LSIAE "Fisheries Development in the Coastal Zone of the Baltic Sea and the Gulf of Riga"

working place, however it was concluded in the study that the issue is controversial, since there is no precedent for creating such a zone in Latvia.

2 Average annual wages and salaries of people employed in fisheries

Remuneration in Latvian fishery has long been lower than average wage in Latvia. For example, in 2016, average gross monthly salary was 859 EUR, while in fisheries sector (fishery and aquaculture) it was only 682 EUR. In recent years wages in fisheries and aquaculture have increased by an average of 1-6% annually, with an exception in 2013, when it decreased by 2% (see Figure 3). The fishing fleet balancing measures have contributed positively to this process, which, under circumstances when available fishing resources decrease allowing the remaining fishermen working more efficiently. However, this increase in remuneration is lower than average wage increase in the country[2].

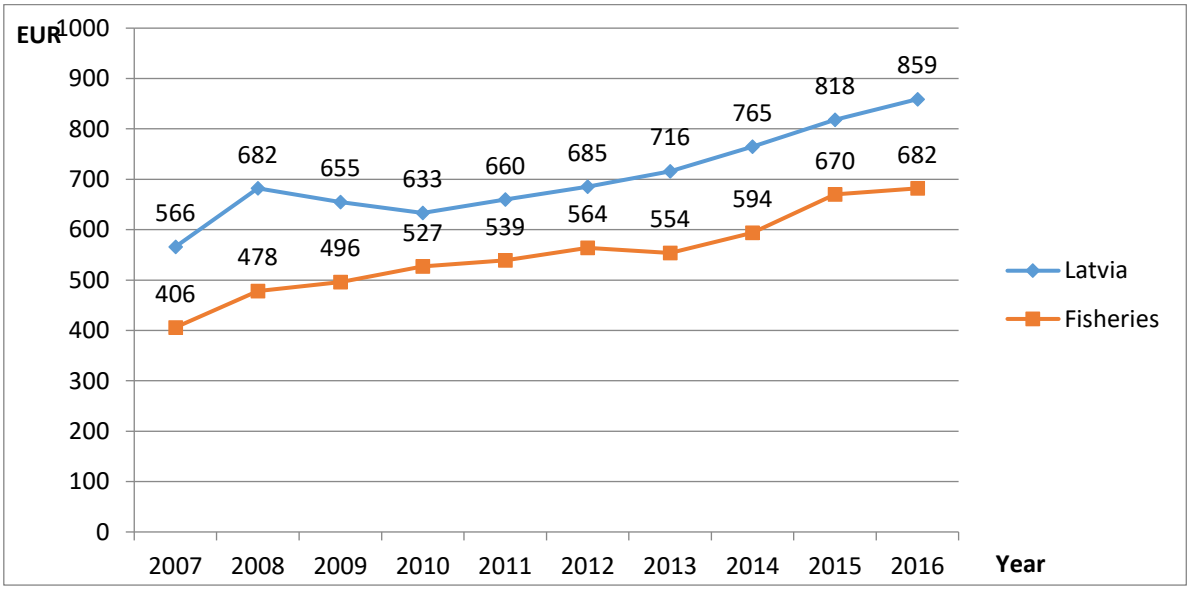


Figure **3. Monthly average gross wages and salaries of the employed in Latvia and in fisheries, years 2007-2016, EUR**

Source: CSB

P.S. It is not possible to prepare wages and salaries by sector, at NACE Rev. 2. at three-digit code level (03.1) Fishing.

Change in the average wage affect not only wage increase for employees, but also structural changes in labour market - enterprises that have started and stopped their operational activities during the year, changes in the number of employees and loads in various sectors, as well as state administrative measures in the fight against the shadow economy. Impact of these factors is generally reflected in changes in the wage fund and full-time staff employed used in the calculation of average wages.

Compared to 2016, in the year 2017, when the average wage in the country amounted to 926 EUR, the average wage increased in all areas, including by 8.8% in agricultural, forestry and fishing sector (at a higher rate in fisheries, amounting to 746 EUR).

[2] Operational programme of EMFF

In higher-ranked sectors of economic activity, increase in the average wage was influenced both by the increase of the wage fund and the decrease in the number of full-time employees. In turn, the wage fund in agricultural, forestry and fisheries sectors grew faster than the number of employees[3].

Table 1

Information on the most common jobs in 2016

NACE Rev. 2 code	Job	Average number of working hours per job per month	Average hourly rate, EUR
Marine fishing	Fish processor	125	4,06
	Worker at fish handling workshop	150	6,87
	Deckhand	167	3,33
Marine aquaculture	Fish/ incubator worker	156	2,41

Source: SRS

Information available on SRS database on the most common statistics for occupational activities in 2016 shows that in fisheries sector inland and coastal fisherman ranks at the third place after fish processor and worker at fish handling workshop with an average 50 working hours per month and an average hourly rate of 3.81 EUR. Among other widespread agricultural, forestry and fishing sectors hourly rate for fishermen is one of the lowest, it is less for agricultural workers – 3.09 EUR/hour and forestry workers – 3.71 EUR/hour.[4] A more detailed overview of the most common jobs is given in Table 1, which leads to the conclusion that the given average number of working hours in the sector is incomplete, and also the average hourly rate is mostly low.

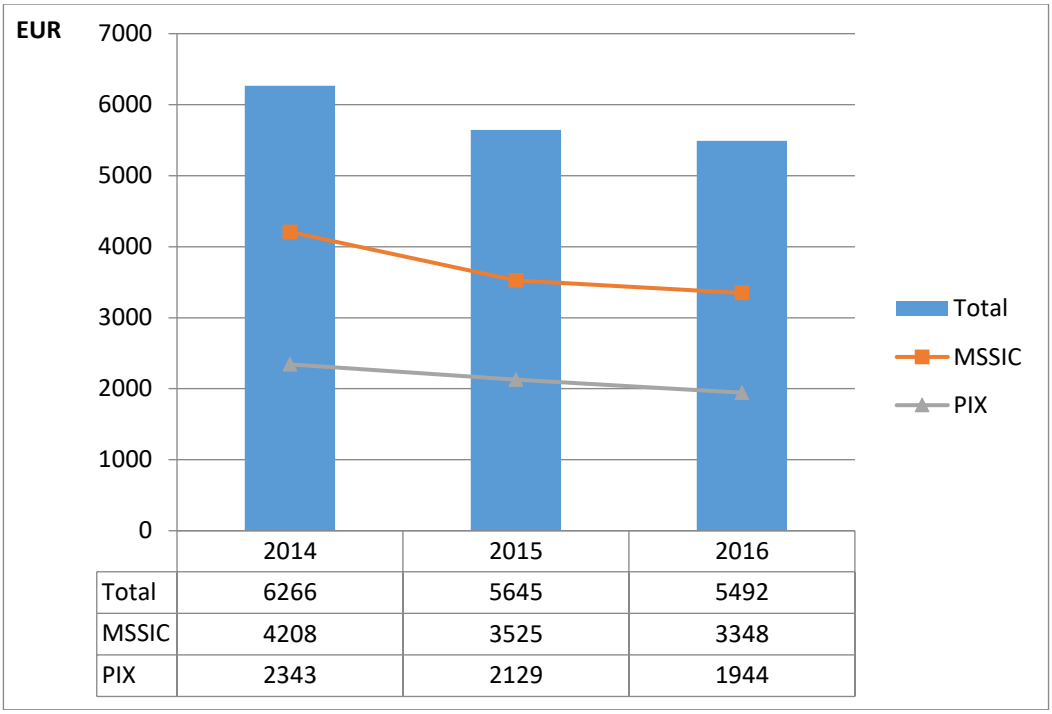
3 Amount of taxes paid in fisheries

Available data for 2014-2016 is used for analysis are aggregated using publicly available information from CSB and SRS. 242 enterprises that have indicated fishing, sea fishing and marine aquaculture as their area of activity were analysed. 85 enterprises of all the enterprises were operating in all or some years of the reporting period (net turnover was reported), taxes were paid by 105 companies.

When analysing the amount of taxes paid by fisheries sector during the reporting period decrease in the total tax amount paid and in the amount of the state social insurance mandatory contributions (SSIMCs) and personal income tax were paid. Total tax revenues have decreased by 14%, while SSMIC and PIT have decreased by 21% and 26% respectively (see Figure 4).

However, according to *Lursoft* data[5], the taxes paid by companies operating in agricultural, forestry and fisheries sectors per one employee have almost doubled from 2014 to 2016 - the average tax burden per employee during these years has increased by 64.04%, increasing from 2.67 thousand EUR per employee in 2014 up to 4.38 thousand in 2016, and it ranked the industry on the second place among other TOP 5 sectors where the tax burden for 1 employee has jumped since 2014.

[3] http://www.csb.gov.lv/notikumi/videja-alga-2017-gada-926-eiro-47212.html
[4] https://www.vid.gov.lv/lv/darba-samaksa-0
[5] http://blog.lursoft.lv/2017/10/16/kuras-nozares-nodoklu-maksajumi-uz-vienu-darbinieku-ir-vislielakie/



	2014	2015	2016
Total	6266	5645	5492
MSSIC	4208	3525	3348
PIX	2343	2129	1944

Figure 4. **Taxes paid by enterprises operating in fisheries, years 2014-2016, EUR**

Source: SIA "Konsorts"

Analysing the information available in SRS databases on the structure of the number of taxpayers - legal entities in fisheries sector by duration of their operational activity as at 1 January 2017 (see Figure 5), it is seen that the largest proportion of 431 enterprises included in SRS database comprise companies that operate more than 15 years, it is almost a half of all companies in the sector. In the 2nd place there are companies operating from 11 to 15 years, in 3rd place there are 5 years old companies, 6-10 years old enterprises are slightly less. Companies operating for less than 1 year constitute less than 1 percent of the total number.

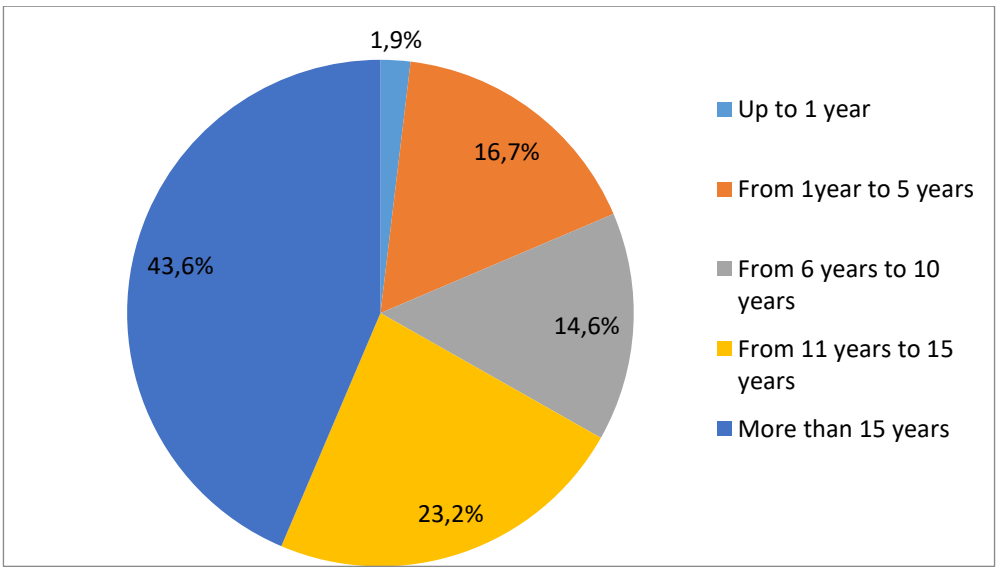


Figure 5. **Structure of tax-payers in fisheries by their activity duration on January 1, 2017**

Source: SRS

Looking at the ratio of basic taxes calculated in fisheries sector to turnover or operating income, it is seen that he national average indicators are mostly higher than those in fisheries sector. State social mandatory insurance contributions calculated for employees and self-employed people and personal income tax calculated for employees are paid more than the national average, which testify on a large proportion of self-employed people in fisheries (see Table 2).

Table 2

Ratio of basic taxes to turnover or operating income calculated for taxpayers other than VAT group in 2016

Number of analysed entrepreneurs	Ratio of basic taxes to turnover or operating income							
	VAT contributions to state budget	VAT re-payments form the state budget	State social mandatory insurance contributions calculated to employees and self-employed people	Personal income tax calculated for employees	Personal income tax from economic activity	Corporate income tax	Micro enterprise tax	Total basic taxes
At national level								
166 891	4,276%	-1,321%	3,306%	1,688%	0,087%	0,676%	0,119%	8,832%
In fisheries sector								
214	2,333%	-3,259%	4,496%	2,161%	0,037%	0,403%	0,043%	6,213%

Source: SRS

4 Quotas allocated to fisheries

4.1 Allocated fishing quotas in the Baltic Sea and the Gulf of Riga beyond the coastal zone

Total fishing quotas for Latvia and other member states of the European Union for fishing in the Baltic Sea are defined in EU legal framework. The amount of catch distributed annually in quotas is related to assessment of total amount, growth and mortality of fish in the Baltic Sea[6]. Total fishing quotas allocated to Latvia by years are shown in Table 3.

Table 3

Total fishing quotas allocated to Latvia by years

	Years							
Fish species/unit of measurement	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Baltic herring, t	23059	22569	18630	18956	22650	25404	23712	22023
Cod, t	5018	5715	6564	5983	6745	4967	3973	2838
Salmon, pieces	38783	32965	16153	14335	9049	12644	12644	12644
Sprats, t	52565	39949	31160	34583	32080	29548	27990	36107

Source: MoA

[6] https://www.zm.gov.lv/zivsaimnieciba/statiskas-lapas/zvejnieciba?id=1492#jump

As it can be seen from Table 3, the fishing quotas allocated to Latvia have been fluctuating over the years. The overall trend is a decrease in the volume of the quota if compared 2017 to 2011, but the volume of reduction and, accordingly, the size of the quota for each fish species are different.

The catch quota for Baltic herring was the lowest in 2012 when it constituted 18 630 tonnes, it increased to comparatively largest volume reaching 25 404 tonnes in 2015, and then gradually decreasing again to 22 023 tonnes in 2017, which compared to 2010 is lower volume by 1 036 tonnes.

Catch quota for cod until 2014 has been higher than in 2010, but in 2015 there was a drop below the level of 2010 and the quota was 4 967 tonnes. In the coming years after 2015, the quota has only decreased and in 2017 it is 2 838 tonnes, which is almost twice less than in 2010.

Catch quota for salmon is determined in pieces. It has decreased over the whole reporting period, the fastest fall was in 2012, which compared to 2011 is slightly more than twice. Since 2015, the quota volume is constant, i.e., 12 644 pieces, but it is by 67.4% lower than in 2010.

The volume of sprat quota has varied. In 2017 the set quota level was relatively high since 2011, i.e., 36 107 t, however, it has not reached the level of 2011, when the quota was 39 949 t. Compared to the quota volume for 2010, the reduction in 2017 is 31.3%.

4.1 Allocated fishing quotas in the Baltic Sea and in the coastal area of the Gulf of Riga

Analysing allocated fishing quotas for coastal fishing during the period from 2010, it is evident that percentage for the total fishing quota was initially set for cod and Baltic herring, 3% and 4% respectively.

Starting from 2015 total fish quota for coastal fishing is set at a percentage of the total fishing quota, and it is:

1. For sprat fishing in the Baltic Sea - not less than 0.04%;
2. For sprat fishing in the Gulf of Riga - not less than 0.6%;
3. For salmon fishing - not less than 6%;
4. For cod fishing in the eastern part of the Baltic Sea - not less than 3%;
5. For herring fishing in the Baltic Sea - not less than 4%;
6. For herring fishing in the Gulf of Riga - not less than 15%.

Table 4

Allocated fishing quotas in the coastal zone by years[7]

		Years							
Fish species/unit of measurement	**Inshore waters**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Baltic herring, t	In the Baltic Sea	140	119	87	100	125	181	197	212
Baltic herring, t	In the Gulf of Riga	2937	2937	2937	2937	2937	3131	2818	2509

[7] https://www.zm.gov.lv/zivsaimnieciba/statiskas-lapas/zvejnieciba/piekrastes-zveja?nid=702#jump

		Years							
Fish species/unit of measurement	**Inshore waters**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Sprat, t	In the Baltic Sea	15	15	15	15	15	11	11	14
Sprat, t	In the Gulf of Riga	10	10	10	10	10	8	7	9
Cod, t	In the Baltic Sea	150,6	172	196,8	179,5	187,3	149	105,4	79
Salmon, pieces.	In the Baltic Sea and In the Gulf of Riga	2000	2000	2000	2000	2000	2000	759	759

Avots: MoA

As shown in Table 4, the fishing quotas allocated to the coastal area have been fluctuating by years, but the overall trend is a decrease in quota volumes if compared year 2017 to 2010.

Quota has increased only for catch of Baltic herring in the coastal zone of the Baltic Sea – by 72 tonnes in 2017 compared to 2010. At the same time, the quota for Baltic herring in the coastal area of the Gulf of Riga has decreased by 428 tonnes during the same period, which in general means that the herring fishing quota in the coastal zone has decreased.

The most significant reduction is observed for cod quota, i.e., almost twice during the reporting period and for salmon quota, i.e., for more than twice or by 1241 pieces.

Since 2014 cod quota in the coastal area is divided by counties and cities by setting the permissible catches for each site (see Table 5).

Table 5

Cod quota breakdown by sites, kg[7]

Site	Y 2014	Y 2015	Y 2016	Y 2017
Ventspils City	2341	1863	1318	988
Ventspils County	31110	22886	16190	12134
Pavilosta County	54879	43657	30882	23147
Grobina County	1292	1028	727	545
Liepaja City	34482	27431	19404	14544
Nica County	55647	44268	31314	23471
Rucava County	9890	7867	5565	4171

Source: MoA

The largest catch volumes are for Pavilosta and Nica counties, which have the largest number of coastal parishes located on the Baltic Sea coast and, accordingly, more people employed in fishing. The counties, which have relatively small cod quota volumes, have one parish located by the sea.

Since 2015 also herring quotas for the Gulf of Riga are divided by coastal geographical areas, and they are as follows:

1. Eastern district – 21.7%;
2. Southern district – 35.1%;
3. Western district – 43.2%.

In addition to the aforementioned breakdown, about 4% of the total herring quota of the Gulf of Riga is allocated to fishing by nets.

5 Catch volume

Vessels fishing with trawls beyond the coastal area of the Baltic Sea and the Gulf of Riga mainly catch sprat, herring, as well as cod, while cod, flatfish and salmon are caught with anchored gill nets. Gilled and gutted nets and long lines are also used for fishing. In the Baltic Sea and the Gulf of Riga the main fish species with the greatest economic value are sprat, herring and cod. Beyond the coastal area of Baltic Sea and the Gulf of Riga fish species to which quotas are not applied, such as flatfish, smelt, northern sea bull, viviparous eelpout, etc., are caught[8].

In coastal fishing stationary fishing tackle, i.e., various types of nets and creels, as well as risers for fishing herring are mostly used. The largest catch on the coast of the Baltic Sea and the Gulf of Riga is made up by herring, round goby, flatfish, cod, vimba, viviparous eelpout and perch.

Table 6

Catch volume by years, t[9]

Years/ fishing area	In all areas	In the Baltic sea and in the Gulf of Riga	In the Baltic Sea and in the Gulf of Riga beyond the coastal area	% of catch in the Baltic sea and in the Gulf of Riga	In the coastal area of the Baltic Sea and in the Gulf of Riga	% of catch in the Baltic sea and in the Gulf of Riga
2007	155342	90956	87018	95,67	2348	2,58
2008	156955	86477	83718	96,81	2759	3,19
2009	162645	78913	75820	96,08	2644	3,35
2010	164363	74037	71513	96,59	2533	3,41
2011	155435	63235	59828	94,61	3407	5,39
2012	89838	58588	54649	93,28	2939	5,01
2013	115613	61001	57337	93,99	3665	6,01
2014	120246	59894	55314	92,35	4580	7,65
2015	78565	62633	60007	95,81	2626	4,19
2016	na*	60433	56611	93,67	3822	6,32

**no data*
Source: MoA

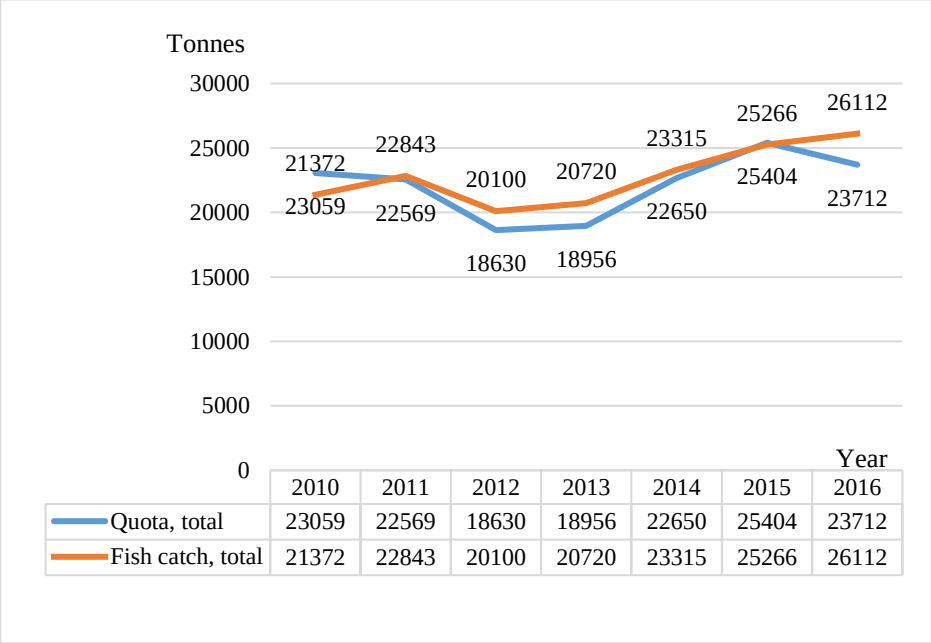
Analysing the data presented in Table 6, it can be concluded that fishing in the Baltic Sea and in the Gulf of Riga accounts for approximately 50% of the total catch of Latvia in all areas, including also fishing in oceans, inland waters, aquaculture, and not only fish, but also fishing of other aquatic species. The exception is year 2012, when fishing in the Baltic Sea and the Gulf of Riga was 65.21% of total fishing volume, and in year 2015 when the respective figure was 79.72%. Looking at catch of fish subdivided by fishing in the Baltic Sea and in the Gulf of Riga beyond the coastal area and in the coastal area, it should be stated that fishing beyond the coastal area account for the largest part of catch, i.e., for more than 90% each year, while fishing in the coastal area reached the largest level in year 2014 - 7, 65%. In 2016 catches beyond the coastal area amount to 93.67% and catches in the coastal zone amount to 6.32% respectively.

[8] https://www.zm.gov.lv/zivsaimnieciba/statiskas-lapas/zvejnieciba/apraksti?nid=700#jump
[9] http://www.laukutikls.lv/sites/laukutikls.lv/files/informativie_materiali/zivsaimniecibas-gadagramata-2017.pdf

When reviewing catches by single fish species, the species of fish to which fishing quotas are allocated will be analysed first.

Baltic herring

As shown in Figure 6, the total catch of Baltic herring in the Baltic Sea and in the Gulf of Riga during the period from 2010 to 2016 has been above the quota level almost every year. The quota is not met only in 2010 by 1687 tonnes and slightly less than by 200 tonnes in 2015. The highest level above the quota (2,400 tonnes) was caught in 2016-, in other years it was up to 2,000 tonnes. Overfishing is possible because quotas have been changed with other EU countries, basically Estonia.

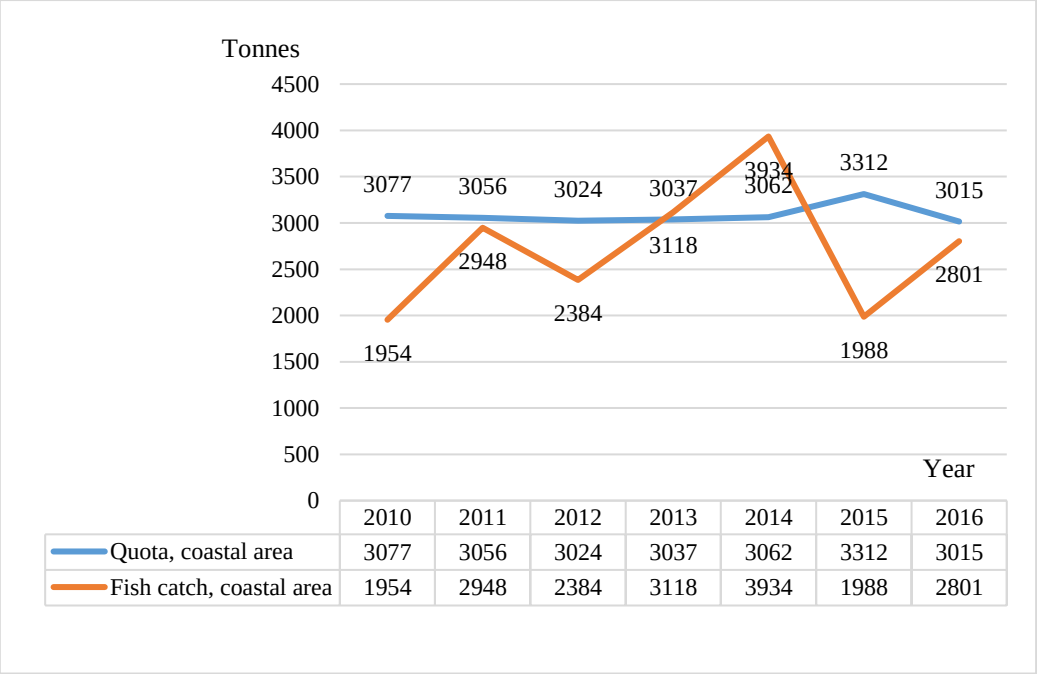


	2010	2011	2012	2013	2014	2015	2016
Quota, total	23059	22569	18630	18956	22650	25404	23712
Fish catch, total	21372	22843	20100	20720	23315	25266	26112

Figure 6. **Comparison of total fish catch of Baltic herring and granted quota**

Source: MoA

Looking at the allocated quotas and catches in the coastal area of the Baltic Sea and the Gulf of Riga, the picture is slightly different (see Figure 7). In the coastal area, fish catch volumes have been very unstable, varying from 1954 tonnes in year 2010 to 3934 tonnes in 2014, while the volume of quota allocated in the reported years has been relatively stable, i.e., slightly above 3000 tonnes. In 2014 the catch has exceeded the quota volume by 872 tonnes. Also in 2013 herring catch quota for in the coastal zone was exceeded by about 100 tonnes.



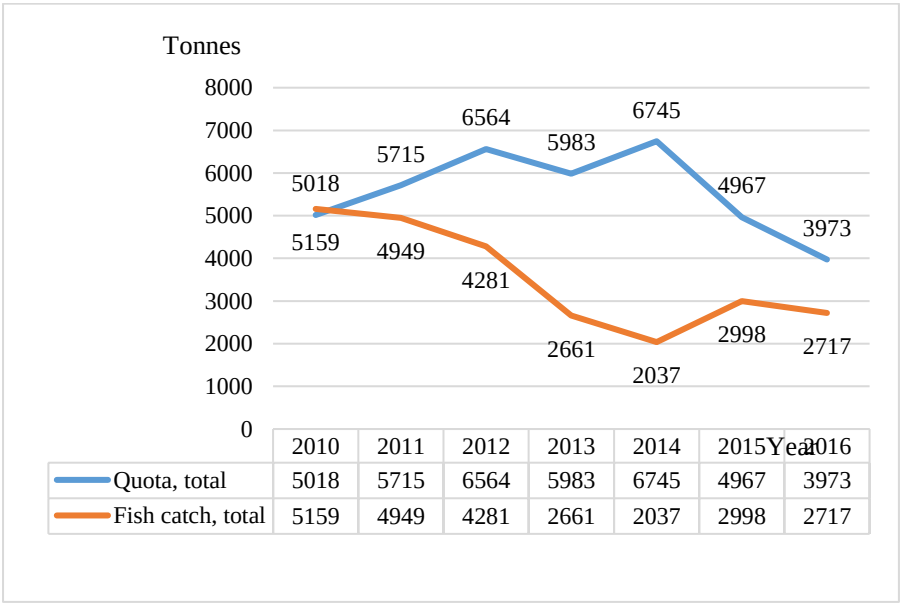
	2010	2011	2012	2013	2014	2015	2016
Quota, coastal area	3077	3056	3024	3037	3062	3312	3015
Fish catch, coastal area	1954	2948	2384	3118	3934	1988	2801

Figure 7. **Comparison of total fish catch of Baltic herring and granted quota in the coastal area of the Baltic sea and the Gulf of Riga**

Source: MoA

Cods

Compared to the herring and sprat quota, cod quotas are small, with a decreasing tendency over the years. However, despite the small volume of quotas, they are not met and catches are even lower (see Figure 8). If in 2010 volume of the quota was slightly exceeded, then in other years the catch volume would decrease proportionally with the quota allocated. The largest difference between the cod quota and the catch was in 2014 - 4708 tonnes, the best since catches in 2016, the catch is 1256 tonnes lower than the quota. In other years the volatility is in the range of 2000-3000 tonnes. Cod catches are affected by the price volatility of the product caught and cod quantity at sea.

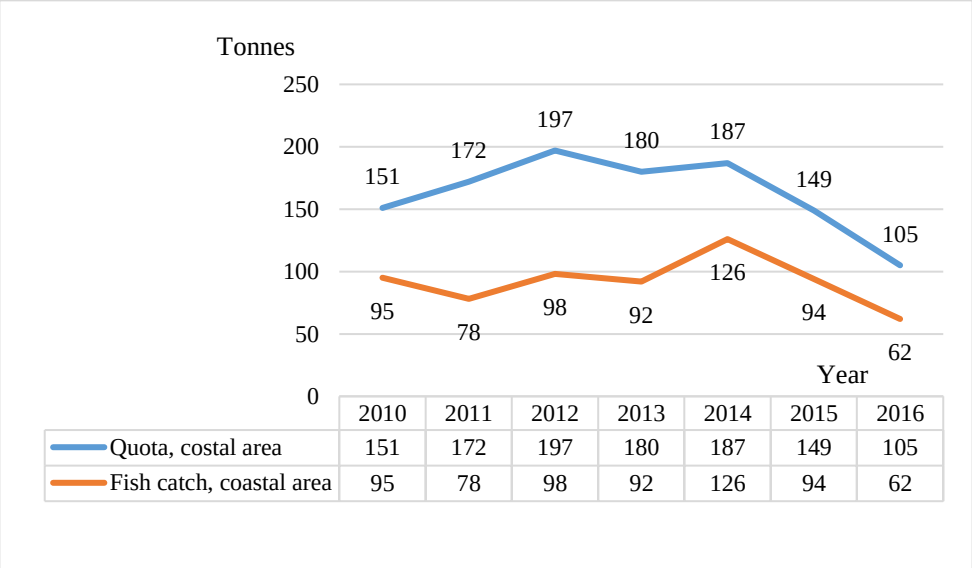


	2010	2011	2012	2013	2014	2015	2016
Quota, total	5018	5715	6564	5983	6745	4967	3973
Fish catch, total	5159	4949	4281	2661	2037	2998	2717

Figure 8. **Comparison of total fish catch of cod and granted quota**

Source: MoA

The same trend can be observed in cod catch in coastal waters, the quota is not met (see Figure 9). The quota was best met and accordingly catch was good in 2016, when just 43 more tonnes were needed to reach the quota, while in 2011 and 2012 the quota has been breached by close to 100 tonnes. In general the conclusion can be drawn the cod catch with the exception of 2016, on average were almost twice less than the allocated quota.



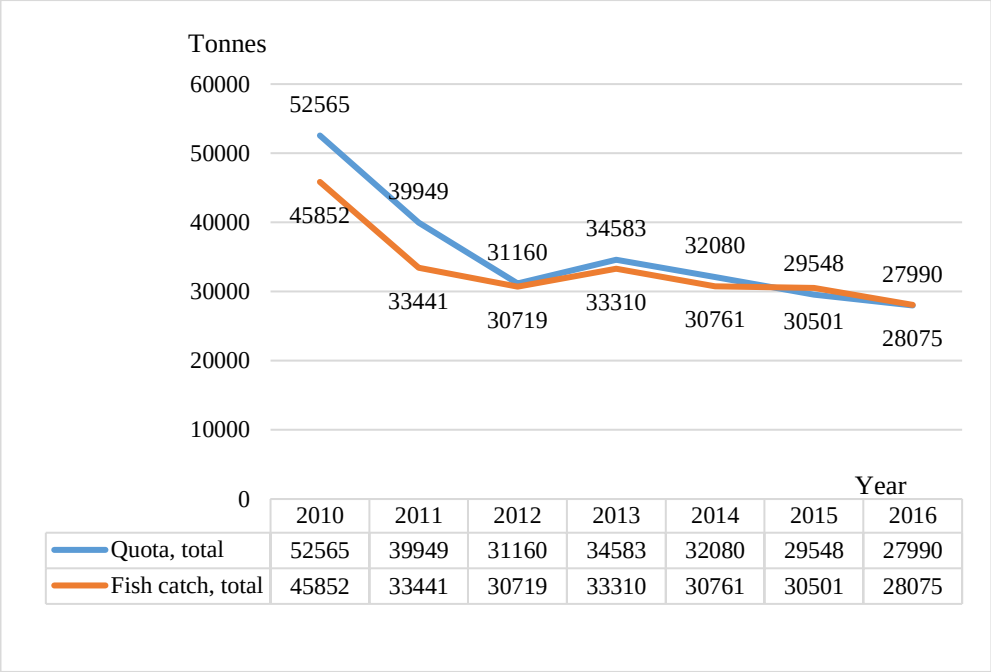
	2010	2011	2012	2013	2014	2015	2016
Quota, costal area	151	172	197	180	187	149	105
Fish catch, coastal area	95	78	98	92	126	94	62

Figure 9. **Comparison of total fish catch of cod and granted quota in the coastal area of the Baltic Sea and the Gulf of Riga**

Source: MoA

Sprats

Similar to catch of herring, catch of sprat is also very close to the quota, but in both recent years (2015 and 2016) it even slightly exceed the quota volume by 953 t and 85 t respectively (see Figure 10). In recent years, catches have been relatively close to the quota volume, with the exception of years 2010 and 2011, when catches of sprat were respectively 6713 tonnes and 6508 tonnes lower than the quota allocated.

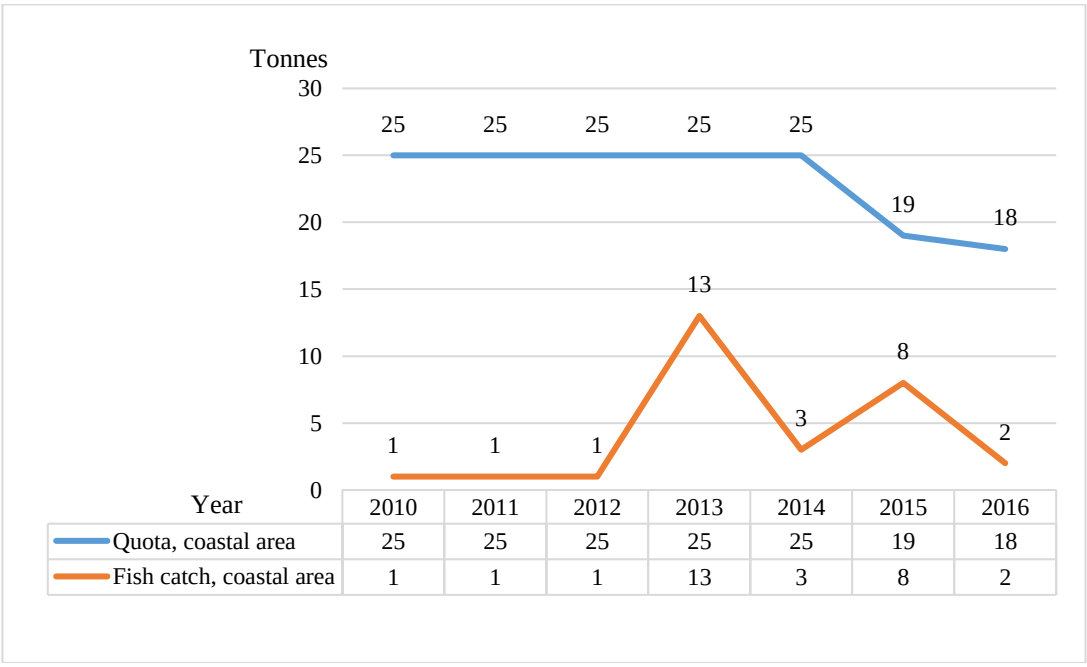


	2010	2011	2012	2013	2014	2015	2016
Quota, total	52565	39949	31160	34583	32080	29548	27990
Fish catch, total	45852	33441	30719	33310	30761	30501	28075

Figure 10. **Comparison of total fish catch of sprat and granted quota**

Source: MoA

The situation is quite opposite regarding catch of sprat in the coastal zone, where very small volumes are caught (see Figure 11). Catch volumes have only reached a half of the allocated quota in just two years, i.e., in 2013 - 13 tonnes, and in 2015 - 8 tonnes. In years 2010-2012 sprat catches were around 1 tonne per year, no reaching even 10% of the quota allocated, while catches in 2014 and 2016 were slightly over 10%.



	2010	2011	2012	2013	2014	2015	2016
Quota, coastal area	25	25	25	25	25	19	18
Fish catch, coastal area	1	1	1	13	3	8	2

Figure 11. **Comparison of total fish catch of sprat and granted quota in the coastal area of the Baltic Sea and the Gulf of Riga**

Source: MoA

Other fish species

Salmon catches beyond the coastal waters has been very small - it has not even made up 0.5 tonnes in all the reported. Slightly better salmon catches were in the coastal area - around four tons of salmon were caught every year from 2010 to 2016.

In the Baltic Sea and the Gulf of Riga beyond the coastal area also such fish as flatfish, sea trout, smelt, viviparous eelpout, and other fish that are not specified (see Table 7) and to which currently catch quotas are not set also caught in the coastal area.

Table 7

Volume of fish caught in the Baltic Sea and the Gulf of Riga beyond the coastal area, t

Year	Flatfish, turbot	Smelt	Viviparous eelpout	Other species
2010	70	1103	6	0
2011	166	1454	3	0
2012	457	1462	11	102
2013	1319	2471	9	161
2014	1682	1490	13	78
2015	1971	1108	11	242
2016	1730	542	4	296

Source: MoA

As it can be seen from Table 7, catch volume of flatfish and/or turbot catch has increased gradually. If in 2010 the volumes were very small (70 tonnes), then by 2016 there was an increasing trend and catch volume reached 1730 tonnes, although there was a slight drop in catch compared to 2015 - by 241 t.

Also catch volume of smelt has been stable over the past years, from 1103 tonnes in 2010 to 2471 tonnes in 2013. After 2013, catch volume of smelt has gradually decreased, and in 2016 it amounted only to only 542 tonnes.

Viviparous eelpout has been fished in small amounts throughout the reporting period, in some years around 10 tonnes, but since 2014 with a drop to 4 tons in 2016.

The catch volume of sea trout has not amounted to 0.5 tonnes per year throughout the reporting period.

While catch of other unspecified fish species shows increasing tendency since 2012. The largest volume (296 tonnes) was reached in 2016.

In the coastal area of the Baltic Sea and the Gulf of Riga in addition fish to which quotas are allocated there were also such fish species the catch of which exceeded 10 tonnes each year (see Table 8).

These include flatfish and/or turbot, whose catch volume has fluctuated over the years, but in 2016 t reached 201 tonnes, which is not the largest catch in comparison with 2010 when 212 tonnes were caught.

The second largest fish group, whose catches have grown each year are other unspecified fish species. If in 2010 the catch was 43 tonnes, then in 2016 it has increase up to 534 tonnes, which exceeds ten times the figure of year 2010 and more than twice the catch in 2015 when 209 tonnes of other fish were caught.

Table 8

Volume of other fish caught in the coastal area of the Baltic Sea and the Gulf of Riga, t

Year	Flatfish, turbot	Vimba	Bream	Smelt	Viviparous eelpout	Perch	Other species
2010	212	45	61	25	32	37	43
2011	162	43	38	16	30	36	29
2012	184	58	33	72	25	31	23
2013	170	50	23	51	31	35	53
2014	196	49	18	25	34	47	124
2015	128	44	17	43	38	30	209
2016	201	45	18	41	62	31	534

Source: MoA

According to the table vimba has been caught between 43 and 58 tonnes during the reference period, and catches do not show an increasing tendency, but they fluctuate. Bream is caught by a decreasing trend over the years, in 2010 the catch volume was 61 tonnes, but in 2016 it was 18 tonnes. The catch volume of smelt and perch is fluctuating. The catch of smelt if year 2010 is compared to year 2016, has increased from 25 tonnes to 41 tonnes, respectively, although catch of 72 tonnes was reported in 2012. While perch was fished between 30 and 47 tonnes during the reference period, reaching the highest level in 2014 - 47 tonnes, but the lowest in 2015 - 30 tonnes. Another fish the catch of which has grown intensely in 2016 is viviparous eelpout. If catch of this fish varies between 25 and 38 tonnes in other years, then in 2016 the catch amounted to 62 tonnes.

In small quantities not exceeding 10 tonnes per year also such fish as sea trout, eel, whitefish and dace are also caught in the coastal area.

6 Number of registered fishing boats and vessels

The Latvian fishing fleet is historically divided into three main groups:

1. Vessels fishing in deep sea.
2. Vessels fishing beyond the coastal zone of the Baltic Sea and the Gulf of Riga.
3. Vessels or boats fishing in the coastal area of the Baltic Sea and the Gulf of Riga

All of the said vessels that fly under the Latvian flag are registered at 10 Latvian ports[10]

Table 9

Indicators of Latvian fleet of vessels and fishing boats

	Y 2004	Y 2013	Y 2014	Y 2015	Y 2016
Number of vessels and fishing boats, pieces	898	703	700	686	679
Total engine power, kW	74 320	49 948	37 412	43 300	47 142
Total gross tonnage, GT	44 449	29 945	19 535	24 676	28 518

Source: BIOR

2004 is used as a reference point for assessing the fleet of fishing vessels. According to Table 9, it can be seen that during the period since 2004, the fishing fleet of Latvian fishing vessels has decreased

[10] https://www.zm.gov.lv/public/files/CMS_Static_Page_Doc/00/00/01/20/94/TheAnnualreportontheLatvianFishingFleet2016.pdf

significantly by 24.4% (2016), the total engine power by 36.6% and the total gross tonnage of vessels by 35.8%.

However, the decrease in the number of vessels has contributed to modernization of vessels. This trend is best illustrated by the data during the period from 2014 to 2016, as the total engine power has increased by 9730 kW, if year 2016 is compared to year 2014, and during the same period total gross tonnage has grown by 8 983 GT. One of the factors having impact on the said trend is attraction of funding from EU Fisheries Fund for scrapping of vessels and investing the received compensation in modernization of the remaining vessels. It means that the remaining vessels have become more powerful/faster and are capable of carrying larger fish catch volumes, thus reducing shipping costs.

The following section analyses fishing vessels and boats that are fishing in the Baltic Sea and the Gulf of Riga beyond the coastal area or in the coastal area.

6.1 Fishing in the Baltic Sea and the Gulf of Riga beyond the coastal area

The fleet of vessels fishing in the Baltic Sea and the Gulf of Riga beyond the coastal zone consists of vessels the length of which is 12 to 40 meters. In year 2016, the said group of vessels constitutes about 8.4% of the total fleet of Latvian fishing vessels, as well as 36.3% of the total fleet engine capacity and 22.9% of the total gross tonnage. About 49.4% of all fish catches were caught by fishing vessel of this group in 2016.

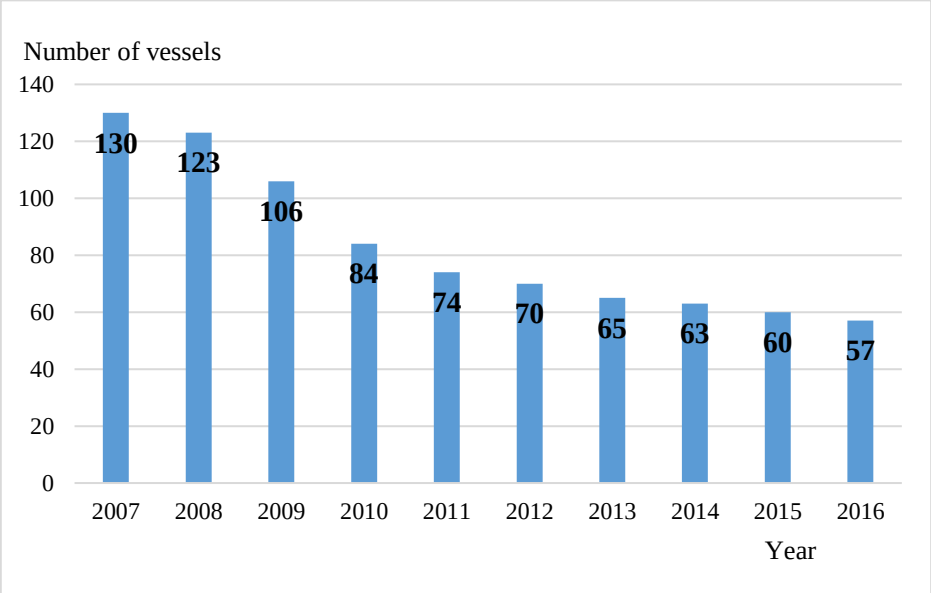


Figure 12. **Number of fishing vessels in the Baltic Sea and the Gulf of Riga beyond the coastal area by year**

Source: BIOR

Analysing the data in Figure 12, it can be concluded that the fleet of fishing vessels has decreased more than twice over 10-year period from 130 vessels in year 2007 to 57 vessels in year 2016. The reduction in the number of vessels during this period has been appropriate and has been facilitated by the possibility of receiving compensation for scrapping of vessels.[11]

[11] https://www.zm.gov.lv/zivsaimnieciba/statiskas-lapas/zvejnieciba/apraksti?nid=700#jump

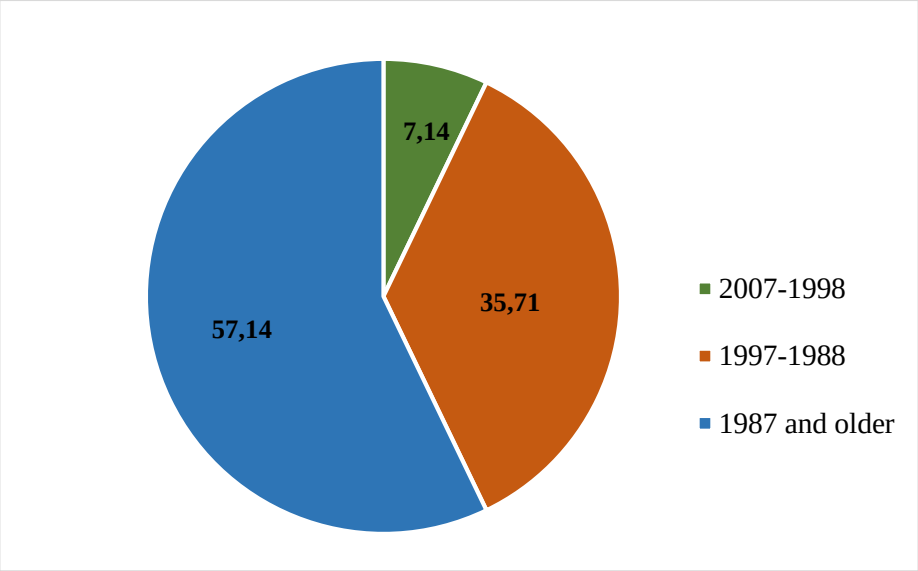


Figure 13. **Breakdown of vessels fishing beyond the coastal area of the Baltic Sea and the Gulf of Riga by age**

Source: MoA

When analysing the age of fishing vessels, it has to be concluded that no new vessels have joined the fleet of fishing vessels since 2008. Figure 13 depicts the breakdown of fishing boats by age groups, which shows that more than a half or 57.14% of vessels are more than 30 years old, of which at least seven are built in the 1970s. Very few of the total number are vessels aged less than 20 years (7.14%), or in terms of value – such vessels are five.

Non-renewal of the fishing fleet is likely to be affected by such factors as lack of financing, including impossibility to attract credit resources, as well as the unstable economic issue of fishing - prices, quotas and increase in resource prices.

For fishing, fishermen (legal entities or self-employed) must obtain licenses for leasing industrial fishing rights. The number of licenses issued, if year 2014 is compared to year 2017, has been gradually declining, with 42 licenses issued in 2014 and 35 in 2017.

6.2 Fishing in the coastal area of the Baltic Sea and the Gulf of Riga

It is understood by coastal zone the part of the waters of the Baltic Sea and the Gulf of Riga the depth of which does not exceed 20 meters. Coastal fishing is an important occupation for the inhabitants of the coastal regions of the Baltic Sea and the Gulf of Riga Gulf, it provides income for coastal inhabitants, which in turn promotes the settlement in fishermen's villages, thus addressing the economic and social aspects of the local population.

The coastal fishing fleet includes vessels with a total maximum ship length of 12 meters.

The Latvian reports to the European Union on the number of registered fishing boats include all inshore fishing boats, which in the last three years comprise the following numbers:

1. Year 2014 – 627 fishing boats
2. Year 2015 – 612 fishing boats
3. Year 2016 – 610 fishing boats.

Inshore fishing boats in 2016 accounted for about 89.8% of the total number of the Latvian fishing fleet units, but only 2.6% of the total gross tonnage and 9.4% of the total engine power.

Not all of the said boats are used in active fishing. They are divided into three groups - boats used for commercial fishing purposes, for self-consumption and the rest boats, which are used for tourism, active recreation, etc.

The number of active boats used in inshore fishing for commercial fishing purposes is shown in Figure 14.

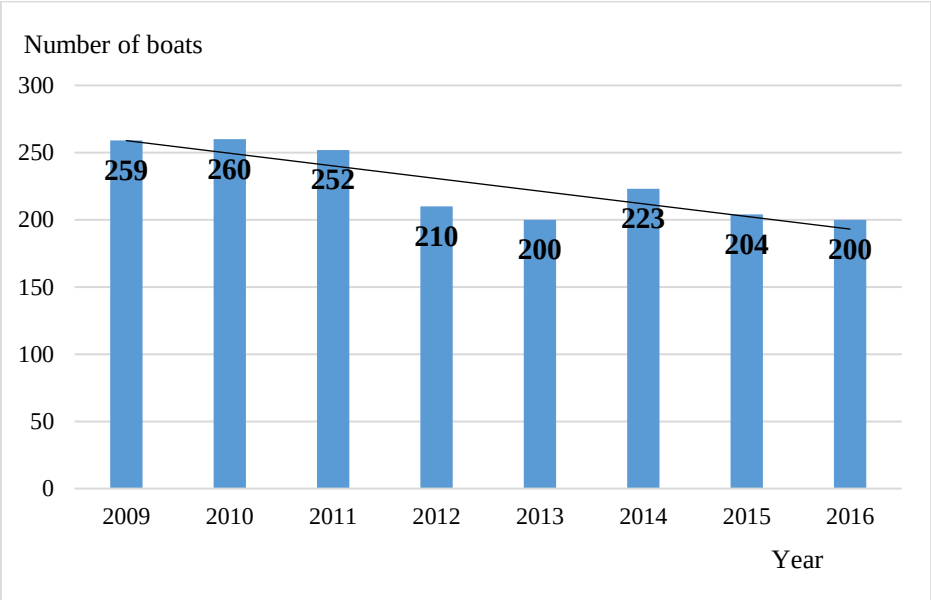


Figure 14. **Number of coastal boats in the Baltic Sea and the coastal area of the Gulf of Riga by year**

Source: MoA

It can be concluded from Figure 14 that the number of boats used for commercial purposes has been fluctuating since 2009, but it has a decreasing tendency. In 2016, the number of boats has decreased by 23% compared to 2009 and has reached the level of 2013.

In year 2016, 88 boats were used for self-consumption. Compared to year 2014, the number of these boats has decreased by 30. The rest of the difference between the total number of boats and the number of boats used for commercial purposes and self-consumption is made up by boats used for non-commercial, which is 322 boats in year 2016.

Coastal fishermen (legal entities or self-employed) should also have licenses for lease of industrial fishing rights. Like the number of fishermen fishing beyond the coastal area, the number of fishermen in this group has also decreased, if compared year 2014 to year 2017: if in year 2014 153 licenses were issued, then in year 2017 the number was 148.

7 Socio-economic aspects of mussel farming and their assessment

1. Over the last 10 years fishing industry has been affected by many factors, such as reduction of fish resources, catch quotas and fishing tackle, and therefore the demand for alternative sources of income in the coastal regions of the Baltic Sea, and development of new business areas would be important for regional growth. For example, establishment of mussel farms could help increase turnover of coastal companies and create new jobs, thus stabilizing the economic environment of the coastal regions of the Baltic Sea. A parallel positive benefit by establishing mussel farms would quality improvement of coastal waters and ability to deliver nutrients from the sea back to land

2. Synergy with other areas would promote development of entrepreneurship. Although employment opportunities on a single mussel farm are limited, if several farms in one region are combined **synergy** can be created. Establishing of such cooperation will enable involvement of other related industries and introduce innovations in mussel farming. Socioeconomic impact on mussels in the Baltic Sea should also be assessed on a wider scale, including impact on creation of new jobs in related industries and impact on the supply chain necessary for the operation of mussel farm. If a mussel farm is developed there will be demand for farm equipment, transportation services, specialized mussel gathering works and mussel feeding farms, as well as there would be benefits of supplying mussel feed to related industries, such as local farms for salmon, poultry and pigs. In addition, the mussel farming as an additional activity can provide benefits to existing fish breeders.[12]

   OECD studies have proven that development of transport and logistics has an impact on development trends of this branch.[13]

3. Final consumption of mussels. In determining socio-economic impacts of this sector, relevant aspect is **final consumption of mussels**, since, regardless if mussels are used in food or otherwise, this will affect the necessary processing equipment and number of jobs.

4. Profitability of the branch. Due to the small size of mussels farmed in the Baltic Sea, their **use in food** is limited, although it is possible because it would be **one of the most profitable sales opportunities**. Regardless of the size of mussels, they can be used in the food industry, producing fish and poultry feed, thus generating higher profits than using mussels in other industrial sectors, such production of fertilizers or bioenergy. [1]

5. Production profitability. Factors that would attract interest of Latvian coastal population to farm mussels would be long-term work, economic sustainability and profit, therefore the most important aspect in establishing a mussel farm would be **production profitability**.

6. Wages are higher than in the industry in general. Wage level of mussel farm employees would vary depending on the particular person's education, previous work experience, etc. **If wage is lower as the person has presumed, people will choose not to continue working**. The higher the real wage, the more coastal residents will be ready to involve in operation of mussel farm, therefore, in the process of formation of the industry it is necessary to crystallize the costs that can be diverted into wage increases to attract potentially high qualified specialists, thus attracting knowledgeable specialists, providing a competitive salary.

7. Symbiosis with tourism. Local authorities would have the opportunity to save not installing more efficient water treatment plants, because mussels will be able to partially clean water. This will improve water quality and the attractiveness of the nearby coast, promoting attraction of tourists. In addition, tourism providers would be able to organize trips to mussel farms to catch and taste mussels combined with other tourism and entertainment options offered.[14] It would be possible to combine tourism with local catering service providers, giving restaurants the opportunity to get fish products from fishermen, including mussels, if the farm his prepared/has obtained all the necessary permits for mussel farming for human consumption. It would create an additional tourist flow by visiting the farm, getting general understanding on their cultivation and the opportunity to taste local production.

[12] http://www.kurzemesregions.lv/userfiles/files/1388333729_Baltic_EcoMussel_projekta_materialu_apkopojums.pdf
[13] https://www.itf-oecd.org/sites/default/files/docs/02rtrinveste.pdf
[14] http://www.kurzemesregions.lv/userfiles/files/1388333729_Baltic_EcoMussel_projekta_materialu_apkopojums.pdf

8. Financing and its sources. Initial investments in establishment of mussel farm could be made with EU assistance, for example, with financing of the EFF fund measures, including LEADER, Altum credit financing for various EU Environmental Measures. Financing of environmental measures in Latvia would be a new field, the development of which would require additional research.
9. Taxes. The state and municipality would have additional revenues from taxes (income tax, VAT, natural resources or corporate income tax or environmental service income), coastal residents - new jobs and additional income sources.

8 Interaction of mussel farming with other sectors

Currently mussel farming as a sector does not have a significant economic impact, both as a promotion of employment and activity in the sector itself (direct impact) and as an effect on the supply chain (indirect effect) and on the wider scope of the Latvian economy (intermediate effect).

It is not expected that mussel farming would promote employment on the coast of the Baltic Sea in the near future, since mussel farms are still to be established and in their first years of operation they do not require more than one to two employees, depending on the size of the farm.

Initially much more workforce will be needed in this particular industry-related areas such as equipment suppliers and service providers of mussel farming, employees of financial institutions, transport service providers, mussel gatherers, other mussel farm workers, etc.

If in future indirect jobs related to sale and processing of mussels, as well as companies - local poultry, pig, etc. farms, which, for example, use animal feed produced from mussels are taken into account, employment rates will increase.

In addition, mussel farms would not be able to operate without properly trained workforce and knowledgeable managers, which means that training of potential owners and employees will be required.

By developing the industry can create at least two to four new direct jobs in each mussel farm, but this can happen in conjunction with industry experts, teaching staff and experienced colleagues from other countries. In addition, a modern and profitable mussel farm should be established on the basis of modern work organization and working and social conditions that meet EU requirements.

Foreign experts with experience not only in mussel farming, but also in other areas of aquaculture could be attracted to establishment of a mussel farm. The attraction of such experts would contribute to the development of aquaculture in general.

As the industry evolves, it will have a direct and indirect impact on tourism industry. Direct impact on tourism industry will be the costs of coastal travellers who will visit seaweed free seaside regions and modern mussel farms, and indirect - extra economic activity related to tourist expenses.

Mussel farming would have an indirect effect on reduction of illegal fishing, as the inspection of mussel farm would prevent potential illegal fishing.

Mussel farm would have an impact on provision of environmental services, as mussels significantly increase clarity of water. Several video materials have proved this fact.[15] Taking into account the unused Baltic Sea area and spatial planning, it would be possible to create several mussel farms providing environmental services in the Baltic Sea or rivers by choosing other species.

[15] https://www.youtube.com/watch?v=iOc0AuHAtDM

Mussel farms could attract tourists who could either visit them by the boats of mussel farmers or inspect farms by diving, which could potentially become one of the objects underwater survey.

Mussel farm could be a sightseeing object in the region, thus attracting additional funds for tourism, as tourists would choose local restaurants and they may also use accommodation services.

Port berth resources will be used to a greater extent when establishing a mussel farm and gathering them, as the size of anchors in Latvia according to expert interviews is at least 1000 kg/1 line.

Technical experts, diving experts, as well as people with metalworking and construction skills would be attracted when establishing farm, also services of port, freight carriers, fishing equipment providers would be use.

At the harvesting stage, people from wholesale, retail sale, frozen product storage, biogas plants, feed processors, developers of insect industry, environmental activists, representatives of the biotechnology sector, processing or processing of products, etc. could be involved. Emergence of new products would increase the range of products or services referred to above.

9 Conclusions

1. Incompatibility of publicly available data and inconsistency between various institutions and literature sources used in this assessment hamper correct data analysis.
2. During the reporting period from 2008 to 2015 there is a steady decreasing tendency in the number of fishermen, in general the number of people employed in sea fishing during this period has decreased by ~45%.
3. After the end of vessel scrapping measure funded by the European Union Fisheries Fund, it should be concluded that there are very few fishermen left in the coastal area and in general the measure has destroyed the coastal fishing fleet, and not all coastal fishermen have found new jobs. However, according to the information provided in this assessment, it is unclear whether there is currently enough coastal inhabitants who can acquire the necessary knowledge and engage in mussel breeding.
4. Annual average wage increase in fishing and aquaculture is 1-6% in recent years. In this process fishing fleet balancing measures have made a positive contribution, which upon general decrease of fishing resources allowed to the remaining active fishermen working economically more efficient.
5. In fisheries sector mostly part-time working hours are registered, and mostly average hourly rate is also low.
6. During the reporting period, the amount of taxes paid by fisheries sector has decreased, both the total amount of taxes paid and SSMIC and PIT.
7. Nearly half of all tax paying companies in the sector operate for more than 15 years.
8. The proportion of state social mandatory insurance contributions calculated for employees and self-employed people and personal income tax calculated for employees in fisheries sector against turnover or revenues from economic activity is larger than national average, which testify on a large proportion of self-employed people in fisheries.
9. Since 2004, which is reference period for the number of vessels and boats fishing in the Baltic Sea and in the Gulf of Riga, it has declined substantially, one of the factors influencing the above-mentioned measure is scrapping of vessels. New ships have not been purchased in the last ten

years. This, certainly, has reduced employment in coastal area, but currently there is no information what was done with the received compensation - whether there are new businesses and jobs emerged that partly reduce workforce for the mussel farming industry.

10. Volumes of fishing quotas that are set for all European Union countries are decreasing year by year. Most of the quotas are transferred to fishermen fishing in the Baltic Sea and the Gulf of Riga beyond the coastal area, and only a small part of them are at the disposal of the fishermen fishing in the coastal zone. The herring catch quota, which is one of the main raw materials of the fish processing industry in Latvia, is regularly exceeded.
11. Fish catch within the quota is only carried out regarding herring, quotas are not reached for the rest of fish. According to the information analysed, it can be concluded that catch of fish to which quotas are not applied increase each year.
12. In fact, Latvia has all the necessary initial socioeconomic preconditions for mussel farming: labour force, fishing tackles, the sea, topicality of environmental pollution prevention. However, the most important precondition for the development of this sector is the cost-effectiveness of mussel farming, which like in agriculture, can be achieved through targeted state and EU support policies.
13. Currently and in the near future no significant development of mussel farming industry is expected, hence its impact on the national economy as a whole and on certain related sectors will be insignificant. However, as the industry evolves, it will create additional demand for workforce in a number of related branches (e.g. suppliers and equipment service providers, employees of financial institutions, transport service providers, specialist mussel producers and employees of mussel farms, etc.).

About

Baltic Blue Growth is a three-year project financed by the European Regional Development Fund. The objective of the project is to remove nutrients from the Baltic Sea by farming and harvesting blue mussels. Farmed mussels will be used for the production of mussel meal, to be used in the feed industry. 18 partners from 7 countries are participating, with representatives from regional and national authorities, research institutions and private companies. The project is coordinated by Region Östergötland (Sweden) and has a total budget of 4,7 M€.

Partners

- *Region Östergötland (SE)*
- *County Administrative Board of Kalmar County (SE)*
- *East regional Aquaculture Centre VCO (SE)*
- *Kalmar municipality (SE)*
- *Kurzeme Planning Region (LV)*
- *Latvian Institute of Aquatic Ecology (LV)*
- *Maritime Institute in Gdańsk (PL)*
- *Ministry of Energy, Agriculture, Environment, Nature and Digitalization of Schleswig-Holstein (DE)*
- *Municipality of Borgholm (DK)*
- *SUBMARINER Network for Blue Growth EEIG (DE)*
- *Swedish University of Agricultural Sciences (SE)*
- *County Administrative Board of Östergötland (SE)*
- *University of Tartu Tartu (EE)*
- *Coastal Research and Management (DE)*
- *Orbicon Ltd. (DK)*
- *Musholm Inc (DK)*
- *Coastal Union Germany EUCC (DE)*
- *RISE Reseach institues of Sweden (SE)*