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## **Maritime potential of the Russian sector of the south-eastern Baltic Sea and its spatial usage**

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**Abstract** Five major uses of sea space in the Russian sector of the southeastern Baltic Sea (SEBS) are navigation, fishery, mining, recreation, and military uses. A brief description of each existing and future marine space user as well as conflicts between them are presented in this study. The total area of each use was calculated. The most extensive zones are occupied by commercial fishery and military uses, which cover almost the entire exclusive economical zone. Special attention was made for potential marine protected areas (especially in offshore areas of the Curonian Spit, which is included in the UNESCO World Heritage List), which are not under legislation of the Kaliningrad Oblast' but require a particular defence. The area offshore of the western coast has the greatest economic activity and is the most vulnerable part of the open sea. Future intensification of the marine space use will result in increased negative load to the marine environment. Sustainable development concept and maritime spatial planning are declarative at the state level for many years, there is still no implementation mechanism.

**Keywords** • *maritime spatial planning* • *conflict use areas* • *south-eastern Baltic Sea*

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## **INTRODUCTION**

Marine spatial planning (MSP) is a tool for rationalizing competing uses of the marine environment in the interest of preserving the quality of the World Ocean. MSP is most developed in the coastal areas due to intensive economic activity. Coastal seas are heavily affected by the increase in conflicts among competing users. The growing needs and conflicts among various usages result in increasing pressure upon the Baltic Sea and require the evaluation of the maritime space and natural resources. Over the past 10 years there has been increasing focus on marine and maritime governance both within the European Union (Marine... 2016). There are global and regional (European Union) documents describing the principles and regulations of maritime spatial planning (European Commission 2007; Douvere, Ehler 2009;

Schaefer, Barale 2011; Schultz-Zehden, Gee 2013; Zaucha 2014a; Santos *et al.* 2014). Baltic countries are presently engaged in this field by both national activities and transboundary dialogue. The fragile Baltic Sea ecosystem needs to be regarded and managed as single entity. This is possible when integrated marine spatial planning is introduced in each Baltic Sea Member State. The nearest to Kaliningrad Oblast' neighbour states has already done steps towards the MSP based at scientific research (Weslawski *et al.* 2010; Zaucha 2014a; Blažauskas *et al.* 2015).

In the past, the coordination of various consumers of marine space has been relatively easy. Today, the increase in mutually exclusive interests should be balanced. Navigation, geological and fisheries exploitation, military uses, recreation, and nature protection are only a few of the sectors that contribute to the problem. Moreover, climate change and other

natural stressors require the development of an adaptation strategy. MSP is expected to solve the conflicts in marine space use and provide improvements to the environmental state while being economically effective (Backer 2011).

The aim of MSP is to analyse and allocate parts of three-dimensional marine spaces to specific uses or non-use and to achieve ecological, economic, and social objectives that are usually specified through a political process (Ehler 2014). The ecosystem-based management should be based on interactions among three crucial dimensions of stakeholders, namely, decision makers, scientists, and other actors, who collaborate to foster credibility in knowledge production (Röckmann *et al.* 2015).

For the first time, construction and geographical engineering in Russia was singled out alongside the physical and socio-economic geography of the ocean in 1989 by V.I. Lymarev (Lymarev 1989). Since then, scientists have made many attempts to develop a rational system of maritime usage based on an ecosystem approach. However, in Russia, land use planning only exists today. A short view on the map of advancements in MSP in the Baltic Sea Region countries created by J. Zaucha revealed that Russian marine areas present zones with “no legislation” (Zaucha 2014b). Some principles and methods of MSP have been perpetuated in the Russian legislation (Russian Federation Maritime Activity Strategy for the period until 2030) but are still in a conceptual phase. Maritime Doctrine of the Russian Federation (approved by the RF Government on 21.07.2001) gives a good start for more concrete initiatives both at the federal and regional levels. Nevertheless, the emphasis is more on sectoral strategies, rather than spatial planning (Kononenko *et al.* 2011). Thus, conflicts are possible between various sectoral strategies when spatially applied. The existing programmes of marine activity planning are characterized by narrow departmentalism and do not provide sustainable development of marine areas. The lack of the Russian federal law on the coastal zone negatively affects the development of the different coastal zone users collaboration. An MSP toolkit, which combines the legal and the methodological parts, will be developed within the framework of “The World Ocean” Federal Target Program. This scientific and technical goals of the program would aim an intensification of the effective use of resources and spaces potential of Russia, as well as realization of the strategic targets on scientific and informational supplying of the marine activity development for 2016–2031-years. One of the Program’s line is oriented at development of the steps for change-over from existing sectoral approach to complex planning of the marine activity.

In European countries, the powers that manage

maritime space are under both federal and municipal jurisdictions. In Russia, the seas are subject to the federal government control and supervision in what concerns their use and protection. Internal sea waters, territorial sea of the Russian Federation and cross-border water bodies are subjects to federal control (Government Decree N 640 as of November 4, 2006). However, due to large areas of Russian seas and coastline lengths, it may be very difficult to account for the interests of all of the sea users. The Baltic Sea is a special water body because of its transboundary location. Therefore, the Russian MSP tools should conform to the Russian Federation territorial planning documents produced in accordance with the Urban Planning Code and be linked to the relevant provisions of the EU requirements.

## **MAIN TYPES OF MARITIME USAGE IN THE SEA AREA**

Intensification and diversification of the human uses of the marine resources together with technological development during the last century had significantly increased the human pressure at marine ecosystems (Report 2016). This forces the ecosystem to respond by rising sea temperatures, ocean acidification, depletion of fish stocks, habitat destruction, altered biodiversity and species distribution with consequent trophic effects, eutrophication and increasing hypoxic zones, and the increased dispersal of various anthropogenically produced substances. Expansion of existing and development of new types of maritime usage should meet all requirements of the ecosystem sustainable functioning. The ecosystem-based management only should be implemented.

Authors highlight that networks of marine protected areas need increased attention as tools within overall ecosystem-based management, including at sea-basin scale. This requires a substantially increased commitment to understand water movements and ecological connections between ecologically important and vulnerable areas.

MSP consists of data collection, stakeholder consultation and the participatory development of a plan (European Commission 2008). The first attempt at data collection for the MSP mapping in the south-eastern Baltic Sea was done within the Interreg/Tacis project named POWER (Perspectives of Offshore Wind Energy development in the marine areas of Lithuania, Poland and Russia, <http://www.corpi.ku.lt/power/>). It was fulfilled in 2006–2009-years in the frames of Neighbourhood Programme Lithuania, Poland and the Kaliningrad Region of the Russian Federation. GIS-based analysis of maritime use revealed relatively little exploitation of the sea resources within studied area of the Baltic Sea.

The area of the Russian 12-nm zone in the SEBS is 3142 km<sup>2</sup>, while that of the EEZ is approximately 6820 km<sup>2</sup>, and the length of the open sea coastline is about 147 km. Water resources are protected and managed for the Russian state by the Water Code, which was adopted in 2006. Identification of all marine space users revealed the following main users: navigation, geological exploitation, fisheries, navy, and recreation.

### **Navigation, communication and navy**

The general part of traffic consists of cargo in the Russian sector, whereas passenger and ferry transport prevail in the other parts of the Baltic Sea. The main navigation routes pass from Port Kaliningrad to the western Baltic Sea (Fig. 1).

Today, Port Pionerskij is not used at full capacity and serves mainly as a base for small fishery fleet. Meanwhile, the mooring places for cruise vessels with a planned turnover of 250 000 passengers as well as ferries are constructed near the city of Pionerskij. In addition, the yacht marine will be located in Pionerskij. Moreover, the marine infrastructure will be developed by the construction of a deep port south of the city of Yantarnyj. It will include a container terminal with a capacity of 35 million tons, cargo terminals, and a regasification terminal with capacity of 2.3 million tons.

The adjacent area to Port Pionerskij is characterized by heightened concentrations of oil products in the water column (Bulycheva *et al.* 2016) and sediments (Nemirovskaya *et al.* 2014). The greatest possible source of this contamination is from port activity. The implementation of the plans mentioned above will significantly increase the anthropogenic load on the marine ecosystem. It is necessary to monitor the environmental parameters in regards to Russian legislation and international recommendations (HELCOM).

In addition to navigation (the main navigational routes and buffer zones), the transport function of the sea is correlated to anchorages, waiting sites, and dumped wrecks (Fig. 2). The anchorages are located at the outer roads of the Baltijsk and north of the Pionerskij cities. The total area used for navigation purposes is approximately 400 km<sup>2</sup>, which is 4% of the Russian sector of the SEBS. Underwater cables and their buffer zones cover approximately 700 km<sup>2</sup> (7%).

The navy has a special role in MSP. It is carried out on the state level only. While it is not related to any economic activity, it serves as a large-scale user of the sea area and has an unchallengeable priority in maritime space use. In spite of its important functions for the state, which include providing military and economic safety, military operations at sea are fre-

quently disturbing the marine environment. Closed or temporary closed areas usually cover large sectors of the territorial waters and Exclusive Economic Zone, especially in the exclave Kaliningrad Region, which is 7535 km<sup>2</sup> and accounts for approximately 76% (Fig. 2). During naval exercises, these occupied areas are closed to all other maritime space users.

### **Biological resources usage**

The Baltic Sea is characterized by a sufficiently limited resource base in comparison with other regions of the World Ocean (Narayanaswamy *et al.* 2013). In spite of this, the fishery development at the coastal fishery is an economic priority in the Kaliningrad Oblast.

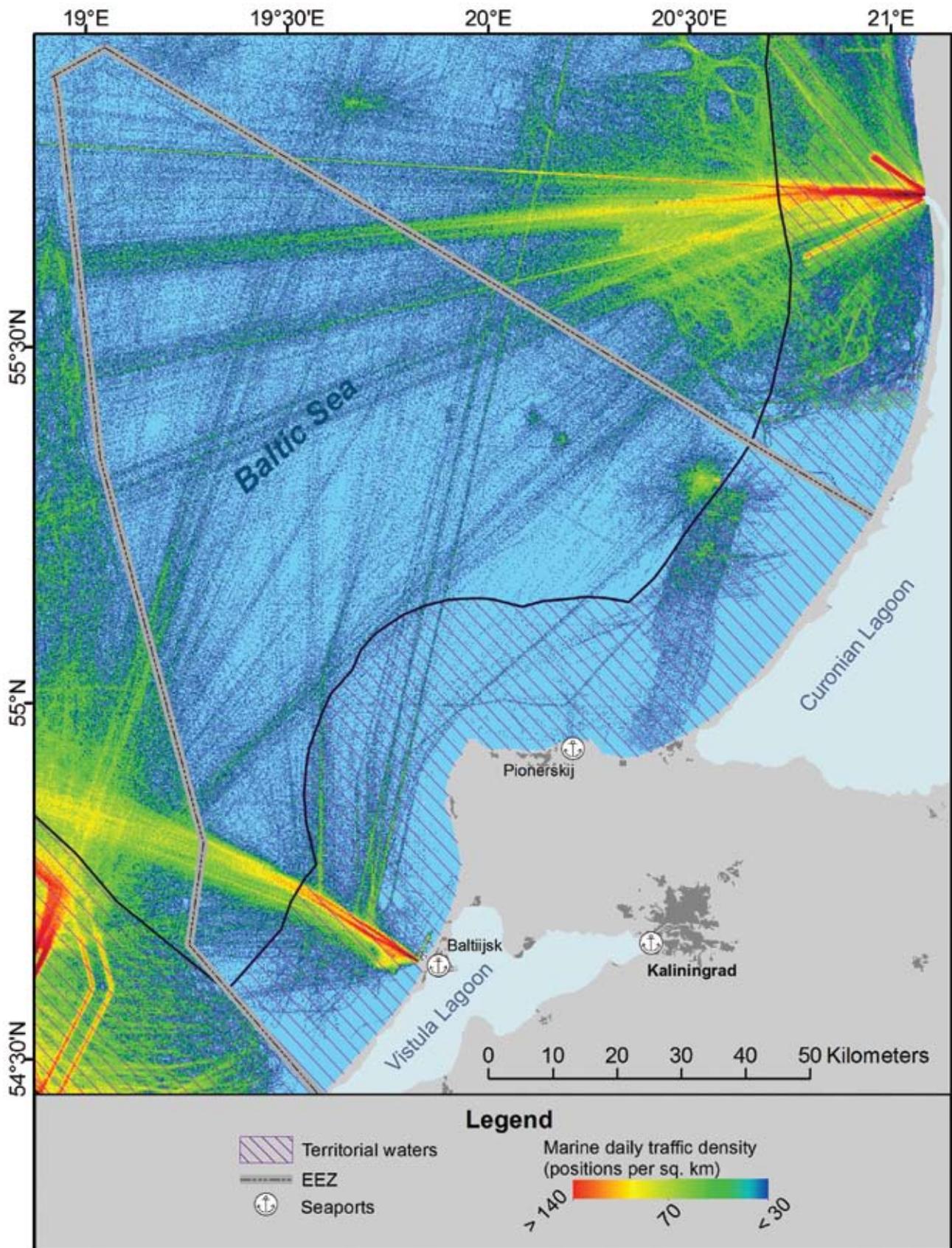
An important element of fishery regulation is fixing the scientific-based limits of the catches. The stocks of the most important bioresources are relatively stable the dynamics of their abundance and biomass are determined by natural reasons. It provides stable catches.

The Russian sector of the SEBS includes the population of the coastal spring-spawning herring, eastern-baltic cod, flounder and turbot; the sector is a place for fish to spawn, fatten and grow (Feldman *et al.* 2012). Due to the poor composition of the ichthyofauna species, any anthropogenic activity affecting the abundance of even one species may result in changes along the food chain.

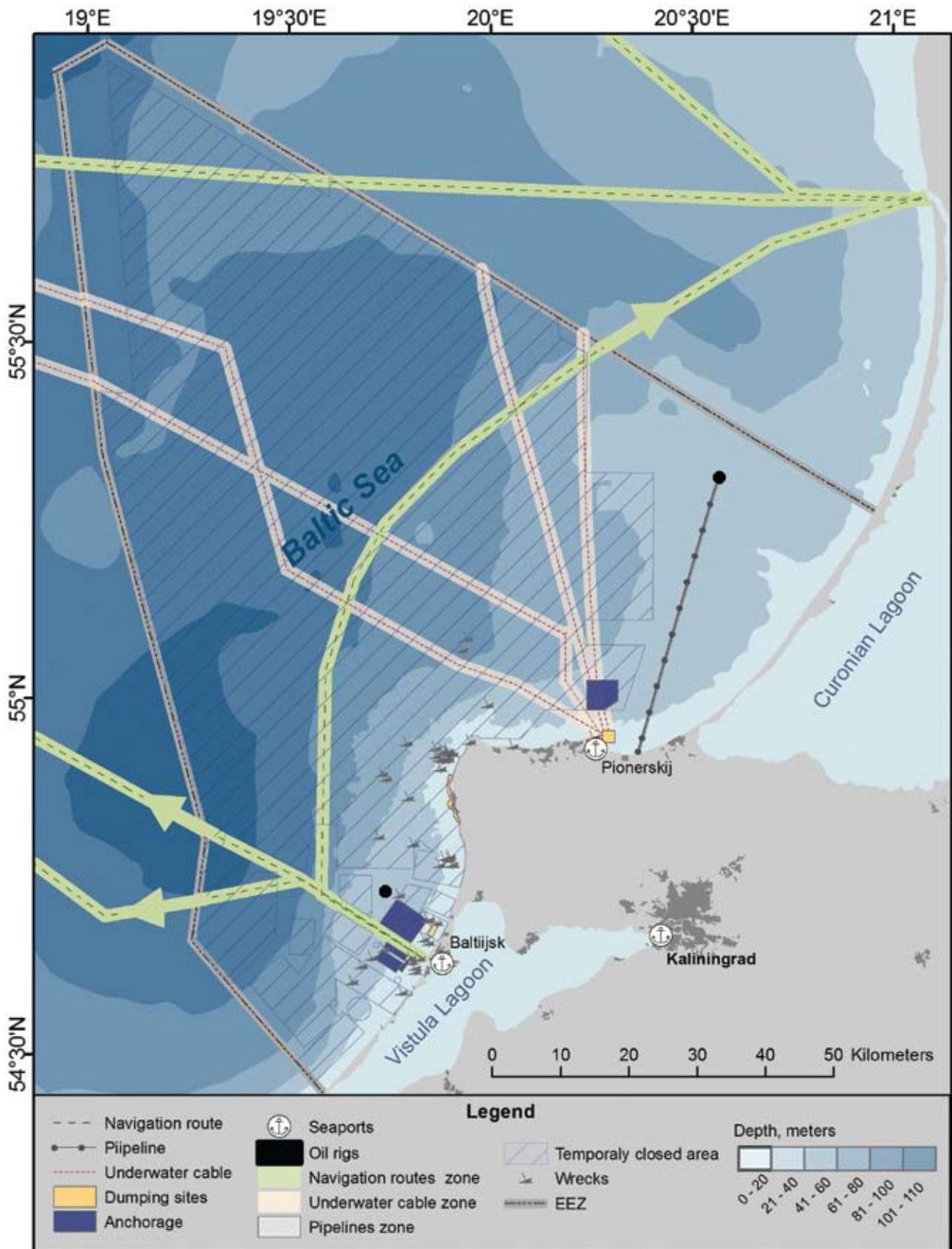
The boundaries of fishery areas differ depending on the season. Monthly catches for the three most distributed fish species (cod, herring, and sprat) were generalized for MSP purposes (Atlas of commercial catches in the Baltic Sea 2011). The areas used for the fishery are contoured (Fig. 3). A considerable part of the Russian sector is occupied by fishing during a certain season, with an area of 7650 km<sup>2</sup> and making up approximately 77% of the sector area. Cod dominates in annual catches both in terrestrial waters and EEZ (Fig. 3, diagrams).

### **Marine protected areas**

The foundation of the protected marine areas in Russia lags in comparison with the protected land areas. The protection of marine areas that have been protected for a long time was considered senseless because of the sea ecosystem integrity, absence of marine objects isolation, and inaccessibility. For example, in the case of an accidental oil spill, the status of the protected area is ineffective in environmental protection. However, environmental protection of the area serves as a good defence against uses such as coastal build up, dredging, and fairways construction. The areas within the Baltic Sea that require environmental protection are included in the largest coordinated network of protected areas in the world known



**Fig. 1** Marine traffic load in the Russian sector of the south eastern Baltic Sea for 2015 (<http://www.marinetraffic.com>). Compiled by M. Ulyanova, 2016



**Fig. 2** Marine space use for navigation, communication, and navy purposes in the Russian sector of the southeastern Baltic Sea. Compiled by M. Ulyanova, 2016

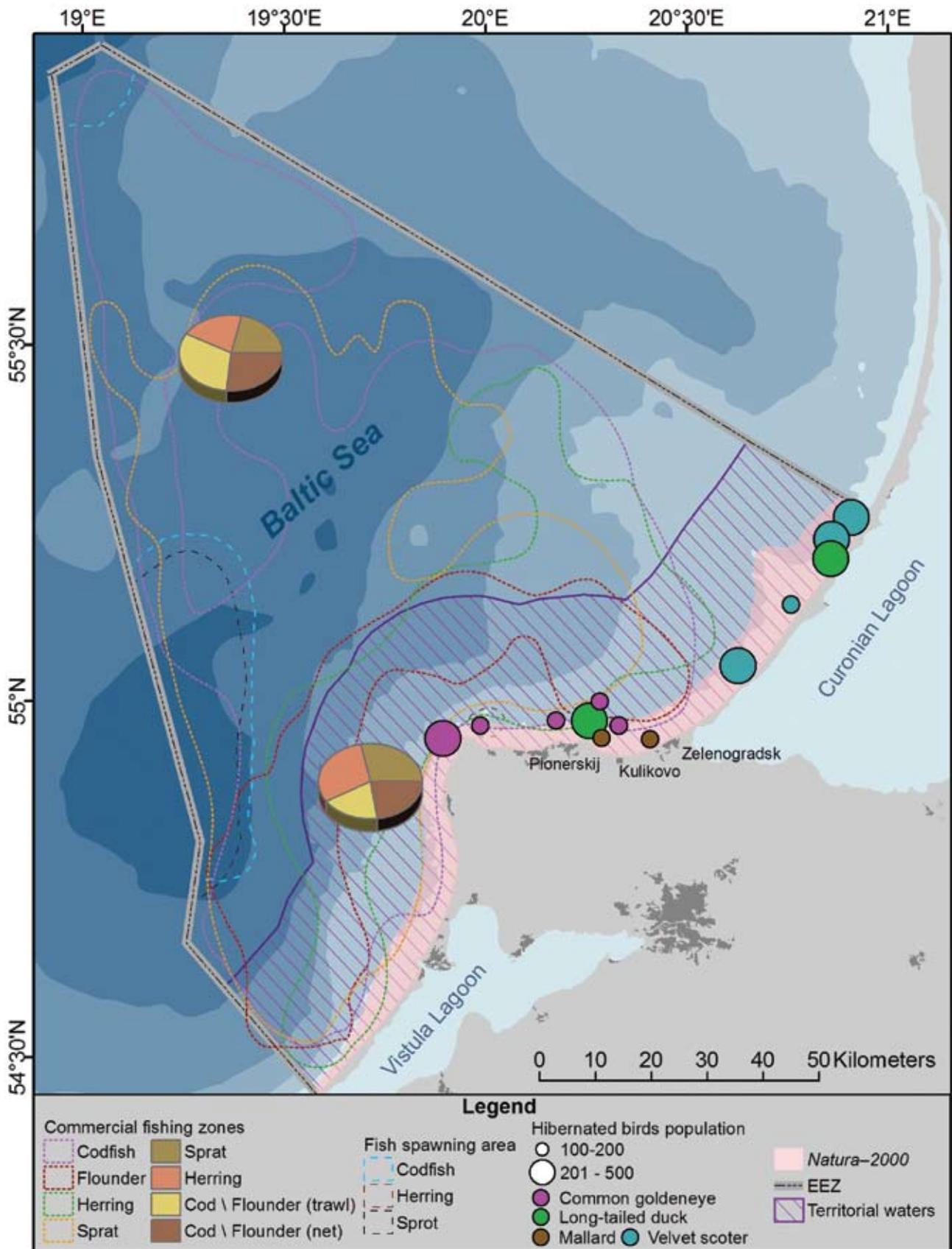


Fig. 3 Biological resources use and the vulnerability in the Russian sector of the south eastern Baltic Sea. Compiled by M. Ulyanova, 2016

as *Natura-2000*. These areas represent core breeding and resting sites for rare and threatened species as well as some rare natural habitats. The objects of *Natura-2000* are territories that are “slightly” covered in water, which is defined by the arbitrary depth of 20 metres below chart datum for the top of the sandbank (European Commission 2007b).

There is a clear gap in the coastal protection policy at the state level in Russia. There are no protected marine areas in the Russian sector of the SEBS. The closeness of the Russian-Lithuanian national park Curonian Spit, which is located at the coastal zone and included in the UNESCO World Heritage List, should be taken into account. The vulnerability of this unique natural object requires marine space users to apply advanced technologies to avoid the negative impacts on the Curonian Spit ecosystem. In regards to this and based on the ecosystem approach to MSP, we suggest that areas with depths of up to 20 m to be indicated as sensitive to economic activity (Fig. 3, named *Natura-2000*). This sensitive area occupies approximately 700 km<sup>2</sup> (7% of the Russian sector).

One of the *Natura-2000* objects is ornithocenosis. The main bird species in the offshore zone are long-tailed duck, herring, and common gulls (Grishanov 2012). In the coastal zone, the dominant species are long-tailed duck, velvet scoter, and goldeneye. The long-tailed duck is the most sensitive species to disturbances in the city of Pionerskij, an area of heightened activity from humans and pollution. The velvet scoter is also sensitive to disturbances. Key protected marine mammals (sea-swine and seals) do not have local populations in the Russian sector of SEBS, but they rarely occur in the studied area.

### Mineral resources

Mining in Russia is under federal control. The following mineral resources occur within the shelf area of the Kaliningrad Region: oil, amber, ferromanganese concretion, phosphorites, with appearances of heavy minerals (Atlas... 2010). The largest oilfield Kravtsovskoe (D-6) is located 22 km offshore of the Curonian Spit and has been under exploitation since 2004 (Fig. 4). The offshore ice-resistant oil platform is connected to the oil-collection point by 47 km of underwater and underground pipeline. The pipeline is subbottom from the coast up to a depth of 15 m and then located on the bottom surface, but sediments have already covered some sections. Oil perspective areas (407 km<sup>2</sup>), including areas ready for drilling (85 km<sup>2</sup>), are located at the northeast area of the Russian sector and northward of the Sambian Peninsula.

Oil and oil products are the most common pollutants in the water basins. In the case of an accidental oil outflow at the D-6 oil platform, only in 35% of the cases will the spill reach the coastline of the Curo-

nian spit (Kostianoy *et al.* 2014). However, due to the application of the “zero discharge” principle for offshore field development as well as the absence of the accidents, the area around the Kravtsovskoe oilfield stays relatively clean for the period of 2004-2014 (Bulycheva *et al.* 2014).

The building sands site (3 km<sup>2</sup>) is located within the shallow area northward of the city of Zelenogradsk. Clean sandy sediments are suitable for the beach nourishment and coastal protection if dumped in ecofriendly manner. The bypassing method is planned to be used. This technology may result in the following negative results for the water bioresources: partial death of fodder plankton and zoobenthos and death of ichtiofauna due to heightened suspended matter concentration in the water in place of sands taking-off.

The largest in the world amber deposits Primorskoye and Palmnikenskoye are located in the Kaliningrad Region. The exploited area is located on land, but it is possible to develop offshore deposits in the near future.

Two potential wind farm locations (total area of 52.3 km<sup>2</sup>) have been suggested in the Russian sector of the SEBS as a result of the POWER project. The optimal place for offshore wind park construction was chosen in light of environmental safety, economic efficiency and technical possibilities as well as avoiding conflicts with other marine space users. Planned wind farms are situated 8 and 12 km offshore of the Curonian Spit, and its possible influence on the safety of coasts is appreciated as non-considerable.

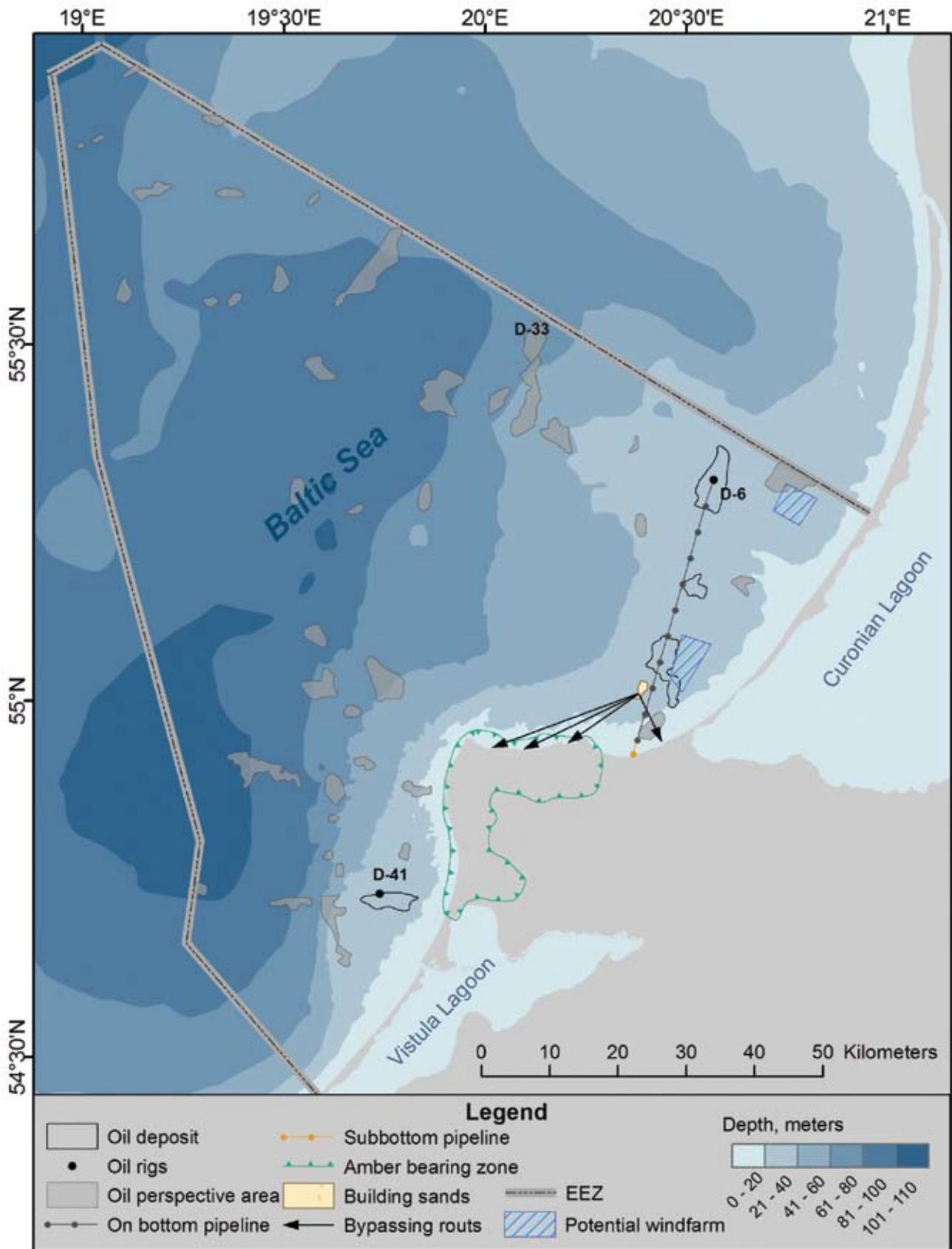
The total area of exploited and perspective oilfields, potential wind farms and building sands deposits is approximately 547 km<sup>2</sup> (5.5% of the Russian sector).

### Recreation resources

Recreation is usually considered as one of the main business types of marine use, and undegraded coastal zones and marine ecosystems provide a significant input to its economics. There are several types of coastal waters and beach uses for recreation such as the following: beach tourism including camping and rental of summer houses, recreational fishing, boating, cruises, and real estate (Hasselström 2008). The Baltic seaside has been widely used for recreation for a long time. The summer season attracts tourists and people who need a treatment of soft marine climate, sandy beaches and clean air of pine forests.

The main problem with recreational activity is maintaining a clean environment. The deviation in any ecosystem parameter (algae bloom for example) negatively impacts the aesthetic perception and recreational characteristics of the region.

Beach tourism in the Kaliningrad region is not lo-



**Fig. 4** Mineral resources in the Russian sector of the south eastern Baltic Sea (Atlas... 2010, with additions). Compiled by M. Ulyanova, 2016

**Table 1** Marine space use conflict matrix for the Russian sector of the SEBS

		M	Sh	F	R	U	P	N	PA
Mining (oil, sand)	M		Yes	Yes		Yes		Yes	<b>Yes</b>
Shipping	Sh	<b>Yes</b>						Yes	Yes
Fishing	F	<b>Yes</b>				Yes		Yes	<b>Yes</b>
Recreation	R						Yes		
Underwater cables, pipelines	U	Yes		Yes					
Ports	P				Yes			Yes	Yes
Navy	N	Yes	Yes	Yes			Yes		<b>Yes</b>
Protected areas	PA	<b>Yes</b>	Yes	<b>Yes</b>			Yes	<b>Yes</b>	

\* Bold type indicates mutually exclusive use

cal but indisputably national as approximately 98% of tourists are from Russia. In addition, it is available for all groups of inhabitants of both social-economic and demographic status. The most popular places for summer tourism in the SEBS are the federal resort cities of Svetlogorsk, Zelenogradsk, and Pionerskij as well as the Curonian Spit beach.

### COMPATIBLE AND CONFLICT USAGES

It is known that the most common type of conflict is between Nature Protection and other users (Pedersen *et al.* 2009). However, the Russian marine areas in SEBS proposed for future zone protection covers only 7% of the area. Minimum 20% of the total area was suggested for protected areas for Europe (Lunney *et al.* 1997). Conversely, the most extensive zones are occupied by commercial fishery (77%) and military (76%) use, and they cover almost the entire EEZ sector (Fig. 5). For comparison, in the neighbouring Polish waters, fishery exploitation occupies 62% of the area, with marine protection for 20% of the area (Węśławski *et al.* 2011); in the Lithuanian sector, the priority activities are shipping, fishing and development of marine infrastructure for oil and ocean energy projects (Milerienė *et al.* 2014). Since most of the offshore military areas are only temporally closed and closures are announced before the exercises are due to begin, for most of the year, it may be considered available for other users. The boundaries of the fishery area vary both in space and in time reflecting the seasonal changes in ichthyocenosis. Therefore, fisheries may be combined with other maritime uses such as shipping or manoeuvres exercises.

The area offshore of the western coast has the greatest economic activity (shipping, recreation, fishery, and military) and is the most vulnerable part of the open sea (marine biotopes and seabird distribution). The sea surface westward of the Sambian Peninsula is most polluted by oil products. The main sources are ships that are laid out or passing the main navigation routes (Bulycheva *et al.* 2014; Bulycheva *et al.* 2016).

A spatial compatibility matrix was constructed for the estimation of various maritime user conflicts (Table 1). Not only existing uses but also potential uses (offshore sand extraction, bypassing, and marine protected areas) were taken into account. The major potential conflicts for space are between mining, fishing and future protected areas. Interactions between sea space users do not always conflict (e.g. recreation is positively linked with protected areas or infrastructure).

### DISCUSSION

In other regions in the Baltic and other seas, the most considerable conflict occurs between the protected areas and other users (Węśławski *et al.* 2011). There are no protected marine areas on Kaliningrad Oblast' shelf so they cannot be considered as one of the main current user. However, it is a wrong point of view and in future it has to be changed in favor of Natura 2000 or other legislative document. If there was a document that defines the responsibility for coasts deterioration, financial measures for the coastal protection, identification of priorities for protection, and communication between federal and regional authorities, it would be very helpful. This would help to overcome the critical situation with coastal erosion processes.

Fishery exploitation naturally disturbs other users as it occupies the largest amount of space. This is especially true of military zones since much of the space used for this purpose is also used by fishery. However, the navy activity has an obvious priority over all other users.

Usually geological exploration is a significant competitor to other marine space users. This rule cannot be applied to the studied area today. The single offshore oil platform occupies a very small area and is situated out of the main marine traffic pathways. The prospective proven oilfield D-41 is located near the coast northward of the city of Zelenogradsk and is at a depth of 17 m; thus, conflicts occur in the planned marine protected areas and from recreational activity.

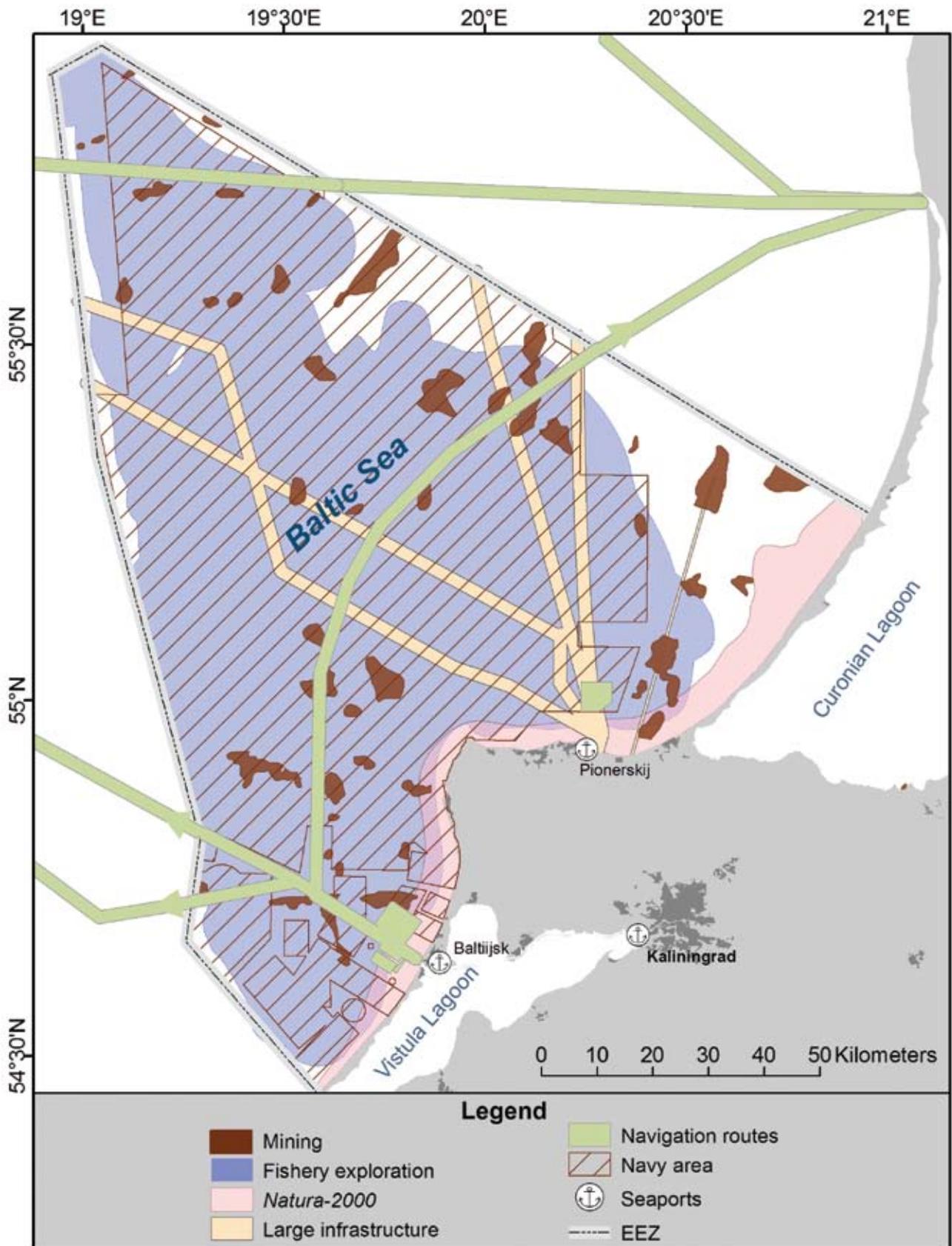


Fig. 5 Use of Russian waters in the south eastern Baltic Sea. Compiled by M. Ulyanova, 2016

The area of sands potential mining from depths of 25–27 m for the expansion of an artificial beach does not conflict with the Natura 2000 but is located within an active fishery area.

The shipping offshore the Kaliningrad region is not as intensive as in neighbour countries (see Fig. 1) but applies restrictions for other users at anchorage zones and navigation routes. Likely increase in cargo turnover and transit cargo results greater needs for space both in ports and on the sea. The Pionerskij port development will increase the negative load to the vulnerable coastal area. This initiative will attract more tourists as a new harbor will allow to moor the passenger ferries. Use of recreational resource will be significantly higher. But the beaches of the federal resorts of Kaliningrad Oblast' are in poor condition. This is an example of not sufficient interaction between marine space users even at planning stage.

The policies focused entirely on marine issues have not been developed in Russia. Some documents take into account marine aspects of Russia, and marine focus is represented there (Kononenko *et al.* 2011). Marine focus is not traced at all in a number of policies, for example in tourism strategy, heritage strategy, developing cluster initiatives.

The state of MSP in other Europe countries is better but not perfect. The latest study (Jones *et al.*, 2016) based on 12 case studies around Europe and related case studies from the literature revealed that MSP is often focused on achieving a specific sectoral objective, related to nationally important strategic priorities, rather than having a broader focus on a diversity of objectives. Thus, MSP often more represents strategic sectoral planning. Real-world MSP (as opposed to theoretical concepts in the academic literature) is arguably more about political expedience than it is about conceptual ideals of proactive, consensual and ecosystem-based approaches to MSP.

## CONCLUSIONS

The intensity of SEBS use is relatively low in comparison to the Western Baltic Sea or the North Sea mainly because of the moderate intensity of the marine traffic. However, the development of existing navigation and industry, various types of mining, communication, oil and gas transport and storage, dumping, recreational services together with planned spatial protected areas, fishery and national safety requirements lead to very extensive space use and require competent management based on an ecosystem approach. The World Ocean" Federal Target Program for 2016–2031-years is partly oriented at development of the complex planning of the marine activity. Hopefully, its' execution will place the MSP in the Russian part of the Baltic Sea to the level comparable

to other Baltic Region countries.

A developed map of spatial distribution of different marine exploitation areas may be considered a pre-estimation of MSP in the studied area. Currently, the main users of the Russian sector of the SEBS shelf are fisheries (77%) and the navy (76%). However, both are characterized by temporal uses, and the boundaries change depending on the season (fishery) and the tacks (navy training). Planned protected area covers approximately 7%. Mining conflicts considerably with other users but covers only 4.5% of the studied area. Thus, the Russian sector of the SEBS has enough place for the development of existing types of maritime space uses as well as introduction of new ones (mariculture, for example), which should be adopted under an ecosystem approach and principles of harmonious exploitation, both involving maritime spatial planning.

It is obvious that today MSP does not work in the Russian marine area of the SEBS. Existing conflicts in marine space use are solved at user-to-user level, without any regard to a complex approach. Increase of the control of all types of marine activity by federal authorities is required. Intensification of an interaction between decision makers, scientists and other actors seems to be one of the most effective steps. A special attention should be paid to the marine protected areas creating.

## ACKNOWLEDGEMENTS

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