

Contamination of the Shore of the Southeast Baltic (Kaliningrad Oblast, Russia) with the Debris of Geosynthetic Materials for the Survey Period 2018 - 2020

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1. List of types of geosynthetic material residues

This section contains information about types of geosynthetic material debris found on the shore of the Kaliningrad Region (Russian, South-East Baltic) during field surveys in the 2018 - 2020 ERANET-RUS_Plus joint project EI-GEO, ID 212 (RFBR 18-55-76002 ERA_a, BMBF 01DJ18005).

Geosynthetic materials are made from polypropylene (PP), polyester (PET), polyethylene (PE), high-density polyethylene (HDPE), polyamide (nylon), polyvinyl chloride (PVC), and fibreglass. PP and PET are the most widely used materials.

The most frequent found debris of geosynthetic materials are related to four types: geotextile, degraded gabion coating, geocontainers and geocells (see figures further).

1.1. Samples of the geotextile materials.



Figure 1.1. Nonwoven geotextile (PP, PET) is used in coastal protection constructions.



Figure 1.2. Fragments of nonwoven geotextile (PP, PET). All pieces are not fresh; they were a long time in natural conditions.



Figure 1.3. Fragments of white nonwoven geotextile (PP, PET). Pieces are not fresh; they were a long time in natural conditions.



Figure 1.4. The Fragment of black nonwoven geotextile (PP, PET)). Pieces are not fresh; they were a long time in natural conditions.



Figure 1.5. The Fragment of white nonwoven geotextile (PP, PET) with reinforcing stitching. The pieces is not fresh; it was a long time in nature.



Figure 1.6. The Fragment of white nonwoven geotextile (PP, PET)). Pieces are not fresh; they were a long time in natural conditions.



Figure 1.7. Examples of the geotextile debris on the beaches of the Kaliningrad Oblast, Russia.

1.2. Samples of the degraded gabion coating



Figure 1.8. Gabion wire braid.



Figure 1.9. Usually, only fragments of plastic coating for gabion wire are present on the beach, but sometimes the pieces contain the wire (two pieces in the figure).



Figure 1.10. Examples of the gabion fragments on the beaches of the Kaliningrad Oblast, Russia.

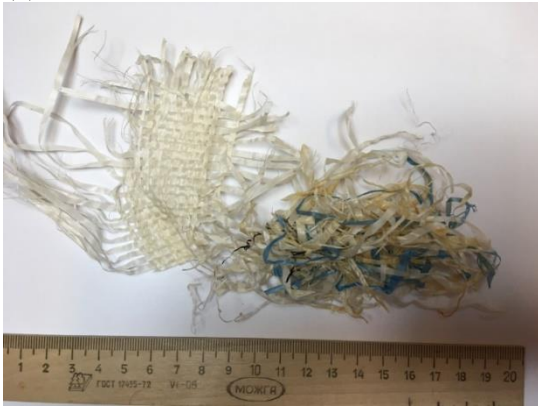
1.3. Samples of the debris of the geocontainers



(a)



(b)



(c)



(d)



(e)



(f)



(g)



(h)

Figure 1.11. Fragments of woven material.

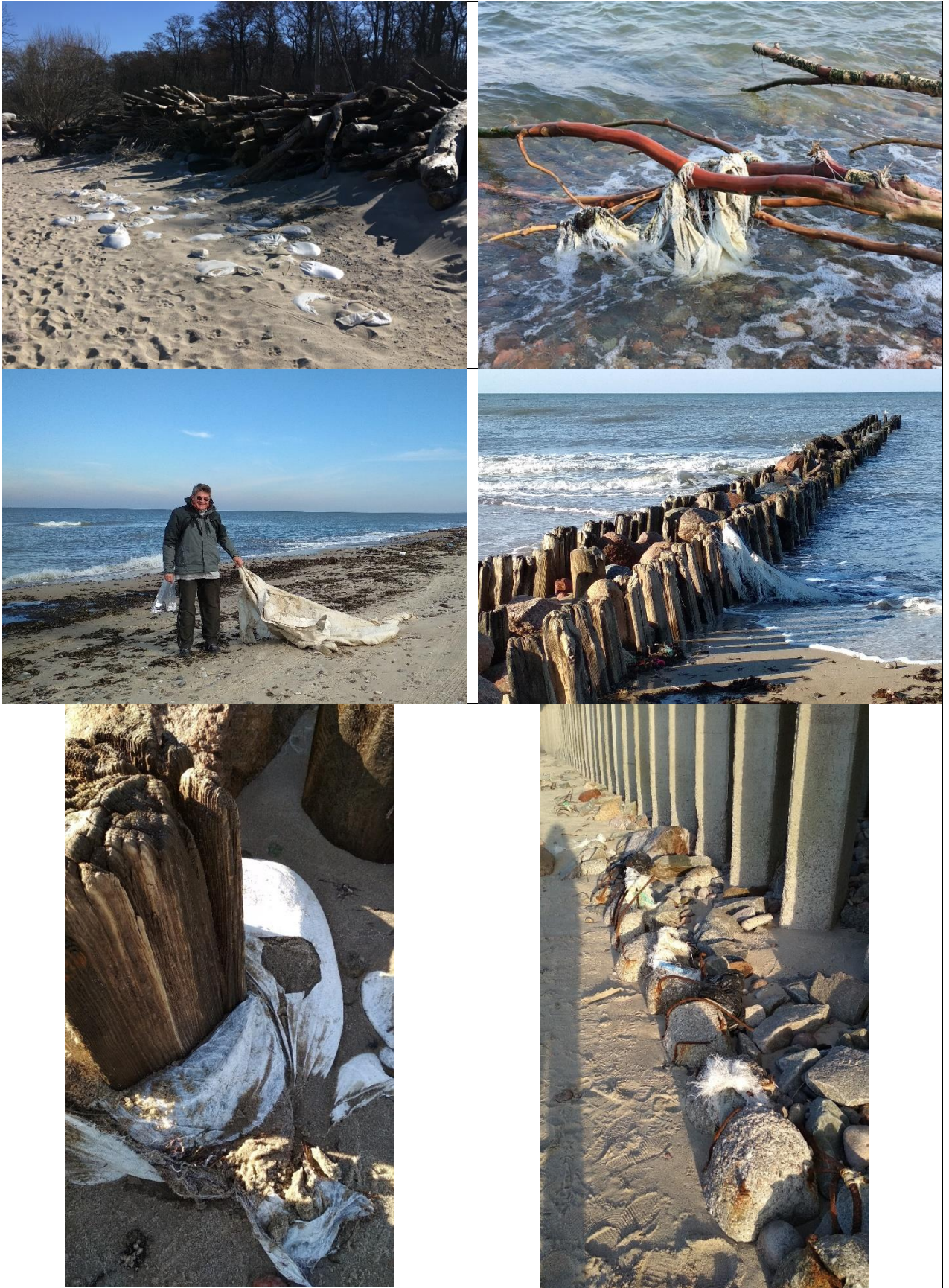


Figure 1.12. Examples of the geocontainer fragments on the beaches of the Kaliningrad Oblast, Russia.



Figure 1.13. Used geotextile (a woven bag, HDPE, PP).

1.4. Samples of the debris of the geocells.



Figure 1.14. Geocells are made from PP, HDPE or PE fibres.



(a)



(b)



(c)

Figure 1.15. Fragments of the tape from which geocells are produced.



Figure 1.16. Examples of the geocell fragments on the beaches of the Kaliningrad Oblast, Russia.

1.5. Samples of the debris of the geomats.

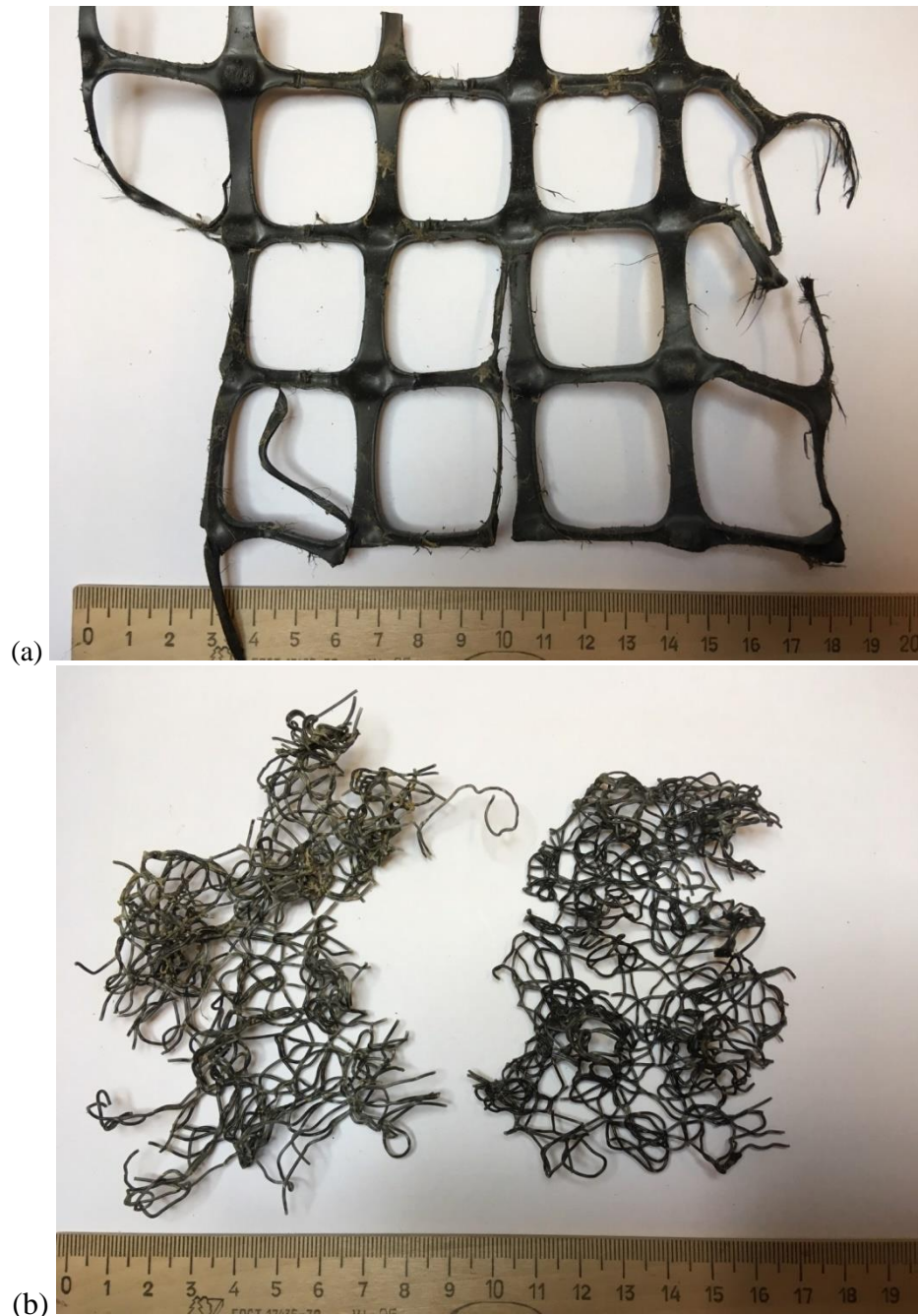


Figure 1.17. Fragments of the geomat.

3. Statistics for geosynthetic debris found on the shore of Kaliningrad Oblast (2018-2020)

This section contains information about statistics on sample size (geometrical dimensions: length and area) for different types of geosynthetic material debris found on the shore of the Kaliningrad Oblast (Russian, South-East Baltic) during field surveys in the 2018 - 2020 ERANET-RUS_Plus joint project EI-GEO, ID 212 (RFBR 18-55-76002 ERA_a, BMBF 01DJ18005).

The statistics on sample size are presented in the form of a box-and-whisker diagram for debris of geotextile (Fig.3.1), geocontainer (Fig.3.2) and gabion plastic coating (Fig.3.3) for each monitoring year. For geotextile and geocontainer, variations of a sample area (cm²) are presented (Figs 3.1 and 3.2), while for gabions, the variations of a sample length (cm) are presented (Fig. 3.3).

The diagrams were not prepared for other types of geosynthetic materials (geocells, geomats) due to the small number of collected samples. The samples usually have such a complicated geometry. The dimensions of the samples were estimated and rounded.

On each box-and-whisker diagram, the label inside the box indicates the value of the median sample size. Upper and lower whiskers correspond to the maximum and minimum values. The upper whiskers are also labelled.

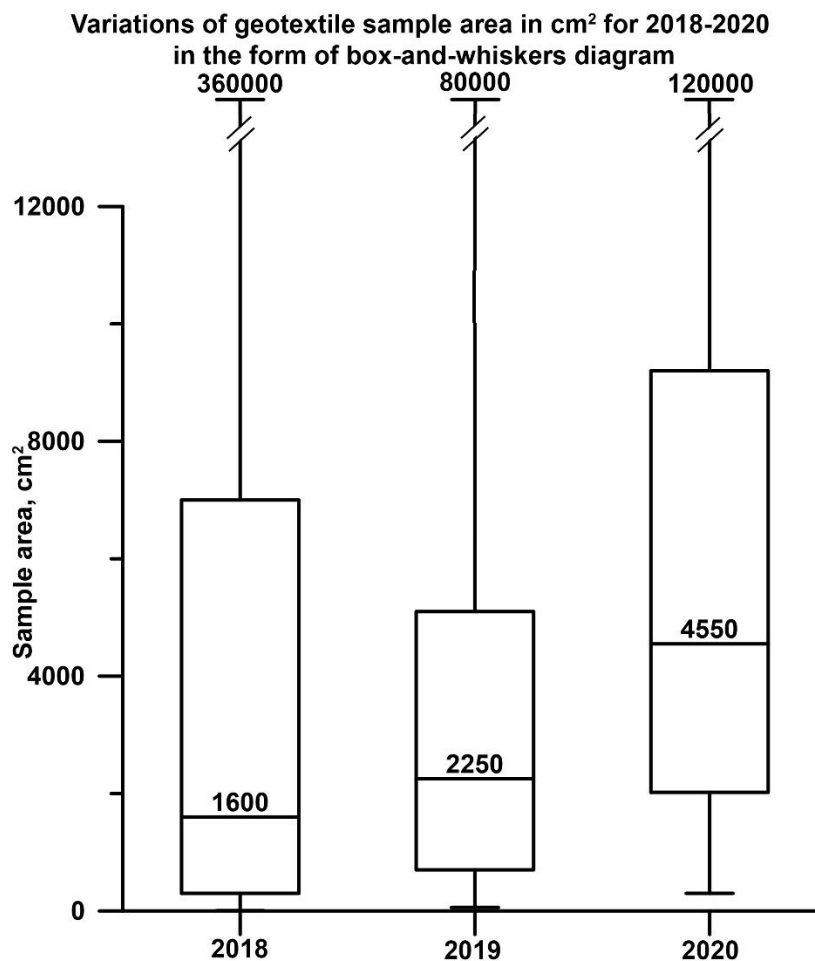


Figure 3.1. Variation of geotextile sample area in cm² for 2018-2020 in the form of a box-and-whiskers diagram. The label inside the box is the median value, the label above the upper whisker is the maximum value.

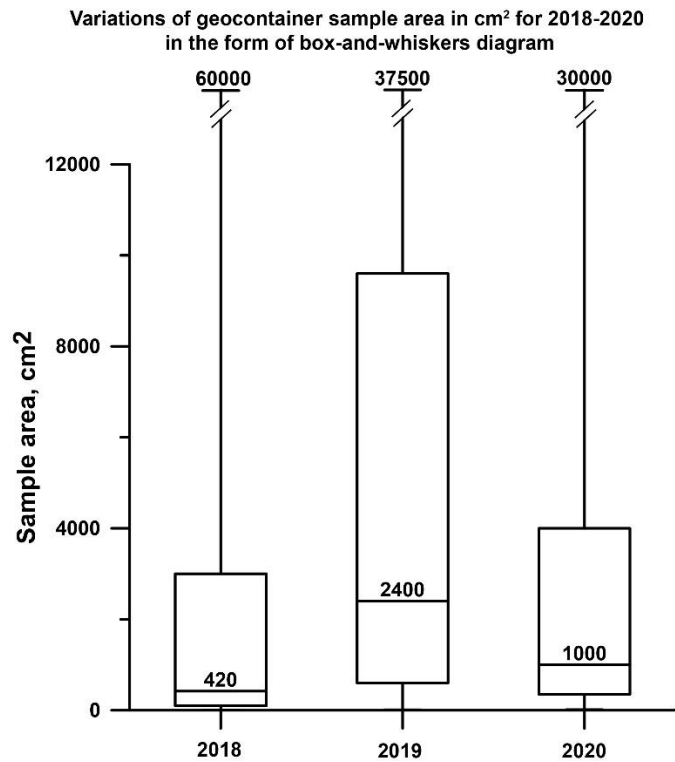


Figure 3.2. Variation of geocontainer sample area in cm² for 2018-2020 in the form of a box-and-whiskers diagram. The label inside the box is the median value, the label above the upper whisker is the maximum value.

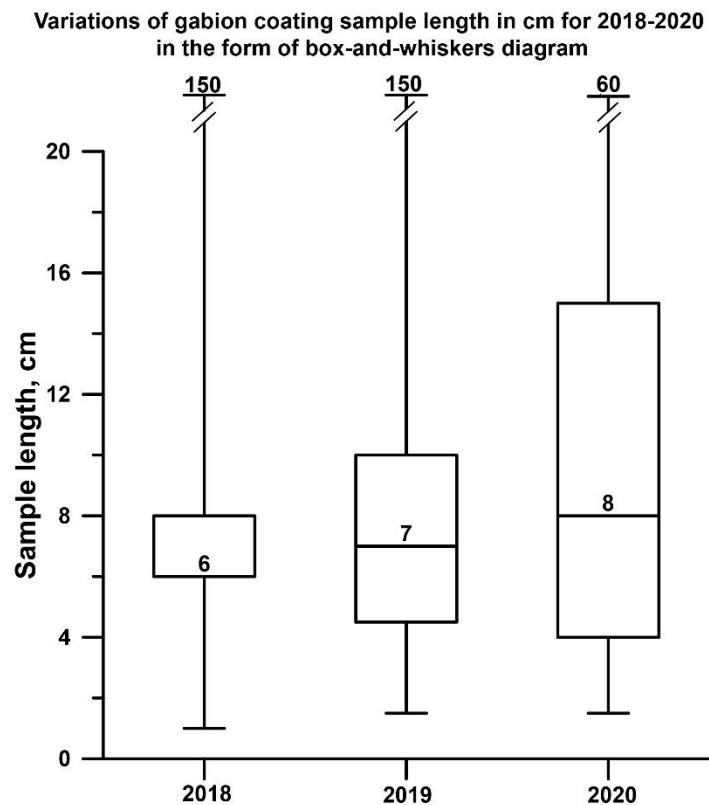


Figure 3.3. Variation of gabion plastic coating sample length in cm for 2018-2020 in the form of a box-and-whiskers diagram. The label inside the box is the median value, the label above the upper whisker is the maximum value.

4. Results of the test surveys on the shores of Lithuania and Poland adjacent to Kaliningrad Oblast

This section contains information about types of geosynthetic material debris found on the shore of the Polish and Lithuanian coasts adjacent to Kaliningrad Oblast (South-East Baltic) during field surveys in May-June 2019 within the ERANET-RUS_Plus joint project EI-GEO, ID 212 (RFBR 18-55-76002 ERA_a, BMBF 01DJ18005).

There were twelve test 1-km segments at the Lithuanian part of the shore of the Southeastern Baltic (Fig. 4.1a): six 1-km segments on the Lithuanian part of the Curonian Spit (spit sector) and six segments on the mainland to the north towards the Latvian-Lithuanian border (mainland sector).

Seven test segments of various lengths were defined at the Polish part of the neighbouring shore - five segments on the Polish part of the Vistula Spit and two segments between the Vistula River mouth and the core of the Vistula spit (Fig.4.1b).

Information about field surveys is in Table 4.1. Results are in Table 4.2.

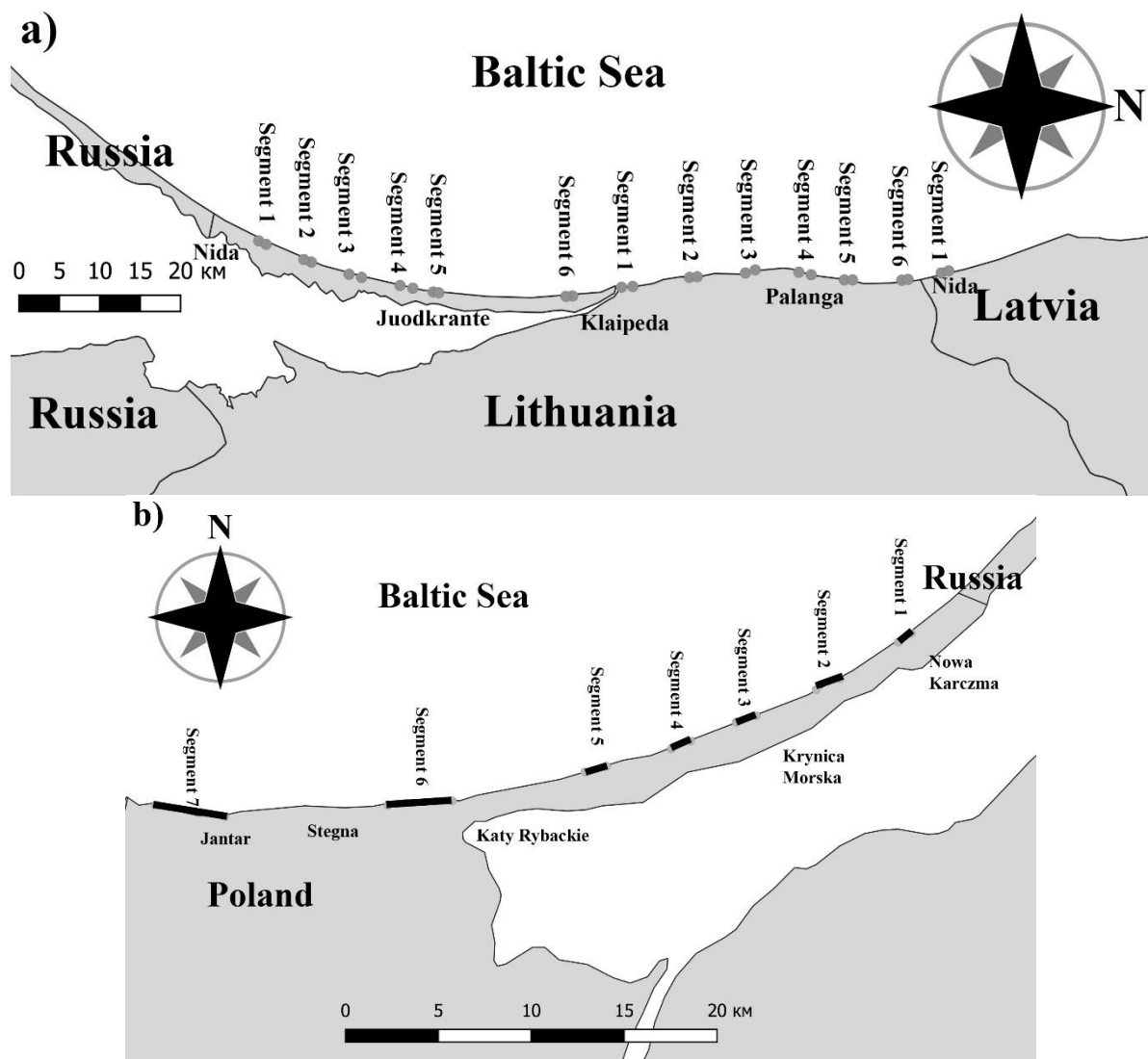


Figure 4.1. Positions of the monitoring segments on the Lithuanian (a) and Polish (b) shores.

Table 4.1. Information about test field surveys on the shore of the Lithuanian and Polish coasts adjacent to Kaliningrad Oblast (South-East Baltic) in May-June 2019 within the ERANET-RUS_Plus joint project EI-GEO, ID 212 (RFBR 18-55-76002 ERA_a, BMBF 01DJ18005).

	Segment number	Coordinates South [Lon_Lat_degree]	Coordinates North [Lon_Lat_degree]	Length [km]	Time survey [month, year]
Lithuania (Guronian Spit)	1	20.99445 55.32765	21.00111 55.33583	1	May 2019
	2	21.03583 55.38611	21.03083 55.37778	1	May 2019
	3	21.05972 55.42806	21.06583 55.44194	1.6	May 2019
	4	21.08167 55.48472	21.08694 55.49889	1.6	May 2019
	5	21.09444 55.52167	21.09611 55.52778	0.8	May 2019
	6	21.10278 55.67667	21.10333 55.66917	1	May 2019
Lithuania (mainland)	1	21.08555 55.73111	21.08416 55.74361	1.5	May 2019
	2	21.06638 55.80666	21.06500 55.81527	1	May 2019
	3	21.05777 55.86888	21.05166 55.87972	1.5	May 2019
	4	21.05638 55.92833	21.06138 55.94194	1.6	May 2019
	5	21.07166 55.97888	21.07166 55.98805	1	May 2019
	6	21.07222 56.04277	21.07083 56.04972	0.9	May 2019
Latvia	1	21.05777 56.08666	21.05388 56.09500	1	May 2019
Poland	1	54.43944 19.60166	54.43500 19.59055	1	June 2019
	2	54.41638 19.54222	54.41055 19.52444	1.5	June 2019
	3	54.39555 19.47416	54.39555 19.47416	1	June 2019
	4	54.38222 19.42222	54.37972 19.40750	1.1	June 2019
	5	54.37972 19.34666	54.36694 19.33333	1.5	June 2019
	6	54.34666 18.97694	54.34388 19.03472	3.5	June 2019
	7	54.35000 19.16972	54.35305 19.22277	3.8	June 2019

Table 4.2. Number of geosynthetic material debris which was found on Lithuanian and Polish coasts adjacent to Kaliningrad Oblast (South-East Baltic) during field surveys in May-June 2019

	Segment number	Geotextile [numbers]	Gabion coating [numbers]	Geocontainer [numbers]	Geocell [numbers]	Geomat [numbers]
Lithuania (Guronian Spit)	1	0	1	3	0	0
	2	1	1	1	0	0
	3	1	2	15	0	0
	4	0	4	8	0	1
	5	0	1	0	0	0
	6	0	0	3	0	0
Lithuania (mainland)	1	0	2	1	0	0
	2	0	0	2	0	0
	3	0	1	2	0	0
	4	0	2	0	0	0
	5	0	0	0	0	0
	6	0	0	0	0	0
Latvia	1	0	0	0	0	0
Poland	1	0	0	0	0	0
	2	0	0	0	0	0
	3	0	0	0	0	0
	4	0	0	0	0	0
	5	0	0	0	0	0
	6	0	4	0	0	0
	7	0	28	0	0	0