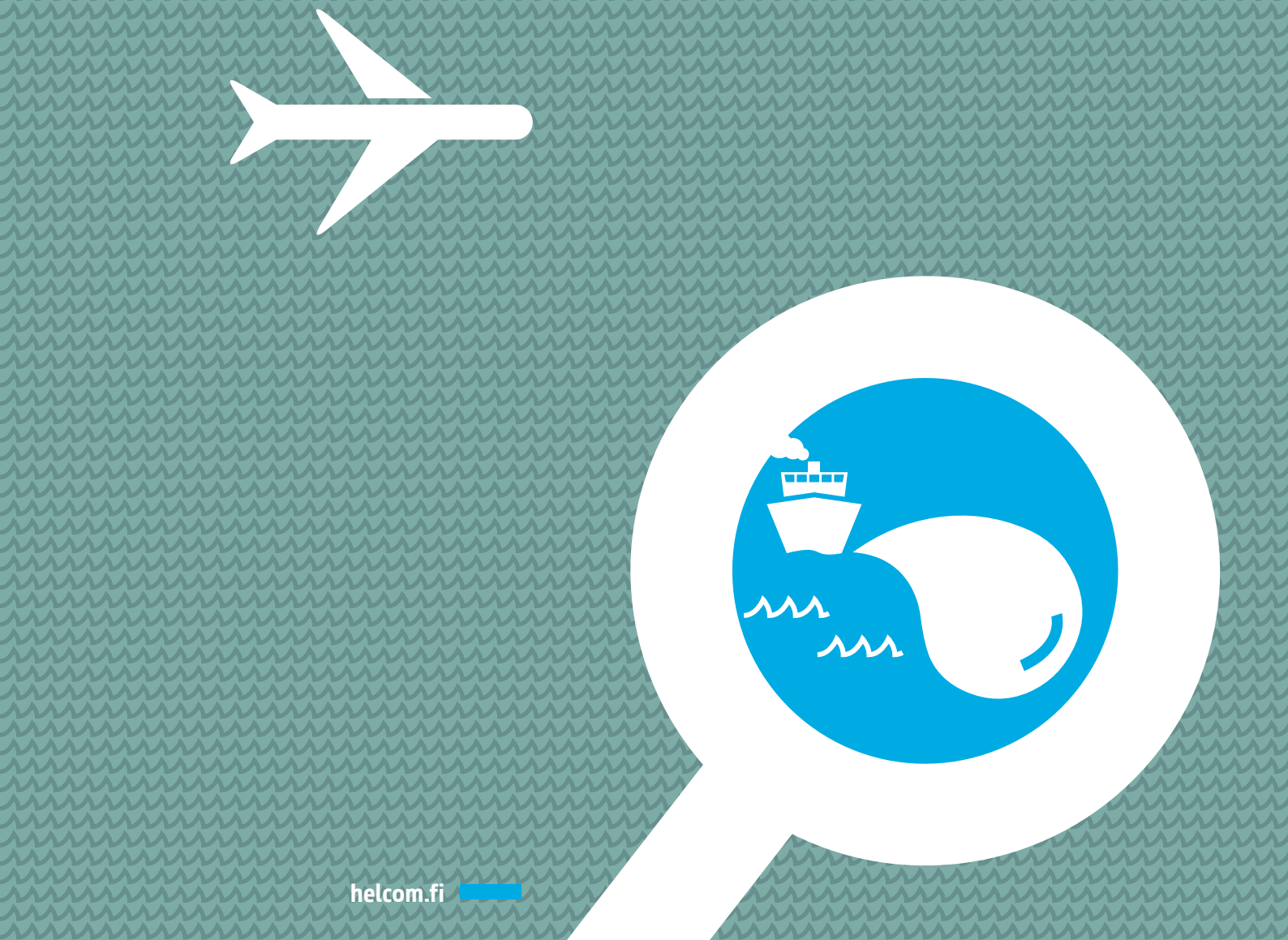
Annual report on discharges observed during aerial surveillance in the Baltic Sea 2019

Baltic Marine Environment Protection Commission

Response to spills

2020



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Introduction

Co-operation on aerial surveillance within the Baltic Sea area was established already during the 1980s within the framework of the Helsinki Commission (HELCOM). Through the Helsinki Convention (Article 14, Annex VII Regulation 7) the Contracting Parties (the nine Baltic countries and the European Commission) have agreed to develop and apply individually or in co-operation, surveillance activities covering the Baltic Sea area in order to spot and monitor oil and other substances released into the sea.

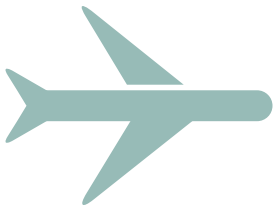
The Contracting Parties have also committed themselves to undertake appropriate measures to conduct the surveillance by using, inter alia, airborne surveillance equipped with remote sensing systems. In addition to the provisions of the Helsinki Convention, the HELCOM Recommendation 34E/4 recommends the Contracting Parties to take actions to cover the whole of the Baltic Sea area with regular and efficient airborne surveillance, develop and improve the existing remote sensing systems and to co-ordinate surveillance activities which take place outside territorial waters. More on the aerial surveillance cooperation in the Baltic Sea can be found in Chapter 7 of the HELCOM Response Manual.

The purpose of regional aerial surveillance is to detect spills of oil and other harmful substances and thus prevent violations of the existing regulations on prevention of pollution from ships. Such spills are a form of pollution which threatens the marine environment of the Baltic Sea area. If possible, an identity of a polluter should be established and the spill should be sampled from both the sea surface and on board the suspected offender to enable prosecution.

In order to follow-up these commitments, and to provide an overview of the situation in the region, the HELCOM Secretariat compiles annually data on discharges observed in the Baltic Sea area during national and joint co-ordinated aerial surveillance activities.

This report presents data from 1988 up to 2019. Data has been reported by the HELCOM Contracting Parties and quality assured by the HELCOM Secretariat. The report focuses on aerial surveillance conducted with fixed-wing aircraft. Nevertheless, the 2018 Annual Meeting of the HELCOM Informal Working Group on Aerial Surveillance (IWGAS) agreed that future reports could include a separate section with data from other types of aerial surveillance such as helicopters and drones, but that this data would be kept separate from the data of aerial surveillance by fixed-wing aircraft, in order not to disrupt the valuable statistics compiled over the years.

The focus of the report is on detected spills of mineral oil. However, since 2014, the reporting not only covers detections of mineral oil but also spills of other substances and unknown substances. The Contracting Parties have also reported detections of other substances and unknown observations as included in the report.



Aerial surveillance activity

In total, 3854 flight hours with fixed-wing aircraft were carried out in 2019 within aerial surveillance activities of the Baltic Sea countries (Table 1). This is a slight decrease of 0,3 % compared to the previous year (3865 in 2018). All Baltic Sea countries reported aerial surveillance related data except for Russia. No aerial surveillance was conducted by Latvia in 2019. In addition, Lithuanian Navy conducted in total 42 flight hours with Lithuanian Air Force helicopter (none with fixed-wing aircraft) during which one spill was detected (Table 5).

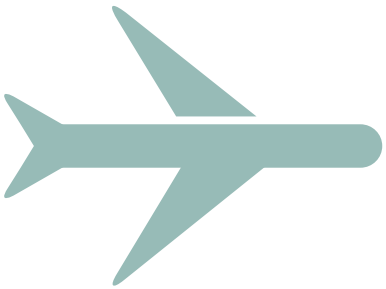
The number of flight hours vary somewhat between the years owing to for example overhaul of aircraft, missions abroad etc. In 2019, Estonia and Finland increased their number of flight hours while there was a decrease in flight hours in Denmark, Germany, Poland and Sweden. No regular aerial surveillance has been conducted in Russian waters since the beginning of 1990s and thus the number of spills in these areas are unknown. This also concerns Latvian waters where only sporadic surveillance has been conducted in the last ten years.

The number of flight hours by individual HELCOM countries, in 2000-2019, is shown in Figure 1.

Certain flight proportions should be ensured for detections in darkness, when deliberate discharges are more likely to occur, which means that the aircraft should be properly equipped to detect oil at night or during poor visibility. In 2019, five countries carried out flights at night (Figure 2), in total 555 flight hours, which constituted 14% of all flight hours (18% in 2018). Most of these countries only conducted a minor share of their aerial surveillance in night-time. However, 50,4% of the total German flight hours were conducted in darkness in 2019, representing 69% of all aerial surveillance conducted in darkness.

In addition to aerial surveillance, the Contracting Parties utilize satellite images to detect illegal discharges of oil and other substances. Satellite surveillance in the Baltic Sea area has been intensified since 2007 due to the CleanSeaNet (CSN) satellite surveillance service, provided to the HELCOM countries by European Maritime Safety Agency (EMSA). The satellite images are delivered in near real time to provide first indication of possible oil slicks to be checked by aircraft on spot.

Altogether, CSN delivered for the HELCOM region a total of 1127 services in 2019 (807 in 2018), indicating 413 possible detections (471 in 2018). In the HELCOM area, 36% of the spill indications were checked within three hours of the alert. Out of these 5% were confirmed to be mineral oil (0,6% in 2018). Satellite surveillance detections provided by EMSA in 2019, including confirmed mineral oil detections, are presented in Table 2.



Detected spills of mineral oil and other substances

In general, the number of detected oil spills in the Baltic Sea has been constantly decreasing (Figure 3), even though the density of shipping has grown and the aerial surveillance activity in the countries has been substantially improved, e.g. the high number of flight hours has been maintained and remote sensing equipment on board aircrafts, like Side Looking Airborne Radar (SLAR), has been more widely used. This is a result of intensive aerial surveillance in the Baltic Sea which indicates to the ships that they are constantly being watched. The aerial surveillance is complemented by satellite surveillance to enable bigger area coverage and optimisation of flights effectiveness.

Altogether the HELCOM countries reported 170 spill observations in 2019 as presented in Figure 4 and Table 1. Of the detected spills 42% were confirmed as discharges of mineral oil, in total 72 spills. The remaining 58% of the detections were identified as other substances (e.g. fish oil, vegetable oil, greywater) or unknown observations, which could not be visually verified as mineral oil or other substances. Methodology for identifying hazardous substances in aerial surveillance is not yet in place. These substances might cause a threat to the marine environment and would be important to be able to identify.

The number of mineral oil spills has been increasing in the last two years compared to the 2017 when only 52 oil spills were observed, which was the lowest ever recorded in the Baltic Sea. It should however be noted that 28 of the oil spills in 2019 were detected from the wreck s/s Georg Buchner in Polish waters at different occasions. Further, three oil spills in 2019 were detected from sunken ships in Swedish waters. Ten years ago the number of detected mineral oil spills was still close to 200 and five years ago over 100. The number of oil spills observed during aerial surveillance activity in individual countries in 2000-2018 is presented in Figure 3.

A good way to evaluate the number of illegal oil discharges is to reflect it as Pollution per Flight Hour (PF) Index, which compares the total number of observed oil spills to the total number of flight hours. A decreasing PF Index over the years indicates less oil spills or/and increased surveillance activity. In 2019, the PF index was 0,019, which is higher than in 2018 (0,016), due to the increase in the number of observations (Figure 5). Figure 6 shows the total number of flight hours and observed oil spills during aerial surveillance in 1988-2019.

Of the total 72 mineral oil discharges detected in 2019, 70 (97%) were smaller than 1 m^3, and of these oil spills as many as 64 were even smaller than 0.1 m^3 (100 litres). The share of each size category of oil spills is presented in Figure 7 and further divided by country waters in Table 3. The total estimated minimum volume of oil spills observed in 2019 amounted to 28 m^3 (11,6 m^3 in 2018). The increase in 2019 is mainly due to the two largest oil spills, which were estimated to be 16 m^3 and 9,1 m^3. The estimated volume of the oil spills has steadily been decreasing and during the last ten years a significant decrease has been recorded. The trend of the spill sizes for the years 1998-2019 is presented in Figure 8. Figure 9 further illustrates the trend in total amount of oil detected and the number of spills observed in 1988-2019. A map illustrating the location of the detected oil spills in 2019 by size is depicted in Figure 10.

In a vast majority of cases of detected discharges polluters remain unknown, which was also the case in 2019 (Table 1). In 14 spill detections the polluter was identified to be a ship and of these cases seven were spills of mineral oil and in 31 spill detections oil was leaking from sunken ships.

The identification of ships suspected of illegally discharging oil into the sea is facilitated by the SeatrackWeb (STW) oil drift forecasting system developed within HELCOM. This tool, in combination with the HELCOM Automatic Identification System (AIS), is used for backtracking and forecasting simulation of detected oil spills and matching the ship tracks with oil spill backtracking trajectory. STW/AIS has also been integrated with satellite information to increase the likelihood that polluters will be identified.

Aerial surveillance data for the years 1988-2019, including the number of flight hours per country, confirmed oil spills in country waters as well as data on the PF Index is contained in Table 4.

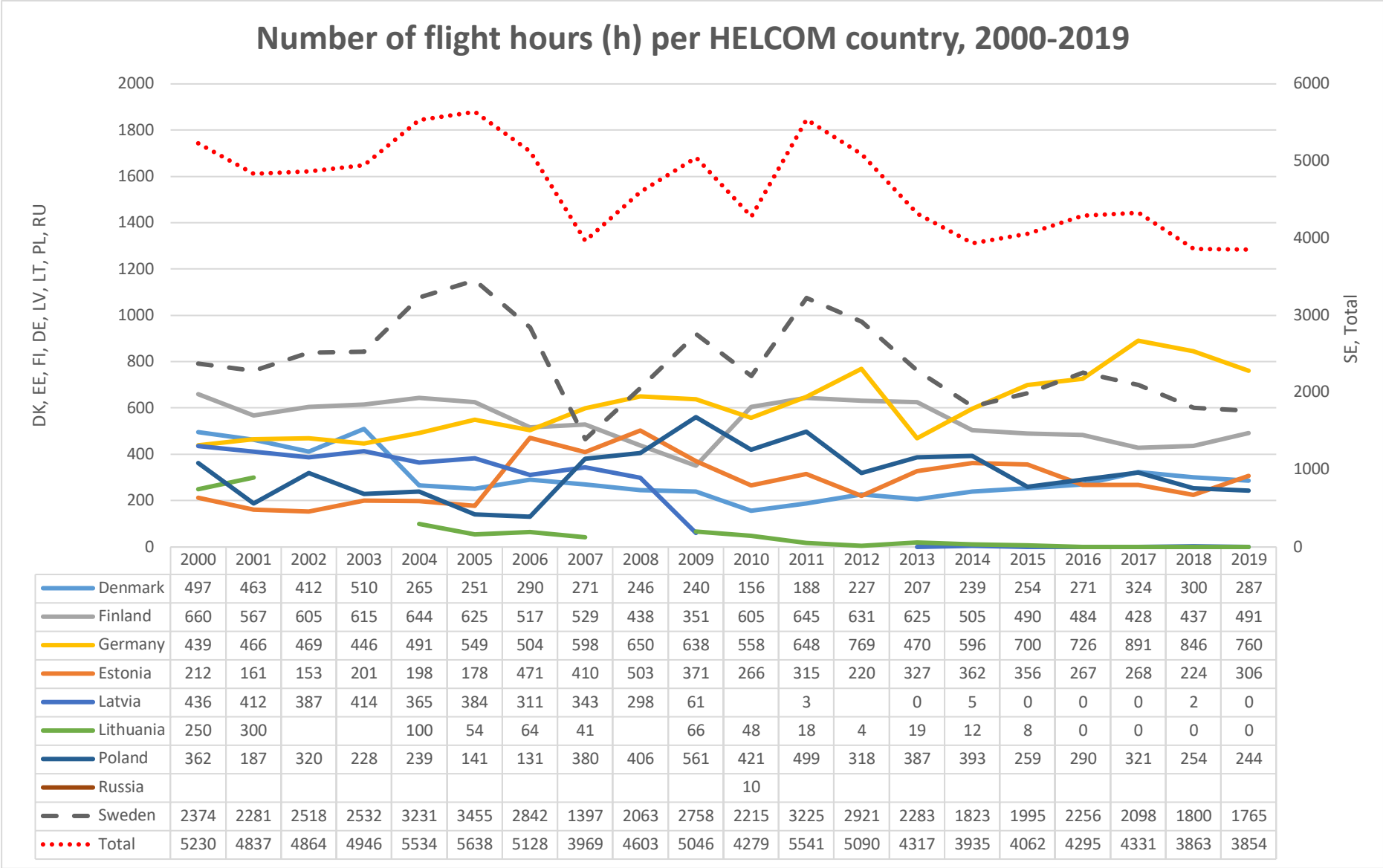
Data on the individual observed oil spills can be viewed and downloaded in the HELCOM map and data service (http://maps.helcom.fi/website/mapservice/).

Table 1. Annual aerial surveillance data for the Baltic Sea in 2019. The flight hours are the total number of hours of aerial surveillance conducted by a country in the Baltic Sea area. The detections of mineral oil, other substances and unknown substances are reported as detections within a country's Exclusive Economic Zone (EEZ).

Country	No. of flight hours			No. of detections inside national EEZ			Detections confirmed / observed as mineral oil spills			No. of polluters (mineral oil)				Estimated volume (m^3)
	Daylight	Darkness	Total	Daylight	Darkness	Total	Daylight	Darkness	Total	Rigs	Ships	Other	Unknown	
Denmark	274:26:00	12:41:00	287:07:00	13	4	17	2	0	2	0	0	0	2	0.01
Estonia	302:14:00	4:15:00	306:29:00	9	0	9	5	0	5	0	0	0	5	0.21
Finland	411:10:00	80:00:00	491:10:00	17	0	17	11	0	11	0	3	0	8	25.13
Germany	376:51:00	383:25:00	760:16:00	11	4	15	4	0	4	0	1	0	3	0.70
Latvia	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	0	0.00
Lithuania	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	0	0.00
Poland	244:02:00	0:00:00	244:02:00	40	0	40	33	0	33	0	0	28	5	0.59
Russia						0			0					
Sweden	1690:00:00	75:00:00	1765:00:00	67	5	72	16	1	17	0	3	3	11	1.22
Total	3298:43:00	555:21:00	3854:04:00	157	13	170	71	1	72	0	7	31	34	27.86

Table 1 continue

Country	Detections confirmed/observed as other substances	No. of polluters (other substances)				Unknown detections	No. of polluters (unknown detections)			
		Rigs	Ships	Other	Unknown		Rigs	Ships	Other	Unknown
Denmark	1	0	0	0	1	14	0	0	0	14
Estonia	0	0	0	0	0	4	0	0	0	4
Finland	3	0	0	0	3	3	0	0	0	3
Germany	1	0	1	0	0	10	0	0	0	10
Latvia	0	0	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0	0	0
Poland	7	0	0	0	7	0	0	0	0	0
Russia										
Sweden	7	0	5	1	1	48	0	1	0	47
Total	19	0	6	1	12	79	0	1	0	78



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Denmark	497	463	412	510	265	251	290	271	246	240	156	188	227	207	239	254	271	324	300	287
Finland	660	567	605	615	644	625	517	529	438	351	605	645	631	625	505	490	484	428	437	491
Germany	439	466	469	446	491	549	504	598	650	638	558	648	769	470	596	700	726	891	846	760
Estonia	212	161	153	201	198	178	471	410	503	371	266	315	220	327	362	356	267	268	224	306
Latvia	436	412	387	414	365	384	311	343	298	61		3		0	5	0	0	0	2	0
Lithuania	250	300			100	54	64	41		66	48	18	4	19	12	8	0	0	0	0
Poland	362	187	320	228	239	141	131	380	406	561	421	499	318	387	393	259	290	321	254	244
Russia											10									
Sweden	2374	2281	2518	2532	3231	3455	2842	1397	2063	2758	2215	3225	2921	2283	1823	1995	2256	2098	1800	1765
Total	5230	4837	4864	4946	5534	5638	5128	3969	4603	5046	4279	5541	5090	4317	3935	4062	4295	4331	3863	3854

Figure 1 Number of flight hours per HELCOM Contracting Party, 2000-2019. Note that the number of flight hours for Sweden and the total number of flight hours are indicated on the vertical axis on the right, which uses a different scale.

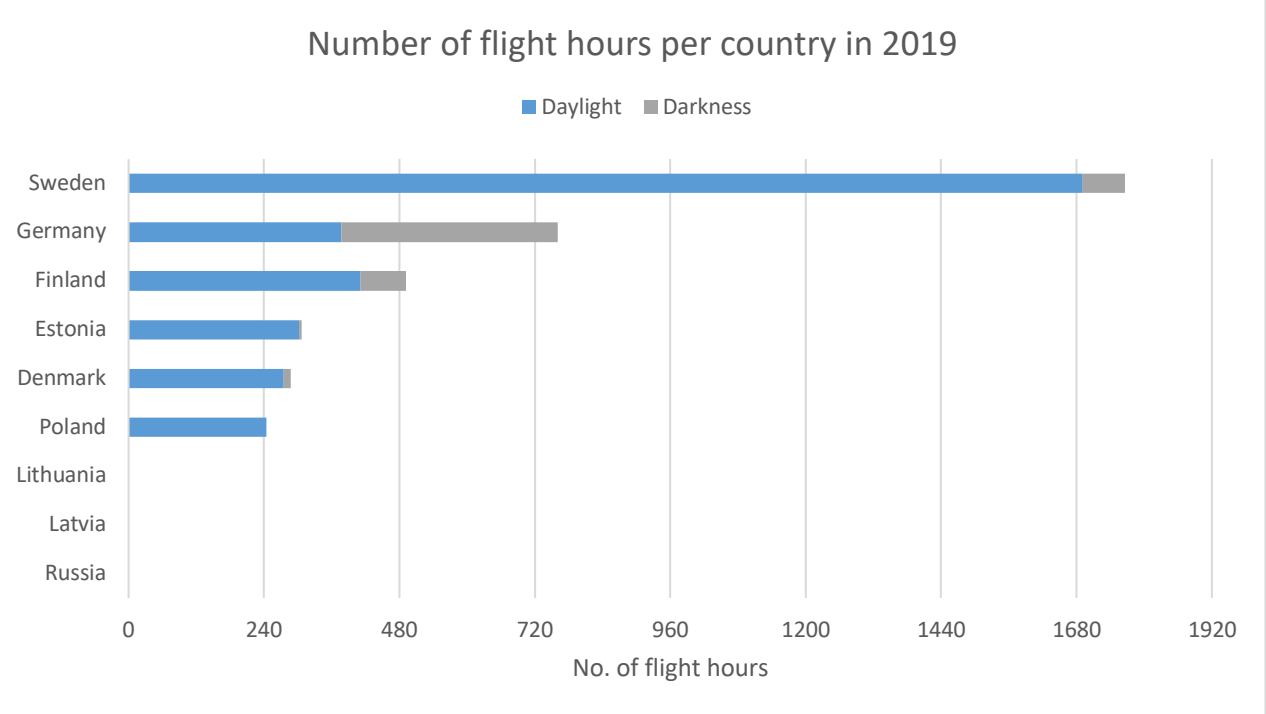


Figure 2 Number of flight hours per country in 2019.

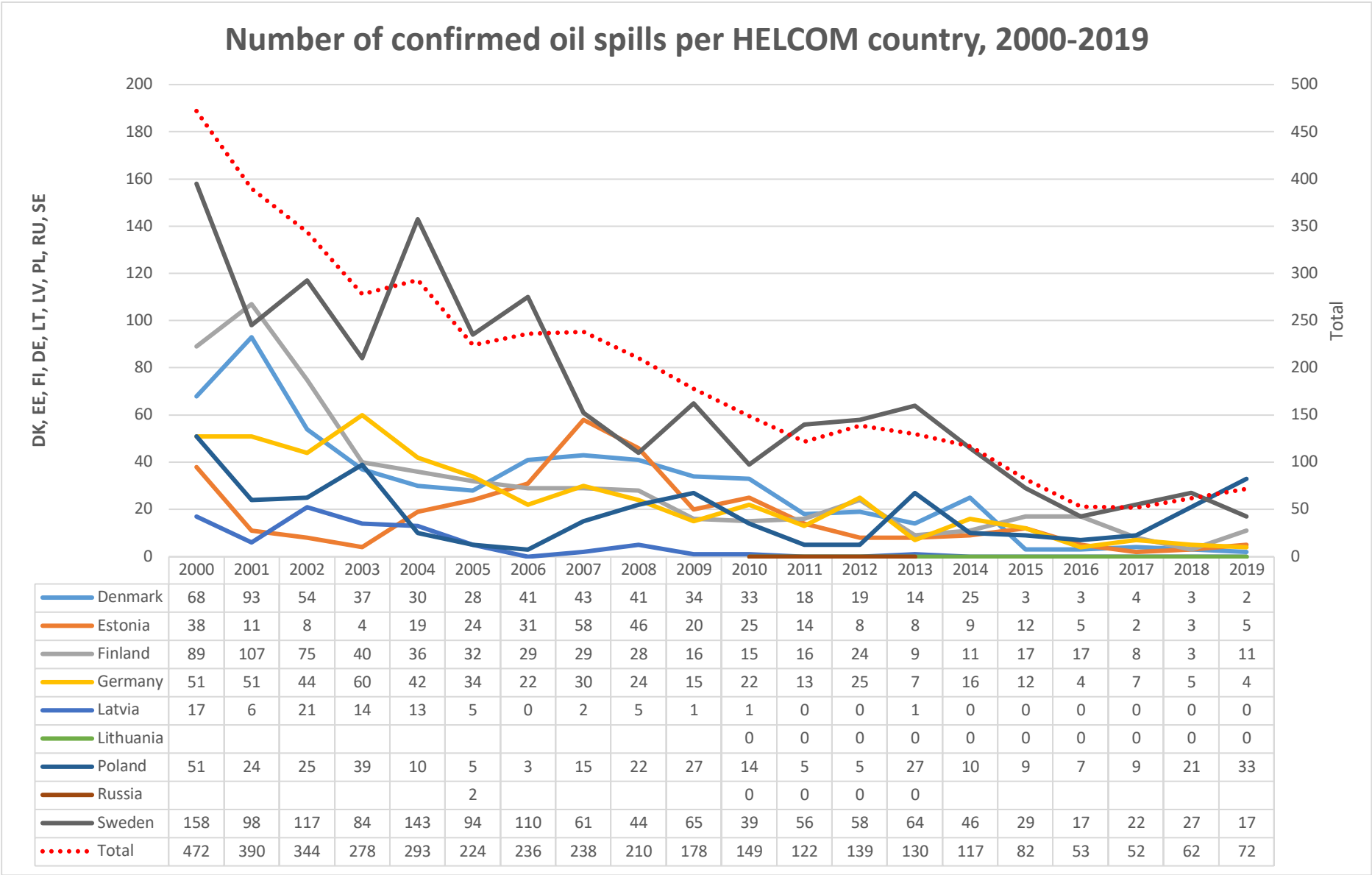
Table 2 Satellite detections of spills in HELCOM countries' waters in 2019 provided by EMSA CleanSeaNet (CSN), including verified detections.

Satellite detections	Verified satellite detections by country					Not checked or no feedback (within 3h)
	Confirmed mineral oil	Confirmed other oil, chemical, sewage or garbage	Confirmed natural phenomena	Unknown substance	Nothing found	
81	2	5	5	2	24	43
21	1	0	2	0	1	17
38	1	10	1	1	7	18
18	1	3	0	0	12	2
16	0	2	0	0	3	11
4	2	0	0	0	2	0
47	1	7	0	2	5	32
33	0	0	0	0	0	33
155	0	16	5	5	21	108
413	**8**	**43**	**13**	**10**	**75**	**264**

Disclaimer:

1) Feedback relates with the location of the spill and not with the country providing feedback (i.e. if Finland provides feedback for a spill in Estonian waters this is reported as verification in Estonian waters).

2) Information provided is based on feedback provided by the coastal states.



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Denmark	68	93	54	37	30	28	41	43	41	34	33	18	19	14	25	3	3	4	3	2
Estonia	38	11	8	4	19	24	31	58	46	20	25	14	8	8	9	12	5	2	3	5
Finland	89	107	75	40	36	32	29	29	28	16	15	16	24	9	11	17	17	8	3	11
Germany	51	51	44	60	42	34	22	30	24	15	22	13	25	7	16	12	4	7	5	4
Latvia	17	6	21	14	13	5	0	2	5	1	1	0	0	1	0	0	0	0	0	0
Lithuania											0	0	0	0	0	0	0	0	0	0
Poland	51	24	25	39	10	5	3	15	22	27	14	5	5	27	10	9	7	9	21	33
Russia						2					0	0	0	0						
Sweden	158	98	117	84	143	94	110	61	44	65	39	56	58	64	46	29	17	22	27	17
Total	472	390	344	278	293	224	236	238	210	178	149	122	139	130	117	82	53	52	62	72

Figure 3 Number of confirmed oil spills per HELCOM country, 2000-2019. Note that the total number of spills is indicated on the vertical axis on the right, which uses a different scale.

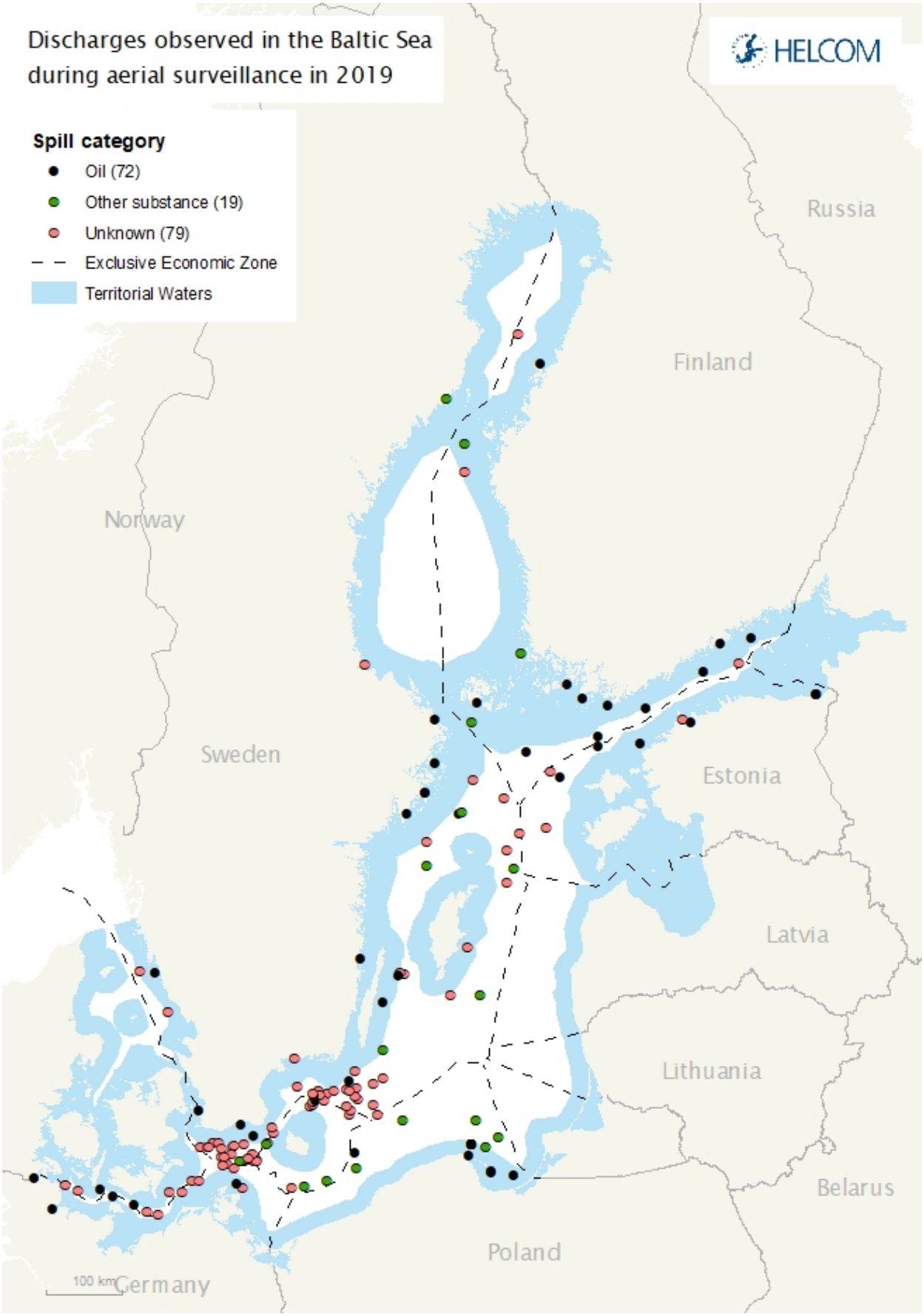


Figure 4 Location of spills observed in the Baltic Sea area in 2019 indicated by type of spill.

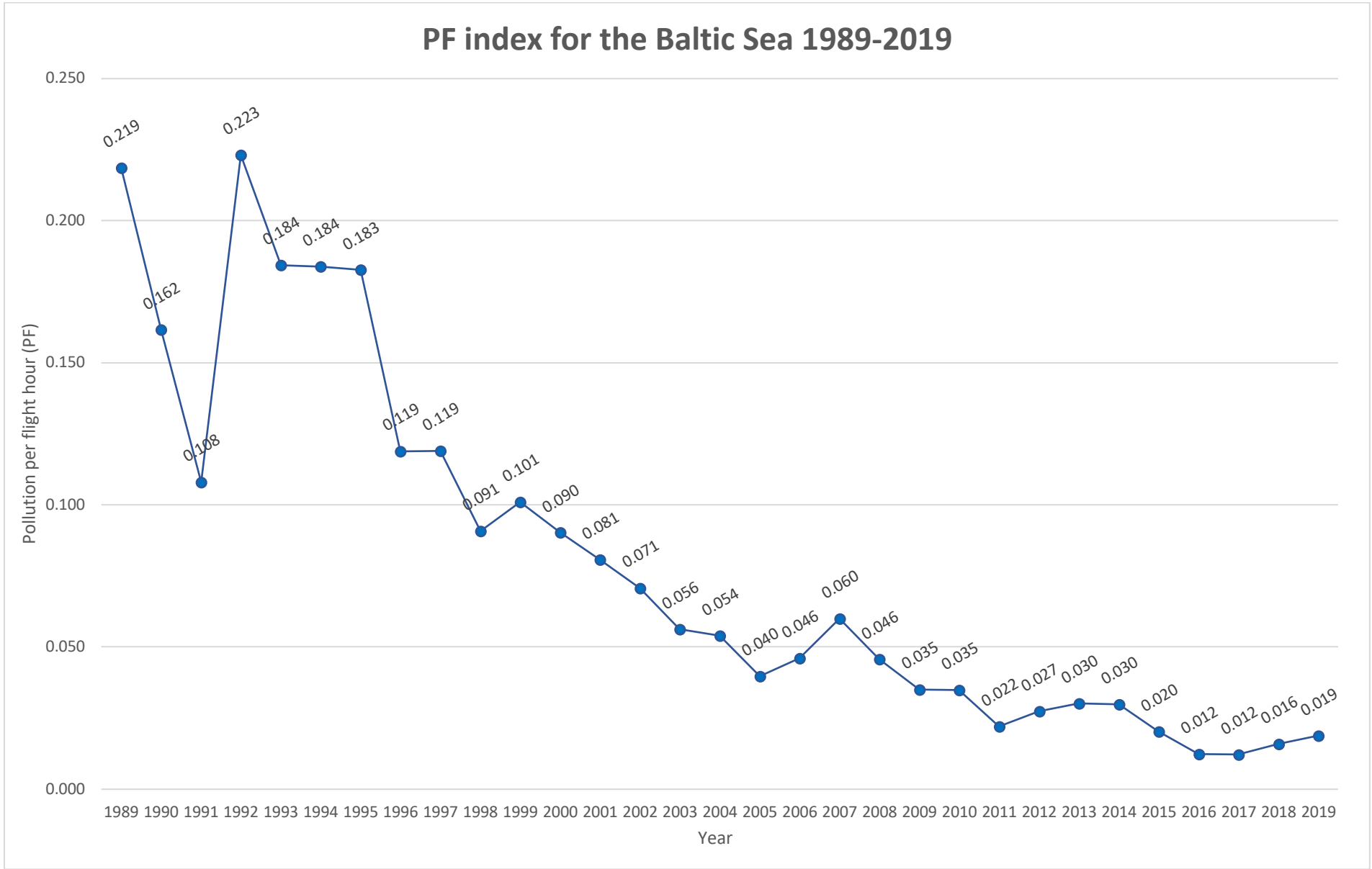


Figure 5 Pollution per flight hour index for the Baltic Sea, 1989-2019.

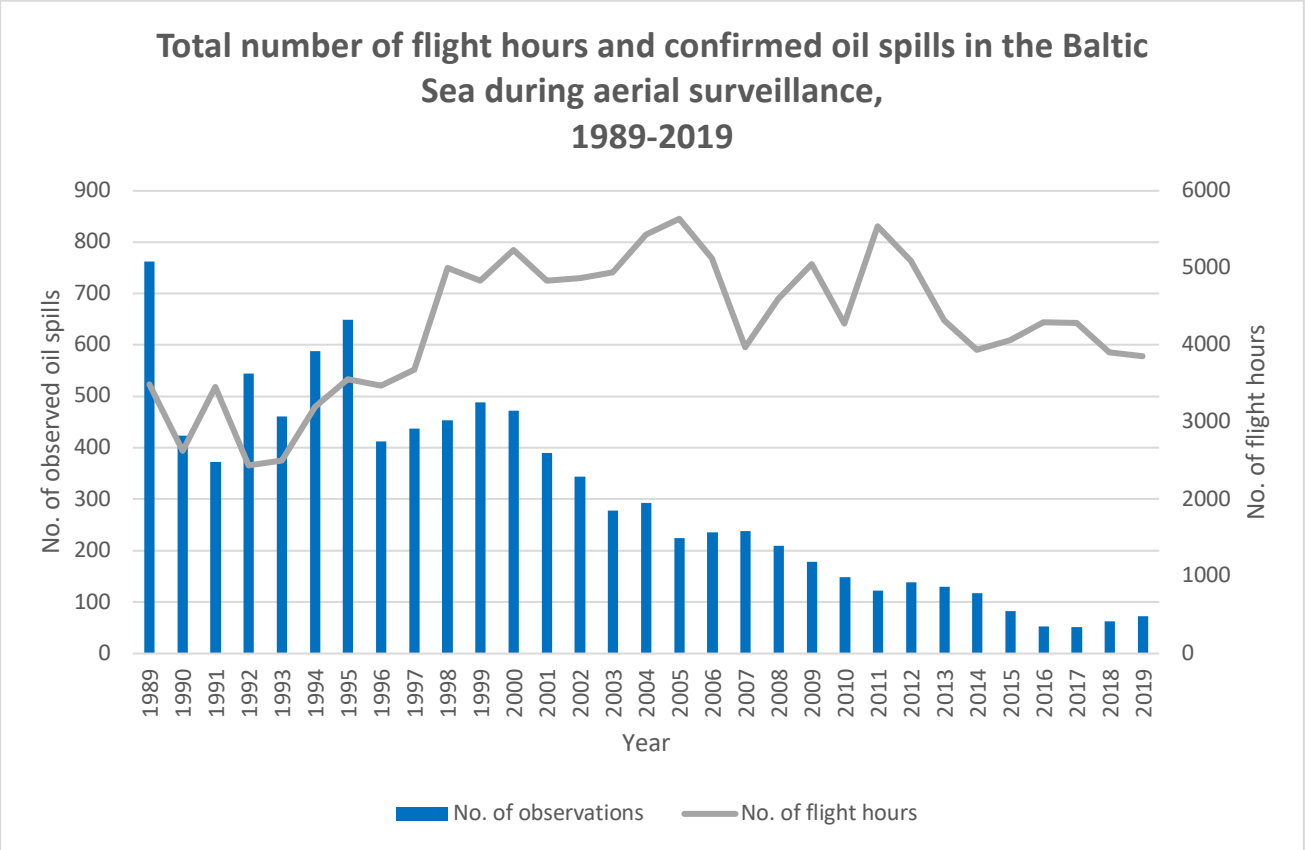


Figure 6 Total number of flight hours and confirmed oil spills in the Baltic Sea during aerial surveillance, 1989-2019.

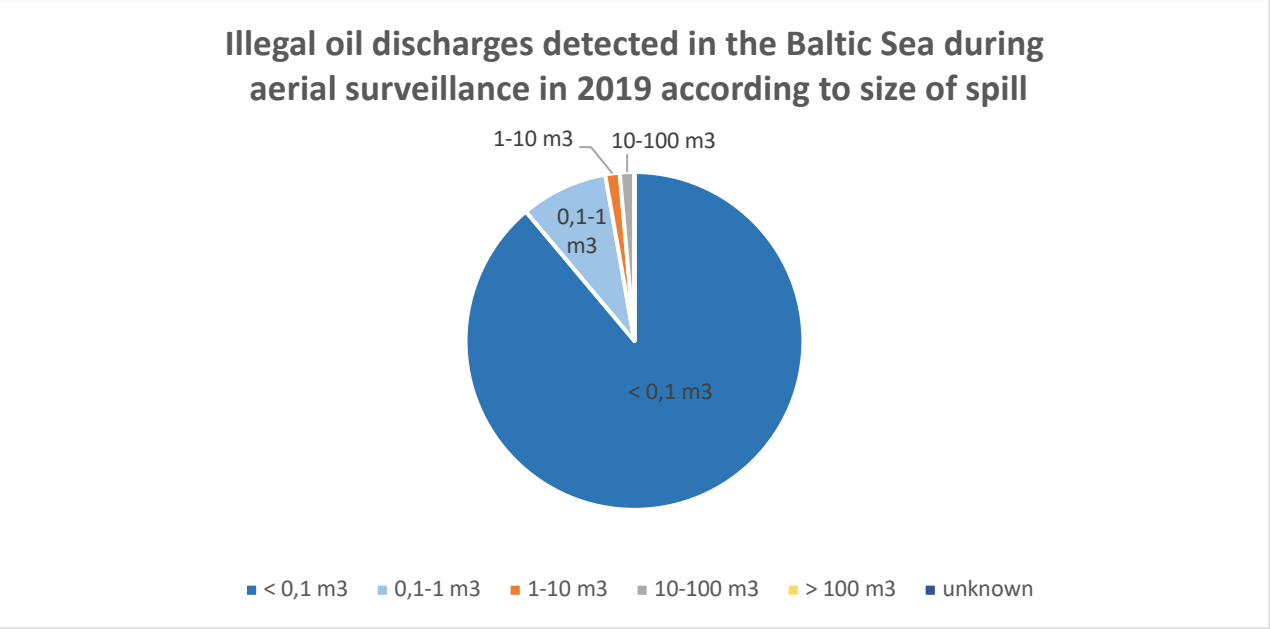
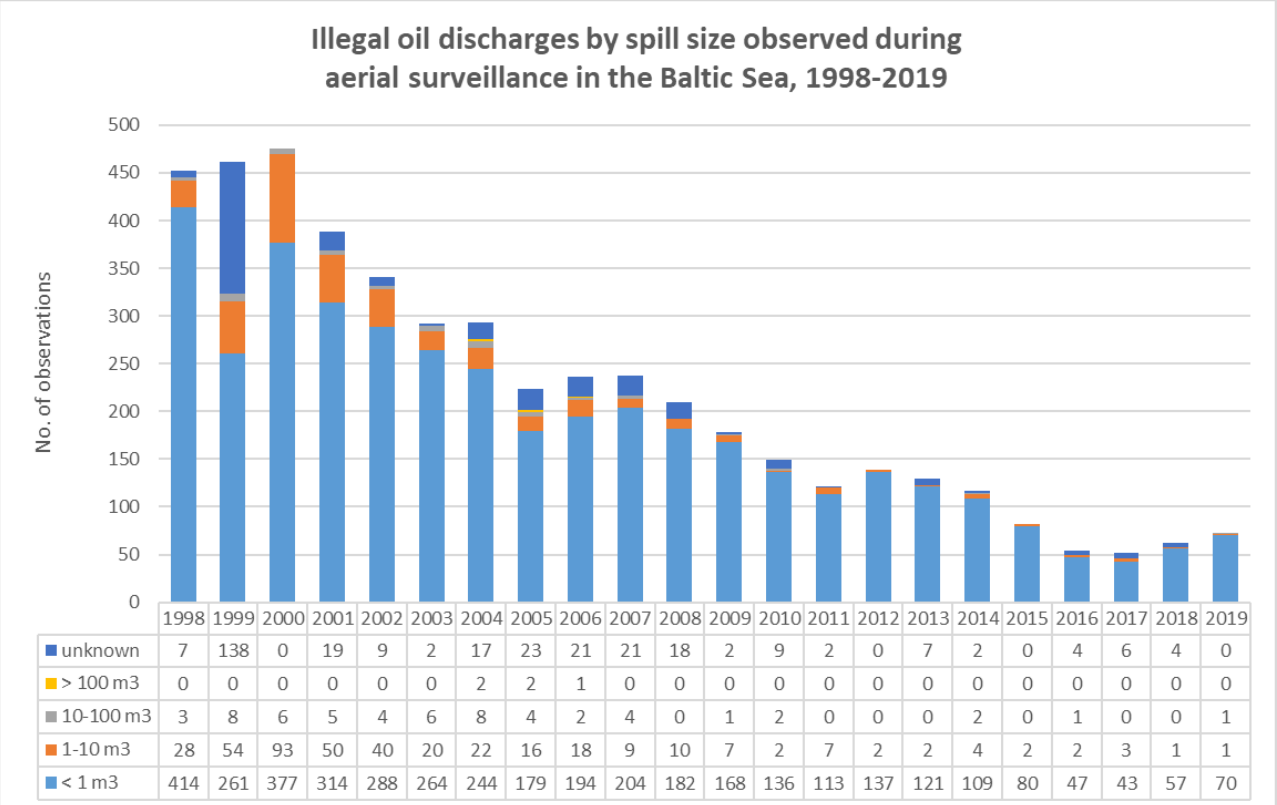


Figure 7 Illegal oil discharges detected in the Baltic Sea during aerial surveillance in 2019 according to estimated volume of the spill.



	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
unknown	7	138	0	19	9	2	17	23	21	21	18	2	9	2	0	7	2	0	4	6	4	0
> 100 m3	0	0	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10-100 m3	3	8	6	5	4	6	8	4	2	4	0	1	2	0	0	0	2	0	1	0	0	1
1-10 m3	28	54	93	50	40	20	22	16	18	9	10	7	2	7	2	2	4	2	2	3	1	1
< 1 m3	414	261	377	314	288	264	244	179	194	204	182	168	136	113	137	121	109	80	47	43	57	70

Figure 8 Illegal oil discharges according to estimated volume of the spill during aerial surveillance in the Baltic Sea, 1998-2019.

Table 3 Confirmed oil spills in HELCOM countries' waters by size in 2019.

Size	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia	Sweden	Total
< 0,1 m3	2	4	9	2	0	0	32		15	64
0,1-1 m3	0	1	0	2	0	0	1		2	6
1-10 m^3	0	0	1	0	0	0	0		0	1
10-100 m^3	0	0	1	0	0	0	0		0	1
> 100 m^3	0	0	0	0	0	0	0		0	0
unknown	0	0	0	0	0	0	0		0	0
Total	**2**	**5**	**11**	**4**	**0**	**0**	**33**		**17**	**72**

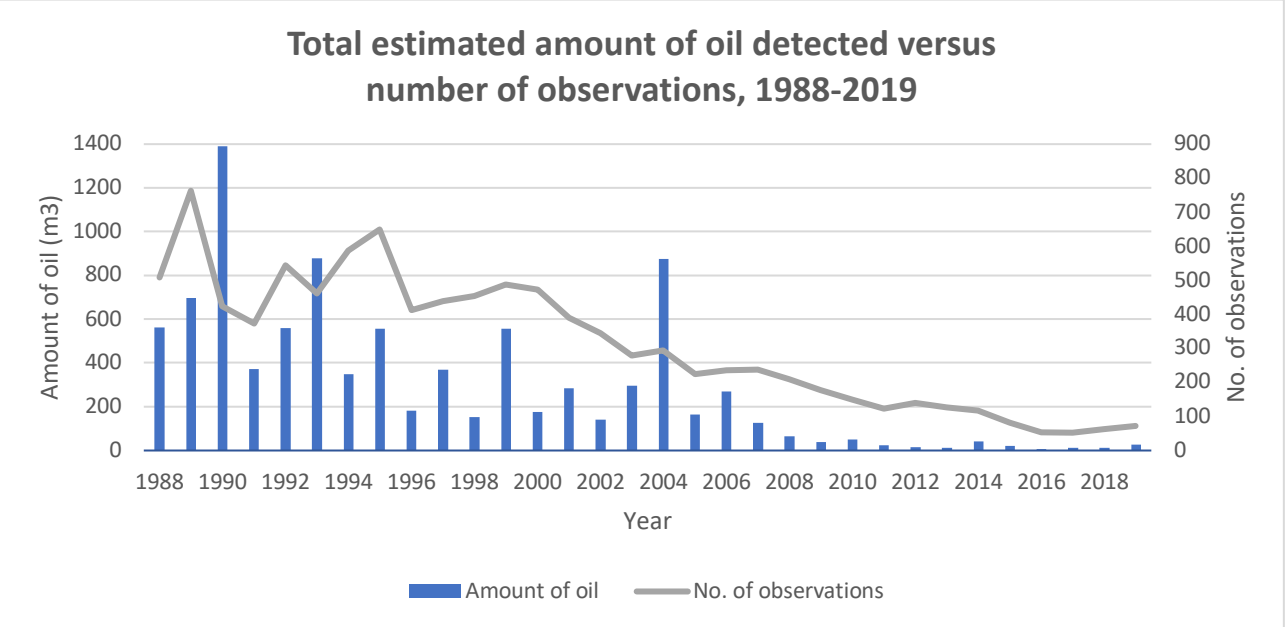


Figure 9 Total estimated amount of oil detected versus number of observations, 1988-2019.

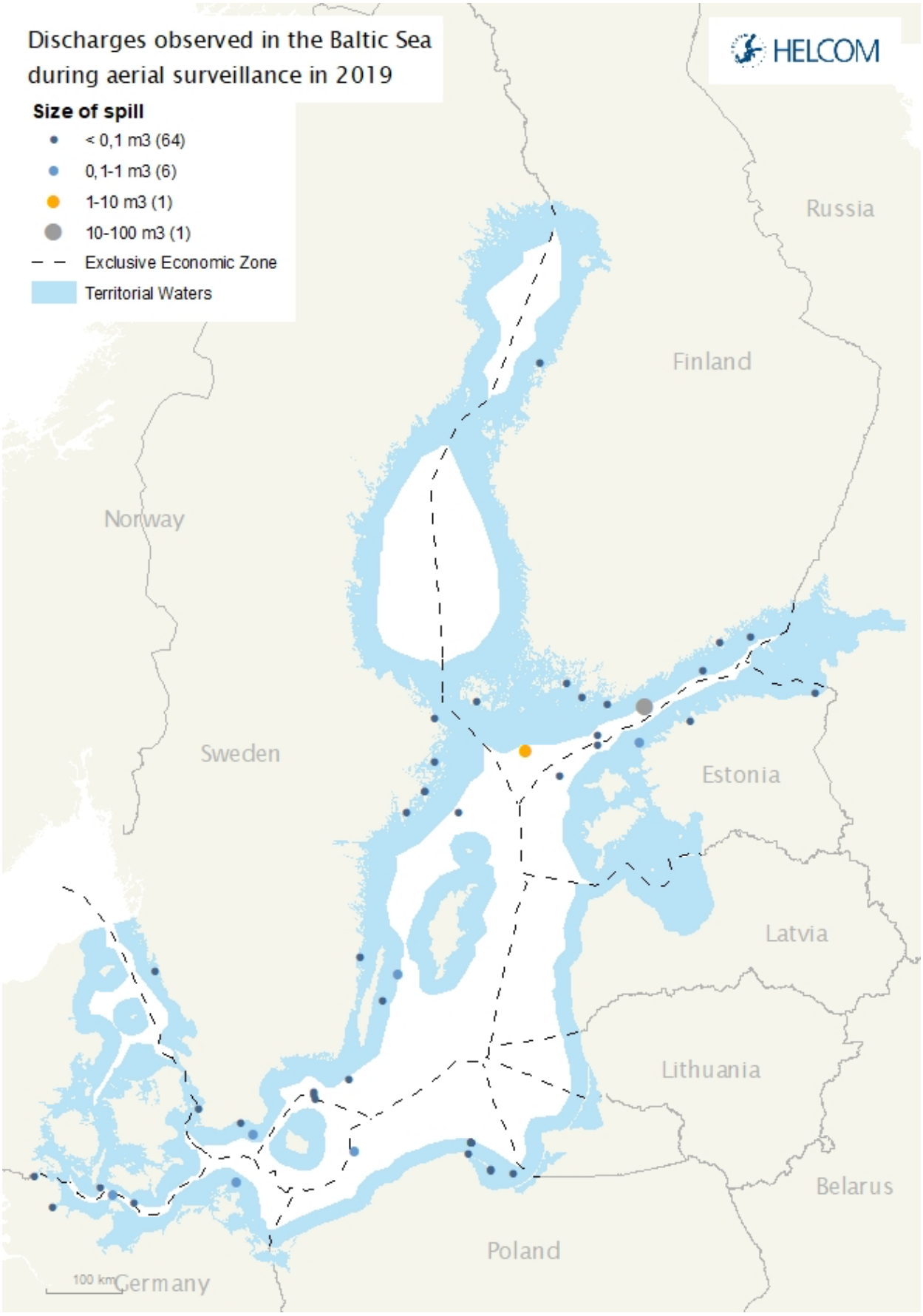


Figure 10 Location of oil spills observed in the Baltic Sea area in 2019 indicated by size.

Table 4 Aerial surveillance data 1988-2019.

Flight hours by country

		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Denmark			292	199	172	153	253	225	275	209	325	416	497	463	412	510	265	251	290	271	246	240	156	188	227	207	239	254	271	324	300	287
Estonia						40	420	420	305	284	236	268	212	161	153	201	198	178	471	410	503	371	266	315	220	327	362	356	267	268	224	306
Finland								355	400	355	649	603	660	567	605	615	644	625	517	529	438	351	605	645	631	625	505	490	484	428	437	491
Germany		142	168	129	267	201	290	291	313	288	206	286	439	466	469	446	491	549	504	598	650	638	558	648	769	470	596	700	726	891	846	760
Latvia			400	408	127	24	18	8	8	64	577	320	436	412	387	414	365	384	311	343	298	61		3		0	5	0	0	0	2	0
Lithuania				348	78	133			65				250	300			100	54	64	41		66	48	18	4	19	12	8	0	0	0	0
Poland		131	164	140	62	49	179	301	345	291	465	375	362	187	320	228	239	141	131	380	406	561	421	499	318	387	393	259	290	321	254	244
Russia		1618		629	32																		10									
Sweden		1600	1600	1600	1700	1900	2038	1953	1763	2189	2544	2565	2374	2281	2518	2532	3231	3455	2842	1397	2063	2758	2215	3225	2921	2283	1823	1995	2256	2098	1800	1765
Total		**3491**	**2624**	**3453**	**2438**	**2500**	**3198**	**3553**	**3474**	**3680**	**5002**	**4833**	**5230**	**4837**	**4864**	**4946**	**5534**	**5638**	**5128**	**3969**	**4603**	**5046**	**4279**	**5541**	**5090**	**4317**	**3935**	**4062**	**4295**	**4331**	**3863**	**3854**

Number of oil observations detected in country waters

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Denmark	129	159	34	46	18	17	30	48	36	38	53	87	68	93	54	37	30	28	41	43	41	34	33	18	19	14	25	3	3	4	3	2
Estonia					18	7	4	3		3	10	33	38	11	8	4	19	24	31	58	46	20	25	14	8	8	9	12	5	2	3	5
Finland								26	42	104	53	63	89	107	75	40	36	32	29	29	28	16	15	16	24	9	11	17	17	8	3	11
Germany	90	139	45	85	76	43	75	55	44	34	23	72	51	51	44	60	42	34	22	30	24	15	22	13	25	7	16	12	4	7	5	4
Latvia			73	20	15	6					33	18	17	6	21	14	13	5	0	2	5	1	1	0	0	1	0	0	0	0	0	0
Lithuania				8	34	28																	0	0	0	0	0	0	0	0	0	0
Poland	40	69	88	14	92	110	104	72	50	25	33	18	51	24	25	39	10	5	3	15	22	27	14	5	5	27	10	9	7	9	21	33
Russia	82	184		3	13													2					0	0	0	0						
Sweden	168	212	184	197	278	250	375	445	241	234	249	197	158	98	117	84	143	94	110	61	44	65	39	56	58	64	46	29	17	22	27	17
Total	**509**	**763**	**424**	**373**	**544**	**461**	**588**	**649**	**413**	**438**	**454**	**488**	**472**	**390**	**344**	**278**	**293**	**224**	**236**	**238**	**210**	**178**	**149**	**122**	**139**	**130**	**117**	**82**	**53**	**52**	**62**	**72**

Year		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Pollutions		763	424	373	544	461	588	649	413	438	454	488	472	390	344	278	293	224	236	238	210	178	149	122	139	130	117	82	53	52	62	72
Flight hours		3491	2624	3453	2438	2500	3198	3553	3474	3680	5002	4833	5230	4837	4864	4946	5434	####	5128	3969	4603	5046	4279	5541	5090	4317	3935	4062	4295	4284	3907	3854
PF index		0.219	0.162	0.108	0.223	0.184	0.184	0.183	0.119	0.119	0.091	0.101	0.090	0.081	0.071	0.056	0.054	0.040	0.046	0.060	0.046	0.035	0.035	0.022	0.027	0.030	0.030	0.020	0.012	0.012	0.016	0.019

Table 5 Spills detected by other types of aerial surveillance in 2019 reported by the Contracting Parties.

Country	Year	Spill ID	Flight Type	Day/Night	Date	Time	Wind speed	Wind direction	Latitude	Longitude	Length	Width	Area	Spill category	Estimated volume	Polluter	Category	Casefile	Remarks
Lithuania	2019	LT-01	N	D	19/08/2019	16:54			55.8356	20.7014	3.334	0.926		UKN		UNK	UNK		