



Baltic Marine Environment Protection Commission

Annual report on

Discharges observed during aerial surveillance in the Baltic Sea 2016



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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.

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 2016. Data has been reported by the HELCOM Contracting Parties and quality assured by the HELCOM Secretariat. Please note that the report only covers aerial surveillance conducted with fixed-wing aircraft and thus does not comprise flight hours or detections made from i.e. helicopters or ships. This might cause a difference to reports based on such information. The focus of the report is on detected spills of mineral oil. However, since 2014, the Contracting Parties have also reported detections of other substances and unknown observations as included in the report.

Aerial surveillance activity

In total, 4295 flight hours with fixed-wing aircraft were carried out in 2016 within aerial surveillance activities of the Baltic Sea countries (**Table 1**). This is an increase of 5.7 % compared to the previous year (4062 in 2015).

All Baltic Sea countries reported aerial surveillance related data except for Russia. No aerial surveillance was conducted by Latvia in 2016. Lithuania conducted aerial surveillance only with helicopter and not with fixed-wing aircraft.

The number of flight hours vary somewhat between the years owing to for example overhaul of aircraft, missions abroad etc. In 2016, Denmark, Germany, Poland and Sweden increased their flight hours while there was a decrease in flight hours in Estonia, Finland and Lithuania. 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 six years.

The number of flight hours by individual HELCOM countries, in 2000-2016, is shown in **Figure 1**. Please note that the number of flight hours for Sweden and the total number of flight hours, are indicated on the secondary vertical axis 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 2016, five countries carried out flights at night (**Figure 2**), which constituted 10 % of all flight hours (18 % in 2015). Most of these countries only conducted a minor share of their aerial surveillance in night time Germany having the largest share with 30% of night time flights in 2016.

In addition to aerial surveillance, the Contracting Parties utilize satellite images to detect illegal discharges of oil. Satellite surveillance in the Baltic Sea area has been intensified since 2007 thanks 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, EMSA provided 673 satellite scenes for the users of CleanSeaNet in the Baltic Sea in 2016 (480 in 2015), indicating 270 possible detections (169 in 2015). In the HELCOM area, 31 % of the spill indications were checked within three hours of the alert. Out of these 8% were confirmed to be mineral oil (10 % in 2015). Satellite surveillance detections provided by EMSA in 2016, 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 160 spill observations in 2016 as presented in **Figure 4** and Table 1. Of the detected spills 33% were confirmed as discharges of mineral oil, in total 53 spills. The remaining 67% of the detections were identified as other substances 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 in 2016 (53) was the lowest ever recorded in the Baltic Sea pointing towards a continuous decreasing trend in oil spills. Compared to year 2015 the decrease was as much as 35%. The number of oil spills observed during aerial surveillance activity in individual countries in 2000-2016 is presented in **Figure 3**. Please note that the total number of oil spills is indicated on the secondary vertical axis 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. Decreasing PF Index over the years indicates less oil spills or/and increased surveillance activity. In 2016, the PF index was the lowest ever recorded at 0.012 due to both the increase in flight hours and the low number of detected oil spills (**Figure 5**). **Figure 6** shows the total number of flight hours and observed oil spills during aerial surveillance in 1988-2016.

Of the total 53 mineral oil discharges detected in 2016, 47 (89%) were smaller than 1 m³, and of these oil spills as many as 41 were even smaller than 0.1 m³ (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 largest oil spill in 2016 was estimated to be 1.6 m³. The total estimated minimum volume of oil spills observed in 2016 amounted to 5.73 m³ which is the lowest recorded. The estimated volume of the oil spills has steadily been decreasing and during the last years a significant decrease has been recorded. The trend of the spill sizes for the years 1998-2016 is presented in **Figure 8**. **Figure 9** further illustrates the trend in total amount of oil detected and the number of spills observed in 1988-2016. A map illustrating the location of the detected oil spills in 2016 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 2016 (Table 1). 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 1988-2016, 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/index.html>).

Table 1. Annual aerial surveillance data for the Baltic Sea in 2016. 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	264:35:00	6:25:00	271:00:00	20	1	21	3	0	3	0	0	0	3	1,43
Estonia	249:00:00	18:05:00	267:05:00	8	4	12	5	0	5	0	0	0	5	0,23
Finland	454:00:00	30:00:00	484:00:00	23	4	27	16	1	17	0	4	0	13	0,44
Germany	484:12:00	242:00:00	726:12:00	11	0	11	4	0	4	0	1	0	3	0,43
Latvia	0:00:00	0:00:00	0:00:00	2	0	2	0	0	0	0	0	0	0	0,00
Lithuania	00:00	0:00:00	00:00	0	0	0	0	0	0	0	0	0	0	0,00
Poland	290:20:00	00:00	290:20:00	9	0	9	7	0	7	0	1	0	6	1,47
Russia														
Sweden	2104:00:00	152:00:00	2256:00:00	64	14	78	17	0	17	0	3	0	14	1,73
Total	3846:07:00	448:30:00	4294:37:00			160			53					5,73

Table 1 continue

Country	Detections confirmed/observed as other substances	No. of polluters (other substances)				Unknown detections	No. of polluters (unknown detections)				Remarks
Denmark	3	0	0	0	3	15	0	0	0	15	As per May 1st 2016, Sundt Air is flying pollution patrol. The speed of their aircraft is slower than the Challenger, which leads to a higher number of flight hours than usual.
Estonia	2	0	2	0	0	5	0	0	0	5	
Finland	4	0	0	0	4	6	0	0	0	6	
Germany	3	0	1	0	2	4	0	0	0	4	
Latvia	0	0	0	0	0	2	0	0	0	2	Spills detected by Estonia and Sweden
Lithuania	0	0	0	0	0	0	0	0	0	0	48 hour by helicopter
Poland	1	0	1	0	0	1	0	0	0	1	
Russia											
Sweden	2	0	2	0	0	60	0	1	0	59	
Total	15					93					

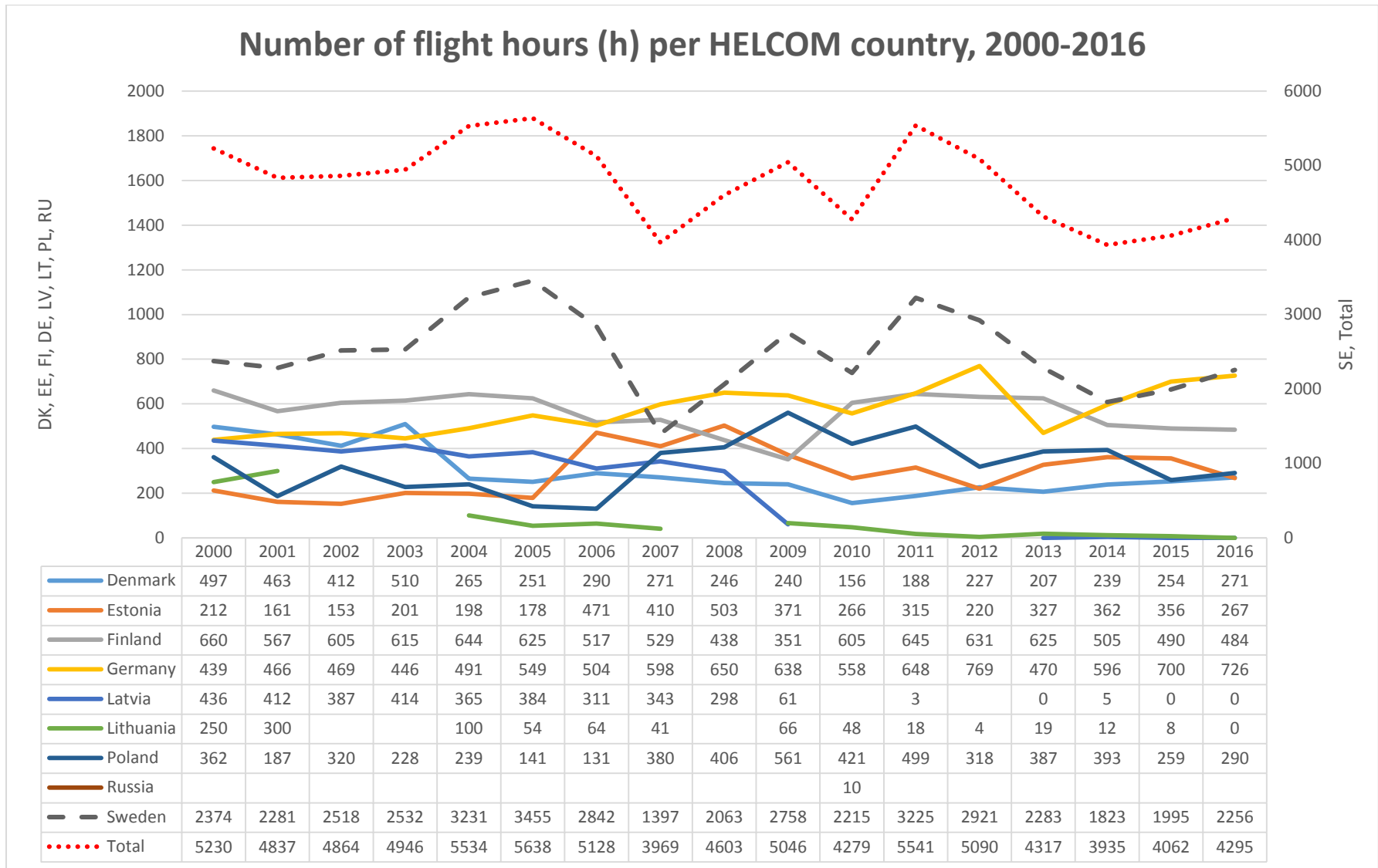


Figure 1. Number of flight hours per HELCOM Contracting Party, 2000-2016. Note that the number of flight hours for Sweden and the total number of flight hours are indicated on the secondary vertical axis.

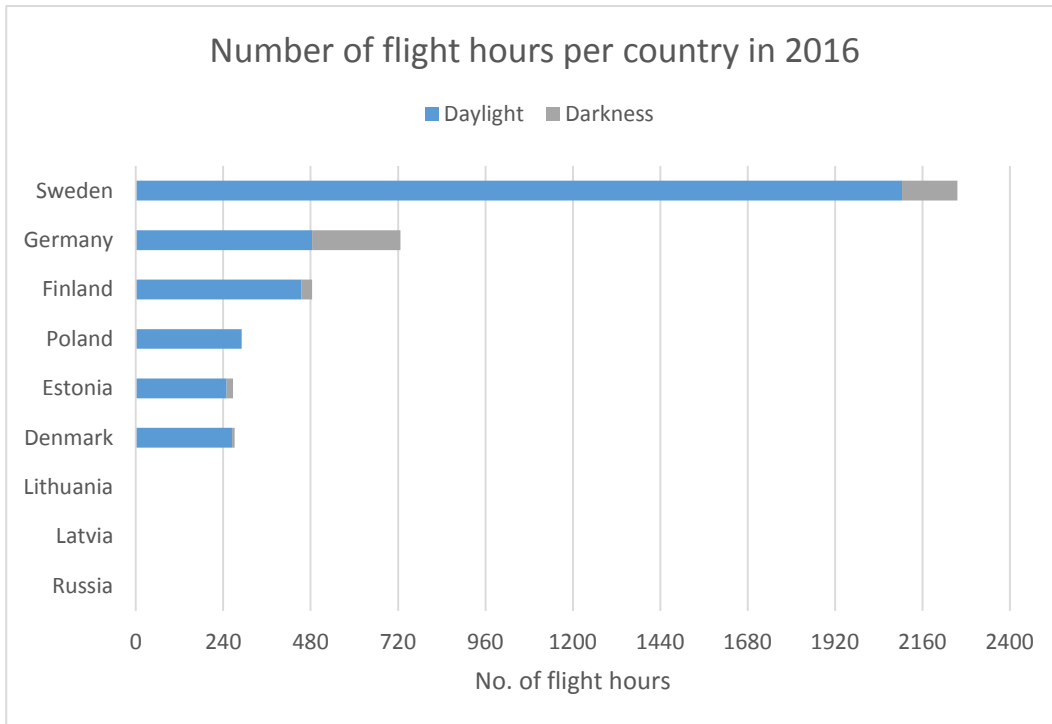


Figure 2. Number of flight hours per country in 2016.

Table 2. Satellite detections of spills in HELCOM countries' waters provided by EMSA CleanSeaNet (CSN) in 2016, including verified detections.

Country Waters	CSN Detections	Verified Satellite Detections					Not Checked or no Feedback
		Mineral oil confirmed	Natural phenomena observed	Nothing observed	Other substance confirmed	Unknown feature observed	
Denmark	40		3	10	3	1	23
Estonia	19			2	1		16
Finland	17	3	1	4	1	1	7
Germany	13	3	4	2	4		
Latvia	15		1	2	2		10
Lithuania	4						4
Poland	31		2	10	2		17
Russia	25						25
Sweden	106	1		11	10		84
TOTAL	270	7	11	41	23	2	186

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.

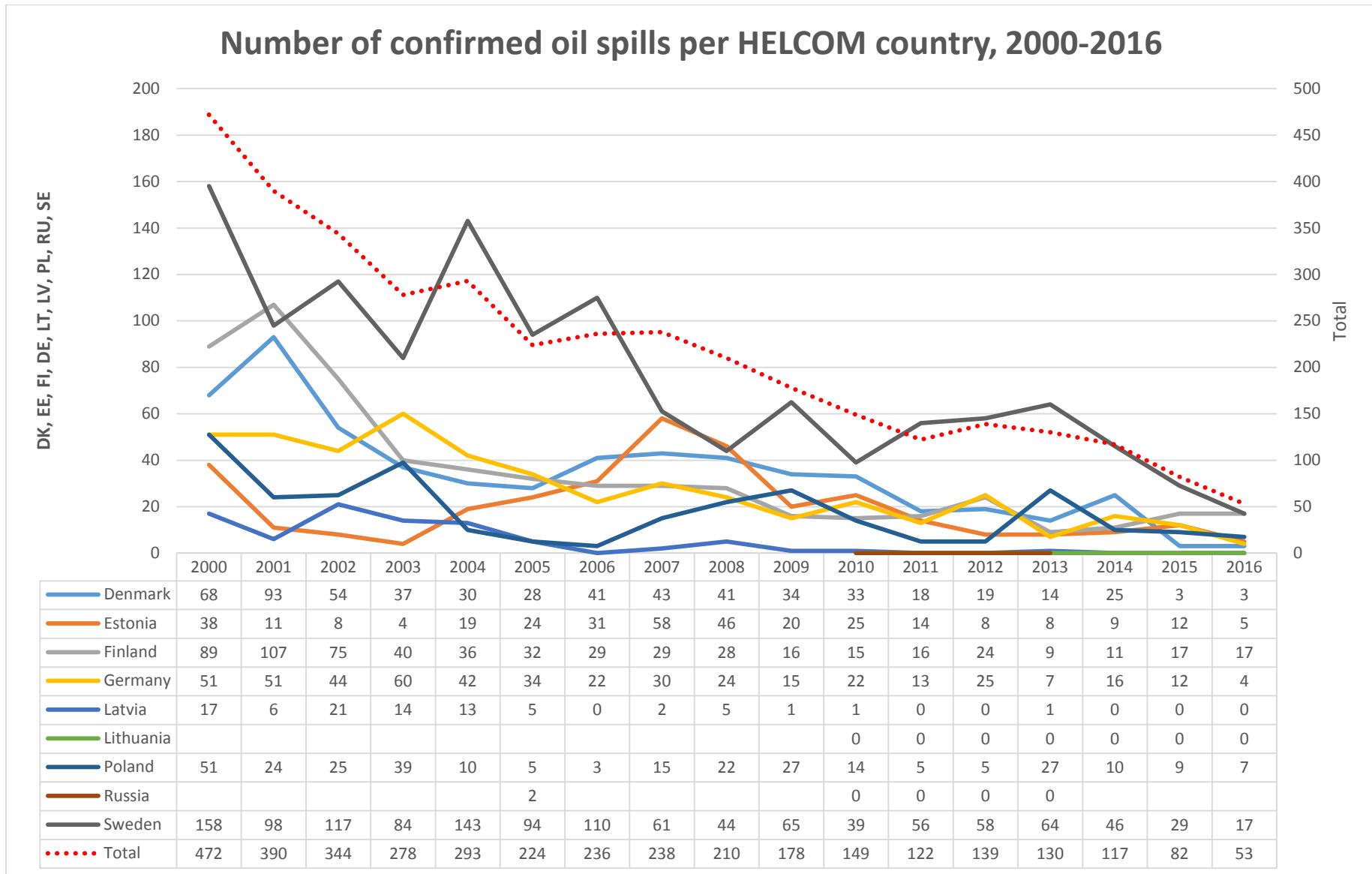


Figure 2 Number of confirmed oil spills per HELCOM country, 2000-2016. Note that the total number of spills is indicated on the secondary vertical axis

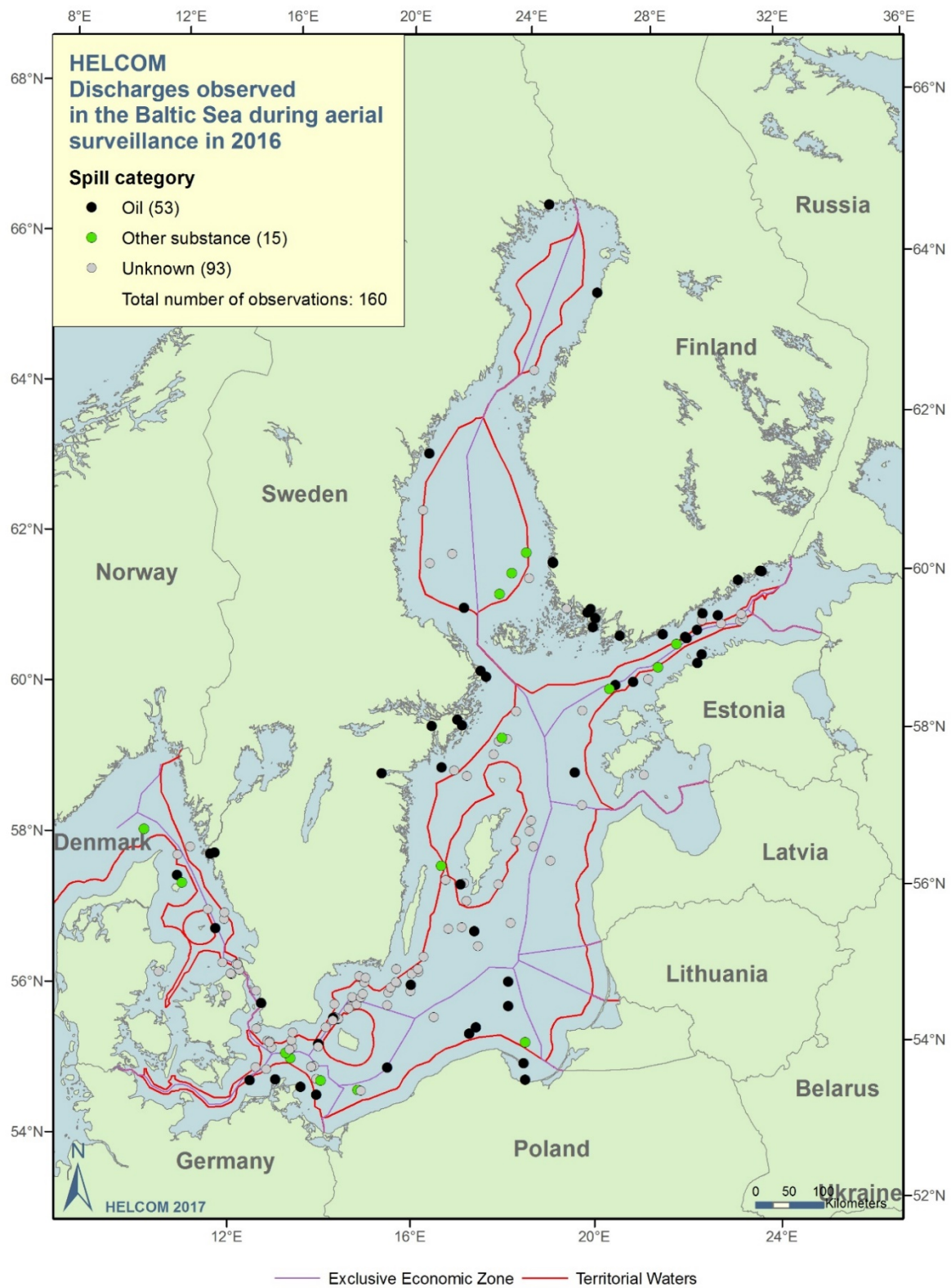


Figure 3 Location of spills observed in the Baltic Sea area in 2016 indicated by type of spill.

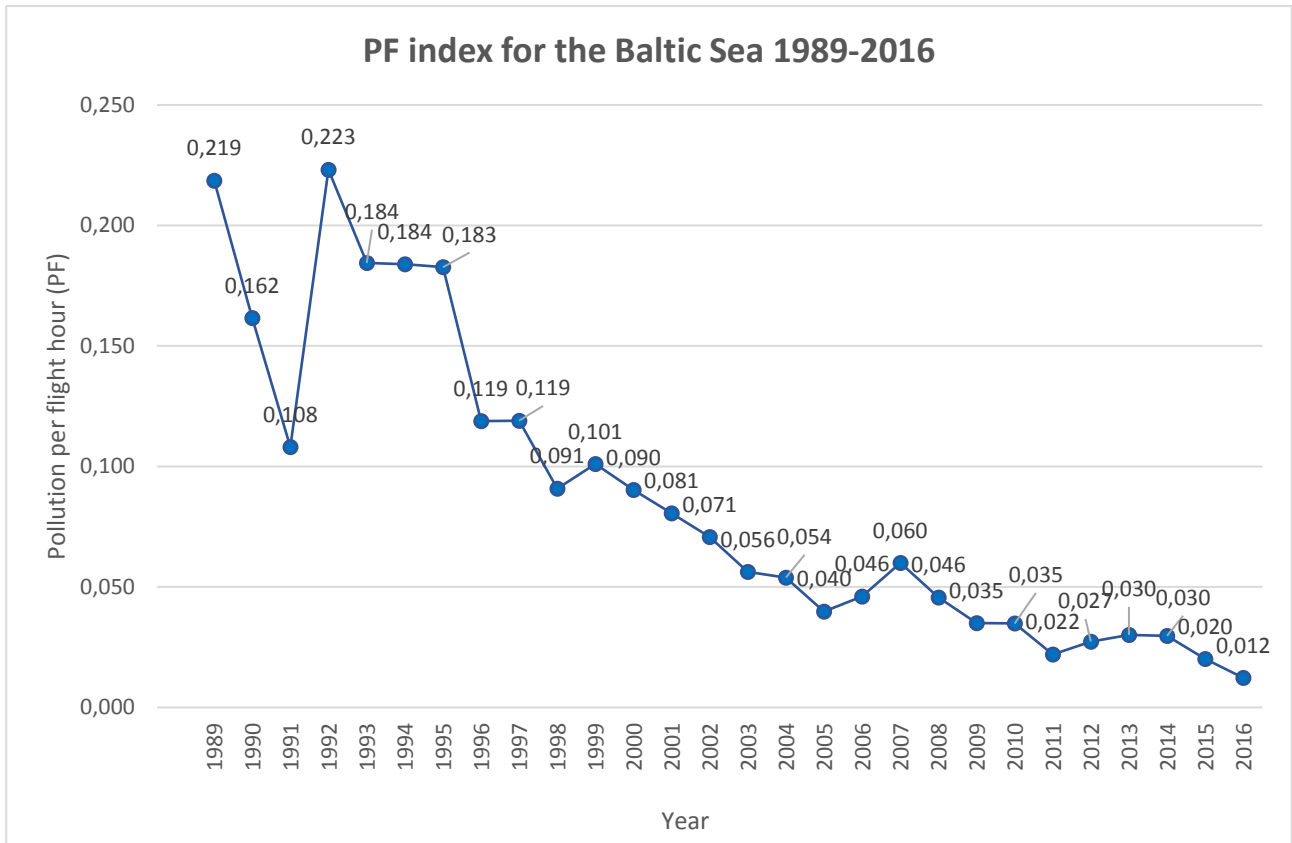


Figure 4 Pollution per flight hour index for the Baltic Sea, 1989-2016.

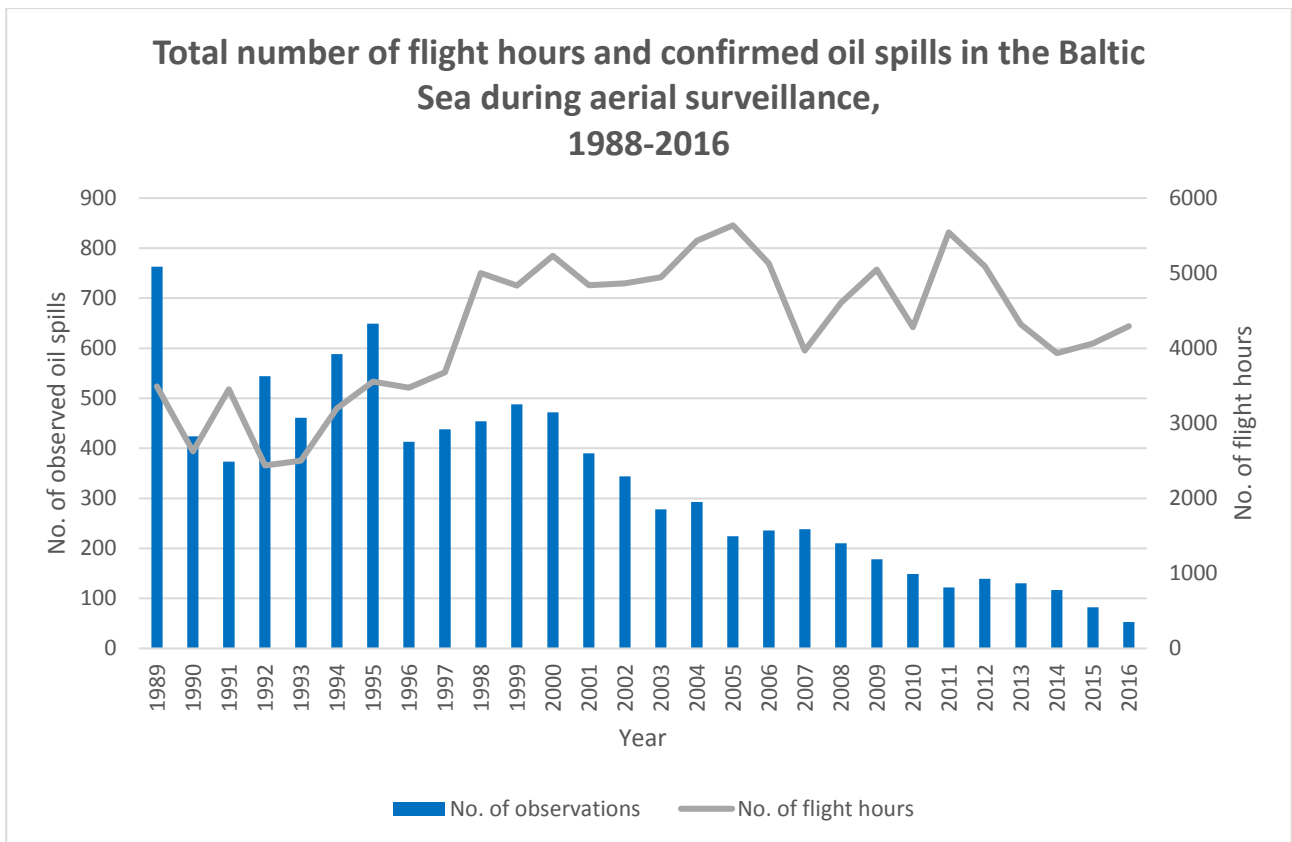


Figure 5 Total number of flight hours and confirmed oil spills in the Baltic Sea during aerial surveillance, 1988-2016.

Illegal oil discharges detected in the Baltic Sea during aerial surveillance in 2016 according to size of spill

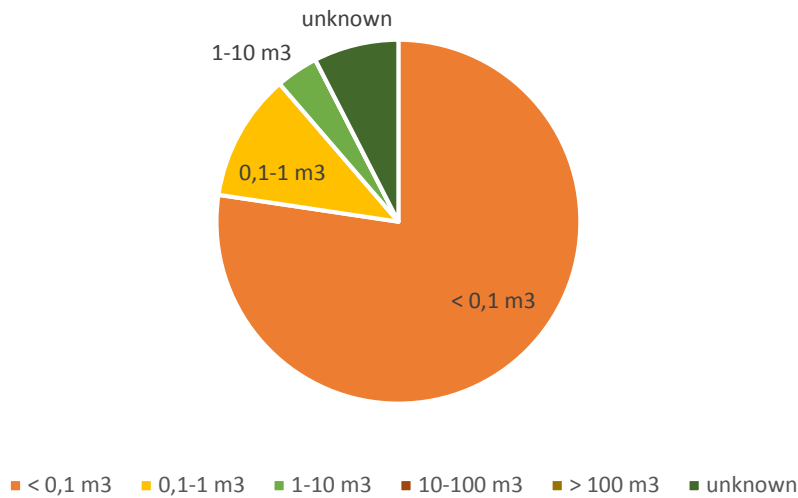


Figure 6 Illegal oil discharges detected in the Baltic Sea during aerial surveillance in 2016 according to estimated volume of the spill.

Illegal oil discharges by spill size observed during aerial surveillance in the Baltic Sea, 1998-2016

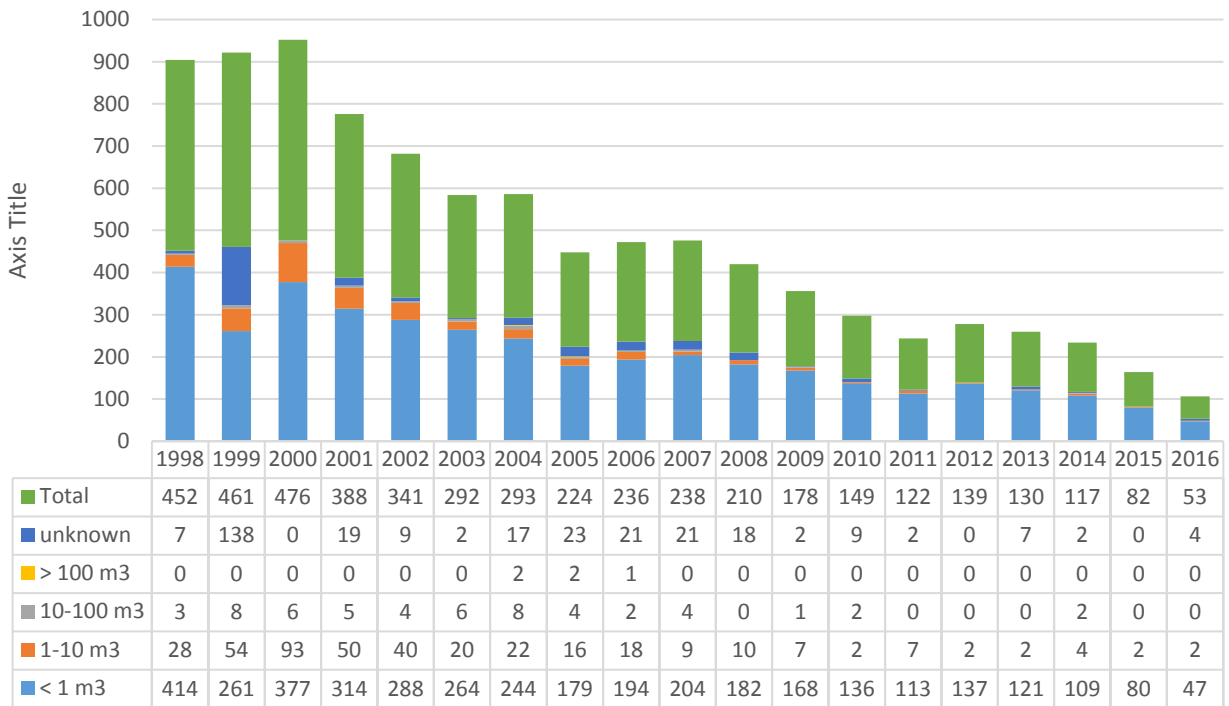


Figure 7 Illegal oil discharges according to estimated volume of the spill during aerial surveillance in the Baltic Sea, 1998-2016.

Table 3 Confirmed oil spills in HELCOM countries' waters by size in 2016.

Size	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia	Sweden	Total
< 0,1 m ³	0	4	16	3	0	0	6		12	41
0,1-1 m ³	3	1	1	1	0	0	0		0	6
1-10 m ³	0	0	0	0	0	0	1		1	2
10-100 m ³	0	0	0	0	0	0	0		0	0
> 100 m ³	0	0	0	0	0	0	0		0	0
unknown	0	0	0	0	0	0	0		4	4
Total	3	5	17	4	0	0	7		17	53

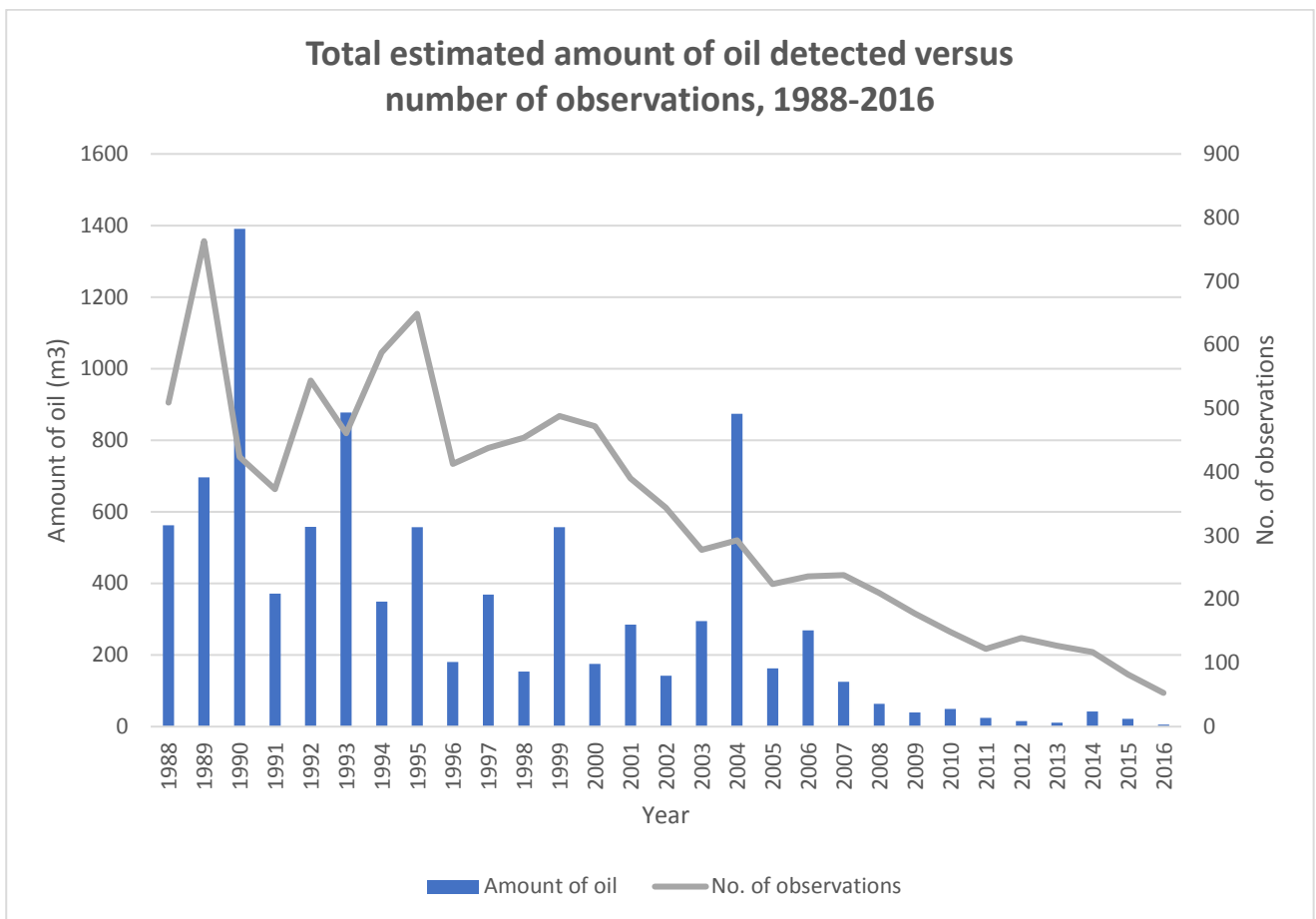


Figure 8 Total estimated amount of oil detected versus number of observations, 1988-2016.

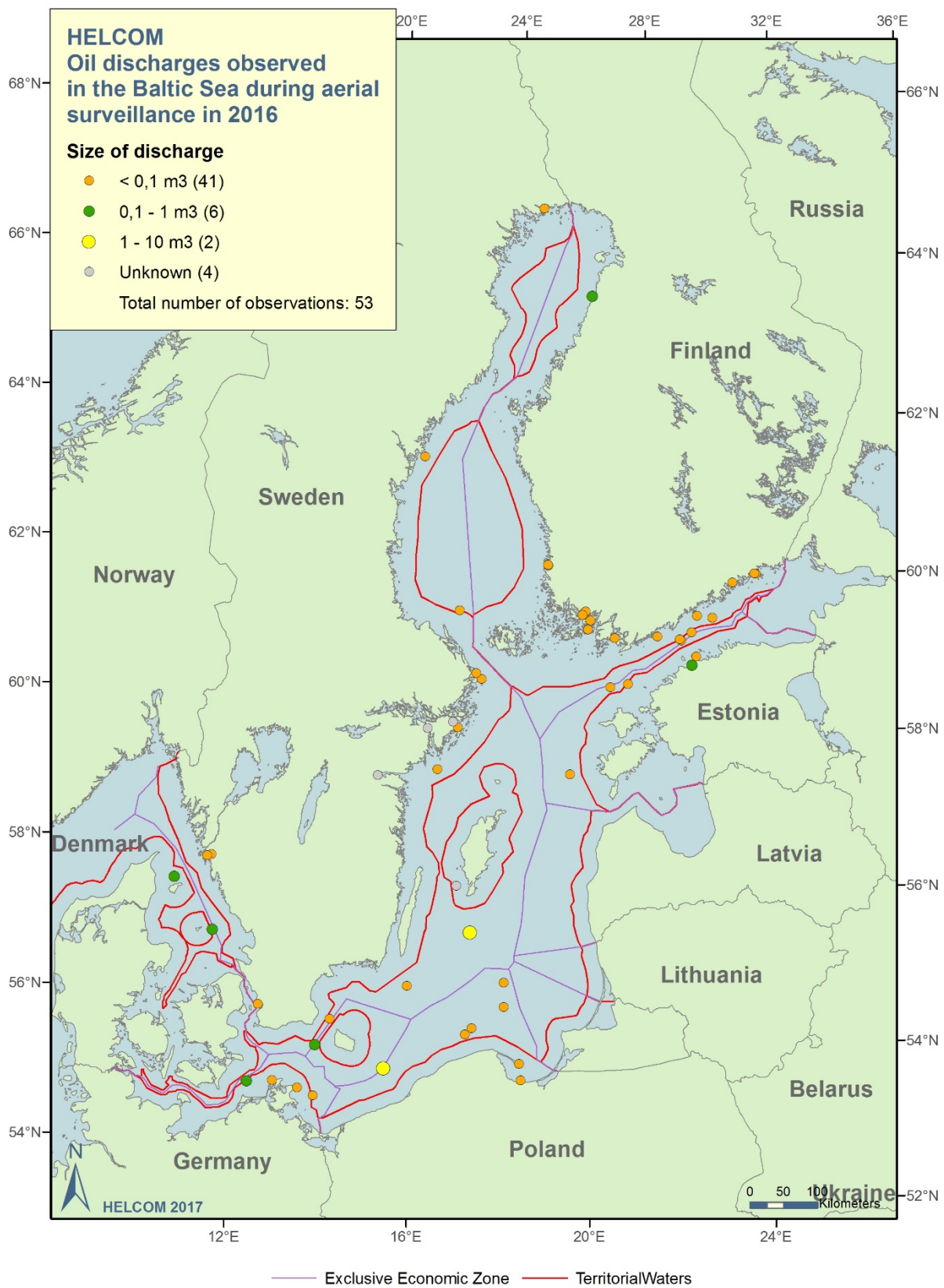


Figure 9 Location of oil spills observed in the Baltic Sea area in 2016 indicated by size.

Table 4 Aerial surveillance data 1988-2016.

Flight hours by country

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
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
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
Finland							355	400	355	649	603	660	567	605	615	644	625	517	529	438	351	605	645	631	625	505	490	484
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
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
Lithuania			348	78	133			65			250	300			100	54	64	41		66	48	18	4	19	12	8	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
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
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

Number of oil observations detected in country waters

Year	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
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
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
Finland								26	42	104	53	63	89	107	75	40	36	32	29	29	28	16	15	16	24	9	11	17	17
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
Latvia			73	20	15	6					33	18	17	6	21	14	13	5	0	2	5	1	1	0	0	1	0	0	0
Lithuania				8	34	28																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
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
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

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
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
Flight hours	3491	2624	3453	2438	2500	3198	3553	3474	3680	5002	4833	5230	4837	4864	4946	5434	5638	5128	3969	4603	5046	4279	5541	5090	4317	3935	4062	4295
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



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