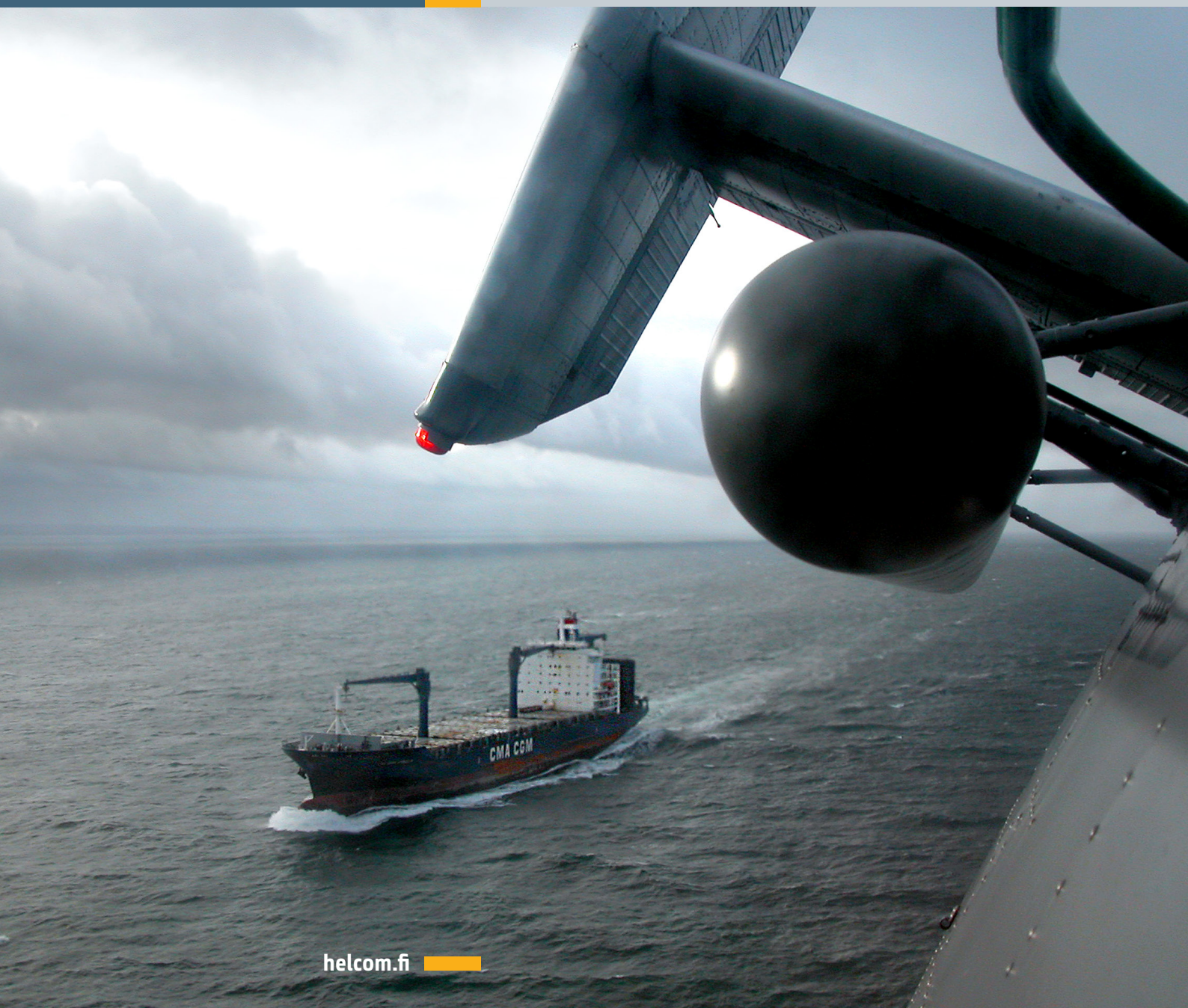
Annual report on discharges observed during aerial surveillance in the Baltic Sea 2017

Baltic Marine Environment Protection Commission

Response to spills

2018



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Published by:
HELCOM – Baltic Marine Environment Protection Commission
Katajanokanlaituri 6 B
FI-00160 Helsinki
Finland
www.helcom.fi

For bibliographic purposes this document should be cited as:
HELCOM (2018), HELCOM Annual report on discharges observed during aerial surveillance in the Baltic Sea, 2017

Editor: Laura Meski, HELCOM Secretariat

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 2017. 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, 4332 flight hours with fixed-wing aircraft were carried out in 2017 within aerial surveillance activities of the Baltic Sea countries (**Table 1**). This is a slight increase of 0,9 % compared to the previous year (4295 in 2016). One Coordinated Extended Pollution Control Operation Flight (CEPCO), a Mini-CEPCO of continuous surveillance for nearly 15h with involvement of Finnish and Swedish aircraft, took place in the Northern Baltic Sea area on 17 October 2017.

All Baltic Sea countries reported aerial surveillance related data except for Russia. No aerial surveillance was conducted by Latvia in 2017. Lithuanian Navy conducted 24 flights (in total 48 hours) with Lithuanian Air Force helicopter (none with fixed-wing aircraft). Estonia reported that due to technical reasons only 9,7 % of the flight hours were performed by fully equipped surveillance aircraft over the high intensity shipping area. Remaining flight hours were conducted near the national coastline and visual surveillance

The number of flight hours vary somewhat between the years owing to for example overhaul of aircraft, missions abroad etc. In 2017, Germany and Poland increased their number of flight hours while there was a decrease in flight hours in Finland and Sweden. The number of flight hours stayed approximately the same for Denmark and Estonia. 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 eight years.

The number of flight hours by individual HELCOM countries, in 2000-2017, 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 2017, four countries carried out flights at night (**Figure 2**), which constituted 6 % of all flight hours (10 % in 2016). Most of these countries only conducted a minor share of their aerial surveillance in night time while the Germany share was 34% of the total German flight hours in 2017 and 65% of all aerial surveillance conducted in darkness.

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 705 satellite scenes for the users of CleanSeaNet in the Baltic Sea in 2016 (673 in 2016), indicating 360 possible detections (270 in 2016). In the HELCOM area, 37 % of the spill indications were checked within three hours of the alert. Out of these 4% were confirmed to be mineral oil (8 % in 2016). Satellite surveillance detections provided by EMSA in 2017, 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 154 spill observations in 2017 as presented in **Figure 4** and Table 1. Of the detected spills 34% were confirmed as discharges of mineral oil, in total 52 spills. The remaining 66% 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 in 2017 (52) was the lowest ever recorded in the Baltic Sea pointing towards a continuous decreasing trend in oil spills. Ten years ago the number of detected mineral oil spills were still over 200 and five years ago over 100. Compared to year 2015 the decrease was as much as 37%. The number of oil spills observed during aerial surveillance activity in individual countries in 2000-2017 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 2017, the PF index was the lowest ever recorded at 0.012 (same as in 2016) 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 1988-2017.

Of the total 52 mineral oil discharges detected in 2017, 43 (83%) were smaller than 1 m^3, and of these oil spills as many as 35 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 largest oil spills in 2017 were

estimated to be 6 m^3, 1.8 m^3 and 1.4 m^3.The total estimated minimum volume of oil spills observed in 2017 amounted to 12 m^3. 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 1998-2017 is presented in **Figure 8**. **Figure 9** further illustrates the trend in total amount of oil detected and the number of spills observed in 1988-2017. 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 2017 (Table 1). Three mineral oil spills were in April 2017 at different occasions detected from the wreck s/s Georg Buchner in Polish waters. In 26 spill detections the polluter was identified to be a ship and of these cases nine were spills of mineral oil.

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 1988-2017, 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).

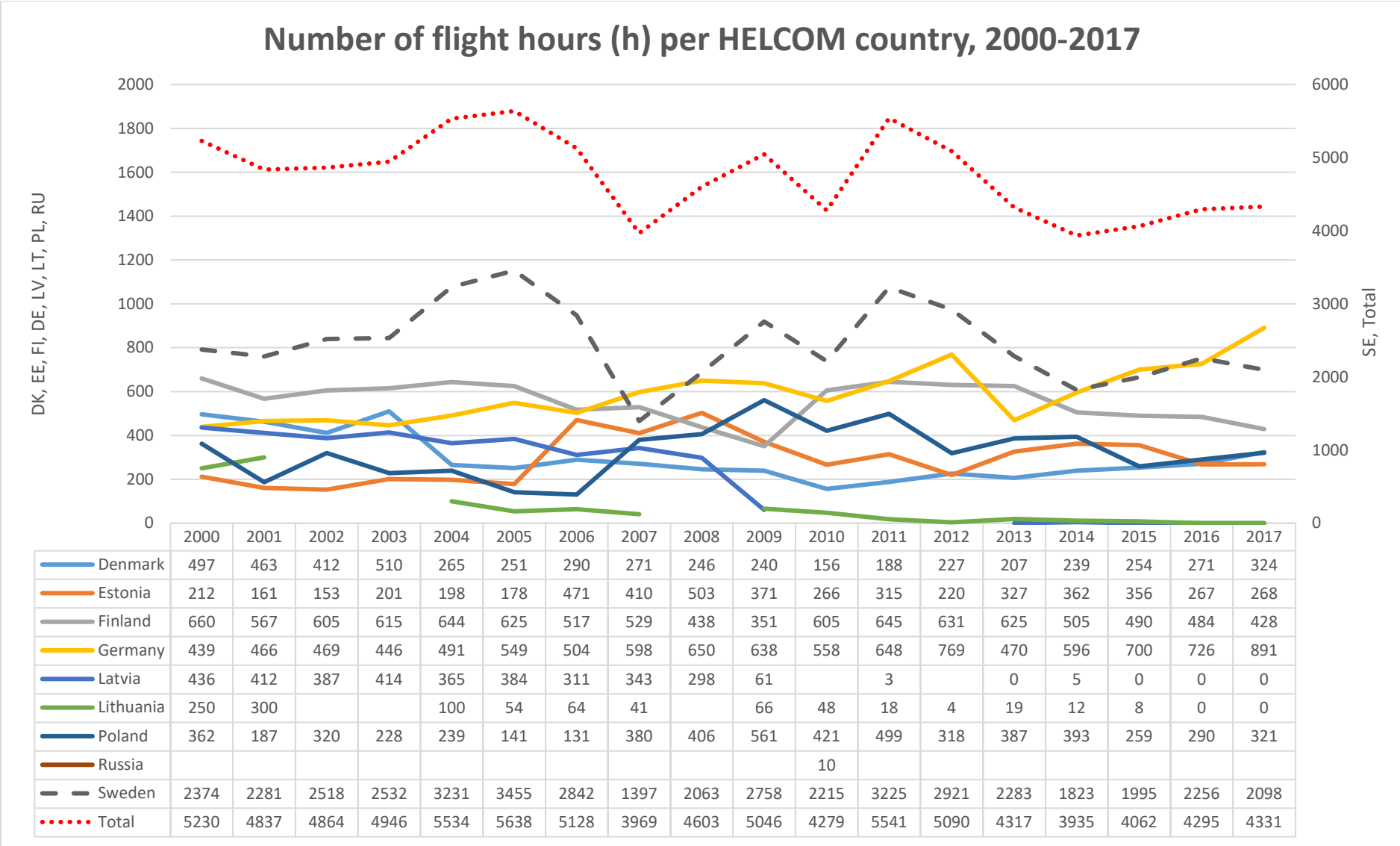
For additional information on the

Table 1. Annual aerial surveillance data for the Baltic Sea in 2017. 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	276:11:00	48:07:00	324:18:00	11	6	17	4	0	4	0	0	0	4	0,11
Estonia	268:27:00	0:00:00	268:27:00	4	0	4	2	0	2	0	0	0	2	0,01
Finland	385:10:00	43:30:00	428:40:00	8	0	8	8	0	8	0	2	0	6	0,43
Germany	584:25:00	306:35:00	891:00:00	16	2	18	5	2	7	0	0	0	7	0,46
Latvia	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	0	0,00
Lithuania	00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	0	0,00
Poland	321:18:00	00:00	321:18:00	14	0	14	9	0	9	0	1	3	5	2,77
Russia														
Sweden	1976:12:00	122:36:00	2098:48:00	87	6	93	21	1	22	0	6	0	16	8,56
Total	3811:43:00	520:48:00	4332:31:00			154			52					12,34

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	2	0	0	0	2	11	0	0	0	11
Estonia	2	0	2	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	0	0	0
Germany	5	0	1	0	4	6	0	1	0	5
Latvia	0	0	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0	0	0
Poland	5	0	1	0	4	0	0	0	0	0
Russia										
Sweden	14	0	11	0	3	57	0	1	0	56
Total	28					74				



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

Figure 1. Number of flight hours per HELCOM Contracting Party, 2000-2017. Note that the number of flight hours for Sweden and the total number of flight hours are indicated on the secondary vertical axis.

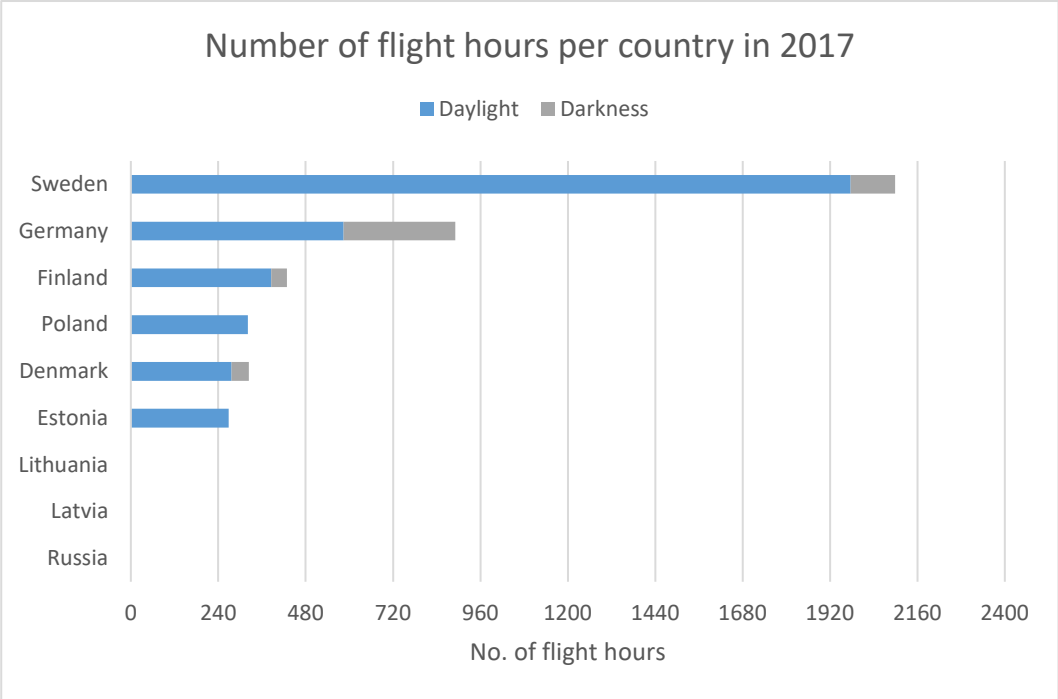


Figure 2. Number of flight hours per country in 2017.

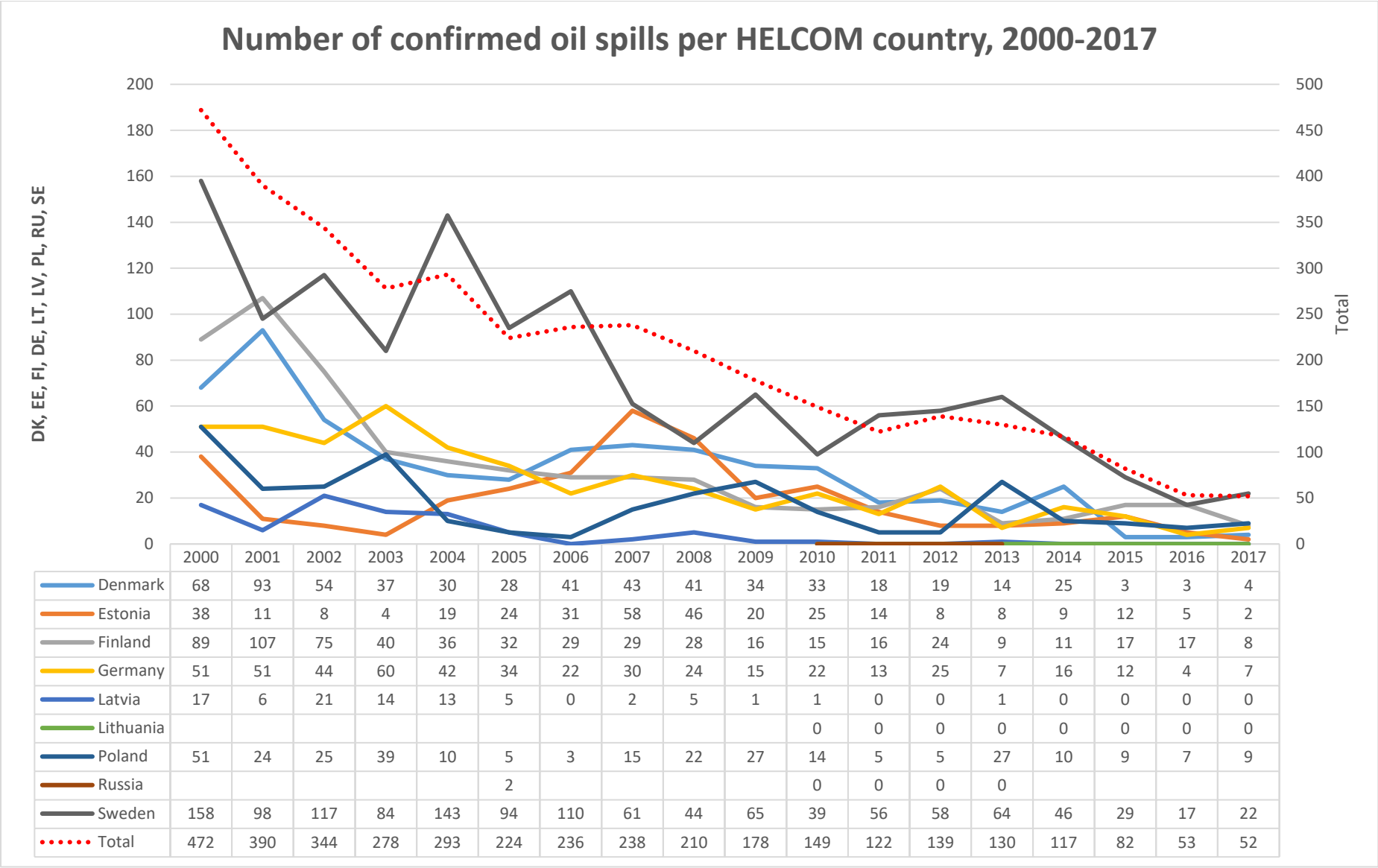
Table 2. Satellite detections of spills in HELCOM countries' waters provided by EMSA CleanSeaNet (CSN) in 2017, including verified detections.

Country waters	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	
Denmark	84	3	8	6	7	12	48
Estonia	14	0	1	0	0	2	11
Finland	13	0	2	0	0	3	8
Germany	12	2	3	3	0	4	0
Latvia	17	0	0	0	0	1	16
Lithuania	3	0	0	0	0	0	3
Poland	59	0	2	3	0	21	33
Russia	27	0	0	0	0	0	27
Sweden	131	0	4	8	3	34	82
Total	**360**	**5**	**20**	**20**	**10**	**77**	**228**

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
Denmark	68	93	54	37	30	28	41	43	41	34	33	18	19	14	25	3	3	4
Estonia	38	11	8	4	19	24	31	58	46	20	25	14	8	8	9	12	5	2
Finland	89	107	75	40	36	32	29	29	28	16	15	16	24	9	11	17	17	8
Germany	51	51	44	60	42	34	22	30	24	15	22	13	25	7	16	12	4	7
Latvia	17	6	21	14	13	5	0	2	5	1	1	0	0	1	0	0	0	0
Lithuania											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
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
Total	472	390	344	278	293	224	236	238	210	178	149	122	139	130	117	82	53	52

Figure 2 Number of confirmed oil spills per HELCOM country, 2000-2017. Note that the total number of spills is indicated on the secondary vertical axis.

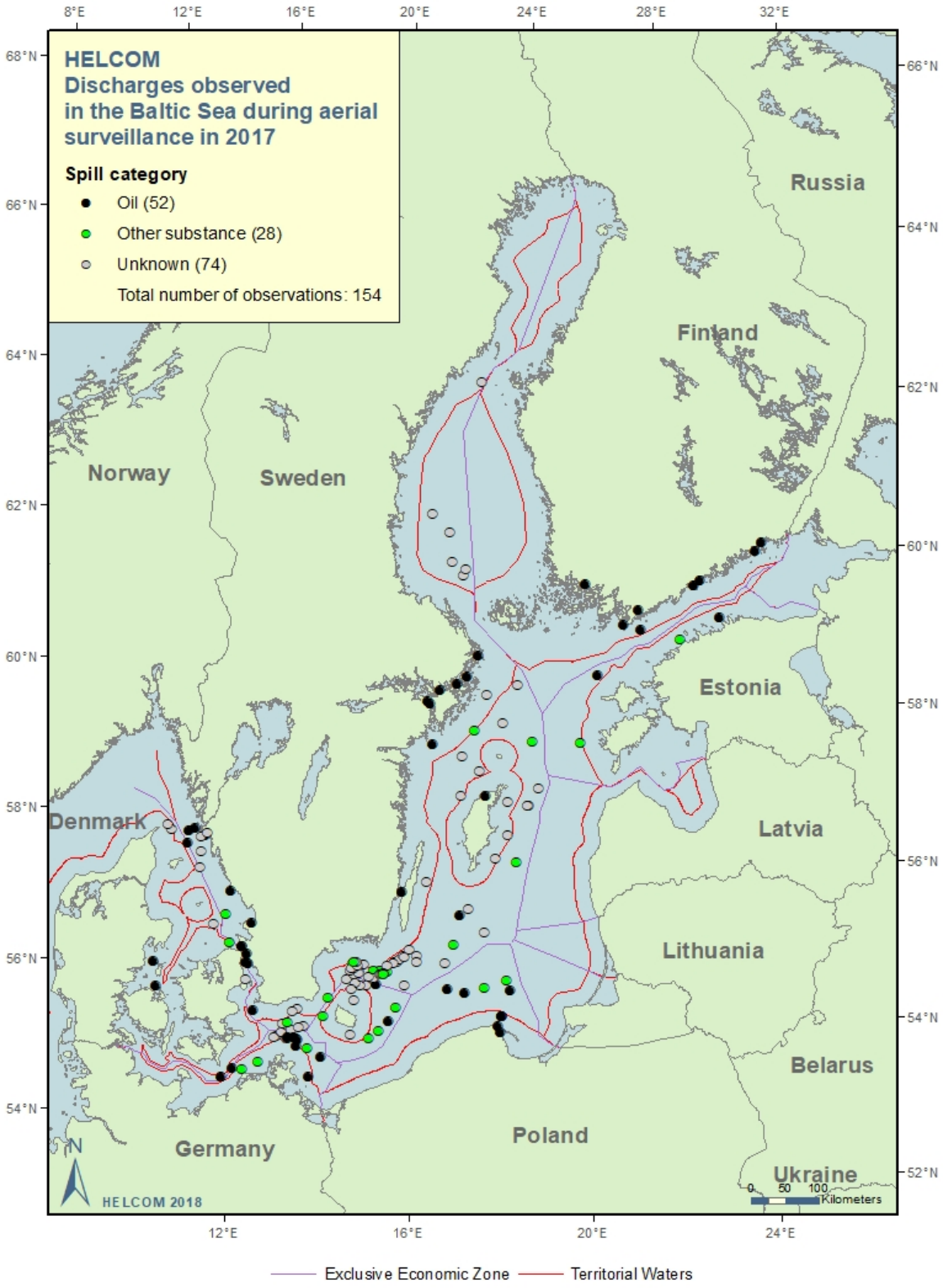


Figure 3 Location of spills observed in the Baltic Sea area in 2017 indicated by type of spill.

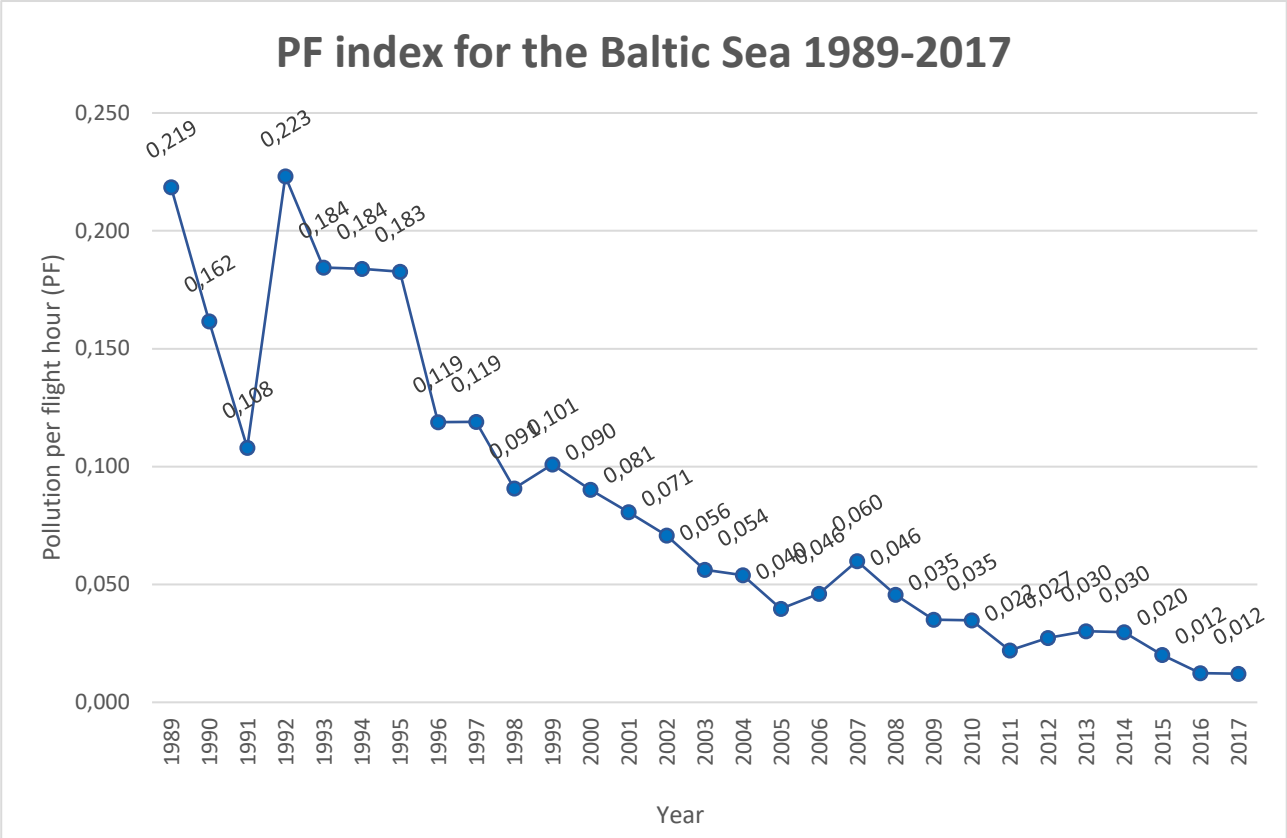


Figure 4 Pollution per flight hour index for the Baltic Sea, 1989-2017.

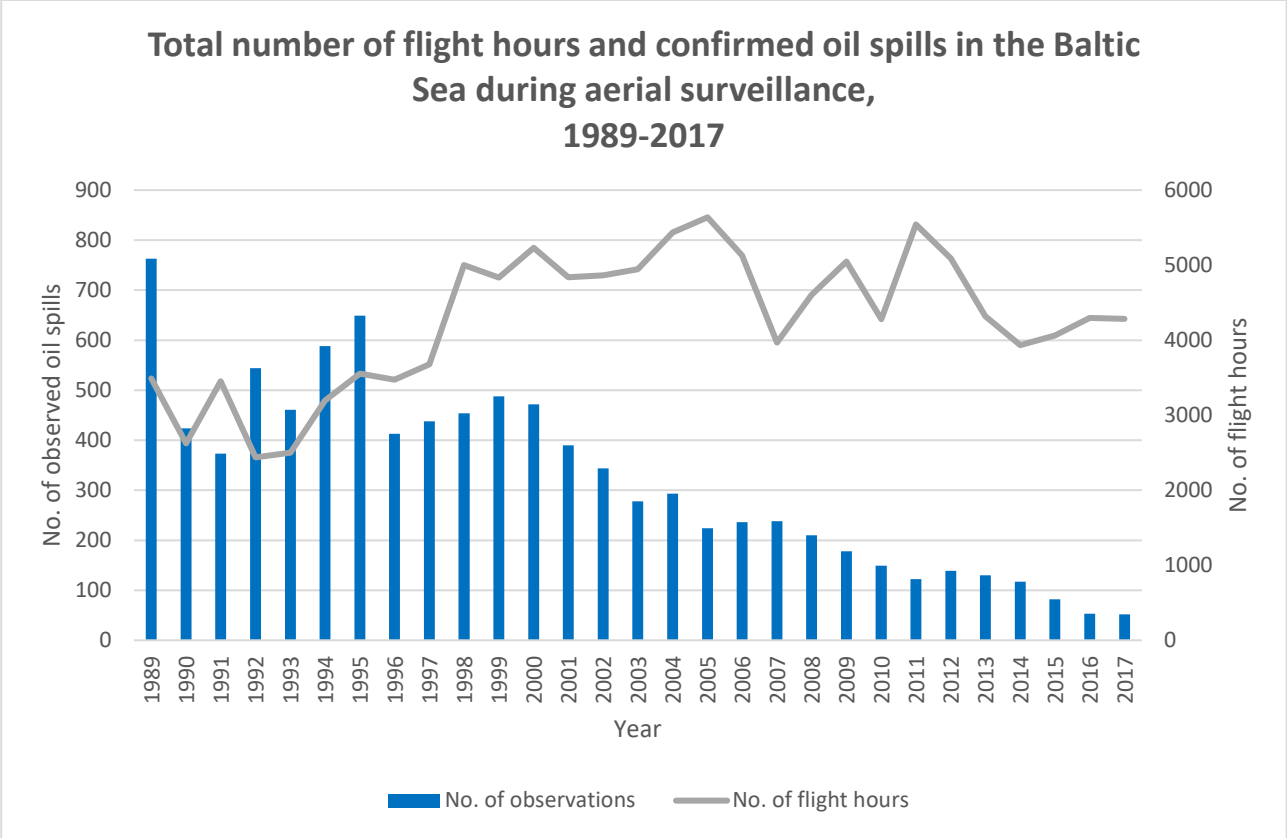


Figure 5 Total number of flight hours and confirmed oil spills in the Baltic Sea during aerial surveillance, 1989-2017.

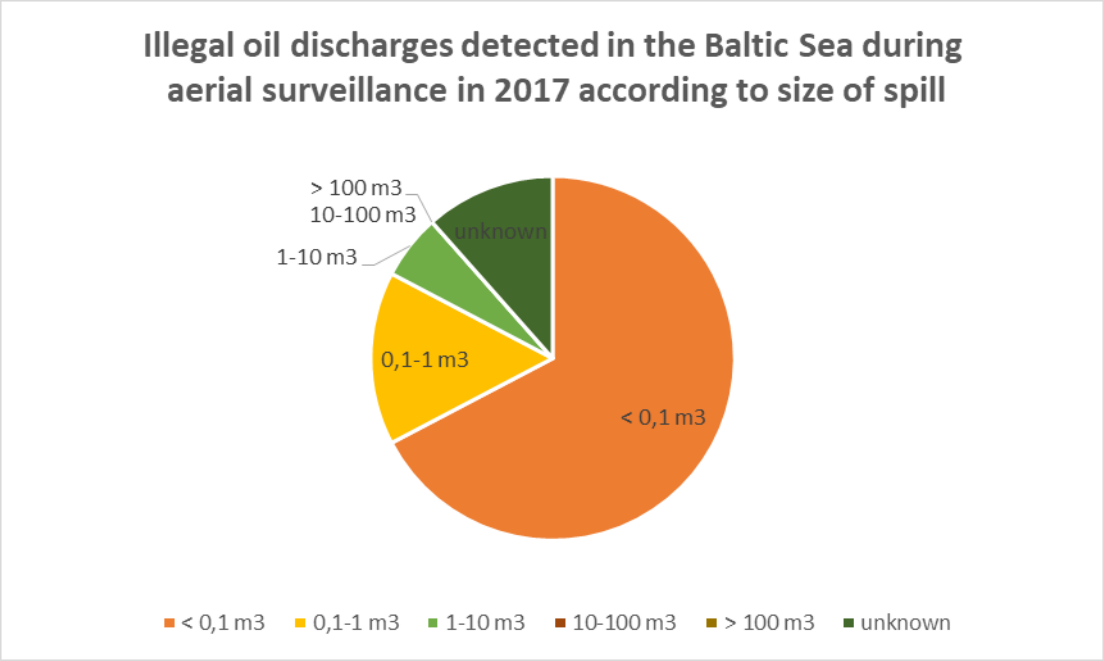
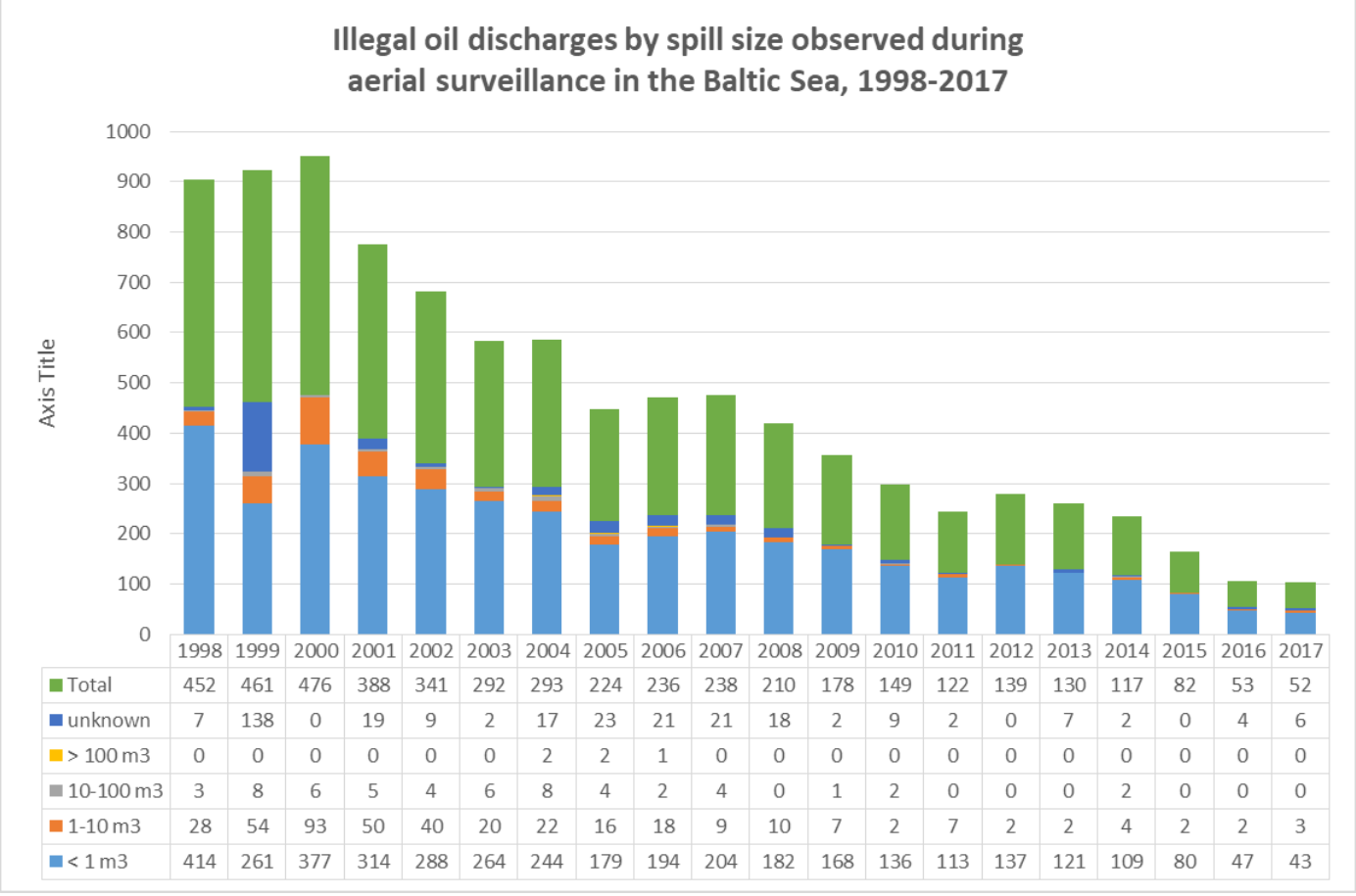


Figure 6 Illegal oil discharges detected in the Baltic Sea during aerial surveillance in 2017 according to estimated volume of the spill.



	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total	452	461	476	388	341	292	293	224	236	238	210	178	149	122	139	130	117	82	53	52
unknown	7	138	0	19	9	2	17	23	21	21	18	2	9	2	0	7	2	0	4	6
> 100 m3	0	0	0	0	0	0	2	2	1	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	0	0
1-10 m3	28	54	93	50	40	20	22	16	18	9	10	7	2	7	2	2	4	2	2	3
< 1 m3	414	261	377	314	288	264	244	179	194	204	182	168	136	113	137	121	109	80	47	43

Figure 7 Illegal oil discharges according to estimated volume of the spill during aerial surveillance in the Baltic Sea, 1998-2017.

Table 3 Confirmed oil spills in HELCOM countries' waters by size in 2017.

Size	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia	Sweden	Total
< 0,1 m3	1	2	7	3	0	0	6		16	35
0,1-1 m3	1	0	1	1	0	0	2		3	8
1-10 m^3	0	0	0	0	0	0	1		2	3
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	2	0	0	3	0	0	0		1	6
Total	**4**	**2**	**8**	**7**	**0**	**0**	**9**		**22**	**52**

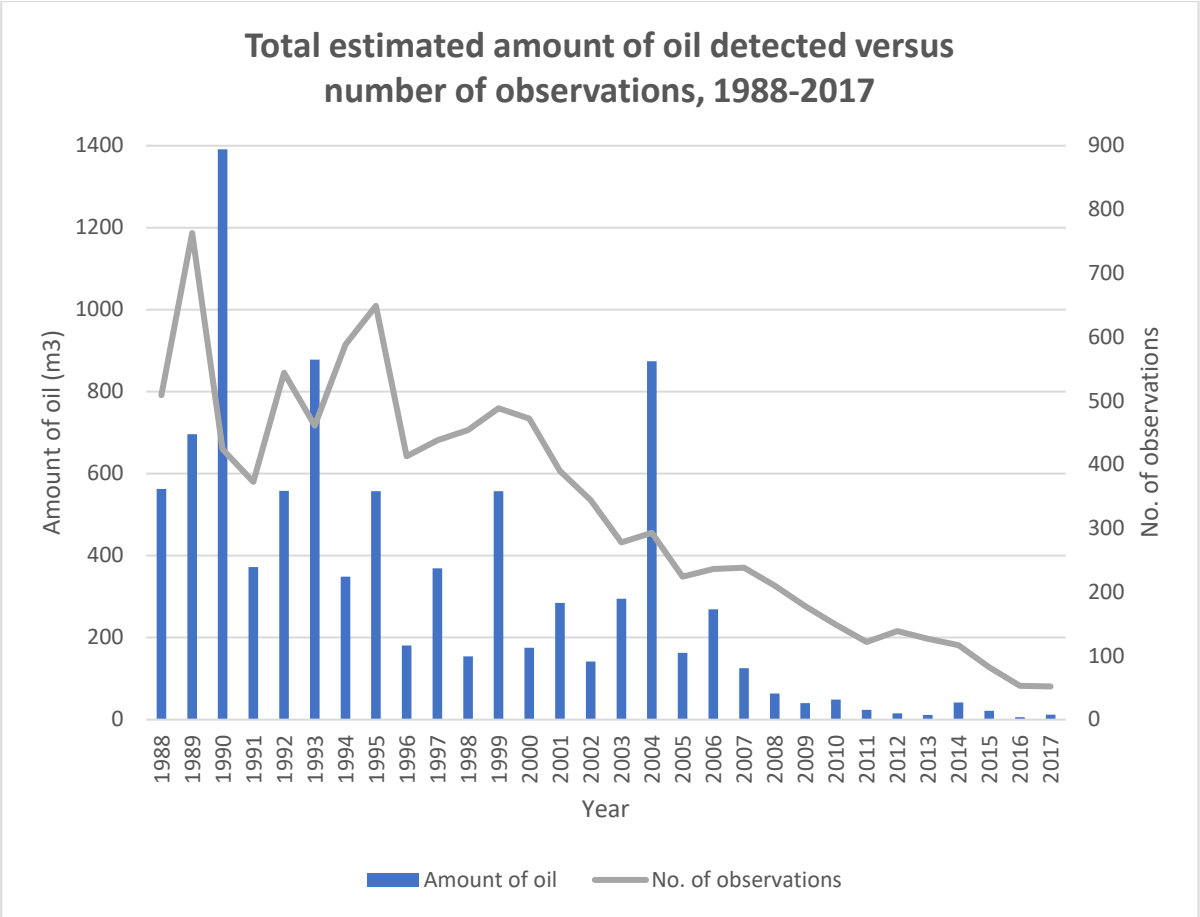


Figure 8 Total estimated amount of oil detected versus number of observations, 1988-2017.

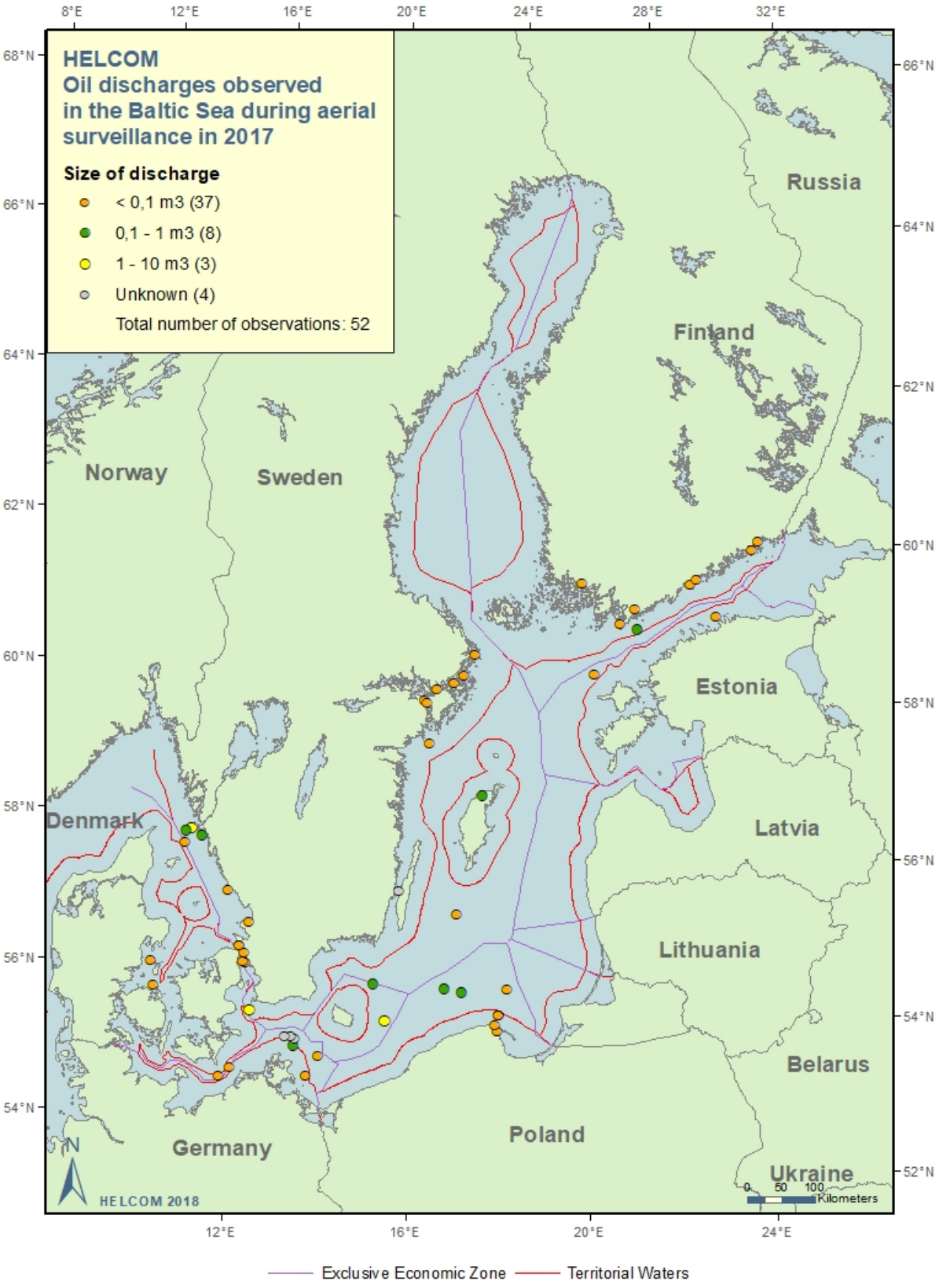


Figure 9 Location of oil spills observed in the Baltic Sea area in 2017 indicated by size.

Table 4 Aerial surveillance data 1988-2017.

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	2017
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
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
Finland							355	400	355	649	603	660	567	605	615	644	625	517	529	438	351	605	645	631	625	505	490	484	428
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
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
Lithuania			348	78	133			65				250	300			100	54	64	41		66	48	18	4	19	12	8	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
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
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**	**4332**

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	2017
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
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
Finland								26	42	104	53	63	89	107	75	40	36	32	29	29	28	16	15	16	24	9	11	17	17	8
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
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
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	9
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
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**

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
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
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	4332
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