OSPAR COMMISSION

Levels and trends in marine contaminants and their biological effects – CEMP Assessment report 2016

2017

Monitoring and Assessment Series

OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the “OSPAR Convention”) was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. The Contracting Parties are Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom of Great Britain and Northern Ireland.

Convention OSPAR

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. Les parties contractantes sont : l'Allemagne, la Belgique, le Danemark, l’Espagne, la Finlande, la France, l’Irlande, l’Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d’Irlande du Nord, la Suède, la Suisse et l’Union européenne.

Acknowledgement

Intersessional work since MIME 2016 and preparation of this report have been undertaken by the Working Group on Monitoring and on Trends and Effects of Substances in the Marine Environment (MIME), led by Dr Rob Fryer. Special thanks to Dr Rob Fryer, UK, for his hard work in producing this report.

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The 2016-17 MIME roll-over (http://dome.ices.dk/osparmime2016/main.html) assessed 8222 time series (of three years or more) in biota, of which 5743 were assessed for trends and 7227 for status, and 4877 time series in sediment, of which 3225 were assessed for temporal trends and 4017 for status. A breakdown of trends and status by OSPAR Region and determinand is given in Tables 1-4. Interpretation of these results can be found in the common indicator assessments of OSPAR's Intermediate Assessment 2017, which are based on this assessment (oap.ospar.org).

Data for the biological effects %DNATAIL (% DNA in tail), NRR (neutral red retention time), MNC (micronuclei) and LP (lysosomal labilisation period) were included in the assessment for the first time.

The assessment methodology is described in the help files that accompany the assessment.

Main results

The assessment found up to 304 temporal trends for cadmium, for the organic contaminants up to 264 temporal trends for CB128 and pesticides, and 157 for PA. The number of temporal trends for newer organic contaminants was far fewer, with up to 88 for BDE47, 30 for TBT and 10 for dioxins and PFOS. Among the biological effects, most results was on imposex (VDS) followed by EROD at 70 temporal trends.

In general, the trends are mainly downwards, especially for the organic contaminants of PCB, pesticides and BDEs. The individual matrices are published as Intermediate Assessment 2017 common indicator assessments with further information on the individual contaminants groups.

Metals cadmium, mercury and copper had a comparatively high number of upward trends (34-50%) compared to the number of downward trends. Cadmium had the highest number of significant temporal trends, and especially in Region II (Central North Sea), many biota stations in Dogger Bank indicated increasing trends (upward triangles), some even above the agreed assessment limit (Figures 1 and 2). But also along the German, Holland and Belgian coastline increasing trends were observed.

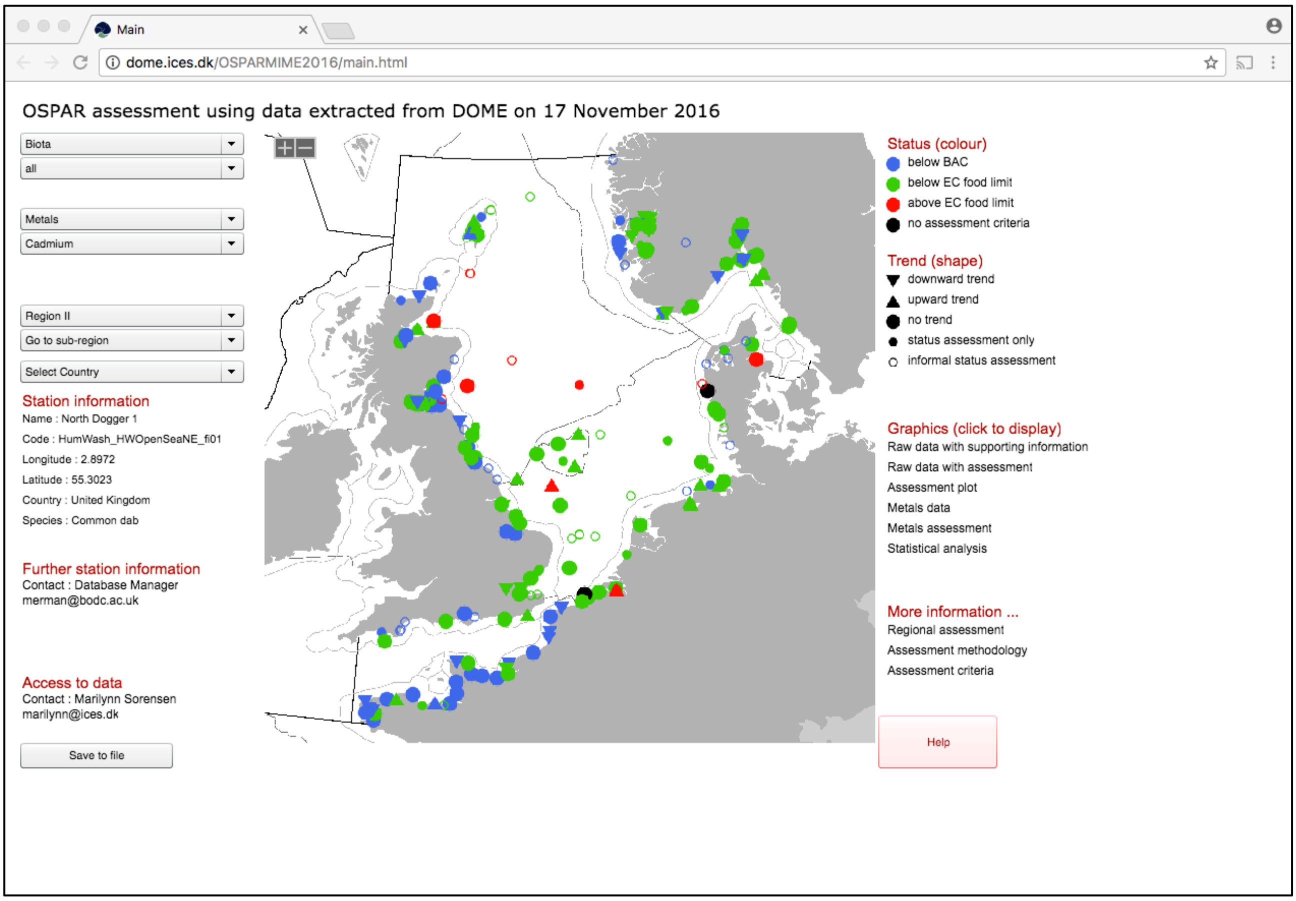

Figure 1: Overview of cadmium temporal trends and levels in biota (from dome-ices.dk/OSPARMIME2016/main.html)

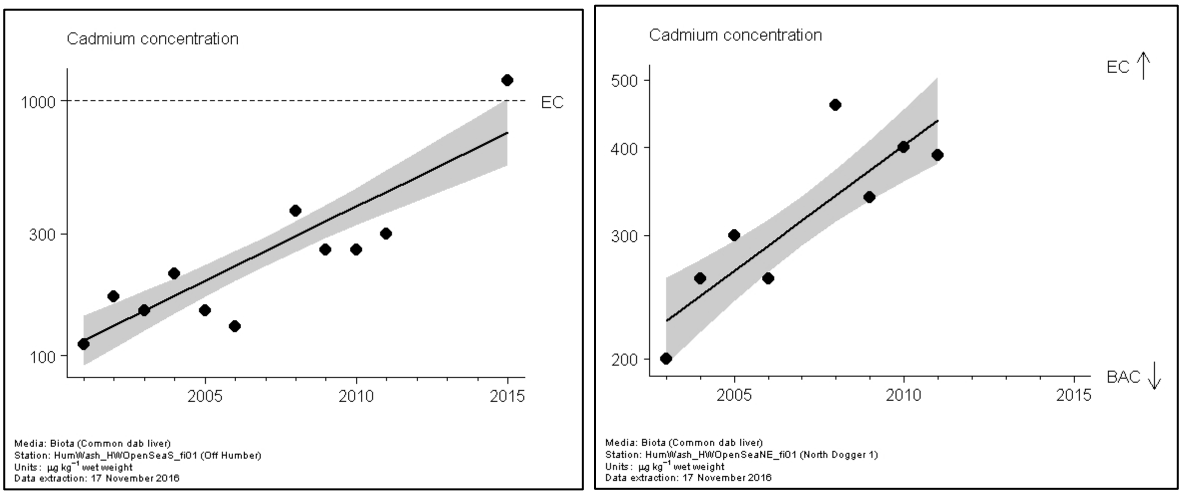

Figure 2: Time temporal of cadmium in common dab liver from the open seas off Humber and in the Northern Dogger; http://dome.ices.dk/OSPARMIME2016/graphics/fish_ukhmwsh_hwpnss_01_cmmd_cd_as.jpg and http://dome.ices.dk/OSPARMIME2016/graphics/fish_ukhmwsh_hwpnsn_01_cmmd_cd_as.jpg

For the organic contaminants, status of CB118 had the most results above the EAC. But of the 256 temporal trends, more than half were decreasing (124) and only 7 showed increasing trends. This indicates that in general the legislation and conventions against PCB pollution is working, except in some special circumstances.

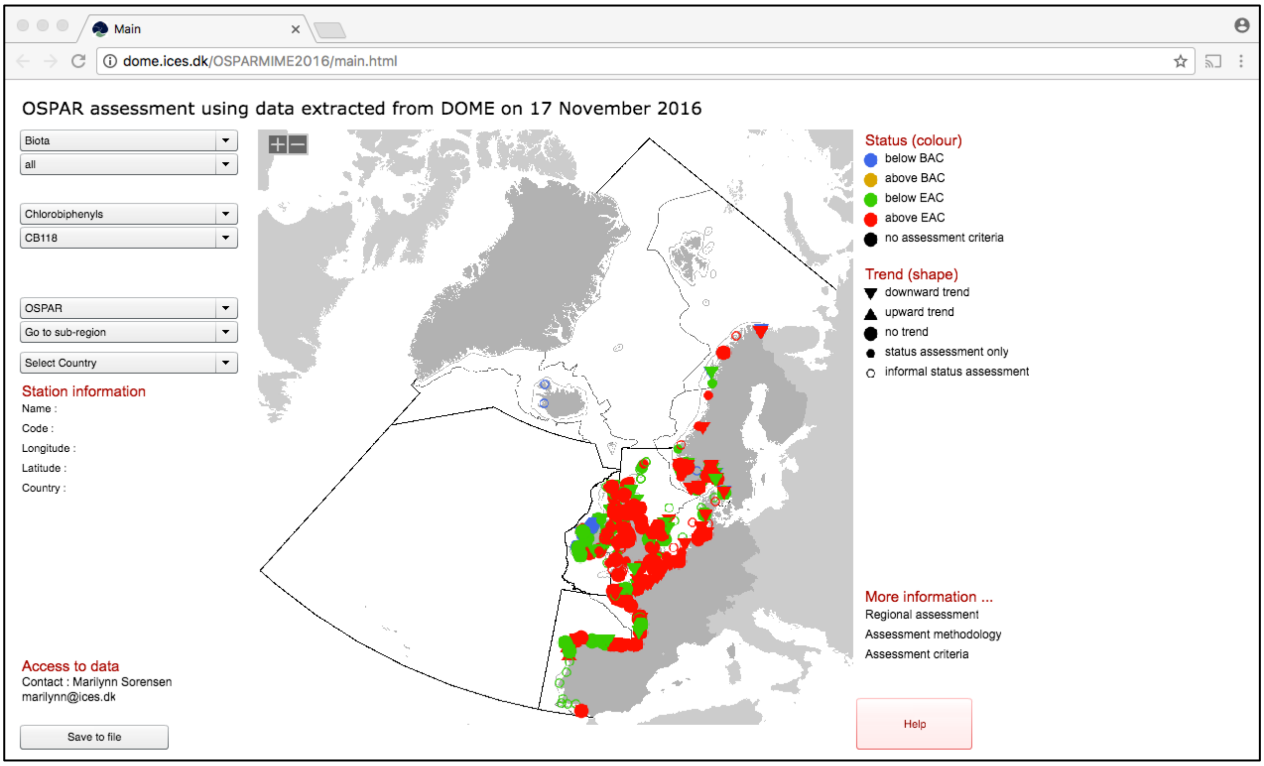

Figure 3: Overview of CB118 in the whole convention area

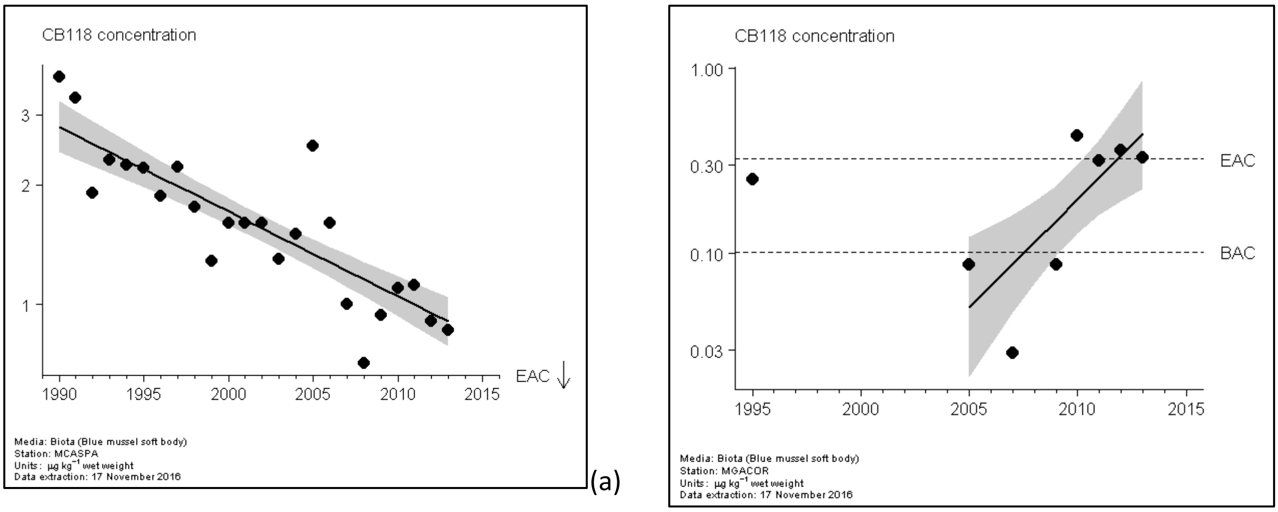

Figure 4: Examples of CB118 monitoring from Spain, both above the assessment criteria. Notice the significant drop at (a) MCASPA of a factor of 3 since 1990. This is most representative for the development over time. In contrast the increasing trends as at (b) MGACOR, one of the 7 increasing time trends in the dataset
http://dome.ices.dk/OSPARMIME2016/graphics/shellfish_spanmgcr_blms_cb118_as.jpg
http://dome.ices.dk/OSPARMIME2016/graphics/shellfish_spainmcaspa_blms_cb118_as.jpg

Of the relative new substances in the OSPAR CEMP are PFOS, which have been monitored in Norway since 2005 at select stations, and mainly in the northern parts of the North Sea. As there are no agreed assessment criteria currently, only the trends are indicated, and of the 10 stations examined for temporal trend, 8 were decreasing (Figure 5). The highest levels were found in Oslo Fjord area, but also the largest decrease (Figure 6).

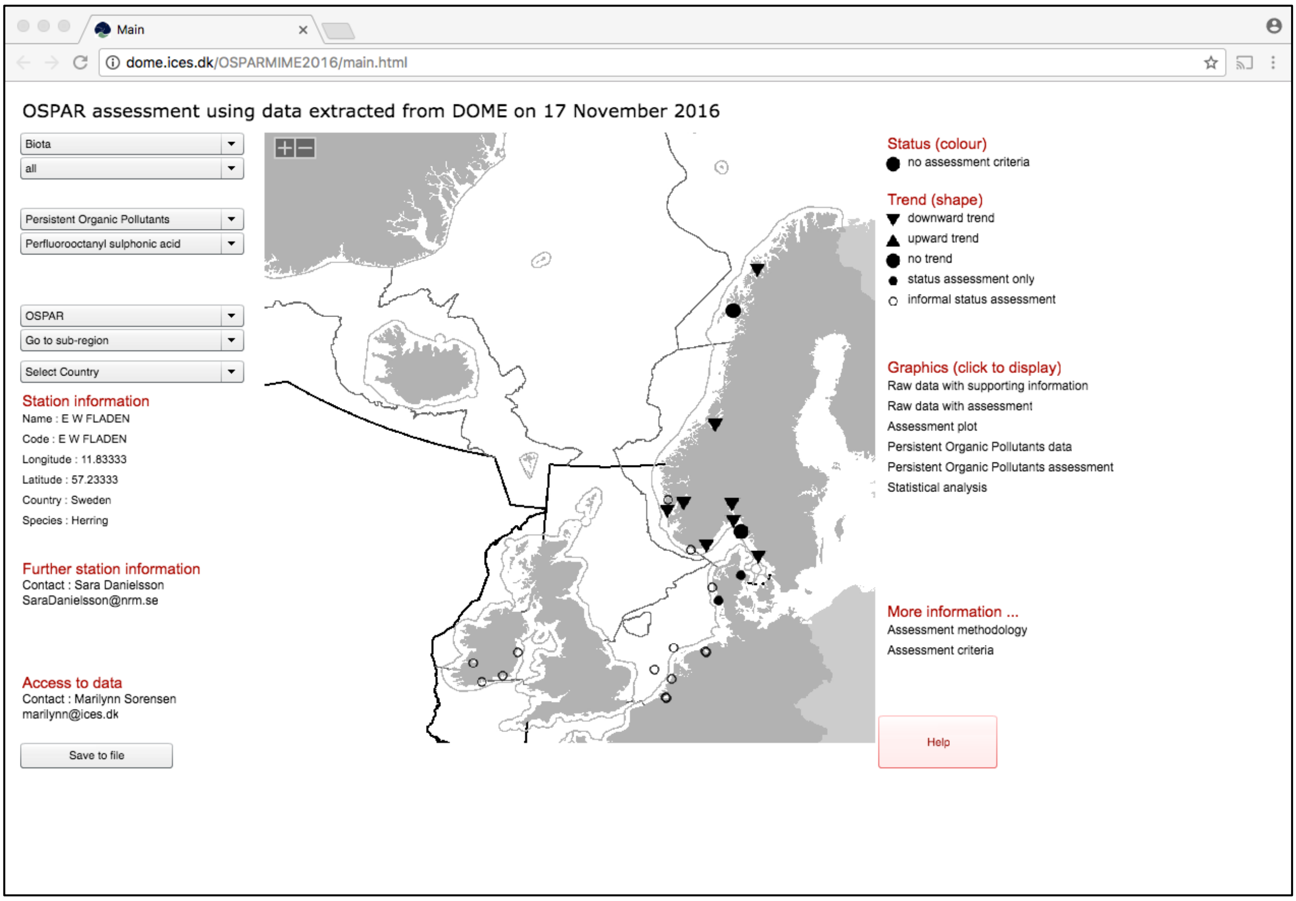

Figure 5: PFOS monitoring results, overview of trends but no assessment criteria agreed yet

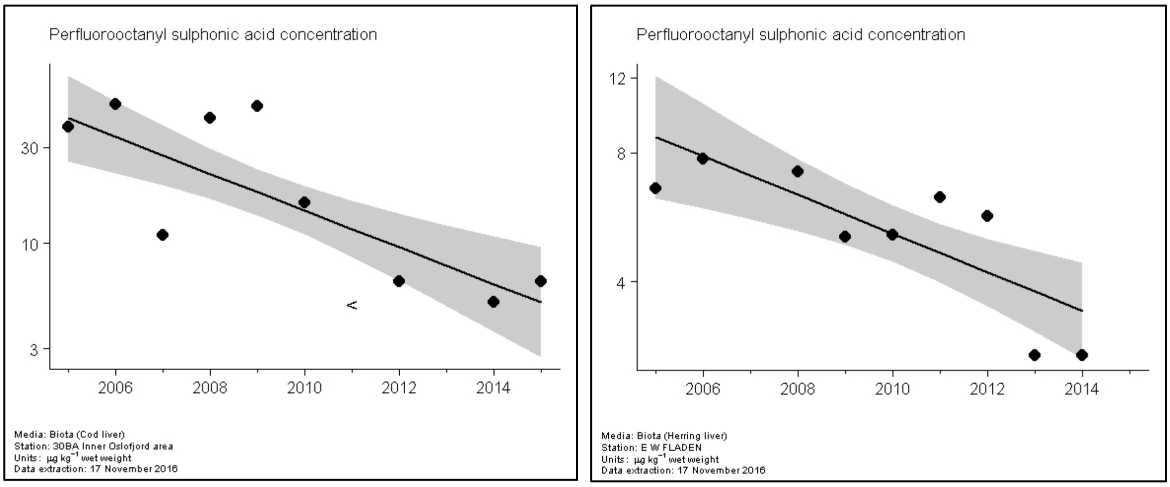

Figure 6: PFOS temporal trends in Norway (Oslo Fjord area) and Sweden (Fladen in Kattegat) http://dome.ices.dk/OSPARMIME2016/graphics/fish_n3ioa_cod_pfos_as.jpg, http://dome.ices.dk/OSPARMIME2016/graphics/fish_sewf_hrrn_pfos_as.jpg

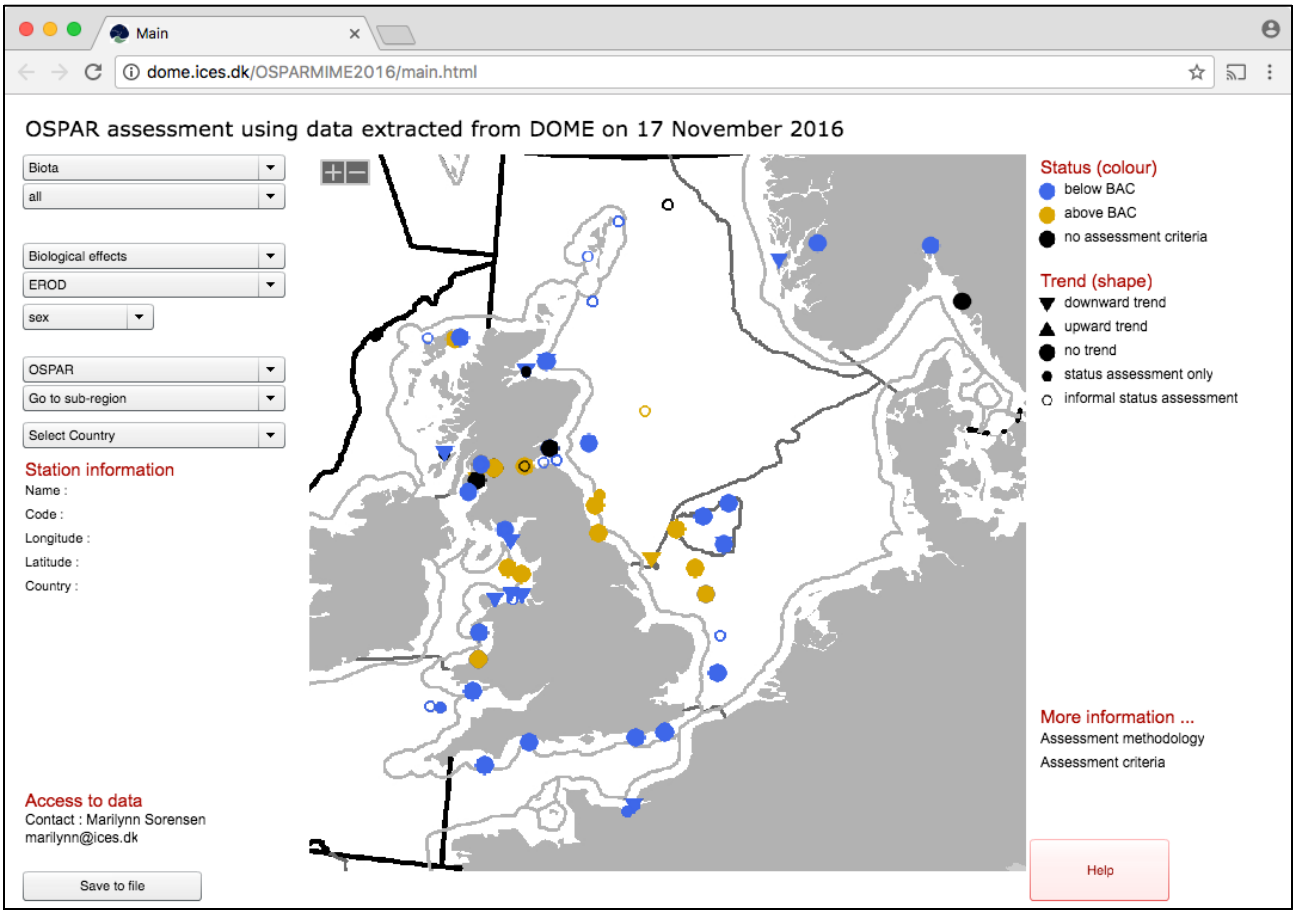

Figure 7: Biological Effects monitoring of EROD, compared to the agreed Background Assessment Criteria. Not all species have agreed BAC levels (e.g. eelpout)

Table 1: Summary of trends in contaminants and biological effects in biota

	Region I			Region II			Region III			Region IV		
	total	down	up	total	down	up	total	down	up	total	down	up
Metals												
CD	10	1	0	151	36	25	91	36	7	52	22	5
HG	9	3	0	163	29	21	76	11	8	53	15	0
PB	8	4	0	149	61	12	89	15	8	53	30	2
CU	9	1	1	145	29	7	86	16	5	52	4	4
ZN	11	3	1	144	33	7	86	18	3	52	17	1
PAHs (parent)												
NAP	3	1	0	63	19	2	13	1	1	15	2	0
PA	4	1	0	82	31	1	33	5	4	38	12	0
ANT	2	0	0	46	13	0	11	0	1	28	8	1
DBT				10	5	0						
FLU	4	2	0	77	22	4	34	4	3	38	12	0
PYR	4	2	0	75	19	1	32	5	1	38	12	0
BAA	4	3	0	62	21	2	16	7	1	38	8	0
CHR	4	2	0	60	18	1	19	8	0	38	10	0
BAP	3	2	0	38	6	2	9	5	0	38	4	5
BGHIP	4	3	0	55	7	0	15	7	0	38	5	0
ICDP	3	2	0	47	5	0	14	1	0	36	6	0
CBs												
CB28	5	4	0	84	43	1	51	18	1	29	10	1
CB52	5	4	0	98	40	0	55	24	1	33	16	0
CB101	6	5	0	127	71	2	64	23	0	42	25	0
CB105	4	4	0	80	62	1	33	8	0	41	20	0
CB118	9	8	0	130	79	1	73	21	2	42	16	4
CB126				7	2	0						
CB138	9	8	0	131	79	0	69	23	1	41	32	0
CB153	9	7	0	139	76	1	74	16	2	42	34	0
CB156	3	3	0	54	24	0	24	1	0	33	12	0
CB169				7	1	0						
CB180	6	4	0	102	57	1	52	7	2	38	28	0
Organobromines												
BDE28	3	2	0	12	5	0	13	2	0			
BDE47	4	3	0	31	21	0	32	15	1	21	5	1
BDE99	3	1	0	20	10	0	26	14	1	21	9	1
BD100	3	0	0	28	5	1	28	10	0	20	7	1
BD153				11	2	2	14	5	0	6	0	0
BD154	3	0	0	10	5	2	17	6	1	13	3	0
Pesticides												
DDEPP	7	6	0	79	31	1	34	1	3	39	7	1

	Region I			Region II			Region III			Region IV		
HCB	7	4	0	58	18	1	27	4	2	5	0	0
HCHA	3	3	0	24	15	0	28	7	1	23	7	0
HCHG	2	2	0	63	55	0	28	10	0	38	21	0
Dioxins, furans and POPs												
TCDD				9	2	0						
CDF2T				10	4	1						
PFOS	3	2	0	7	6	0						
Organometals												
DBTIN				18	12	0						
MBTIN				10	4	1						
TBTIN	3	3	0	27	22	0						
TPTIN				3	1	0						
Biological effects												
EROD				41	8	0	29	10	0			
PYR1OH				28	2	3	14	0	2			
PA1OH				4	2	0						
BAP3OH				3	1	0						
ACHE				1	0	0						
ALAD				3	0	0						
GST				1	0	0						
SFG										17	4	0
VDS	2	2	0	104	62	0	53	9	0	15	11	0
INTS				3	0	0						

Table 2: Summary of trends in contaminants in sediment

	Region II			Region III			Region IV		
	total	down	up	total	down	up	total	down	up
Metals									
CD	66	20	0	20	2	4	29	2	1
HG	72	27	0	26	7	0	29	7	1
PB	83	15	2	26	7	2	29	3	1
AS	61	4	1	27	0	4	29	0	3
CR	76	1	4	27	4	2	29	6	0
CU	78	16	4	27	7	1	29	0	2
NI	79	3	5	27	4	2	29	0	1
ZN	74	7	1	27	8	1	29	9	0
PAHs (parent)									
NAP	45	0	1	23	6	1			
PA	70	13	2	29	2	1	29	6	0
ANT	62	10	3	24	2	0	29	6	2
DBT	14	0	0	15	5	0			
FLU	69	11	4	28	3	2	29	7	0
PYR	70	13	2	29	3	3	29	9	0
BAA	66	11	2	28	3	2	29	7	0
CHR	63	12	2	21	3	2	29	7	0
BAP	67	14	2	28	3	2	29	10	0
BGHIP	67	20	2	27	6	0	29	3	0
ICDP	67	13	2	28	5	0	29	14	0
PAHs (alkylated)									
NAPC1	10	1	1	3	0	1			
NAPC2	25	1	2	19	4	1			
NAPC3	26	0	2	19	4	1			
PAC1	16	2	1	16	3	0			
PAC2	16	1	1	16	4	0			
PAC3	13	1	1	15	3	0			
DBTC1	15	2	2	15	3	0			
DBTC2	16	2	1	15	5	0			
DBTC3	15	1	2	15	3	0			
CBs									
CB28	34	10	2	14	4	2	19	0	0
CB52	30	11	1	16	6	1	26	5	4
CB101	46	15	2	18	8	1	20	0	0
CB105	12	4	0	7	0	0	22	0	1
CB118	45	18	1	19	4	2	21	0	1
CB138	45	23	1	19	6	1	24	0	0
CB153	48	12	1	19	3	3	27	0	0
CB156	2	0	0	4	0	0	24	0	1

	Region II			Region III			Region IV		
CB180	36	11	1	14	4	3	23	0	0
Organobromines									
BDE28				2	0	0			
BDE47	5	0	0	7	2	0			
BDE66				3	1	0			
BDE99				1	1	0			
BD100				5	1	0			
BD153				2	0	0			
BD154				4	0	0			
BD183				2	1	0			
Organometals									
DBTIN	15	12	0						
MBTIN	15	5	0						
TBTIN	13	13	0						

Table 3: Summary of status of contaminants and biological effects in biota: B = blue, G = green, O = orange (above BAC, but no EAC or equivalent), R = red

	Region I				Region II				Region III				Region IV			
	B	G	O	R	B	G	O	R	B	G	O	R	B	G	O	R
Metals																
CD	1	10	0	1	53	117	0	6	43	63	0	1	54	21	0	3
HG	5	6	0	0	19	167	0	0	14	90	0	1	13	64	0	0
PB	4	9	0	1	32	139	0	9	30	70	0	7	23	47	0	7
CU	0	0	5	0	22	0	98	0	17	0	67	0	10	0	65	0
ZN	0	0	7	0	1	0	118	0	1	0	83	0	0	0	75	0
PAHs (parent)																
NAP	0	5	0	0	0	76	0	8	0	34	0	5	0	21	0	1
PA	1	4	0	0	9	84	0	1	1	59	0	0	12	49	0	0
ANT	0	5	0	0	0	77	0	1	0	47	0	1	0	49	0	1
FLU	2	1	0	2	4	74	0	11	3	47	0	8	17	42	0	2
PYR	1	2	0	2	4	70	0	15	2	45	0	9	8	51	0	2
BAA	0	3	0	2	5	74	0	7	1	43	0	7	7	44	0	3
CHR	2	0	3	0	12	0	79	0	9	0	43	0	9	0	49	0
BAP	0	5	0	0	8	52	0	1	3	30	0	2	5	48	0	1
BGHIP	1	4	0	0	1	72	0	2	1	45	0	5	5	47	0	1
ICDP	0	0	5	0	4	0	63	0	3	0	41	0	10	0	44	0
CBs																
CB28	3	8	0	0	36	95	0	22	29	35	0	19	30	16	0	3
CB52	3	8	0	0	18	115	0	13	22	49	0	12	16	30	0	4
CB101	1	10	0	1	8	128	0	29	13	66	0	15	3	45	0	9
CB105	3	0	6	0	32	0	59	0	25	0	24	0	28	0	27	0
CB118	3	3	0	6	5	44	0	113	7	31	0	64	0	17	0	40
CB138	2	10	0	0	0	136	0	13	2	80	0	6	0	49	0	9
CB153	0	12	0	0	0	160	0	5	0	98	0	1	0	57	0	1
CB156	3	0	5	0	42	0	48	0	31	0	15	0	35	0	19	0
CB180	3	7	0	0	35	106	0	3	23	57	0	2	15	39	0	0
Pesticides																
DDEPP	3	0	6	0	0	0	96	0	0	0	48	0	0	0	43	0
HCB	3	0	6	0	23	0	54	0	30	0	9	0	17	0	7	0
HCHA	3	0	0	0	46	0	17	0	32	0	4	0	29	0	10	0
HCHG	3	3	0	0	51	28	0	6	30	0	0	7	39	4	0	0
Organometals																
TBTIN	0	1	0	1	1	3	0	29	0	2	0	1	0	1	0	8
Biological effects																
EROD					33	0	14	0	19	0	11	0				
PYR1OH					1	18	12	0	0	13	0	0				
PA1OH					1	0	3	0								
SFG													1	12	0	11
VDS	2	0	0	0	21	47	0	38	1	36	0	16	2	4	0	42

Table 4: Summary of status of contaminants in sediment: B = blue, G = green, O = orange (above BAC, but no EAC or equivalent), R = red

	Region II				Region III				Region IV			
	B	G	O	R	B	G	O	R	B	G	O	R
Metals												
CD	22	70	0	11	19	7	0	2	3	25	0	1
HG	13	16	0	73	9	9	0	9	0	8	0	21
PB	13	6	0	86	10	4	0	13	1	1	0	27
AS	26	0	51	0	19	0	9	0	0	0	0	29
CR	0	21	0	84	0	4	0	24	0	7	0	22
CU	44	16	0	44	15	2	0	11	0	2	0	27
NI	33	0	72	0	6	0	22	0	0	2	0	27
ZN	18	11	0	76	7	8	0	13	0	9	0	20
PAHs (parent)												
NAP	12	42	0	23	2	27	0	6	0	0	0	0
PA	19	75	0	23	4	17	0	14	13	12	0	4
ANT	12	59	0	37	5	22	0	8	7	20	0	2
DBT	0	16	0	0	0	16	0	0	0	0	0	0
FLU	17	89	0	11	5	26	0	4	12	15	0	2
PYR	14	91	0	12	4	26	0	5	10	19	0	0
BAA	15	77	0	23	3	23	0	9	12	15	0	2
CHR	11	90	0	8	3	27	0	3	13	16	0	0
BAP	24	78	0	13	6	25	0	4	13	16	0	0
BGHIP	41	0	72	0	8	0	27	0	11	0	18	0
ICDP	48	0	64	0	9	0	26	0	13	0	16	0
CBs												
CB28	7	51	0	17	6	22	0	3	0	26	0	2
CB52	1	60	0	18	1	28	0	0	0	26	0	2
CB101	0	66	0	27	1	28	0	1	0	21	0	8
CB118	4	20	0	74	2	9	0	20	0	11	0	18
CB138	5	61	0	3	0	29	0	2	0	23	0	6
CB153	5	94	0	1	0	30	0	0	0	29	0	0
CB180	5	83	0	1	2	28	0	0	0	25	0	4

OSPAR COMMISSION

Victoria House
37-63 Southampton Row
London WC1B 4DA
United Kingdom

t: +44 (0)20 7430 5200
f: +44 (0)20 7242 3737
e: secretariat@ospar.org
www.ospar.org

OSPAR's vision is of a clean, healthy and biologically diverse North-East Atlantic used sustainably

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