OSPAR COMMISSION

Updated audit trail of OSPAR Environmental Assessment Criteria (EAC) and other assessment criteria used to distinguish above and below thresholds

Hazardous Substances and Eutrophication Series

2021

Updated audit trail of OSPAR EACs and other assessment criteria used to distinguish above and below thresholds

Acknowledgments

Dr Martin Mørk Larsen (Denmark) was lead author for this Audit trail, with preparation supported by members of the Working Group on Monitoring and on Trends and Effects of Substances in the Marine Environment (MIME).

2020 updated Audit trail of OSPAR EACs and other assessment criteria used to distinguish above and below thresholds

Contents

2020 updated Audit trail of OSPAR EACs and other assessment criteria used to distinguish above and below thresholds

Executive Summary

The Audit Trail is a list of all references to assessment criteria currently and many previously used in the OSPAR assessments performed by MIME. It lists both OSPAR defined EACs and BAC, but also other international assessment criteria such as EU EQS, Canadian FEQS, US ERL. The references are safely kept at the OSPAR secretariat to ensure changes in websites or revision of values are recorded over time. The assessment criteria used in each assessment are also included in the OSPAR Hazardous Substances Tool[1] help files, but the audit trail carries the full reference to the papers, legal documents or workshop reports. There is a spreadsheet also included with a shortlist of references and values, and some further identification of the background for the individual assessment criteria.

Récapitulatif

La piste d'audit est une liste de toutes les références aux critères d'évaluation utilisés actuellement et dans le passé dans les évaluations OSPAR effectuées par le Groupe de travail MIME d'OSPAR. Elle énumère non seulement les EAC (critères d'évaluation environnementale) et les BAC (concentrations d'évaluation de fond) définis par OSPAR, mais également d'autres critères d'évaluation, tels que les EQS (normes de qualité environnementale) de l'UE, les FEQS (Recommandations fédérales pour la qualité de l'environnement) du Canada, et les ERL (Fourchette d'effets – faible) des Etats-Unis. Les références sont conservées en toute sécurité au secrétariat d'OSPAR pour s'assurer que les modifications des sites web ou les révisions des valeurs sont enregistrées au fil du temps. Les critères d'évaluation utilisés pour chaque évaluation sont également inclus dans les fichiers d'aide pour l'Outil OSPAR sur les substances dangereuses, mais la piste d'audit comporte la référence complète aux documents, aux documents juridiques ou aux rapports d'atelier. Un tableur est également inclus avec une liste de références et de valeurs, ainsi qu'une identification plus précise du contexte des critères d'évaluation individuels.

[1] https://ocean.ices.dk/ohat/

Introduction

Appendix 1 lists the EACs used in the MIME rollover assessments, where they were formally adopted, any documentation describing their derivation, and some comments on their applicability. The Table also lists the assessment criteria used to distinguish between good and moderate status when EACs are not available and any corresponding EQS values (EC 2011b).

Most EACs were conceived in a series of OSPAR workshops finalised in 1996 and a follow up ICES/OSPAR workshop in 2004 (OSPAR, 1998 and OSPAR, 2004), further updated in 2008 (SIME 2008 document 0505, OSPAR 2009 Henceforth referred to as MAS 461) in preparation for the QSR 2010, taking into account the EU guidelines for EQS development (EC 2011).

The derivation of the EACs is summarised below. For CBs, some rounding and conversion errors were discovered and revised EACs are presented. MIME recommends that HASEC adopts these revised EACs.

In 2017, MIME made a trial run of Canadian FEQS for brominated flame-retardants. These have been included in the tables as reported in the web-based assessment tool http://dome.ices.dk/OSPARMIME2018/main.html.

All values and derivation links for the 2018 MIME assessment have been extracted from the web-based assessment tool in the accompanying EAC_audit_trail_2018 excel spreadsheet, for easy browsing. Note that the list can be filtered in line 1, to show only the relevant substances or matrix or any of the headlines in the spreadsheet. BACs have been included in the spreadsheet for completeness.

In 2020, it was suggested to split the assessment into an environmental criteria and human health criteria part, to take into account the EFSA food criteria in a D9 relevant section of the assessment (including OHAT), and where possible, environment criteria were taken from EU documentation for EQS where possible.

EACs for CBs

A number of different versions of EACs have been used, varying both in basis and values (table 1).

SIME 08/5/5-Add.2-E proposed EACs for CBs in water and hence derived

- EACs for CBs in sediment with 1% TOC using direct effect measurements in water and the partitioning coefficient for octanol-water (K_{oc})
- EACs for CBs in fish and mussel using bio-concentration factors (BCFs)

The EACs for CBs in sediment were later modified to apply to sediment with 2.5% TOC and adopted by OSPAR (MAS 461).

The EACs for CBs in fish and mussel derived using BCFs were rejected by ICES MCWG and not adopted by OSPAR.

Alternative EACs for CBs in biota were derived using partitioning theory (MAS 461). The EAC for sediment with 1% TOC was multiplied by 100 to give an EAC for sediment with 100% TOC and this was equated to an EAC for lipid. This assumed that CBs transfer totally to the lipid (or organic carbon) from the (pore)water phase due to high lipophilicity and has been shown to work for silicone rubber in sediment. The EAC for fish was retained on a lipid weight basis and was adopted by OSPAR (MAS 461). The EAC for mussels and oysters was converted to a dry weight basis assuming a lipid content of 1% and a dry weight content of 20% and adopted by OSPAR (MAS 461).

Some errors were found when checking the data and conversions and the EACs for CBs for biota have been recalculated. They are now presented on a lipid basis and apply to all fish and shellfish (indicated in table 1). To convert to a wet weight basis, they need to be multiplied by a species-specific lipid conversion factor. For fish, these are tabulated in MIME 2011 Annex 4. For shellfish, conversion factors were derived from all the data in the ICES data base (Table 2) and updated in 2020 for all species future use (table 3).

EQS values have not been developed for CBs in the water phase, due to the high hydrophobicity. A PCB draft dossier (2010) suggests AA-EQS of 0.003 µg/kg for biota, with corresponding AA-EQS of 4.3 10^{-9} µg/l in freshwater and MAC-EQS of 3.2 10^{-4} µg/l with marine waters a factor of 10 lower. These values are based on freshwater toxicity. Water quality criteria/objectives sited at 0.074–0.175 ng/l USA or IKSR/ICPR (Rhine). These values are not sensible compared to BAC and known concentrations in biota.

HASEC adopted the EACs highlighted (and headed with EAC) in Table 1, using the median lipid weights in table 2 for species specific conversion.

***Table 1**: Various proposals for EACs for CBs in water, sediment and biota. The shaded EAC were adopted in 2013 and are still in use.*

	water[2]	**sediment[3]**	**sediment[4]**	**fish[5]**	**fish[6]**	**fish[7]**	**mussel[8]**	**mussels, oysters[9]**	**shellfish[10]**
		1% TOC	2.5% TOC			EAC			EAC
	ng l^{-1}	µg kg^{-1}dw	µg kg^{-1}dw	µg kg^{-1}ww	µg kg^{-1}lw	µg kg^{-1}lw	µg kg^{-1}ww	µg kg^{-1}dw	µg kg^{-1}lw
CB28	0.7	0.67	1.7	8.35	64	67	6.0	3.2	67
CB52	0.86	1.08	2.7	163	108	108	16.2	5.4	108
CB101	0.2	1.21	3.0	32	120	121	10.2	6.0	121
CB118	0.026	0.25	0.6	6.5	24	25	1.95	1.2	25
CB138	0.2	3.17	7.9	79.6	316	317	19.9	15.8	317
CB153	1.0	15.85	40	3200	1600	1585	358	80	1585
CB180	0.2	4.69	12	126	480	469	6.5	24	469

[2] Values proposed in SIME 08/5/5-Add.2-E

[3] Values proposed in SIME 08/5/5-Add.2-E calculated by adjusting proposed EACs for water using Koc estimates

[4] Adopted EACs (ref) calculated by multiplying the proposed EACs for sediment by 2.5

[5] Values proposed in SIME 08/5/5-Add.2-E based on adjusting proposed EACs for water using BCF estimates

[6] Adopted EACs (ref) calculated by dividing the adopted EACs for sediment by 0.025 – this assumes that the concentration in sediment with 100% TOC is equivalent to the concentration in the lipid of fish. To convert to a wet weight basis, these concentrations are multiplied by the typical species specific lipid content; e.g. 0.16 for dab, 0.45 for cod (MIME 2011 Summary Record (MIME 11/9/1), Annex 4). There was a transcription error in calculating the value for CB28.

[7] The values that should have been adopted if there hadn't been any rounding errors

[8] Values proposed in SIME 08/5/5-Add.2-E based on adjusting proposed EACs for water using BCF estimates

[9] Adopted EACs (ref) calculated by multiplying the adopted EACs for fish by 0.05 – this assumes the lipid content is 1% and the dry weight content is 20%. To convert to a wet weight basis, these concentrations are divided by the typical species specific dry weight content; e.g. 0.19 for blue mussel, 0.19 for Pacific oyster (MIME 2011 Summary Record (MIME 11/9/1), Annex 4).

[10] The values that should have been adopted. To convert to wet weight, need to multiply by the typical species specific lipid content; e.g. 0.013 for blue mussel, 0.018 for Pacific oyster, table 3 and 4.

***Table 2**: Lipid weight conversions for bivalves based on data in the ICES DOME database used 2013-2018. See table 4 for current standards (only Mya have changed).*

Bivalve	ICES code	**Median soft body lipid wt (%)**	**Number of observations**
Pacific oyster	CRAS GIG	1.8	237
softshell clam	MYA ARE	0.7	>62
blue mussel	MYTI EDU	1.3	6976
Mediterranean mussel	MYTI GAL	2.2	>45
native oyster	OSTR EDU	1.8	33

A revised table 3 for species specific conversions include all species found in sufficient numbers in ICES DOME database, showing both “species specific” lipid and dry weight to be used for conversions between the different bases used in future assessments. As more data are reported, the table can change, but the use of medians makes it fairly robust, indicated by only a small change for softshell clams between table 2 (2013 extraction of data) and table 3 (2020 extraction of data).

***Table 3**: Median %lipid (lw) and %dry weight (dw) in different organs based on extract of species in ICES database from 1999-2018 (inclusive), performed July 2020. This table will be updated, and the actual table can be found in the OHAT in the “assessment criteria” help file for biota going forward.*

species	**common name**	**% lw** in muscle	**% dw** in muscle	**% lw** in liver	**% dw** in liver	**% lw** in soft body	**% dw** in soft body	**% lw** in tail muscle	**% dw** in tail muscle
Anguilla anguilla	European eel	15.3	35.1						
Brosme brosme	cusk	0.3		54.0					
Clupea harengus	herring	4.6	26.6	4.4	31.9				
Gadus morhua	cod	0.3	19.3	42.0	55.0				
Lepidorhombus whiffiagonis	megrim	0.3	20.2	24.0	40.0				
Limanda limanda	common dab	0.7	20.1	19.4	32.8				
Merlangius merlangus	whiting		20.2	36.9	44.3				
Merluccius merluccius	hake		20.0	44.0					
Molva molva	common ling	0.3	21.1	53.5	64.2				
Platichthys flesus	flounder	0.9	21.3	14.7	31.8				
Pleuronectes platessa	plaice	0.5	20.0	11.4	26.5				

species	common name	% **lw** in muscle	% **dw** in muscle	% **lw** in liver	% **dw** in liver	% **lw** in soft body	% **dw** in soft body	% **lw** in tail muscle	% **dw** in tail muscle
Scomber scombrus	Atlantic mackerel		25.6	7.0	26.6				
Zoarces viviparus	eelpout	0.6	18.7		22.1				
Cerastoderma edule	common cockle						19.0		
Mya arenaria	softshell clam					0.8	14.8		
Ruditapes philippinarum	manila clam						16.0		
Mytilus edulis	blue mussel					1.3	16.1		
Mytilus galloprovincialis	Mediteranean mussel					2.2	19.0		
Crassostrea gigas	Pacific oyster					2.1	18.0		
Ostrea edulis	native oyster					1.8	20.5		
Crangon crangon	common shrimp							1.4	27.3
Littorina littorea	common periwinkle						21.3		
Nassarius reticulatus	netted dog whelk						26.8		
Nucella lapillus	dog whelk						33.0		

PAH EACs

The PAH EACs was derived as the PCB's but the use of BCF was accepted, so no recalculation using $EAC^{passive}$. EQS for fluoranthene and benzo(a)pyrene are set for human health, so these are used in the human health assessment part.

Alkylated PAH ERLs

The alkylated PAH ERLs was not part of the original work by Long et al, but is nevertheless presented with reference to Long by Barakat et al, 2011. The values presented in Barakat et al are in agreement with the OSPAR targets used, but it does not give any indication from where the values originate. The ERLs have been decommissioned as OSPAR assessments due to the missing provenance.

Metal ERLs

The metal in biota EACs was rejected, and as a last resort, EU food criteria were used directly. From 2020 the food criteria are dealt with separately, and only BAC are used for environmental assessments, together with the EQS for mercury. Due to the low limit of the EQS, BAC for fish and oysters will not be used, and the EQS will be applied directly to both fish and shellfish without trophic adjustment or adjustment to whole fish. The QS derived for metals are lower than the BAC for mussels, so not considered helpful in the assessment.

2020 updated Audit trail of OSPAR EACs and other assessment criteria used to distinguish above and below thresholds

For sediments, it was decided to use the US-EPA ERL system (NOAA, 1999; Buchman 2008) as a precautionary limit. The Effect Range Low is set on the basis of ecotoxicological criteria for sediment living organisms (Long *et al*, 1995), and based set as the lower 10% effect level. As such, it is possible, but unlikely that effects can occur at concentrations lower than the ERL. A concentration above the ERL is on the other hand not a sign that effects will be expected (O'Conner, 2004), but only that it cannot be excluded that an effect can occur. As the dataset used is from before 1995, an update should yield at least some new data.

TBT EAC and Swedish EQS sediment.

The TBT EAC was set in the 2004 BRC/EAC workshop of The Hague. The EAC for biota was accepted, but the EAC for sediment was not included.

Short description of the datasets used for ERL derivation

ERL for methods are based on ppm dry weight (mg/kg DW), and organics on ppb dry weight (µg/kg DW).

Long et al (1995), Donald et al (1996) and NOAA (1999) contains metals (also Ag at 1 mg/kg DW) and PAHs – inclusive sums of PAHs, 2-methyl-naphthalene, ppDDE, total DDTs and total PCBs. There is also a Quick reference table (NOAA 2008), which includes a slightly higher number of substances, but as an official NOAA list can be taken as accepted and Quality assured publication for use by US authorities.

The Swedish EPA set an EQS for TBT (Sahlin& Ågerstrand, 2018) which was presented at MIME 2019, the background to the derivation of the standard and proposed a way forward for use in QSR2023 (MIME 19/3/6). The limit was found at 1.6 µg/kg at 5% TOC, i.e. 0.8 µg/kg at the OSPAR normalisation level of 2.5% TOC.

EU EQS values for biota

The revision of the EU EQS directive in 2013 added several new substances to the biota EQS list, compared to the original three (Hg, Hexachloro- benzene and Hexachloro- butadiene). The background documents for many of these can be found in the corresponding EQS data sheets (EC 2006) and revisions as EQS dossiers (EC 2011b). There is a clear statement that the EQS biota values are set for fish, apart from dioxins, which could and PAHs and fluoranthene which should be measured in crustaceans and molluscs. It is possible to use other biota taxa, as long as they provide the same level of protection though. As PAH's are only given as Benz(a)pyrene toxicity, it is suggested to only measure this PAH, but another way to go is to use toxicity factors for the other PAH's using e.g. (Fisher et al, 2011; Nisbet LaGoy, 1992 given first) or the pragmatic way by the ratio of EAC for the individual PAH to benz(a)pyrene (given below under OSPAR comments).

It should also be noted, that in the guideline for using EQS_{biota} (EU, 2014) a discussion on the use of fish data from fillet or liver vs. whole fish, and comparison of QS's based on human health vs. secondary poisoning for most of the contaminants (except Hg, dicofol and HBCDD) are generally higher for secondary poisoning (a factor of 2 to 5000). The conclusion is that for organochlorines, a lipid corrected concentrations would be preferable, whereas Hg and PFOS probably should be corrected to dry weight. Another topic of discussion is the trophic level, where freshwater is assumed to be protective around 4.5 whereas marine top predators typically is at 5.5, interpreted like the level to analyse from to secure adequate protection in freshwater systems is trophic level 3.5, versus 4.5 in the marine environment. The guide suggests an adjusted (equally protective) $EQS_{biota, x}$ can be calculated from the trophic level magnification factor (TMF) for the taxon x at trophic level TL(x), also considering a factor for the expected difference in lipid content (not included in the formula):

$EQS_{biota,x} = EQS_{biota}/TMF^{(4-TL(x))}$

Alternatively, the measured concentration can be adjusted to fit the EQS (including correction for lipid/dry weight):

$Conc_{TL\text{-}adj,\,norm} = conc_{meas} * TMF^{(4-TL(x))} *0.05/Lipid\ content_x$ [or for Hg, PFOS: * 0.26/dry weight $_x$]

Examples of TL and model lipid contents can be found in the Hg-EQS document [reference to Brendans document]. It was not generally accepted by the contracting parties to adjust the concentrations for Trophic levels, as it was considered to introduce very high degree of uncertainty in the end results. It was also noted that a 5% fat normalisation could be used according to (EU, 2014), for Hg it was noticed that this would amount to the same correction factor as for trophic levels, and this would again lead to higher uncertainty in the final values.

No	Name of substance	EQS biota[12] µg/kg wet weight	OSPAR Comments
5	Brominated diphenylethers[5]	0.0085	Fish ∑28, 47, 99, 100, 153 and 154
15	Fluoranthene	30	Crustaceans and molluscs OSPAR 110 µg/kg DW!
16	Hexachloro- benzene	10	Fish
17	Hexachloro- butadiene	55	Fish
21	Mercury and its compounds	20	Fish
28	PAHs		Crustaceans and molluscs
	Benzo(a)pyrene	5	OSPAR 600 µg/kg DW!
	Benzo(b)fluoranthene	Footnote 11 *(Nisbet: 0,5)*	TEF(B(a)P)* 10.4; n.a.
	Benzo(k)fluoranthene	Footnote 11 *(Nisbet: 2)*	TEF(B(a)P)* 2.7; 600/260= 2.3
	Benzo(g,h,i)perylene	Footnote 11 *(Nisbet: 1)*	TEF(B(a)P)* 0.1; 600/110= 5.5
	Indeno(1,2,3- cd)pyrene	Footnote 11 *(Nisbet: 1,7)*	TEF(B(a)P)* 3; n.a.
34	Dicofol	33	Fish
35	Perfluorooctane sulfonic acid and its derivatives (PFOS)	9.1	Fish
37	Dioxins and dioxin-like compounds	Sum of PCDD+PCDF+ PCB-DL 0,0065 µg kg^{-1} TEQ[14]	Fish, crustaceans and molluscs
43	Hexabromocyclododecane (HBCDD)	167	Fish
44	Heptachlor and heptachlor epoxide	$6.7 \cdot 10^{-3}$	Fish

(1) CAS: Chemical Abstracts Service.

(2) This parameter is the EQS expressed as an annual average value (AA-EQS). Unless otherwise specified, it applies to the total concentration of all isomers.

(5) For the group of priority substances covered by brominated diphenylethers (No 5), the EQS refers to the sum of the concentrations of congener numbers 28, 47, 99, 100, 153 and 154.

(11) For the group of priority substances of polyaromatic hydrocarbons (PAH) (No 28), the biota EQS and corresponding AA-EQS in water refer to the concentration of benzo(a)pyrene, on the toxicity of which they are based. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA- EQS in water.

(12) Unless otherwise indicated, the biota EQS relate to fish. An alternative biota taxon, or another matrix, may be monitored instead, as long as the EQS applied provides an equivalent level of protection. For substances numbered 15 (Fluoranthene) and 28 (PAHs), the biota EQS refers to crustaceans and molluscs. For the purpose of assessing chemical status, monitoring of Fluoranthene and PAHs in fish is not appropriate. For substance number 37 (Dioxins and dioxin-like compounds), the biota EQS relates to fish, crustaceans and molluscs, in line with section 5.3 of the Annex to Commission Regulation (EU) No 1259/2011 of 2 December 2011 amending Regulation (EC) No 1881/2006 as regards maximum levels for dioxins, dioxin-like PCBs and non-dioxin-like PCBs in foodstuffs (OJ L 320, 3.12.2011, p. 18).

(13) These EQS refer to bioavailable concentrations of the substances.

(14) PCDD: polychlorinated dibenzo-p-dioxins; PCDF: polychlorinated dibenzofurans; PCB-DL: dioxin-like polychlorinated biphenyls; TEQ: toxic equivalents according to the World Health Organisation 2005 Toxic Equivalence Factors.'

*: TEF by Nisbet and LaGoy (1992); then OSPAR EAC ratio

Federal Environmental Quality Guidelines (FEQGs) from Canada

Canada (2018) have also set up a system for deriving environmental quality guidelines. In the MIME 2017 meeting, the lack of PBDE EQS and EACs was tried to be filled with the Canadian FEQS, based on the Environment Canada (2013) derived values. The FEQS are derived based on ecotoxicological values, and the basis for derivation was the lowest toxicity endpoint with an application factor of 100 (10 to account for the extrapolation from laboratory to field conditions and inter- and intra- species variations in sensitivities, and 10 because PBDEs are persistent and bioaccumulative). The only accepted data was for invertebrates, as fish data was found to be of unacceptable quality. Data used for the assessment was *Acartia tonsa* for the congeners 28,47,99 and 100 and Daphnia magna for 153 and heptaBDE and octaBDE's, combined with mouse, mink and American Kestrel data for wildlife diet (mammalian). Lipid weight normalisation was used for BMF. For sediments, data was normalised to 1% organic carbon, and the most sensitive species was found to be the oligochaete (*Lumbriculus variegatus*) over amphiphods. The sediment values were corrected to 2.5% TOC for us in the OSPAR trial assessment.

For biota, the FEQGs would be multiplied by 20 in trial assessment 2020, so that they were on a lipid weight basis (assuming the fish used in the toxicity trials had 5% lipid). The fish assessment would then be conducted on a lipid weight basis. However, the shellfish assessment would continue to be conducted on a wet weight basis (since most shellfish have lipid content less than 3%), with the FEQGs adjusted to take into account the lower lipid content of shellfish by multiplying the original FEQGs by the ratio $lipid_{shellfish}$ / 5 (where $lipid_{shellfish}$ is the typical % lipid content of the shellfish species being assessed from table 4 above).

The documentation on use of FEQS and BACs have been published in (OSPAR 2020a and 2020b) giving more details on why the FEQS are preferred to QS, due to more specific values and more stringent assessment outcome as not all .

Table 5. *Federal Environmental Quality Guidelines for Polybrominated Diphenyl Ethers (PBDEs) (from Environment Canada, 2013) NOTE: Fish tissue converted to lipid by a factor of 20.*

Homologue*	**Congener**	**Water (ng/L)**	**Fish Tissue (ng/g lipid)**	**Sediment ** (ng/g dw)**	**Wildlife Diet† (ng/g ww food source)**	**Bird Eggs (ng/g ww)**
triBDE	total	46	2400	44	–	–
tetraBDE	total	24	1760	39	44	–
pentaBDE	total	0.2	20	0.4	3 (mammal) 13 (birds)	29‡
pentaBDE	BDE-99	4	20	0.4	3	–
pentaBDE	BDE-100	0.2	20	0.4	–	–
hexaBDE	total	120	8400	440	4	–
heptaBDE	total	17¦¦	–	–	64	–
octaBDE	total	17¦¦§	–	5600§	63§	–
nonaBDE	total	–	–	–	78	–
decaBDE	total	–	–	19§#	9	–

*FEQG for triBDE (tribromodiphenyl ether), tetraBDE (tetrabromodiphenyl ether), hexaBDE (hexabromodiphenyl ether), heptaBDE (heptabromodiphenyl ether), nonaBDE (nonabromodiphenyl ether) and decaBDE (decabromodiphenyl ether) are based on data for the congeners: BDE-28, BDE-47, BDE-153, BDE-183, BDE-206, and BDE-209, respectively unless otherwise noted.

**Values normalised to 1% organic carbon.

† Applies to mammalian wildlife unless otherwise noted.

‡ Value based on the commercial PentaBDE formulation, DE-71, which contains mostly pentaBDE and some tetraBDE.

¦¦ Values based on commercial OctaBDE mixture DE-79, which is composed mainly of heptaBDE and octaBDE (octabromodiphenyl ether).

§ Values adopted from Ecological Screening Assessment Report (Environment Canada 2006). Sediment guidelines for octaBDE and decaBDE were adapted from the SAR by being corrected for the reported sediment organic carbon

References

Barakat, A.O, Mostafa, A. Wade, T.L., Sweet, S.T., El Sayed, N.B. (2011): Assessment of persistent organochlorine pollutants in sediments from Lake Manzala, Egypt. Marine Pollution Bulletin 62, 1969-1978

Buchman, M.F. (2008) NOAA Screening Quick reference Tables, NOAA OR&R Report 08-1, Seattle WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34 Link: http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf

Canada (2018) Federal Environmental Quality Guidelines (FEQGs) https://www.canada.ca/en/health-canada/services/chemical-substances/fact-sheets/federal-environmental-quality-guidelines.html#a5

DONALD D. MACDONALD, R. SCOTT CARR, FRED D. CALDER, EDWARD R. LONG and CHRISTOPHER G. INGERSOLL (1996): Development and evaluation of sediment quality guidelines for Florida coastal waters. Ecotoxicology 5: 253-278

EC 1881/2006 Commission Regulation (EC) No 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs. http://data.europa.eu/eli/reg/2006/1881/oj

EC 1259/2011 Commission Regulation (EU) No 1259/2011 of 2 December 2011 amending Regulation (EC) No 1881/2006 as regards maximum levels for dioxins, dioxin-like PCBs and non dioxin-like PCBs in foodstuffs. http://data.europa.eu/eli/reg/2011/1259/oj

EC (2006) WFD EQS datasheets. Bibliotek > framework_directive > thematic_documents > priority_substances > supporting_background > substance_sheetshttps://circabc.europa.eu/w/browse/b55f4c81-d664-43db-8b27-264b26a7424b

EC (2011) Guidance Document No. 27 Technical Guidance For Deriving Environmental Quality Standards. Technical Report - 2011 - 055 ISBN: 978-92-79-16228-2 DOI: 10.2779/43816 https://circabc.europa.eu/w/browse/a3c92123-1013-47ff-b832-16e1caaafc9a

EC (2011b) EQS dossiers for priority substances. https://circabc.europa.eu/webdav/CircaBC/env/wfd/Library/framework_directive/thematic_documents/priority_substances/supporting_substances/eqs_dossiers

Environment Canada (2013) Federal Environmental Quality Guidelines *Polybrominated Diphenyl Ethers* (PBDEs) http://www.ec.gc.ca/ese-ees/05DF7A37-60FF-403F-BB37-0CC697DBD9A3/FEQG_PBDE_EN.pdf

EPA (2005): Marine Water Pollution: Estuarine Sediment Concentrations (www.nj.gov/dep/bmw)

EU (2013) EU daughter directive for EQS's: Directive 2013/39/EU (24.8.2013)

EU (2014) COMMON IMPLEMENTATION STRATEGY FOR THE WATER FRAMEWORK DIRECTIVE (2000/60/EC) Guidance Document No. 32 ON BIOTA MONITORING (THE IMPLEMENTATION OF EQSBIOTA) UNDER THE WATER FRAMEWORK DIRECTIVE. Technical Report - 2014 - 083

Long, E.R., MacDonald, D.D., Smith S.L. and Calder F.D. (1995): Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management 19(1):81-97

MAS 461 – see OSPAR (2009)

NOAA (1999) Sediment Quality Guidelines developed for the National Status and Trends Program (http://ccma.nos.noaa.gov/publications/sqg.pdf)
O'Conner, T.P. (2004): Marine Pollution Bulletin 49, 383–385

OSPAR (1998). Report of the Third OSPAR Workshop on Ecotoxicological Assessment Criteria The Hague: 25-29 November 1996. Hazardous Substances Series ISBN 0 94955 79 4

OSPAR (2004). OSPAR/ICES Workshop on the evaluation and update of background reference concentrations (B/RCs) and ecotoxicological assessment criteria (EACs) and how these assessment tools should be used in assessing contaminants in water, sediment and biota. Anders Bignert , Daniel Cossa, Richard Emmerson, Rob Fryer, Christine Füll, Jose Fumega, Remi Laane, Hector Martinez Calls, Brendan McHugh, Brian Miller, Geoff Millward, Colin Moffat (editor), Janny Pijnenburg (editor), Patrick Roose, Anders Ruus, Stefan Schmolke, Foppe Smedes, Jakob Strand, Joost Stronkhorst, John Thain, Chrystèle Tissier, Theo Traas (editor) and Jacek Tronczynski.

OSPAR (2004b) MON 04/02/02, Application of proposed Background Concentrations and Environmental Assessment Criteria in the CEMP Assessment. MEETING OF THE WORKING GROUP ON MONITORING (MON) COPENHAGEN: 6-10 DECEMBER 2004

OSPAR (2008). OSPAR Publication 2008-379 CEMP Assessment Manual: Co-ordinated Environmental Monitoring Programme Assessment Manual for contaminants in sediment and biota. https://www.ospar.org/documents?v=7115

OSPAR (2009) MAS 461, Monitoring and assessment series 461, Background document on CEMP Assessment Criteria for QSR 2010). https://www.ospar.org/documents?v=7167

OSPAR(2020a) Hazardous substances and Eutrophication series 2020/760. Background document for Canadian Federal Environmental Quality Guidelines (FEQGs) for Polybrominated Diphenyl Ethers (PBDEs) in sediment and biota. https://www.ospar.org/documents?v=42746

OSPAR(2020b) Hazardous substances and Eutrophication series 2020/761. Background document on background assessment concentrations for Polybrominated Diphenyl Ethers (PBDE) in sediment report https://www.ospar.org/documents?v=42738

OSPAR(2020c) Hazardous substances and Eutrophication series 2020/762. Background document on Tributlytin (TBT) in sediment, Swedish Quality Standard. https://www.ospar.org/documents?v=43227

Sahlin, S. Ågerstrand, M. (2018) Tributyltin – TBT, Sediment EQS derivation, ACES report 29, Department of Environmental Science and Analytical Chemistry (ACES). Stockholm University. URN: urn:nbn:se:su:diva-169620

SIME (2008) Documents from SIME 2008, agenda item 5: *0505 EACs, 0505a1_NL sime EAC for PAH,*

0505a2_NL sime EAC for PCB. https://www.ospar.org/meetings/archive/working-group-on-concentrations-trends-and-effects-of-substances-in-the-marine-environment-4

2020 updated Audit trail of OSPAR EACs and other assessment criteria used to distinguish above and below thresholds

Appendix 1 OSPAR EACs and equivalent green / red transition assessment criteria

The sum of CBs was removed, as it is not agreed in the EU as an EQS.

Matrix / Determinand	OSPAR EAC or proxy	value	(MAC-) EQS	Adoption of EAC or proxy by OSPAR	Derivation of EAC or proxy	Comments
Water						
CBs (ng/l)						
CB28	EAC	0.7	-	Not adopted	SIME 08/5/5-Add.2-E	Used to derive biota and sediment EAC
CB52	EAC	0.86		Not adopted	SIME 08/5/5-Add.2-E	Used to derive biota and sediment EAC
CB101	EAC	0.2		Not adopted	SIME 08/5/5-Add.2-E	Used to derive biota and sediment EAC
CB118	EAC	0.026		Not adopted	SIME 08/5/5-Add.2-E	Used to derive biota and sediment EAC
CB138	EAC	0.2		Not adopted	SIME 08/5/5-Add.2-E	Used to derive biota and sediment EAC
CB153	EAC	1.0		Not adopted	SIME 08/5/5-Add.2-E	Used to derive biota and sediment EAC
CB180	EAC	0.2		Not adopted	SIME 08/5/5-Add.2-E	Used to derive biota and sediment EAC

Fish muscle metals (µg/kg)		ww	ww			
Mercury	MPC EQS QS	500	20 22$ QS	MAS 461 (table 5c) (OSPAR 2009) 21_Mercury_EQSdatasheet (150105)		EC food limit (Commission Regulation (EC) No 1881/2006) inappropriate proxy for EAC EQS from 2013/39/EU QS secondary poisoning as MeHg not used
Cadmium	MPC	50		EC 1881/2006		
Lead	MPC	300		EC 1881/2006		
Fish liver metals (µg/kg)		ww	ww			
Cadmium	MPC	1000		MAS 461 (table 5c)		EC food limit (Commission Regulation (EC) No 1881/2006) used, but inappropriate proxy for EAC
Lead	MPC	1500		MAS 461 (table 5c)		EC food limit (Commission Regulation (EC) No 1881/2006) used, but inappropriate proxy for EAC
CBs (µg/kg)		lw	ww			
CB28	EAC	64		MAS 461 (table 5c)	SIME080505a2, MAS 461	conversion errors so need to be revised
CB52	EAC	108		MAS 461 (table 5c)	SIME080505a2, MAS 461	conversion errors so need to be revised
CB101	EAC	120		MAS 461 (table 5c)	SIME080505a2, MAS 461	conversion errors so need to be revised
CB118	EAC	24		MAS 461 (table 5c)	SIME080505a2, MAS 461	conversion errors so need to be revised
CB138	EAC	316		MAS 461 (table 5c)	SIME080505a2, MAS 461	conversion errors so need to be revised
CB153	EAC	1600		MAS 461 (table 5c)	SIME080505a2, MAS 461	conversion errors so need to be revised
CB180	EAC	480		MAS 461 (table 5c)	SIME080505a2, MAS 461	conversion errors so need to be revised
SCB6 (CB28+CB52+CB101+ CB138+CB153+CB180)	MPC MPC	fish liver fish muscle	75 200	Trial 2020	EC 1259/2011 EC 1259/2011	Used for Human Health. Fish muscle also applied to shellfish

other (µg/kg)		ww				
γ-HCH	EAC fish EAC fish liver EAC fish	1.1 11 (0.5-5)		MON 2004 (MON 1998 annex 5) (Agreement 97-15e-2)	OSPAR, 2004b Derived from 1.1 µg/kg ww whole fish in OSPAR (2008) (OSPAR Commission, 1996 Third Workshop on Ecotoxicological Assessment Criteria)	Derived intersessionally MON 04/02/02 page 17 First used in OSPAR 390:2009 CEMP Assessment EAC in liver is EAC in whole fish multiplied by 10, by expert judgement of the MON group. Original EAC range (firm) for fish
DDE	EAC	5-50		Agreement 97-15e-2	OSPAR Commission, 1996 Third Workshop on Ecotoxicological Assessment Criteria	Not assessed in 2004 as DDT/DEE was not part of the OSPAR list of substances anymore, but it is still analysed together with PCBs and show a nice decreasing trend most places.
HCB (Hexachlorobenzene)			10			EQS from 2013/39/EU
HCBD (Hexachlorobutadien)			55			EQS from 2013/39/EU
PFOS			9.1			EQS from 2013/39/EU Perfluorooctane sulfonic acid and its derivatives, taken as human health (fish muscle), conversion factor for liver of 5 used. Directly used on shelfish.

Mussel/oyster (µg/kg)						
metals (µg/kg)		ww	ww			
Mercury	MPC EQS QS	500	 20 22$	MAS 461 (table 5b) 21_Mercury_EQSdatasheet (150105)		EC food limit (Commission Regulation (EC) No 1881/2006) inappropriate proxy for EAC EQS from 2013/30/EU (whole fish) QS secondary poisoning from 150105 as MeHg not used
Cadmium	MPC QS	1000	 160$	MAS 461 (table 5b) 06_Cadmium_EQSdatasheet (310705)		EC food limit (Commission Regulation (EC) No 1881/2006) inappropriate proxy for EAC QS secondary poisoning from 310705
Lead	MPC QS	1500	 1000$	MAS 461 (table 5b) 20_Lead_EQSdatasheet (310705)		EC food limit (Commission Regulation (EC) No 1881/2006) inappropriate proxy for EAC QS secondary poisoning from 310705
CBs (µg/kg)		dw	ww			
CB28	EAC	3.2	67	MAS 461 (table 5b)	SIME080505a2, MAS 461	conversion errors so needs to be revised
CB52	EAC	5.4	108	MAS 461 (table 5b)	SIME080505a2, MAS 461	conversion errors so needs to be revised
CB101	EAC	6.0	121	MAS 461 (table 5b)	SIME080505a2, MAS 461	conversion errors so needs to be revised
CB118	EAC	1.2	25	MAS 461 (table 5b)	SIME080505a2, MAS 461	conversion errors so needs to be revised
CB138	EAC	15.8	317	MAS 461 (table 5b)	SIME080505a2, MAS 461	conversion errors so needs to be revised
CB153	EAC	80	1585	MAS 461 (table 5b)	SIME080505a2, MAS 461	conversion errors so needs to be revised
CB180	EAC	240	469	MAS 461 (table 5b)	SIME080505a2, MAS 461	conversion errors so needs to be revised
SPCB6 (sum of CB28+52+ 101+138+153+180)	MPC MPC		0,075 0,200	Trial 2020	EC 1259/2011 EC 1259/2011	Fish muscle Fish liver

2020 updated Audit trail of OSPAR EACs and other assessment criteria used to distinguish above and below thresholds

PBDEs (µg/kg)						
BDE28	FEQS		120	OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialled 2017->
BDE47	FEQS		44	OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialled 2017->
BDE99	FEQS		1	OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialled 2017->
BD100	FEQS		1	OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialled 2017->
BD153	FEQS		4	OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialled 2017->
BD154	FEQS		4	OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialled 2017->
SBDE6 (sum of BDE's above)	EQS QS		0.0085[HH] 44 [Sec.pois.]	OSPAR(2020a)	PolyBDEs EQS dossier 2011	EQS from 2013/39/EU QS from PolyBDEs EQS dossier 2011.
HBCDD (Hexabromo-cyclododecane)	EQS		167		HBCDD EQS dossier 2011	EQS from 2013/39/EU

PAHs (µg/kg)		dw	ww			
Naphthalene	EAC	340		MAS 461 (table 5b)	SIME080505a1	
Phenanthrene	EAC	1700		MAS 461 (table 5b)	SIME080505a1	
Anthracene	EAC	290		MAS 461 (table 5b)	SIME080505a1	
Fluoranthene	EAC EQS	110	 30	MAS 461 (table 5b)	SIME080505a1	 EQS from 2013/39/EU crustaceans and molluscs.
Pyrene	EAC	100		MAS 461 (table 5b)	SIME080505a1	
Benzo[bj]]fluoranthene	EQS		*			EQS from 2013/39/EU crustaceans and molluscs.
Benzo[k]fluoranthene	EAC	260	*	MAS 461 (table 5b)	SIME080505a1	EQS from 2013/39/EU crustaceans and molluscs.
Benz[a]anthracene	EAC	80		MAS 461 (table 5b)	SIME080505a1	
Benzo[a]pyrene	EAC EQS	600	 5*	MAS 461 (table 5b)	SIME080505a1	 EQS from 2013/39/EU
Benzo[ghi]perylene	EAC	110	*	MAS 461 (table 5b)	SIME080505a1	EQS from 2013/39/EU crustaceans and molluscs.
Indeno[1,2,3-cd] pyrene	EQS		*			EQS from 2013/30/EU crustaceans and molluscs

2020 updated Audit trail of OSPAR EACs and other assessment criteria used to distinguish above and below thresholds

other (µg/kg)		dw	**ww**			
γ-HCH	EAC QS		1.1 *(22 lw)* 61 HH		18_HCHs-combined_EQSdatasheet_310705	Will be used as 22 µg/kg lipid weight in 2020, based on 5% lipid used for deriving the ww content. Applied to both fish muscle and liver. QS used for human health
DDE (p,p-)	EAC	5-50		Agreement 1997-15e	OSPAR Commision, 1996 Third Workshop on Ecotoxicological Assessment Criteria	Not assessed in 2004 as DDT/DEE was not part of the OSPAR list of substances anymore, but it is still analysed together with PCBs and show a nice decreasing trend most places.
TBT	EAC	12	15.2 Sec.pois. 230 HH	Agreement 2009-2	Derived from 2.4 µg/kg ww in OSPAR 379 2008 30_Tributyltin_EQSdatasheet_150105	Sec.Pois=:QS secondary poisoning HH.= QS human Health QS from 30_Tributyltin_EQSdatasheet_150105
Dioxin TEQ-DFP	QS		0.0012 *(0.024 lw)*	Trial 2020	Dioxins & PCB-DL EQS dossier 2011	Converted to 0.024 µg/kg lw assuming 5% lw. Used for shellfish and fish liver, muscle
Dioxin TEQ-DFP	MPC MPC		0.0065 0.020	Trial 2020	EC 1259/2011 EC 1259/2011	TEQ fish muscle TEQ fish liver

Sediment						
metals (mg/kg)		5% Al				
Arsenic	ERL	8.2			NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised) Not used as ERL < BC
Cadmium	ERL	1.2		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Chromium	ERL	81			NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised).
Copper	ERL	34			NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised).
Mercury	ERL	0.15		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Nickel	ERL	21			NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised) Not used as ERL < BC
Lead	ERL	47		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Zinc	ERL	150			NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised).
CBs (µg/kg)		2.5% TOC				
CB28	EAC	1.7		MAS 461 (table 5a)	SIME080505a1, MAS 461	
CB52	EAC	2.7		MAS 461 (table 5a)	SIME080505a1, MAS 461	
CB101	EAC	3.0		MAS 461 (table 5a)	SIME080505a1, MAS 461	
CB118	EAC	0.6		MAS 461 (table 5a)	SIME080505a1, MAS 461	
CB138	EAC	7.9		MAS 461 (table 5a)	SIME080505a1, MAS 461	
CB153	EAC	40		MAS 461 (table 5a)	SIME080505a1, MAS 461	
CB180	EAC	12		MAS 461 (table 5a)	SIME080505a1, MAS 461	
PBDEs (µg/kg)		2.5% TOC				

2020 updated Audit trail of OSPAR EACs and other assessment criteria used to distinguish above and below thresholds

BDE28	FEQS	110		OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialed 2017->
BDE47	FEQS	97.5		OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialed 2017->
BDE66	FEQS	97.5		OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialed 2017->
BDE85	FEQS	1		OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialed 2017->
BDE99	FEQS	1		OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialed 2017->
BD100	FEQS	1		OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialed 2017->
BD153	FEQS	1100		OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialed 2017->
BD154	FEQS	1100		OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialed 2017->
BD183	FEQS	14000		OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialed 2017->
BD209	FEQS	47.5		OSPAR(2020a)	Environment Canada 2013	Background document 2020 and trialed 2017->
TBT (µg/kg)		2.5% TOC				
TBT	EQS^{S}	0.8		OSPAR(2020c)	MIME 19/3/6 Sahlin S&Ågerstrand, M ACES 29, 2018	EQS calculated by Sweden. Note the original value of 1.6µg/kg at 5% TOC was adjusted to 2.5% TOC by division with 2.

PAHs (µg/kg)		2.5% TOC				
Naphthalene	ERL	160		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Phenanthrene	ERL	240		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Anthracene	ERL	85		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Dibenzothiophene	ERL	190		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Fluoranthene	ERL	600		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Pyrene	ERL	665		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Benz[a]anthracene	ERL	261		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Chrysene/Triphenylene	ERL	384		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised) ERL applies to CHR, but formally adopted for CHRTR – currently assess CHR
Benzo[a]pyrene	ERL	430		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Benzo[ghi]perylene	ERL	85		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
Indeno[1,2,3-cd] pyrene	ERL	240		MAS 461 (table 5a)	NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
2-methyle-Naphthalene	ERL	70			NOAA (1999)/Long (1995)	ERL for whole sediment (not-normalised)
C1-Naphthalene	ERL	155			Barakat (2011)[&]	ERL for whole sediment (not-normalised). ERL rejected due to lack of provenance
C2-Naphthalene	ERL	150			Barakat (2011)[&]	ERL for whole sediment (not-normalised). ERL rejected due to lack of provenance
C1-Phenanthrene	ERL	170			Barakat (2011)[&]	ERL for whole sediment (not-normalised). ERL rejected due to lack of provenance

2020 updated Audit trail of OSPAR EACs and other assessment criteria used to distinguish above and below thresholds

PAHs (µg/kg)		2.5% TOC				
C2-Phenanthrene	ERL	200			Barakat (2011)[&]	ERL for whole sediment (not-normalised). ERL rejected due to lack of provenance
C1-Dibenzothiophene	ERL	85			Barakat (2011)[&]	ERL for whole sediment (not-normalised). ERL rejected due to lack of provenance
γ-HCH	ERL	3	1.1 [QS,] µg/kg dw	OSPAR agreement 2009-2	USEPA (2005); as BHC	First used in OSPAR 390:2009 CEMP Assessment
DDE-p,p'	ERL	2.2		OSPAR agreement 2009-2	NOAA (1999)/Long (1995) Buchman (2008)	First used in OSPAR 390:2009 CEMP Assessment
DDT-p,p'	ERL	1			MacDonald (1996)	For future use
Sum DDT	ERL	1.58			NOAA (1999)/Long (1995) NOAA (2008)	For future use, sum of all DDTs
HCB	ERL	20		OSPAR agreement 2009-2	USEPA (2005); Buchman (2008)	First used in OSPAR 390:2009 CEMP Assessment
Dieldrin	ERL	0.02 (Revised according to macDonald)		OSPAR agreement 2009-2	MacDonald (1996)/ Buchman (2008)	First used in OSPAR 390:2009 CEMP Assessment Notice error of a factor 100 compared to MacDonald (1996)

$: EQS datasheet 2005 secondary poisoning of top-predators

§: EQS datasheet 2005 Food uptake by man

*: the biota EQS and corresponding AA-EQS in water refer to the concentration of benzo(a)pyrene, on the toxicity of which they are based. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA- EQS in water.

[&]: Barakat (2011) reference to Long (1995) for methylated PAHs but these are not found in Long (1995). C1-Naphthalenes as 70+85 for 2-methylnaphthalene and 1-methylnapthalene respectively used in the table above

Notes

- MIME 2011 Annex 4 gives species specific factors for converting fish EACs between lw, ww and dw bases
- MIME 2011 Annex 4 gives species specific factors for converting mussel / oyster EACs between ww and dw bases
- The latest conversion factors can be found on the web-tool http://dome.ices.dk/OSPARMIME2018/main.html under assessment criteria, and species-specific conversion factors

The Aspect
12 Finsbury Square
London EC2A 1AS
United Kingdom

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

Our vision is a clean, healthy and biologically diverse North-East Atlantic Ocean, which is productive, used sustainably and resilient to climate change and ocean acidification.

Publication Number: 798/2021