

Chapter 3 Summary of Results of the FY2003 Environmental Survey for Exposure Study

1. Purpose of the Survey

The purpose of this survey is to grasp the status of environmental persistence of chemical substances such as the Designated Chemical Substances specified in the Chemical Substances Control Law and Class 1 Designated Chemical Substances of the PRTR Law, which is necessary for understanding the exposure amount to humans and wildlife used in the environmental risk assessment targeting these chemical substances.

2. Target survey substances, media and survey areas

In FY2003, environmental survey for exposure study was conducted on the following 7 substances (groups) totaling 10 substances-media selected from among the priority substances-media determined by the Expert Group on Substance Selection of the Comprehensive Survey of Chemical Substances on Environmental Safety.

Table 3-1 Target Substances and Media for the FY2003 Environmental Survey for Exposure Study

Survey No.	Target Substance	Number of survey areas classified by media		
		Surface water	Bottom sediment	Aquatic wildlife
1	Octabromodiphenyl ether	38		9
2	<i>o</i> -Chloroaniline	38		
3	1-Chloro-2,4-dinitrobenzene	38		
4	2,4-Dinitrophenol	38		
5	Phenol	38		
6	Perfluorooctane sulfonic acid (PFOS)		20	9
7	Perfluorooctanoic acid (PFOA)		20	9

Surveyed areas are shown in Figures 3-1 to 3-3. Surveys were conducted for 5 substances (groups) in 38 areas in total for surface water (Figure 3-1), 2 substances (groups) in 20 areas in bottom sediment (Figure 3-2), 3 substances (groups) in 9 areas for aquatic wildlife (Figure 3-3).

3. Sampling and analytical method

Suggested sampling and analytical methods are shown in Appendix C and Appendix D, respectively.

4. Survey results

Among the 7 substances (groups) in the total of 10 substances-media, 7 substances-media were detected. The 3 substances-media exceptions were octabromodiphenyl ether in aquatic wildlife, 2,4-dinitrophenol and phenol in surface water, and PFOS and PFOA both in bottom sediment and aquatic wildlife.

Table 3-2 List of Detection Limits of the Environmental Survey for Exposure Study in FY2003

Survey No.	Substance	Detection limit		
		Surface water (ng/L)	Bottom sediment (ng/g-dry)	Aquatic wildlife (ng/g-wet)
1	Octabromodiphenyl ether	3		0.0007
2	<i>o</i> -Chloroaniline	25		
3	1-Chloro-2,4-dinitrobenzene	10		
4	2,4-Dinitrophenol	19		
5	Phenol	28		
6	PFOS		0.096	0.033
7	PFOA		0.070	0.059

Note 1: Hatched area denotes that the survey was conducted in other media not targeted in this survey.

Note 2: Measured values of bottom sediment are converted to dry sediment basis and the maximum detection limit was determined as the detection limit for each area, because the detection limit for each area varied considerably depending on the difference of the sediment moisture content.

Table 3-3 Summary of Results of the Environmental Survey for Exposure Study in FY2003

Survey No.	Substance	Surface water 38 areas, 114 samples		Bottom sediment 20 areas, 60 samples		Aquatic wildlife 9 areas, 27 samples	
		Range (frequency (area))	Median value (ng/L)	Range (frequency (area))	Median value (ng/g-dry)	Range (frequency (area))	Median value (ng/g-dry)
1	Octabromodiphenyl ether	ND (0/38)	ND			ND - 0.064 (8/9)	0.0065
2	<i>o</i> -Chloroaniline	ND (0/38)	ND				
3	1-Chloro-2,4-dinitrobenzene	ND (0/38)	ND				
4	2,4-Dinitrophenol	ND - 540 (5/38)	ND				
5	Phenol	ND - 670 (6/38)	ND				
6	PFOS			ND - 1.5 (10/20)	tr (0.076)	0.16 - 16 (9/9)	1.3
7	PFOA			ND - 0.55 (12/20)	tr (0.066)	ND - 0.10 (4/9)	ND

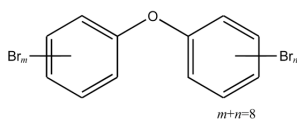
Note 1: Hatched area denotes that the survey was conducted in other media not targeted in this survey.

Note 2: Frequency (area) indicates: Number of detected areas / Number of surveyed areas.

Note 3: As to bottom sediment, detected values below the detection limit in Table 3-2 were expressed as tr ().

5. Survey results of each substance (group)

[1] Octabromodiphenylether (CAS RN: 32536-52-0; surveyed media in FY2003: surface water and aquatic wildlife)



Chemical formula / molecular weight: C₁₂H₂Br₈O / 801.4

Melting point: 75-220°C (Thermal decomposition temperature)¹¹⁾

Boiling point: Unknown

Water solubility (Sw): <0.001 mg/L (25°C)¹¹⁾

Specific gravity: 2.76 (25°C)¹¹⁾

n-Octanol/water partition coefficient (LogPow): 5.5¹¹⁾, 6.29¹²⁾

Degradability: Unknown

Accumulativeness: Unknown

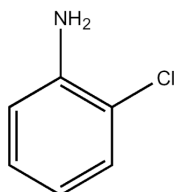
A survey of octabromodiphenylether in surface water was conducted under the detection limit of 3 ng/L and it was not detected in any of the surveyed 38 areas.

A survey of octabromodiphenylether in aquatic wildlife was conducted under the detection limit of 0.0007 ng/g-wet and it was detected in 8 areas out of 9. The maximum detected concentration was 0.064 ng/g-wet.

○ Survey Results of Octabromodiphenylether

Media	Geometric mean	Median value	95% value	Max. value	Detection limit	Detection Frequency	
						Sample	Area
Surface water	ND	ND	ND	ND	3 ^{ng/L}	0/114	0/38
Aquatic wildlife	0.0051 ^{ng/g-wet}	0.0065 ^{ng/g-wet}	0.058 ^{ng/g-wet}	0.064 ^{ng/g-wet}	0.0007 ^{ng/g-wet}	23/27	8/9

[2] *o*-Chloroaniline (CAS RN: 95-51-2; surveyed media in FY2003: surface water)



Chemical formula / molecular weight: C₆H₆ClN / 127.6

Melting point: -14°C¹⁾

Boiling point: 208.84°C (99.61 mol %)¹⁾

Water solubility (Sw): 8,165 mg/L (25°C)¹⁾

Specific gravity: 1.2114 (d₄²²)¹⁾

n-Octanol/water partition coefficient (LogPow): 1.90¹⁾

Degradability: Not easily degradable¹⁷⁾

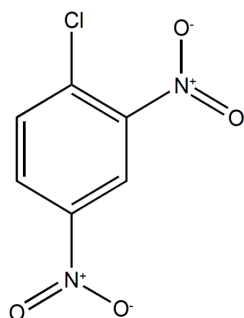
Accumulativeness: Low concentration¹⁷⁾

o-Chloroaniline in surface water was surveyed in FY2003 under the detection limit of 25 ng/L and it was not detected in any of the surveyed 38 areas.

○ Survey Results of *o*-Chloroaniline

Media	Geometric mean	Median value	95% value	Max. value	Detection limit	Detection Frequency	
						Sample	Area
Surface water	ND	ND	ND	ND	25 ^{ng/L}	0/114	0/38

[3] 1-Chloro-2,4-dinitrobenzene (CAS RN: 97-00-7; surveyed media in FY2003: surface water)



Chemical formula / molecular weight: C₆H₃ClN₂O₄ / 202.6

Melting point: 54°C¹⁾

Boiling point: 315°C¹⁾

Water solubility (Sw): 8 mg/L (15°C)¹⁾

Specific gravity: 1.7¹⁾

n-Octanol/water partition coefficient (LogPow): 2.17¹⁾

Degradability: Not easily degradable¹⁷⁾

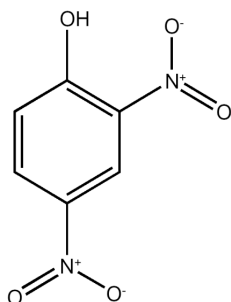
Accumulativeness: Low concentration¹⁷⁾

1-Chloro-2,4-dinitrobenzene in surface water was surveyed in FY2003 under the detection limit of 10 ng/L and it was not detected in any of the surveyed 38 areas.

○ Survey Results of 1-Chloro-2,4-dinitrobenzene

Media	Geometric mean	Median value	95% value	Max. value	Detection limit	Detection Frequency	
						Sample	Area
Surface water	ND	ND	ND	ND	10 ^{ng/L}	0/114	0/38

[4] 2,4-Dinitrophenol (CAS RN: 51-28-5; surveyed media in FY2003: surface water)



Chemical formula / molecular weight: C₆H₄N₂O₅ / 184.1

Melting point: 112 - 114°C²⁾

Boiling point: sublimates^{3,4)}

Water solubility (Sw): 2,790 mg/L (20°C)¹⁾, 6,000 mg/L (25°C)¹⁾

Specific gravity: 1.683 (24°C)^{3,4)}

n-Octanol/water partition coefficient (LogPow): 1.67¹⁾

Degradability: Not easily degradable¹⁷⁾

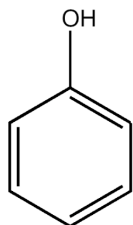
Accumulativeness: Low concentration¹⁷⁾

2,4-Dinitrophenol in surface water was surveyed in FY2003 under the detection limit of 19 ng/L and it was detected in 5 areas out of 38, with the maximum detected concentration being 540 ng/L.

○ Survey Results of 2,4-Dinitrophenol

Media	Geometric mean	Median value	95% value	Max. value	Detection limit	Detection Frequency	
						Sample	Area
Surface water	ND	ND	ND	540 ng/L	19 ng/L	11/114	5/38

[5] Phenol (CAS RN: 108-95-2; surveyed media in FY2003: surface water)



Chemical formula / molecular weight: C₆H₆O / 94.1

Melting point: 40.8°C²⁾

Boiling point: 182°C²⁾

Water solubility (Sw): 6,700 mg/L (16°C)⁵⁾

Specific gravity: 1.071 (20°C)²⁾

n-Octanol/water partition coefficient (LogPow): 1.46 (measured value)⁶⁾, 1.47 (calculated value)⁷⁾

Degradability: Easily degradable¹⁷⁾

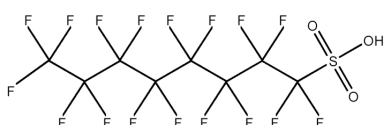
Accumulativeness: Unknown

Phenol in surface water was surveyed in FY2003 under the detection limit of 28 ng/L and it was detected in 6 areas out of 38, with the maximum detected concentration being 670 ng/L.

○ Survey Results of Phenol

Media	Geometric mean	Median value	95% value	Max. value	Detection limit	Detection Frequency	
						Sample	Area
Surface water	ND	ND	52 ng/L	670 ng/L	28 ng/L	10/114	6/38

[6] Perfluorooctane sulfonic acid (PFOS) (CAS RN: 1763-23-1; surveyed media in FY2003: bottom sediment and aquatic wildlife)



Chemical formula / molecular weight: C₈HF₁₇SO₃ / 500.1

Melting point: >400°C⁸⁾, 133°C (0.8 kPa)¹⁾

Boiling point: >400°C⁸⁾

Water solubility (Sw): 519 mg/L (20±0.5°C)⁸⁾, 370 mg/L (purified water)¹⁾, 124 mg/L (sea water)¹⁾

Specific gravity: Unknown

n-Octanol/water partition coefficient (LogPow): 2.49 (calculated value)⁸⁾, 5 (calculated value, unmeasurable because of its surface activity)¹⁾

Degradability: Not easily degradable¹⁷⁾

Accumulativeness: Low concentration¹⁷⁾

Perfluorooctane sulfonic acid (PFOS) in bottom sediment was surveyed in FY2003 for the first time under the detection limit of 0.096 ng/g-dry and it was detected in 10 areas out of 20, with the maximum concentration being 1.5 ng/g-dry.

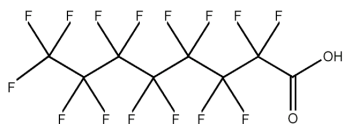
Perfluorooctane sulfonic acid (PFOS) in aquatic wildlife was surveyed in FY2003 for the first time under the detection limit of 0.033 ng/g-wet and it was detected in 9 areas out of 9, with the maximum concentration being 16 ng/g-wet.

○ Survey Results of PFOS

Media	Geometric mean	Median value	95% value	Max. value	Detection limit	Detection Frequency	
						Sample	Area
Bottom sediment	ng/g-dry tr(0.085)	ng/g-dry tr(0.076)	ng/g-dry 0.65	ng/g-dry 1.5	ng/g-dry 0.096	25/60	10/20
Aquatic wildlife	ng/g-wet 1.3	ng/g-wet 1.3	ng/g-wet 12	ng/g-wet 16	ng/g-wet 0.033	27/27	9/9

Note: As to bottom sediment, detected values below the detection limit were expressed as tr(). Measured values of bottom sediment are converted to dry sediment basis and the maximum detection limit was determined as the detection limit for each area, because the detection limit for each sample varied considerably depending on the difference of the sediment moisture content

[7] Perfluorooctanoic acid (PFOA) (CAS RN: 335-67-1; surveyed media in FY2003: bottom sediment and aquatic wildlife)



Chemical formula / molecular weight: C₈HF₁₅O₂ / 414.1

Melting point: 54°C⁹⁾

Boiling point: 188°C⁹⁾

Water solubility (Sw): 171 g/L (22°C)¹⁰⁾

Specific gravity: Unknown

n-Octanol/water partition coefficient (LogPow): 4.4 (calculated value)¹⁾

Degradability: Not easily degradable¹⁷⁾

Accumulativeness: Low concentration¹⁷⁾

Perfluorooctanoic acid (PFOA) in bottom sediment was surveyed in FY2003 for the first time under the detection limit of 0.070 ng/g-dry and it was detected in 12 areas out of 20, with the maximum concentration being 0.55 ng/g-dry.

Perfluorooctanoic acid (PFOA) in aquatic wildlife was surveyed in FY2003 for the first time under the detection limit of 0.059 ng/g-wet and it was detected in 4 areas out of 9, with the maximum concentration being 0.10 ng/g-wet.

○ Survey Results of PFOA

Media	Geometric mean	Median value	95% value	Max. value	Detection limit	Detection Frequency	
						Sample	Area
Bottom sediment	ng/g-dry tr (0.059)	ng/g-dry tr (0.066)	ng/g-dry 0.27	ng/g-dry 0.55	ng/g-dry 0.070	29/60	12/20
Aquatic wildlife	ND	ND	ng/g-wet 0.089	ng/g-wet 0.10	ng/g-wet 0.059	6/27	4/9

Note: As to bottom sediment, detected values below the detection limit were expressed as tr(). Measured values of bottom sediment are converted to dry sediment basis and the maximum detection limit was determined as the detection limit for each area, because the detection limit for each sample varied considerably depending on the difference of the sediment moisture content

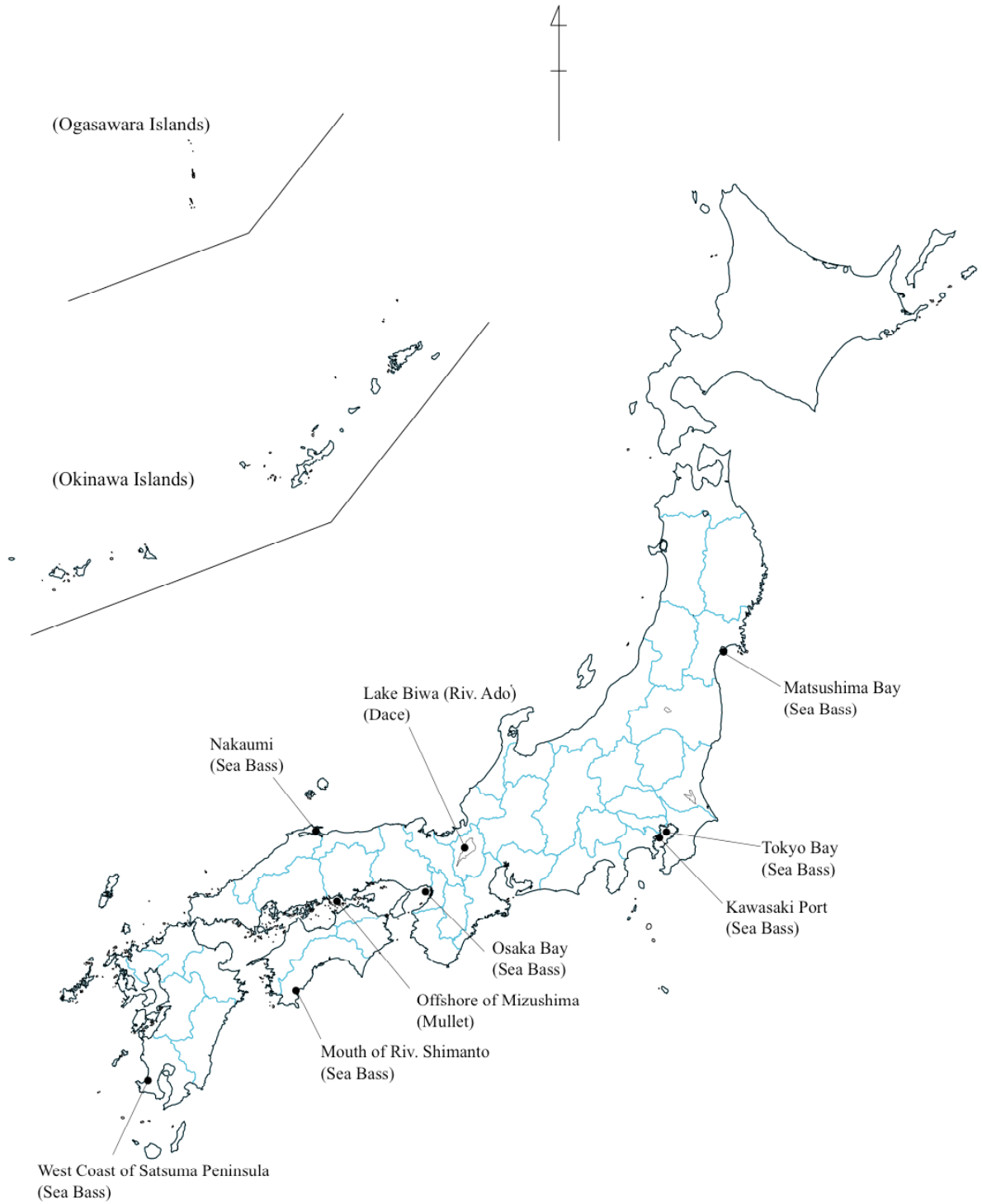
Figure 3-1 Locations of the Environmental Survey for Exposure Study
(Surface water, FY2003)



Figure 3-2 Locations of the Environmental Survey for Exposure Study
(Bottom sediment, FY2003)



Figure 3-3 Locations of the Environmental Survey for Exposure Study
(Aquatic wildlife, FY2003)



[References]

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