Results of Research on Effects of Endocrine Disrupting Chemicals on Wildlife

October, 1999

Planning and Coordination Division, Nature Preservation Bureau, Environment Agency

Results of Research on Effects of Endocrine Disrupting Chemicals on Wildlife (Data)

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (Carp-1)

No.	Specimen collection site	Gender(M:Male, F:Female)	Age (A:Adult)	Weight	Overall length	Body length	Weight of gonad	Gonad-weight ratio	Videllogenin
			Unit	kg	cm	cm	g	%	μg/ml
1	Hamura-seki	M	A	0.66	38	30	3.0	0.46	< 0.10
2	Hamura-bashi	M	A	1.7	46	36	147	8.8	<0.10
3	Hamura-bashi	M	A	2.1	50	40	173	8.4	100
4	Hamura-bashi	M	A	2.6	57	45	219	8.3	<0.10
5	Hamura-bashi	M	A	2.3	52	42	170	7.4	40
6	Hamura-bashi	M	A	1.5	47	37	107	7.0	0.17
7	Hamura-bashi	M	A	2.4	56	45	159	6.6	<0.10
8	Hamura-bashi	M	A	3.4	63	50	226	6.6	<0.10
9	Hamura-bashi	M	A	2.7	58	48	168	6.3	<0.10
10	Hamura-bashi	M	A	2.7	56	45	165	6.0	<0.10
11	Hamura-bashi	M	A	2.9	60	48	169	5.9	19
12	Hamura-bashi	M	A	2.0	52	41	110	5.5	<0.10
13	Hamura-bashi	M	A	2.7	59	47	150	5.5	<0.10
14	Hamura-bashi	M	A	3.5	62	50	188	5.4	<0.10
15	Hamura-bashi	M	A	3.3	64	51	149	4.5	<0.10
16	Hamura-bashi	M	A	2.0	53	43	80	4.1	<0.10
17	Tamagawara-bashi	M	A	1.7	49	40	130	7.5	<0.10
18	Tamagawara-bashi	M	A	1.7	53	41	124	7.1	0.83
19	Tamagawara-bashi	M	A	2.0	57	44	62	3.1	<0.10
20	Tamagawara-bashi	M	A	1.6	48	37	40	2.5	<0.10
21	Denenchofu-seki	M	A	1.6	48	38	176	11	<0.10
22	Denenchofu-seki	M	A	2.7	57	45	233	8.6	2.4
23	Denenchofu-seki	M	A	2.5	56	45	188	7.6	<0.10
24	Denenchofu-seki	M	A	2.7	56	44	188	7.0	3.5
25	Denenchofu-seki	M	A	2.2	54	43	145	6.5	<0.10
26	Denenchofu-seki	M	A	2.8	58	47	180	6.4	<0.10
27	Denenchofu-seki	M	A	2.5	57	47	156	6.2	<0.10

* Source of the above date: "Results of 1998 Endocrine Disrupting Chemicals Surveillance at Public Water Areas" compiled by the Ministry of Construction

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (Carp-2)

No.	Specimen collection site	Gender(M:Male,F:Female)	Age (A:Adult)	Weight	Overall length	Body length	Weight of gonad	Gonad-weight ratio	Videllogenin	Estradiol	Testosterone
		Unit		kg	cm	cm	g	%	μg/ml	pg/ml	ng/ml
28	Akikawa	M	A	2.7	62	51	204	7.5	0.072	1.1	1.1
29	Akikawa	M	A	2.2	54	42	162	7.3	<0.039	0	2.0
30	Akikawa	M	A	1.7	50	41	113	6.7	<0.039	0	2.7
31	Akikawa	M	A	3.0	61	48	190	6.3	<0.039	0	5.1
32	Akikawa	M	A	2.3	56	47	138	6.0	<0.039	0	2.9
33	Akikawa	M	A	2.1	52	43	124	5.9	<0.039	0	5.1
34	Akikawa	M	A	2.6	55	45	134	5.2	<0.039	0	1.3
35	Akikawa	M	A	2.9	62	50	143	4.9	<0.039	0	1.5
36	Akikawa	M	A	2.9	62	50	139	4.8	<0.039	0.48	1.5
37	Akikawa	M	A	2.4	58	48	98	4.1	<0.039	0	2.8
38	Akikawa	M	A	2.3	54	45	73	3.2	0.059	0	2.5
39	Akikawa	M	A	3.4	67	53	54	1.6	<0.039	0	0.85
40	Akikawa	M	A	1.9	49	41	19	1.0	6.9	1.0	1.6
41	Asaskawa	M	A	2.6	60	48	261	10	<0.039	44	1.6
42	Asaskawa	M	A	2.4	59	47	185	7.7	<0.039	54	1.2
43	Asaskawa	M	A	2.8	66	51	211	7.5	0.10	43	3.4
44	Asaskawa	M	A	1.3	45	36	89	6.8	<0.039	33	2.1
45	Asaskawa	M	A	3.0	63	51	204	6.8	<0.039	44	0.74
46	Asaskawa	M	A	2.8	63	50	190	6.8	<0.039	7.5	2.5
47	Asaskawa	M	A	2.2	56	47	140	6.4	2.1	22	0.63
48	Asaskawa	M	A	2.4	58	47	149	6.2	7.7	85	1.7
49	Asaskawa	M	A	1.8	56	46	100	5.6	<0.039	13	0.71
50	Asaskawa	M	A	1.9	54	45	104	5.5	<0.039	38	1.7
51	Asaskawa	M	A	3.5	66	54	188	5.4	<0.039	42	0.47
52	Asaskawa	M	A	2.6	65	52	128	4.9	<0.039	36	0.54
53	Asaskawa	M	A	2.7	63	52	130	4.8	<0.039	51	1.8
54	Inbanuma	M	A	1.5	46	39	114	7.6	<0.039	0	0.30
55	Inbanuma	M	A	4.6	73	59	243	5.3	<0.039	0	1.2
56	Inbanuma	M	A	1.8	52	44	94	5.2	<0.039	4.6	1.3
57	Inbanuma	M	A	2.2	58	47	109	5.0	<0.039	0.82	0.70
58	Inbanuma	M	A	2.2	59	47	94	4.3	<0.039	35	1.5
59	Inbanuma	M	A	2.1	56	46	67	3.2	<0.039	1.4	1.1
60	Inbanuma	M	A	3.4	65	55	100	2.9	1.1	23	1.1
61	Inbanuma	M	A	2.2	59	49	60	2.7	<0.039	0	0.74
62	Inbanuma	M	A	1.6	57	47	10	0.61	<0.039	0.13	0.22
63	Teganuma	M	A	1.5	48	41	166	11	<0.039	0	0.10
64	Teganuma	M	A	1.3	45	39	82	6.6	0.088	3.6	2.8
65	Teganuma	M	A	1.2	48	39	78	6.5	<0.039	0	1.2
66	Teganuma	M	A	0.70	44	36	38	5.4	2.5	0	0.32
67	Teganuma	M	A	0.80	42	36	27	3.3	<0.039	0	0.055
68	Teganuma	M	A	0.85	49	34	23	2.7	0.46	16	1.1
69	Teganuma	M	A	0.82	42	35	19	2.4	0.45	1.3	0.47
70	Teganuma	M	A	0.89	45	36	17	1.9	<0.039	2.5	0.42
71	Teganuma	M	A	1.4	48	40	14	1.1	9.0	0.36	0.45
72	Teganuma	M	A	0.90	45	37	8.2	0.91	<0.039	0	0.0050
73	Teganuma	M	A	0.85	45	37	3.1	0.36	<0.039	0	0
74	Teganuma	M	A	0.85	44	37	2.7	0.32	<0.039	0	0

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (Carp-3)

No.	Specimen collection site	Gender(M:Male、F:Female)	Age (A:Adult)	Weight	Overall length	Body length	Weight of gonad	Gonad-weight ratio	Videllogenin
		Unit		kg	cm	cm	g	%	μg/ml
75	Hamura-seki	F	A	1.3	45	36	57	4.2	2,400
76	Hamura-seki	F	A	1.3	43	35	26	2.1	12
77	Hamura-seki	F	A	2.2	52	44	25	1.1	4.3
78	Hamura-seki	F	A	0.45	31	26	2.6	0.58	1.9
79	Haijima-bashi	F	A	2.9	57	45	462	16	7,700
80	Haijima-bashi	F	A	3.6	59	49	518	15	15,000
81	Haijima-bashi	F	A	5.3	70	57	758	14	3,600
82	Haijima-bashi	F	A	3.2	59	47	419	13	23,000
83	Haijima-bashi	F	A	2.3	56	46	57	2.5	150
84	Tamagawara-bashi	F	A	3.2	59	46	643	20	11,000
85	Tamagawara-bashi	F	A	2.3	55	44	400	17	5,000
86	Tamagawara-bashi	F	A	2.9	55	44	446	15	5,100
87	Tamagawara-bashi	F	A	1.6	51	39	229	15	5,000
88	Tamagawara-bashi	F	A	2.6	59	47	376	14	5,900
89	Tamagawara-bashi	F	A	1.7	50	40	236	14	9,800
90	Tamagawara-bashi	F	A	2.6	60	45	351	14	6,000
91	Tamagawara-bashi	F	A	2.1	57	44	276	13	2,100
92	Tamagawara-bashi	F	A	3.0	59	47	395	13	4,300
93	Tamagawara-bashi	F	A	2.9	62	48	275	9.4	2,000
94	Tamagawara-bashi	F	A	1.7	51	39	150	8.7	10,000
95	Tamagawara-bashi	F	A	2.9	58	47	235	8.3	5,400
96	Tamagawara-bashi	F	A	2.2	58	47	167	7.6	2,300
97	Denenchofu-seki	F	A	6.5	74	60	1,881	29	6,300
98	Denenchofu-seki	F	A	1.8	52	42	325	18	4,400
99	Denenchofu-seki	F	A	4.1	66	51	654	16	12,000
100	Denenchofu-seki	F	A	1.9	54	43	227	12	4,000
101	Denenchofu-seki	F	A	1.9	54	43	173	9.3	3,500
102	Denenchofu-seki	F	A	2.3	53	41	182	7.8	3,800

* Source of the above date: "Results of 1998 Endocrine Disrupting Chemicals Surveillance at Public Water Areas" compiled by the Ministry of Construction

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (Carp-4)

No.	Specimen collection site	Gender(M:Male、F:Female)	Age (A:Adult)	Weight	Overall length	Body length	Weight of gonad	Gonad-weight ratio	Videllogenin	Estradiol	Testosterone
		Unit		kg	cm	cm	g	%	μg/ml	pg/ml	ng/ml
103	Akikawa	F	A	3.5	62	52	550	16	9,400	290	4.3
104	Akikawa	F	A	3.5	66	52	497	14	2,800	230	2.7
105	Akikawa	F	A	2.3	59	47	308	13	4,500	160	2.2
106	Akikawa	F	A	3.2	62	52	358	11	3,200	190	1.3
107	Akikawa	F	A	3.5	65	52	325	9.3	4,200	64	1.8
108	Akikawa	F	A	1.9	49	40	60	3.2	96	2.7	0
109	Akikawa	F	A	1.7	51	42	19	1.1	1.3	0	0.039
110	Akikawa	F	A	1.1	43	35	5.2	0.47	4.5	0	0
111	Asakawa	F	A	2.8	61	48	622	22	1,500	230	1.9
112	Asakawa	F	A	2.8	60	50	398	14	380	190	1.6
113	Asakawa	F	A	2.3	55	45	326	14	1,100	290	0.88
114	Asakawa	F	A	3.5	72	57	459	13	1,900	230	1.4
115	Asakawa	F	A	3.3	63	52	406	12	1,400	390	0.93
116	Asakawa	F	A	2.9	60	49	336	12	11,000	420	1.5
117	Asakawa	F	A	2.8	61	50	214	7.6	150	34	0
118	Asakawa	F	A	2.2	59	47	128	5.8	36	19	0
119	Asakawa	F	A	2.7	62	50	153	5.7	420	8.4	0
120	Asakawa	F	A	3.2	66	54	75	2.3	2.7	10	0
121	Asakawa	F	A	2.6	66	54	51	2.0	1.3	29	0
122	Inbanuma	F	A	7.8	89	73	1152	15	2,700	1,200	1.8
123	Inbanuma	F	A	3.5	66	54	360	10	2,000	190	0.73
124	Inbanuma	F	A	2.5	60	49	194	7.8	1,900	110	0.28
125	Inbanuma	F	A	4.6	74	60	283	6.2	2,100	150	0.49
126	Inbanuma	F	A	4.0	70	58	164	4.1	190	1.3	0
127	Inbanuma	F	A	2.0	57	47	66	3.3	160	2.5	0.028
128	Inbanuma	F	A	2.3	56	44	75	3.3	75	3.7	0
129	Inbanuma	F	A	2.0	61	52	40	2.0	4.5	0	0
130	Inbanuma	F	A	2.0	58	48	35	1.8	4.0	0	0
131	Inbanuma	F	A	2.5	62	50	40	1.6	0.55	0	0
132	Inbanuma	F	A	1.6	59	46	23	1.4	1.0	0	0
133	Inbanuma	F	A	4.0	75	58	52	1.3	0.52	0	0
134	Inbanuma	F	A	3.5	71	59	44	1.3	0.28	0	0
135	Inbanuma	F	A	3.2	68	57	39	1.2	1.5	0	0
136	Inbanuma	F	A	2.1	60	51	20	0.95	<0.039	0.32	0.24
137	Inbanuma	F	A	2.5	66	53	20	0.82	2.0	0	0
138	Teganuma	F	A	1.4	46	39	159	11	2,000	360	1.7
139	Teganuma	F	A	1.6	51	43	170	11	4,100	180	0.42
140	Teganuma	F	A	1.5	50	42	90	5.9	530	69	0.49
141	Teganuma	F	A	1.1	46	38	53	5.0	1,300	0	0
142	Teganuma	F	A	0.80	43	37	21	2.6	1.7	0	0
143	Teganuma	F	A	1.2	49	41	27	2.3	15	0	0
144	Teganuma	F	A	0.95	45	38	18	1.9	33	0	0
145	Teganuma	F	A	1.0	39	34	4.0	0.40	12	0	0

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (Carp-5)

(Concentration per wet weight)

No.						1											2	3				
SPEED'98 No.						2											4	12				
						Polychlorinated biphenyls (PCBs)												Hexachlorocyclohexane				
No.	Specimen collection site	Gender(M:Male, F:Female)	Age (A:Adult)	Specimen	Lipid	Chlorinated biphenyl	Dichloro biphenyl	Trichloro biphenyl	Tetrachloro biphenyl	Pentachloro biphenyl	Heachloro biphenyl	Heptachloro biphenyl	Octachloro biphenyl	Nonachloro biphenyl	Decihloro biphenyl	PCB total*	Hexachlorobenzene (HCB)	α-HCH	β-HCH	γ-HCH	δ-HCH	HCH total*
				Unit	%	μg/kg-wet																
1	Hamura-seki	M	A	Muscle	1.9	<0.10	<0.10	0.37	1.6	6.9	6.6	0.70	<0.10	<0.10	<0.10	16	< 5	< 5	< 5	< 5	< 5	0
2	Haijima-bashi	M	A	Muscle	1.5	<0.10	<0.10	<0.10	3.8	10	13	2.4	0.16	<0.10	<0.10	29	< 5	< 5	< 5	< 5	< 5	0
3	Haijima-bashi	M	A	Muscle	1.6	<0.10	<0.10	<0.10	8.8	7.8	19	3.6	<0.10	<0.10	<0.10	39	< 5	< 5	< 5	< 5	< 5	0
4	Haijima-bashi	M	A	Muscle	1.4	<0.10	0.34	<0.10	4.3	19	16	2.9	0.39	<0.10	<0.10	43	< 5	< 5	< 5	< 5	< 5	0
5	Haijima-bashi	M	A	Muscle	2.7	<0.10	<0.10	0.90	6.3	13	12	2.3	0.28	<0.10	<0.10	35	< 5	< 5	< 5	< 5	< 5	0
6	Haijima-bashi	M	A	Muscle	1.9	<0.10	0.30	<0.10	4.7	7.8	6.9	0.82	<0.10	<0.10	<0.10	21	< 5	< 5	< 5	< 5	< 5	0
7	Haijima-bashi	M	A	Muscle	2.3	<0.10	<0.10	<0.10	8.5	10	8.7	1.2	<0.10	<0.10	<0.10	28	< 5	< 5	< 5	< 5	< 5	0
8	Haijima-bashi	M	A	Muscle	1.7	<0.10	<0.10	<0.10	2.6	4.2	4.6	0.58	<0.10	<0.10	<0.10	12	< 5	< 5	< 5	< 5	< 5	0
9	Haijima-bashi	M	A	Muscle	2.1	<0.10	<0.10	<0.10	5.3	11	9.5	1.8	0.22	<0.10	<0.10	28	< 5	< 5	< 5	< 5	< 5	0
10	Haijima-bashi	M	A	Muscle	2.1	<0.10	<0.10	<0.10	2.5	8.7	8.6	0.86	<0.10	<0.10	<0.10	21	< 5	< 5	< 5	< 5	< 5	0
11	Haijima-bashi	M	A	Muscle	1.1	<0.10	<0.10	<0.10	2.1	3.2	3.3	0.63	<0.10	<0.10	<0.10	9.2	< 5	< 5	< 5	< 5	< 5	0
12	Haijima-bashi	M	A	Muscle	1.3	<0.10	2.0	<0.10	2.2	15	11	1.1	<0.10	<0.10	<0.10	31	< 5	< 5	< 5	< 5	< 5	0
13	Haijima-bashi	M	A	Muscle	3.6	<0.10	<0.10	1.5	13	18	16	2.2	0.40	<0.10	<0.10	51	< 5	< 5	< 5	< 5	< 5	0
14	Haijima-bashi	M	A	Muscle	1.3	<0.10	<0.10	0.39	3.7	9.0	12	1.7	0.10	<0.10	<0.10	26	< 5	< 5	< 5	< 5	< 5	0
15	Haijima-bashi	M	A	Muscle	1.1	<0.10	<0.10	0.30	1.7	4.3	6.3	1.4	0.13	<0.10	<0.10	14	< 5	< 5	< 5	< 5	< 5	0
16	Haijima-bashi	M	A	Muscle	1.4	<0.10	<0.10	<0.10	1.7	4.8	4.8	0.54	<0.10	<0.10	<0.10	12	< 5	< 5	< 5	< 5	< 5	0
17	Tamagawara-bashi	M	A	Muscle	1.7	<0.10	<0.10	0.21	3.2	3.0	3.1	0.53	<0.10	<0.10	<0.10	10	< 5	< 5	< 5	< 5	< 5	0
18	Tamagawara-bashi	M	A	Muscle	2.1	<0.10	<0.10	3.6	6.4	9.7	20	4.8	0.61	<0.10	<0.10	45	< 5	< 5	< 5	< 5	< 5	0
19	Tamagawara-bashi	M	A	Muscle	0.90	<0.10	<0.10	<0.10	2.5	2.7	3.3	0.48	<0.10	<0.10	<0.10	8.9	< 5	< 5	< 5	< 5	< 5	0
20	Tamagawara-bashi	M	A	Muscle	1.0	<0.10	<0.10	0.29	2.3	2.1	2.5	0.60	<0.10	<0.10	<0.10	7.8	< 5	< 5	< 5	< 5	< 5	0
21	Denenchofu-seki	M	A	Muscle	3.2	<0.10	0.46	7.7	21	30	28	4.1	0.42	<0.10	<0.10	91	< 5	< 5	< 5	< 5	< 5	0
22	Denenchofu-seki	M	A	Muscle	3.0	<0.10	0.44	23	110	300	220	29	1.9	<0.10	<0.10	690	< 5	< 5	< 5	< 5	< 5	0
23	Denenchofu-seki	M	A	Muscle	3.4	<0.10	<0.10	27	88	130	76	2.9	0.57	<0.10	<0.10	330	< 5	< 5	< 5	< 5	< 5	0
24	Denenchofu-seki	M	A	Muscle	1.6	<0.10	4.3	10	72	150	99	12	0.65	<0.10	<0.10	350	< 5	< 5	< 5	< 5	< 5	0
25	Denenchofu-seki	M	A	Muscle	3.0	<0.10	<0.10	7.8	34	87	60	9.3	0.83	<0.10	<0.10	200	< 5	< 5	< 5	< 5	< 5	0
26	Denenchofu-seki	M	A	Muscle	3.3	<0.10	<0.10	22	86	180	120	14	0.83	<0.10	<0.10	420	< 5	< 5	< 5	< 5	< 5	0
27	Denenchofu-seki	M	A	Muscle	1.5	<0.10	<0.10	12	70	110	90	15	0.39	<0.10	<0.10	290	< 5	< 5	< 5	< 5	< 5	0

* Calculated on the assumption that values below the limit of detection are counted as 0.

Table of Contents

Results of research on effects of endocrine disrupting chemicals on wildlife (summary)

1. Basic approach to research

This research was conducted in line with the objectives of "Strategic Programs on Environmental Endocrine Disruptors' 98 (SPEED '98)" to extensively obtain data on levels of chemicals suspected of having an endocrine disrupting effect that could be found in the bodies of wildlife.

Wildlife species (vertebrate animals) were selected for this research based on reports on abnormality contained in both domestic and foreign documents, and whether they showed any morphologic or histologic abnormality was also surveyed during the research.

2. Specimens surveyed

As per attachment "A List of Specimens Surveyed."

3. Results of research

This was the first research conducted to extensively study the accumulation of chemicals suspected of having an endocrine disrupting effect in the bodies of wildlife, and as such it obtained specific data. However, because the conditions under which the specimens were collected differed from one specimen to another, the specimens surveyed were of different kinds and quantities, and the number of specimens surveyed was small, researchers failed to make a complete analysis of differences among species or regions. In addition, although histologic changes were observed in some specimens, the results of this research did not clarify the relation between the accumulation of chemicals in their bodies and such histologic changes.

[Summary of research results]

(1) Analytical test of chemicals

Accumulation of PCB and organic chlorine agricultural chemicals (DDT, etc.) was observed in higher-order predators in the food chain (whales, black kites, birds of prey). Details are shown in attachment "Research Results (Summary Table)."

(2) Pathological test

No specific abnormality was recognized in the species surveyed except the following two species.

Carp: The histologic test of testes revealed that one specimen had fewer sperms.

Raccoon dogs: The gross anatomic examination revealed that one specimen had a testicular tumor, which was confirmed by the histologic test.

(3) Blood test

Blood vitellogenin was detected in 19 male carp out of 74.

Based upon the results of this research, it will be necessary in the future to improve the accuracy of research by limiting species to be surveyed and by

List of Specimens

Category	Species	Place	Number of specimens collected
Fishes	Carp	Total	145
		Tamagawa	55
		Akikawa	21
		Asakawa	24
		Inbanuma	25
		Teganuma	20
Amphibians	Frogs	Total	100
	Montane brown frogs	Yamada Ryokuchi	20
		Place A selected for comparison purposes	20
		Preserved specimen (Yamada Ryokuchi)	1
	Japanese brown frogs	Yamada Ryokuchi	20
		Place B selected for comparison purposes	20
		Preserved specimen (Yamada Ryokuchi)	8
		Preserved specimen (place B selected for comparison purposes)	11
Sea mammals	Whales	Total	26
	Seals	Total	19
	Common Seals	Hokkaido	12
	Spotted seals	Hokkaido	7
Birds	Feral pigeons	Total	32
		Tokyo	9
		Osaka	23
	Black kites	Total	26
		Miyagi	3
		Kanagawa	8
		Ehime	5
		Nagasaki	10
	Birds of prey	Total	30
	Blakiston's fish-owls	Total Hokkaido	5
Land mammals	Wood mice	Total	30
		Saitama	7
		Fukui	9
		Nagasaki	14
	Japanese macaques	Total	52
		Nagano	18
		Niigata	2
		Tokyo	13
		Fukui	8
		Hyogo(blood)	8
		Experiment facilities(blood)	3
	Bears	Total	17
		Hokkaido	5
		Gifu	10
		Hiroshima	2
	Raccoon dogs	Total	15
		Hokkaido	1
		Tokyo	4
		Gifu	5
		kyoto	1
		Hyogo	3
		Kochi	1
Grand total			499

Research Results (Summary Table)

(Concentration per wet weight: μg/kg-wet)

No.		1	2	3	4		5	6	7		8				9	10	11	12	13	14	15	16	17	18	19	20			21	22	23	24	25	26	27	28	
SPEED'98 No.		2	4	12	14		15	16	18		19				23	25	26	43	33	34			9	11	35	36			37	38	39	40	42	45		66	
					クロルデン				DDT		DDE and DDD															Alkyl phenol										Styrene polymerization	
Chemicals surveyed		Polychlorinated biphenyl (PCB total)	Hexachlorobenzene (HCB)	Hexachlorocyclohexane (HCH total)	cis-Chlordane	trans-Chlordane	Oxychlordane	trans-Nonachlor	o,p'-DDT	p,p'-DDT	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	Dieldrin	Heptachlor	Heptachlor epoxide	Bezo(a)pyrene	Tributyltin	Triphenyltin	Dibutyltin	Monobutyltin	Atrazine	CAT (simazine)	Trifluralin	Nonyl phenol	4 −t-Octyl phenol	4 −n-Octyl phenol	Bisphenol A	Di-(2-ethylhexyl) phthalate	Buty benzyl phthalate	Di-n-butyl phthalate	Diethyl phthalate	Diethylhexyl adipate	Styrene monomer	Styrene dimer	Styrene triner
Carp	Max.value	1,600	nd	6	36	26	7	32	nd	nd	nd	27	nd	21	6	nd	nd	nd	75	99	16	6	nd	nd	11	nd	nd	nd	nd	260	nd	79	nd	nd	1	nd	nd
	Min.value	2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Detection rate	145/145	0/145	1/145	18/145	9/145	2/145	19/145	0/145	0/145	0/145	39/145	0/145	2/145	2/145	0/145	0/145	0/145	92/145	108/145	32/145	28/145	0/145	0/145	3/145	0/145	0/145	0/145	0/145	88/145	0/145	27/145	0/145	0/145	14/145	0/145	0/145
Frogs	Max.value	nd	nd	5	nd	nd	8	nd	3	33	nd	185	nd	19	12	nd	nd	nd					nd	nd													
Yamada Ryokuchi	Min.value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd					nd	nd													
	Detection rate	0/40	0/40	2/40	0/40	0/40	21/40	0/40	1/49	13/49	0/49	29/49	0/49	6/49	1/40	0/40	0/40	0/40					0/40	0/40													
Frogs	Max.value	13	nd	nd	nd	nd	6	nd	nd	1	nd	7	nd	nd	3	nd	nd	nd					nd	nd													
Place selected for	Min.value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd					nd	nd													
comprison purposes	Detection rate	1/40	0/40	0/40	0/40	0/40	5/40	0/40	0/51	1/51	0/51	5/51	0/51	0/51	1/40	0/40	0/40	0/40					0/40	0/40													
Whales	Max.value	120,600	549	2,357	459	45	1,190	7,570	2,270	6,610	351	30,300	392	4,780	1,930	nd	220	nd	330	60	1,100	300															
	Min.value	nd	nd	nd	nd	nd	nd	nd	12	20	nd	60	nd	20	nd	nd	nd	nd	nd	nd	nd	nd															
	Detection rate	24/26	25/26	25/26	25/26	19/26	25/26	25/26	26/26	26/26	24/26	26/26	25/26	26/26	24/26	0/26	23/26	0/26	18/26	12/26	16/26	2/26															
Seals	Max.value	8,660	17	630	7	nd	305	434	6	549	nd	2,530	nd	117	90	nd	70	nd	110	nd	nd	nd															
	Min.value	120	nd	15	nd	nd	40	57	nd	30	nd	150	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd															
	Detection rate	19/19	14/19	19/19	1/19	0/19	19/19	19/19	1/19	19/19	0/19	19/19	0/19	16/19	7/19	0/19	17/19	0/19	1/19	0/19	0/19	0/19															
Common pigeons	Max.value	6	nd	10	nd	nd	11	3	nd	2	nd	10	nd	3	3	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	113	6	nd	48	3,290	nd	nd	nd	nd	3	nd	nd
	Min.value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Detection rate	6/32	0/32	7/32	0/32	0/32	9/32	1/32	0/32	1/32	0/32	17/32	0/32	1/32	1/32	0/32	0/32	0/32	0/31	0/31	0/31	0/31	0/31	0/31	0/31	16/31	9/31	0/31	1/31	3/31	0/31	0/31	0/31	0/31	2/31	0/30	0/30
Black kites	Max.value	8,871	12	35	119	13	80	322	nd	8	nd	230	nd	18	124	nd	7	nd	8	10	nd	nd															
	Min.value	48	nd	nd	nd	nd	3	10	nd	nd	nd	5	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd															
	Detection rate	26/26	7/26	25/26	23/26	9/26	26/26	26/26	0/26	16/26	0/26	26/26	0/26	23/26	24/26	0/26	9/26	0/26	2/26	3/26	0/26	0/26															
Birds of prey	Max.value	14,255	65	297	74	5	510	761	nd	4	nd	5,940	nd	82	506	nd	170	nd	nd	nd	nd	nd															
	Min.value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	12	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd															
	Detection rate	26/30	18/30	26/30	7/30	1/30	27/30	26/30	0/30	3/30	0/30	30/30	0/30	15/30	20/30	0/30	26/30	0/30	0/30	0/30	0/30	0/30															
Blakiston's fish owls	Max.value	72	3	3	nd	nd	4	5	nd	6	nd	34	nd	8	nd	nd	nd	nd	nd	3	30	nd															
	Min.value	9	nd	nd	nd	nd	nd	nd	nd	nd	nd	15	nd	3	nd	nd	nd	nd	nd	nd	nd	nd															
	Detection rate	5/5	4/5	1/5	0/5	0/5	2/5	4/5	0/5	2/5	0/5	5/5	0/5	5/5	0/5	0/5	0/5	0/5	0/5	2/5	1/5	0/5															
Wood mice	Max.value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	190	7	nd	42	390	nd	nd	nd	nd	56	nd	nd
	Min.value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Detection rate	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	1/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	22/30	21/30	0/30	1/30	2/30	0/30	0/30	0/30	0/30	8/30	0/30	0/30
Japanese macaques	Max.value	nd	nd	20	3	nd	28	12	nd	nd	nd	10	nd	3	115	nd	178	nd	nd	nd	nd	nd															
(except blood)	Min.value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd															
	Detection rate	0/41	0/41	24/41	1/41	0/41	24/41	17/41	0/41	0/41	0/41	7/41	0/41	1/41	31/41	0/41	16/41	0/41	0/41	0/41	0/41	0/41															
(Blood)	Detection rate	0/11	0/11	0/11	0/11	0/11	0/11	0/11	0/11	0/11	0/11	1/11	1/11	0/11	0/11	0/11	0/11	0/11	0/11	0/11	0/11	0/11															
Bears	Max.value	14	6	nd	nd	nd	110	12	nd	nd	nd	23	nd	nd	12	nd	80	nd	nd	nd	nd	nd															
	Min.value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd															
	Detection rate	2/17	1/17	0/17	0/17	0/17	4/17	1/17	0/17	0/17	0/17	1/17	0/17	0/17	3/17	0/17	2/17	0/17	0/17	0/17	0/17	0/17															
Raccoon Dogs	Max.value	577	24	54	nd	nd	196	241	nd	26	nd	60	nd	nd	29	nd	23	nd	nd	nd	nd	nd	nd	nd	nd	2,000	37	nd	nd	363,000	nd	nd	nd	57,230	240	4	339
	Min.value	nd	nd	nd	nd	nd	12	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Detection rate	10/15	1/15	8/15	0/15	0/15	15/15	12/15	0/15	2/15	0/15	6/15	0/15	0/15	8/15	0/15	9/15	0/15	0/15	0/15	0/15	0/15	0/15	0/15	0/15	14/15	6/15	0/15	0/15	10/15	0/15	0/15	0/15	4/15	12/15	1/15	7/15

(Note) Nd means was "not detected."

restricting conditions and methods for collecting specimens.

Results of Research on Effects of Endocrine Disrupting Chemicals on Wildlife

1 Outline of research

(1) Basic approach to research

This research was conducted in line with the objectives of "Strategic Programs on Environmental Endocrine Disruptors' 98 (SPEED '98)" to extensively obtain data on levels of chemicals suspected of having an endocrine disrupting effect that could be found in the bodies of wildlife.

Wildlife species (vertebrate animals) were selected for this research based on reports on abnormality contained in both domestic and foreign documents, and whether they showed any morphologic or histologic abnormality was also surveyed during the research.

The research was conducted in accordance with "Manual for Research on Effects of Endocrine Disrupting Chemicals on Wildlife," and "Tentative Manual for Research on Exogenous Endocrine Disrupting Chemicals" was used as reference for the analysis methods employed.

(2) Selection of species to be surveyed

Species to be surveyed were selected in consideration of feasibility of collecting specimens with priority given to aquatic life, and consisted mainly of wildlife (vertebrates) on which abnormality reports were made.

The number of specimens and places where specimens would be collected were determined in consideration of the state of their distribution, and birds and animals that were caught as harmful ones were used as specimens as far as possible. The following considerations were given to select species to be surveyed for each category.

(Fishes)

Carp were selected because several abnormality cases have already been reported in Japan, and research is under way in foreign countries.

(Amphibians)

As for amphibians, frogs were selected because the decreasing number of frogs and cases of deformed frogs have been reported worldwide and cases of deformed frogs were reported in Kitakyushu City and other parts of Japan. Surveys were conducted in different places including the place where cases of deformed frogs were reported (Yamada Ryokuchi).

(Sea mammals)

The ocean receives much attention as the place where various substances finally arrive or accumulate, and chemicals are highly likely to accumulate in the bodies of marine mammals that occupy a high-order position in the marine ecosystem.

A survey was conducted mostly on sea mammals stranded in Japan, and whales and seals that could be obtained were selected for the survey.

(Birds)

From the viewpoint of food chain bio-concentration (higher-order predators) and in consideration of the feasibility of collecting specimens, common pigeons, black kites, birds of prey and Blakiston's fish owls were selected.

(Land mammals)

A survey was conducted on land mammals with a view to obtaining baseline data as they live close to the living environment of human beings. From the viewpoint of food chain bio-concentration (prey) and in consideration of the feasibility of obtaining specimens, wood mice, Japanese macaques, bears and raccoon dogs were selected.

(3) Selection of substances subjected to chemical analysis

Substances were selected mostly from Table 3 of SPEED '98 (chemicals suspected of having an endocrine disrupting effect) in consideration of bio-concentration, environmental residual tendency, actual applications of substances, examples of substances detected in the environment, etc. (Table 1). Highly degradable substances that have a low possibility of being detected were excluded.

Since dibutyltin and monobutyltin are known for their immunotoxicity and styrene monomer is used in large quantities and is likely to change its form to a dimer or a trimer through polymerization, these substances were also analyzed. Environmental concentrations were measured in water and sediment for ethynyl estradiol, a synthetic hormone that pollutes rivers according to foreign reports.

Table 1 List of Compounds Surveyed

Speed '98 No.	Names of substances	Speed '98 No.	Names of substances
1	Polychlorinated biphenyl (PCB)	18	CAT (simazine)
2	Hexachlorobenzene (HCB)	19	Trifluralin
3	Hexachlorocyclohexane (HCH)	20	Alkyl phenol (Nonyl phenol, 4-Oc
4	Chlordane	21	Bisphenol A
5	Oxychlordane	22	tyl phenol)
6	trans-Nonachlor	21	Bisphenol A
7	DDT	22	Di-(2-ethylhexyl) phthalate
8	DDE and DDD	23	Butyl benzyl phthalate
9	Dieldrin	24	Di-n-butyl phthalate
10	Heptachlor	25	Diethyl phthalate
11	Heptachlor epoxide	26	Di-2-ethylhexyl adipate
12	Benzo(a)pyrene	27	Styrene monomer
13	Tributyltin	28	Styrene dimer and trimer
14	Triphenyltin	29	Testosterone
15	Dibutyltin	30	17 β - Estradiol
16	Monobutyltin	31	Vitellogenin
17	Atrazine	32	Ethynyl estradiol

1) Considered as a group consistir

accumulability and residual tendency, those from No. 1 to No. 16 considered were measured in all the species surveyed.

2) Considered as a group consisting mainly of substances that have been in use and detected in the environment, those from No. 17 to No. 28 were measured in fishes.

3) Substances Nos. 29 and 30 (sex hormones) were measured in species from which blood could be collected (fishes, amphibians, etc.).

4) Substance No. 31 was measured in fishes.

5) The above-mentioned substances (those from No. 1 to No. 32 excluding Nos. 29 and 31) were measured in the surrounding environment for fishes and amphibians.

(4) Research on effects (pathologic anatomy, etc.)

Morphological examinations (gross anatomy) and histologic tests of endocrine organs and reproductive organs were performed.

2. Results

(1) Fishes and surrounding environment

1) Species: Carp

2) Ecology:

Habitat

They live in the lower-middle reaches of rivers, and like to inhabit the bottoms of deep pools with a gentle current, the bottoms of sandy muds, space between ripraps or blocks, and places around snags.

Food habit

They are omnivorous and feed mainly on benthic animals. Fry larvae feed on plankton and attached organism in dead water where waterweeds grow thickly. Many carp fry feed on midge larvae. Full-grown carp feed on shellfish such as mud snails and "shijimi" clams, midge larvae, tubifexes, lugworms and attached diatoms.

3) Number of specimens collected: 145 (74 males and 71 females)

4) Collection method: Specimens were caught in nets.

5) Details of survey

The survey was conducted jointly by the Ministry of Construction and the Water Conservation Bureau of the Environment Agency.

① athological examinations - Appearance checks, gross anatomical examinations, and histologic examinations of testes

② Blood test - Measurement of concentration of vitellogenin, estradiol and testosterone (Nos. 29-31 in Table 1)

③ Chemical analysis - Samples : muscle

Analyzed substances: Nos. 1-28 in Table 1 (28 kinds in total)

③ Environmental survey - Chemical analysis of water and sediment:

Nos. 1-28, 30 and 32 (30 kinds in total)

6) Results:

① Pathological examinations

The histologic examination of testes revealed that one specimen had fewer sperms.

② Blood test

Blood vitellogenin was detected in 19 out of 74 male specimens.

③ Chemical analysis

Of the 28 kinds of substances subjected to analysis, the following 15 kinds were detected.

[Polychlorinated biphenyl (PCB), Hexachlorocyclohexane (HCH), Chlordane, Oxychlordane, trans-Nonachlor, DDE and DDD, Dieldrin, Tributyltin, Triphenyltin, Dibutyltin, Monobutyltin, Trifluralin, Di-(2-ethylhexyl)phthalate, Di-n-butyl phthalate, and Styrene monomer]

④ Environmental survey

Of the 30 kinds of substances subjected to analysis, the following six kinds were detected.

[Monobutyltin, Nonyl phenol, 4-Octyl phenol, Bisphenol A, Di-n-butyl phthalate, Styrene monomer and 17β- Estradiol]

The following 15 substances were detected in the sediment.

[Polychlorinated biphenyl (PCB), Benzo(a)pyrene, Tributyltin, Triphenyltin, Dibutyltin, Monobutyltin, Nonyl phenol, 4-Octyl phenol, Bisphenol A, Di-(2-ethylhexyl) phthalate, Butyl benzyl phthalate, Di-n-butyl phthalate, Di-2-ethylhexyl adipate, Styrene dimer and trimer, 17β- Estradiol and Ethynyl estradiol]

(2) Amphibians and surrounding environment

1) Names of species: Japanese brown frog, montane brown frog

2) Ecology:

Habitat

Brown frogs surveyed in this research often live in and around marshes and ponds, in grass around paddy fields, fallow fields and wetland. They are also found in slightly dry grassland and light forest floors, and live mainly on land.

Food habit

Larvae are omnivorous, but full-grown frogs are carnivorous and feed on spiders, flies, beetles, butterfly larvae, worms and slugs.

3) Number of specimens collected:

Specimens were collected in Yamada Ryokuchi located in Kitakyushu City, Fukuoka Prefecture where multi-legged frogs were observed and in a place in the city selected for comparison purposes where no multi-legged frogs were observed.

Yamada Ryokuchi 49 (20 males and 12 females)

Place selected for comparison purposes 51 (29 males and 22 females)

Total: 100

In addition to these specimens, the following specimens were collected to perform a blood test on 1 - 4 specimens under the same conditions.

Yamada Ryokuchi 29 (17 males and 12 females)

Place selected for comparison purposes 26 (14 males and 12 females)

4) Collection method

Frogs that came out to ponds to lay eggs or breed were caught in a net trap or with a net.

5) Details of survey

① Pathological examinations - Appearance checks, gross anatomical examinations, and histologic examinations of testes

② Blood test - Measurement of concentration of estradiol and testosterone (Nos. 29 and 30 in Table 1)

③ Chemical analysis - Samples : whole body

Analyzed substances: Nos. 1-12, 17 and 18 in Table 1 (14 kinds in total)

④ Environmental survey - Chemical analysis of water and soil or sediment

Water and soil or sediment in Yamada Ryokuchi and in the place selected for comparison purposes were analyzed.

Substances analyzed: Nos. 1-28, 30 and 32 (30 kinds in total)

6) Results

① Pathological examinations

No specific abnormality was recognized.

② Blood test

No significant differences were recognized between Yamada Ryokuchi and the place selected for comparison purposes.

③ Chemical analysis

Of the 14 kinds of substances subjected to analysis, the following six kinds were detected.

[Polychlorinated biphenyl (PCB), Hexachlorocyclohexane (HCH), Oxychlordane, DDT, DDE and DDD and Dieldrin]

The analysis revealed that the specimens collected in Yamada Ryokuchi tended to have a higher concentration of DDTs and Oxychlordane as compared with specimens collected in the place selected for comparison purposes. However, the relation between the development of deformity and accumulation of these substances remained to be accounted for.

④ Environmental survey

Of the 30 kinds of substances subjected to analysis, the following four substances were detected in the water.

[Nonyl phenol, 4-Octyl phenol, Bisphenol A, Di-2-ethylhexyl adipate and 17β-Estradiol]

The following six kinds of substances were detected in the soil.

[DDT, DDE and DDD, Benzo(a)pyrene, Di-(2-ethylhexyl) phthalate, Di-n-butyl phthalate and 17β-Estradiol]

The following eight kinds of substances were detected in the sediment.

[Polychlorinated biphenyl (PCB), DDT, DDE and DDD, Benzo(a)pyrene, Nonyl phenol, 4-Octyl phenol, Bisphenol A, Di-(2-ethylhexyl) phthalate and 17β-Estradiol]

Of these substances, Polychlorinated biphenyl (PCB), DDT, DDE and DDD, Di-n-butyl phthalate, Di-2-ehylhexyl dipate were found only in Yamada Ryokuchi.

(3) Marine mammals

3-1 Whales

1) Ecology:

Habitat

Many of them are pelagic whales, but the harbor porpoises and finless porpoises subject to this survey are littoral mammals.

Food habit

They are carnivorous; whalebone whales feed on gregarious small fishes and plankton including krill, while toothed whales mainly feed on cephalopods (squids, etc) and fishes. Although finless porpoises are a species of toothed whale, they feed on gregarious small fishes and benthic invertebrates that inhabit shallow seas.

2) Number of specimens collected: 26 (11 males and 15 females)

3) Collection method: Dead bodies washed ashore (strandings), etc.

Frogs that came out to ponds to lay eggs or breed were caught in a net trap or with a net.

4) Details of survey

① Pathological examinations - Appearance checks, gross anatomical examinations, and histologic examinations of major organs. Histologic examinations were not conducted as some parts of the bodies were frozen for storage.

② Chemical analysis - Samples : Blubber, liver as a rule for measuring organic tin

Analyzed substances: Nos. 1-16 (16 kinds in total)

5) Results

① Pathological examinations

The appearance checks revealed that two specimens had vinyl, etc. in their stomachs as an alien substance. The histologic examinations did not disclose any significant abnormality, and some specimens were very difficult to diagnose because of sever postmortem changes.

② Chemical analysis

Of the 16 kinds of substances subjected to analysis, the following 14 kinds were detected.

[Polychlorinated biphenyl (PCB), Hexachlorobenzene (HCB), Hexachlorocyclohexane (HCH), Chlordane, Oxychlordane, trans-Nonachlor, DDT, DDE and DDD, Dieldrin, Heptachlor epoxide, Tributyltin, Triphenyltin, Dibutyltin and Monobutyltin]

3-2 Seals

1) Names of species: Ringed seal, spotted seal

2) Ecology:

Habitat

In the sea near Japan, they are distributed on the coasts of the Pacific, the sea of Okhotsk and the Sea of Japan in Hokkaido.

Food habit

They are carnivorous, and prey on littoral Northern Pacific giant octopuses in addition to fishes (bullheads, right-eyed flounders, butterfishes, etc.).

3) Number of specimens collected: 19 (5 males and 14 females)

4) Collection method: Dead bodies accidentally trapped in a net or washed ashore

5) Details of survey

① Pathological examinations - Appearance checks, gross anatomical examinations, and histologic examinations of major organs. Histologic examinations were not conducted as some parts of the bodies were frozen for storage.

② Chemical analysis - Samples : Blubber, liver as a rule for measuring organic tin

Analyzed substances: Nos. 1-16 (16 kinds in total)

6) Results

① Pathological examinations

No specific abnormality was recognized.

② Chemical analysis

Of the 16 kinds of substances subjected to analysis, the following 11 kinds were detected.

[Polychlorinated biphenyl (PCB), Hexachlorobenzene (HCB), Hexachlorocyclohexane (HCH), Chlordane, Oxychlordane, trans-Nonachlor, DDT, DDE and DDD, Dieldrin, Heptachlor epoxide and Tributyltin]

(4) Birds

4-1Common pigeons

1) Ecology:

Habitat

Currently in Japan, they are widely observed in urban and rural areas and in is olated islands. Particularly in recent days, their distribution has markedly increased from the central parts of urban areas to suburbs.

Food habit

They are herbivorous and feed mainly on land, and formulated granular feed and bread, rice and cooked rice, and cookies fed by people are considered to account for a significant portion. In addition o these, they sometimes feed on tree fruits and small snails.

2) Number of specimens collected: 32 (16 males and 16 females)

3) Collection method: Pigeons caught as harmful birds were used.

4) Details of survey

① Pathological examinations - Appearance checks, gross anatomical examinations

② Chemical analysis - Samples : Muscle, liver as a rule for measuring organic tin

Analyzed substances: Nos. 1-28 (28 kinds in total)

5) Results

① Pathological examinations

No specific abnormality was recognized.

② Chemical analysis

Of the 28 kinds of substances subjected to analysis, the following 11 kinds were detected.

[Polychlorinated biphenyl (PCB), Hexachlorocyclohexane (HCH), Oxychlordane, trans-Nonachlor, DDT, DDE and DDD, Dieldrin, Nonyl phenol/4-Octyl phenol, Bisphenol A, Di-(2-ethylhexyl) phthalate and Styrene monomer]

4-2 Black kites

1) Ecology:

Habitat

They are observed in flatlands in various parts of Japan, and mainly inhabit farm land in and around urban areas. They also live near the waterside in mountainous regions. They prefer to live in places near rivers, lakes, wetlands, and open water such as harbors. They normally live around their feeding grounds, and travel about 1-3 km. However, they fly a distance of up to about 10 km during migration or dispersion.

Food habit

They are carnivorous and feed on small- and medium-size mammals, birds, reptiles, amphibians, fishes, insects, spiders and worms.

2) Number of specimens collected: 26 (16 males and 10 females)

3) Collection method: Dead bodies of black kites killed in accidents or died after rescue

4) Details of survey

① athological examinations - Appearance checks, gross anatomical examinations

② Chemical analysis - Samples: Muscle, liver as a rule for measuring organic t t in

Analyzed substances: Nos. 1-16 (16 kinds in total)

5) Results

① Pathological examinations

No specific abnormality was recognized.

② Chemical analysis

Of the 16 kinds of substances subjected to analysis, the following 12 kinds were detected.

[Polychlorinated biphenyl (PCB), Hexachlorobenzene (HCB), Hexachlorocyclohexane (HCH), Chlordane, Oxychlordane, trans-Nonachlor, DDT, DDE and DDD, Dieldrin, Nonyl, Heptachlor epoxide and Triphenyltin]

4-3 Birds of prey

1) Ecology:

Habitat

Of the birds surveyed, Japanese lesser sparrow hawks and brown hawk owls are summer birds, marsh harriers are winter birds, and others are resident birds. They inhabit forests in flatlands and mountainous regions. Their feeding

grounds include forests, farmland, riverbeds and golf courses.

Food habit

They are carnivorous and feed on small-size mammals, birds, reptiles, amphibians, fishes and insects.

2) Number of specimens collected: Hawks - 6 species: 25 (8 males, 7 females and 10 whose sex is unknown)

Owls - 3 species: 5 (1 female and 4 whose sex is unknown)

3) Collection method: Dead bodies collected (frozen for storage)

4) Details of survey

① Pathological examinations - Appearance checks, gross anatomical examinations. Histologic examinations were not conducted since the specimens were frozen for storage.

② Chemical analysis - Samples : liver

Analyzed substances: Nos. 1-16 (16 kinds in total)

5) Results

① Pathological examinations

No specific abnormality was recognized.

② Chemical analysis

Of the 16 kinds of substances subjected to analysis, the following 10 kinds were detected.

[Polychlorinated biphenyl (PCB), Hexachlorobenzene (HCB), Hexachlorocyclohexane (HCHs), Chlordane, Oxychlordane, trans-Nonachlor, DDT, DDE and DDD, Dieldrin, Nonyl and Heptachlor epoxide]

4-4 Blakiston's fish owls

1) Ecology:

Habitat

They are resident birds living along some of the rivers and forests near lakes in Hokkaido.

Food habit

They feed on fishes, amphibians, crayfishes, etc.

2) Number of specimens collected: 5 (1 male, 3 females, 1 whose sex is unknown)

3) Collection method: Dead bodies collected (frozen for storage)

4) Details of survey

① Pathological examinations - Appearance checks, gross anatomical examinations. Histologic examinations were not conducted since the specimens were frozen for storage.

② Chemical analysis - Samples: Muscle, liver as a rule for measuring organic tin

Analyzed substances: Nos. 1-16 (16 kinds in total)

5) Results

① Pathological examinations

No specific abnormality was recognized during appearance checks and gross anatomical examinations.

② Chemical analysis

Of the 16 kinds of substances subjected to analysis, the following 9 kinds were detected.

[Polychlorinated biphenyl (PCB), Hexachlorobenzene (HCB), Hexachlorocyclohexane (HCHs), Oxychlordane, trans-Nonachlor, DDT, DDE and DDD, Tributyltin and Triphenyltin]

(5) Land mammals

5-1 Wood mice

1) Ecology:

Habitat

The are distributed mainly in forests located from lowlands to alpine regions, including shrine and temple groves, forests around farmland and riverbeds. Their home range is several hectares.

Food habit

They are omnivorous, and feed on roots and stalks of herbaceous plants, seeds, nuts and insects.

2) Number of specimens collected: 61 (31 males, 30 females)

Since they are small, a group of 1 - 4 mice having the same conditions are counted as one specimen.

3) Collection method: They were caught in a trap (some were frozen for storage).

4) Details of survey

① Pathological examinations - Appearance checks, gross anatomical examinations, and histologic examinations of major organs. Histologic examinations were not conducted since some specimens were frozen for storage.

② Chemical analysis - Samples: Whole body (skinned, and entrails, head, limbs and tail removed), liver as a rule for measuring organic tin

Analyzed substances: Nos. 1-28 (28 kinds in total)

5) Results

① Pathological examinations

No specific abnormality was recognized.

② Chemical analysis

Of the 28 kinds of substances subjected to analysis, the following 5 kinds were detected.

[DDE and DDD, Nonyl phenol, 4-Octyl phenol, Bisphenol A, Di-(2-ethylhexyl) phthalate, Styrene monomer]

5-2 Japanese macaques

1) Ecology:

Habitat

The are distributed in forests from Aomori Pref. to Kagoshima Pref., and sometimes observed in farmland. Their groups have a home range of 2~25km2.

Food habit

They are omnivorous, and feed on fruits, seeds, leaves, buds, insects and small animals on trees and on ground. Plants account for a larger portion of their feed.

2) Number of specimens collected: 41 (24 males, 15 females, 2 whose sex is

unknown)

In addition to these specimens, blood was taken for chemical analysis from 8 (2 males, 6 females) belonging to a group of Japanese macaques having deformity, and from 3 (1 male and 2 females) belonging to other groups.

3) Collection method: Japanese macaques caught as harmful animals were used as specimens (some were frozen for storage). Blood was taken from those caught for academic research purposes.

4) Details of survey

① Pathological examinations - Appearance checks, gross anatomical examinations, and histologic examinations of major organs. Histologic examinations were not conducted since some specimens were frozen for storage.

② Chemical analysis - Samples: Liver, parts of bodies, fat and muscle, and liver as a rule for measuring organic tin. Blood

Analyzed substances: Nos. 1-16 (16 kinds in total)

5) Results

① Pathological examinations

No specific abnormality was recognized.

② Chemical analysis

Of the 16 kinds of substances subjected to analysis, the following 6 kinds were detected from the organs.

[Hexachlorobenzene (HCB), Chlordane, Oxychlordane, trans-Nonachlor, DDE and DDD, Dieldrin, Heptachlor epoxide]

5-3 Bears

1) Names of species: Japanese bear, brown bear

2) Ecology

Habitat

They live mainly in deciduous broadleaf forests in the cold temperate zone (beech forests) in Hokkaido, Honshu and Shikoku, and have a home range of several km2 to 80 km. They hibernate in tree hollows and burrows during the winter.

Food habit

They are omnivorous, but mainly feed on plants, including stalks, roots and seeds of herbaceous plants. They also feed on insects such as bees and ants, dead bodies of deer and antelopes, and at times prey on fawns. Brown bears have a stronger tendency to eat flesh, and some of them living in the Shiretoko Peninsula prey on salmons.

3) Number of specimens collected: 17 (10 males, 7 females)

4) Collection method: Bears caught as harmful animals were used as specimens.

5) Details of survey

① Pathological examinations - Appearance checks, gross anatomical examinations, and histologic examinations of major organs.

② Chemical analysis - Samples: Fat, and liver as a rule for measuring organic tin.

Analyzed substances: Nos. 1-16 (16 kinds in total)

6) Results

① Pathological examinations

No specific abnormality was recognized.

② Chemical analysis

Of the 16 kinds of substances subjected to analysis, the following 7 kinds were detected.

[Polychlorinated biphenyl (PCB), Hexachlorobenzene (HCB), Oxychlordane, trans-Nonachlor, DDE and DDD, Dieldrin, Heptachlor epoxide]

5-4 Raccoon dogs

1) Ecology

Habitat

They inhabit forests, forest edges and mountains near villages and towns located from flatlands to the sub-alpine zone. They sometimes appear in residential areas in suburbs.

Food habit

They are omnivorous, and feed on fruits, nuts, cereals, insects, worms, crustaceans, snakes, frogs, field mice and birds. Soil animals such as beetle larvae and worms account for a relatively larger portion of their feed. They have a limited home range in the suburbs of cities, but have a broader home range of about several tens of hectares to several hundreds of hectares in mountainous areas.

2) Number of specimens collected: 15 (7 males, 4 females)

3) Collection method: Raccoon dogs that died after rescue and those caught as harmful animals were used as specimens.

4) Details of survey

① Pathological examinations - Appearance checks, gross anatomical examinations, and histologic examinations of major organs.

② Chemical analysis - Samples: Fat, and liver as a rule for measuring organic tin.

Analyzed substances: Nos. 1-28 (28 kinds in total)

5) Results

① Pathological examinations

No specific abnormality was recognized during the appearance checks, except external wounds inflicted in traffic and other accidents. The gross anatomical examinations revealed that one specimen had a tumor in its testis.

② Chemical analysis

Of the 28 kinds of substances subjected to analysis, the following 14 kinds were detected.

[Polychlorinated biphenyl (PCB), Hexachlorobenzene (HCB), Hexachlorocyclohexane, (HCH), Oxychlordane, trans-Nonachlor, DDT, DDE and DDD, Dieldrin, Heptachlor epoxide, Nonyl phenol/4-Octyl phenol, Di-(2-ethylhexyl) phthalate, Di-2-ethylhexyl adipate, Styrene monomer, Styrene dimer and trimer]

(6) Comments on the results of this research

This was the first research conducted to extensively study the accumulation of chemicals suspected of having an endocrine disrupting effect in the bodies of wildlife, and as such it obtained specific data. However, because the conditions under which the specimens were collected differed from one specimen to another, the specimens surveyed were of different kinds and quantities, and the number of specimens surveyed was small, researchers failed to make a complete analysis of differences among species or regions. In addition, although histologic changes were observed in some specimens, the results of this research did not clarify the relation between the accumulation of chemicals in their bodies and such histologic changes.

Based upon the results of this research, it will be necessary in the future to improve the accuracy of research by limiting species to be surveyed and by restricting conditions and methods for collecting specimens.

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (1)

(Concentration per wet weight)

Substances surveyed		Fat	Chlorinated biphenyl	Dichiloro biphenyl	Trichloro biphenyl	Tetrachloro biphenyl	Pentachloro biphenyl	Hexachloro biphenyl	Heptachloro biphenyl	Octachloro biphenyl	Nonachloro biphenyl	Decichloro biphenyl	PCB total	Hexachlorobenzene(HCB)	α-HCH	β-HCH	γ-HCH	δ-HCH	HCH total
No.			1											2	3				
SPEED'98 No.			2											4	12				
			Polychlorinated biphenyls (PCBs)												Hexachlorocyclohexane				
Unit		%	μg/kg-wet																
Carp	Max. value	8.3	nd	4.3	79	330	640	490	76	7.5	0.17	nd	1,600	nd	6.0	nd	nd	nd	6.0
	Min. value	0.49	nd	nd	nd	0.21	0.66	0.80	0.10	nd	nd	nd	2.5	nd	nd	nd	nd	nd	nd
	Limit of detection		0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	5	fe (1)	5	5	5	5
	Frequency of detection		0/145	28/145	68/145	145/145	145/145	145/145	145/145	58/145	4/145	0/145	145/145	0/145	1/145	0/145	0/145	0/145	1/145
Frogs	Max. value	3.2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	5	nd	nd	5	5
Yamada Ryokuchi	Min. value	0.50	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection		1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
			～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5
	Frequency of detection		0/40	0/40	0/40	0/40	0/40	0/40	0/40	0/40	0/40	0/40	0/40	0/40	1/40	0/40	0/40	1/40	2/40
Frogs	Max. value	2.8	nd	nd	nd	nd	4	9	nd	nd	nd	nd	13	nd	nd	nd	nd	nd	nd
Place selected for	Min. value	0.48	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
comparision purposes	Limit of detection		1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
			～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5
	Frequency of detection		0/40	0/40	0/40	0/40	1/40	1/40	0/40	0/40	0/40	0/40	1/40	0/40	0/40	0/40	0/40	0/40	0/40
Whales	Max. value	90	nd	nd	310	8,220	17,100	57,000	33,300	4,740	240	nd	120,600	549	192	2,330	30	nd	2,357
	Min. value	20	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection		50	50	50	50	50	50	50	50	50	50	50	5	5	10	10	10	10
															～10				
	Frequency of detection		0/26	0/26	6/26	22/26	23/26	24/26	21/26	6/26	1/26	0/26	24/26	25/26	21/26	25/26	6/26	0/26	25/26
Seals	Max. value	94	nd	nd	nd	180	2,470	5,490	520	nd	nd	nd	8,660	17	91	560	nd	nd	630
	Min. value	72	nd	nd	nd	nd	nd	120	nd	nd	nd	nd	120	nd	13	nd	nd	nd	15
	Limit of detection		50	50	50	50	50	50	50	50	50	50	50	5	10	10	10	10	10
	Frequency of detection		0/19	0/19	0/19	1/19	13/19	19/19	4/19	0/19	0/19	0/19	19/19	14/19	19/19	15/19	0/19	0/19	19/19

(Note) No nd was detected.

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (2)

(Concetration per wet weight)

Substances surveyed		Fat	Chlorinated biphenyl	Dichloro biphenyl	Trichloro biphenyl	Tetrachloro biphenyl	Pentachloro biphenyl	Hexachloro biphenyl	Heptachloro biphenyl	Octachloro biphenyl	Nonachloro biphenyl	Decichloro biphenyl	PCB total	Hexachlorobenzene(HCB)	α-HCH	β-HCH	γ-HCH	δ-HCH	HCH total
No.			1											2	3				
SPEED'98 No.			2											4	12				
			Polychlorinated biphenyls (PCBs)												Hexachlorocyclohexane				
Unit		%	μg/kg-wet																
Feral pigeons	Max. value	7.3	nd	nd	nd	nd	1	6	1	nd	nd	nd	6	nd	nd	10	nd	nd	10
	Min. value	1.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection		1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
			～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5						
	Frequency of detection		0/32	0/32	0/32	0/32	1/32	6/32	1/32	0/32	0/32	0/32	6/32	0/32	0/32	7/32	0/32	0/32	7/32
Black kites	Max. value	12	nd	nd	67	494	2,230	3,940	1,760	346	38	21	8,871	12	nd	35	nd	nd	35
	Min. value	1.5	nd	nd	nd	5	14	20	4	nd	nd	nd	48	nd	nd	nd	nd	nd	nd
	Limit of detection		1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
	Frequency of detection		0/26	0/26	25/26	26/26	26/26	26/26	26/26	24/26	7/26	4/26	26/26	7/26	0/26	25/26	0/26	0/26	25/26
Bird of prey	Max. value	8.8	nd	nd	202	1,460	3,310	6,160	2,560	419	93	51	14,255	65	nd	297	nd	nd	297
	Min. value	0.020	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection		1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
			～50	～50	～50	～50	～50	～50	～50	～50	～50	～50	～50	～50	～10	～10	～10	～10	～10
	Frequency of detection		0/30	0/30	8/30	11/30	23/30	26/30	23/30	15/30	10/30	9/30	26/30	18/30	0/30	26/30	0/30	0/30	26/30
Blakiston`s fish.owls	Max. value	6.8	nd	nd	2	11	23	27	11	nd	nd	nd	72	3	nd	3	nd	nd	3
	Min. value	3.2	nd	nd	nd	nd	4.0	5.0	nd	nd	nd	nd	9.0	nd	nd	nd	nd	nd	nd
	Limit of detection		1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
	Frequency of detection		0/5	0/5	4/5	4/5	5/5	5/5	4/5	0/5	0/5	0/5	5/5	4/5	0/5	1/5	0/5	0/5	1/5

(Note) No nd was detected.

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (3)

(Concentration per wet weight)

Substances surveyed		Fat	Chlorinated biphenyl	Dichloro biphenyl	Trichloro biphenyl	Tetrachloro biphenyl	Pentachloro biphenyl	Hexachloro biphenyl	Heptachloro biphenyl	Octachloro biphenyl	Nonachloro biphenyl	Decichloro biphenyl	PCB total	Hexachlorobenzene(HCB)	α-HCH	β-HCH	γ-HCH	δ-HCH	HCH tatal
No.			1											2	3				
SPEED'98 No.			2											4	12				
			Polychlorinated biphenyls (PCBs)												Hexachlorocyclohexane				
Unit		%	μg/kg-wet																
Wood mice	Max. value	7.7	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Min. value	1.6	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection		2	2	2	2	2	2	2	2	2	2	-	2	2	2	2	2	2
			～5	～5	～5	～5	～5	～5	～5	～5	～5	～5		～4	～4	～4	～4	～4	～4
	Frequency of detection		0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30
Japanese macaques (except blood)	Max. value	13	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	20	nd	nd	20
	Min. value	1.6	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection		1	1	1	1	1	1	1	1	1	1	-	2	2	2	2	2	2
			～10	～10	～10	～10	～10	～10	～10	～10	～10	～10		～4	～4	～4	～4	～4	～4
	Frequency of detection		0/41	0/41	0/41	0/41	0/41	0/41	0/41	0/41	0/41	0/41	0/41	0/41	0/41	24/41	0/41	0/41	24/41
Bears	Max. value	89	nd	nd	nd	nd	nd	14	nd	1	nd	nd	14	6	nd	nd	nd	nd	nd
	Min. value	42	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection		1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
			～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5
	Frequency of detection		0/17	0/17	0/17	0/17	0/17	2/17	0/17	1/17	0/17	0/17	2/17	1/17	0/17	0/17	0/17	0/17	0/17
Raccoon dogs	Max. value	89	nd	nd	26	90	178	223	85	8	nd	nd	577	24	nd	54	nd	nd	54
	Min. value	44	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection		4	4	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2
			～25	～25	～25	～25	～25	～25	～25	～25	～25	～25	～25	～8	～8	～8	～8	～8	～8
	Frequency of detection		0/15	0/15	1/15	2/15	8/15	10/15	7/15	1/15	0/15	0/15	10/15	1/15	0/15	8/15	0/15	0/15	8/15

(Note) No nd was detected

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (4)

(Concentration per wet weight)

Substances surveyd		No.	4		5	6	7		8				9	10	11	12	13	14	15	16	17	18
		SPEED'98 No.	14		15	16	18		19				23	25	26	43	33	34			9	11
			Chlordane				DDT		DDE and DDD													
			cis-Chlordane	trans-Chlordane	Oxychlordane	trans-Nonachlor	o,p'-DDT	p,p'-DDT	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	Dieldrin	Heptachlor	Heptachlor epoxide	Benzo(a)pyrene	Tributyltin	Triphenyltin	Dibutyltin	Monobutyltin	Atrazine	CAT (Simazine)
Unit			μg/kg-wet																			
Carp	Max. value		36	26	7.4	32	nd	nd	nd	27	nd	21	5.7	nd	nd	nd	75	99	16	6	nd	nd
	Min. value		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection		5	5	5	5	5	5	5	5	5	5	5	5	5	1	0.3	0.3	2	2	1	1
	Frequency of detection		18/145	9/145	2/145	19/145	0/145	0/145	0/145	39/145	0/145	2/145	2/145	0/145	0/145	0/145	92/145	108/145	32/145	28/145	0/145	0/145
Frogs Yamada Ryokuchi	Max. value		nd	nd	8	nd	3	33	nd	185	nd	19	12	nd	nd	nd					nd	nd
	Min. value		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd					nd	nd
	Limit of detection		2	2	2	2	1	1	1	1	1	1	2	2	2	2					2	0.5
			～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5					～5	～3
	Frequency of detection		0/40	0/40	21/40	0/40	1/49	13/49	0/49	29/49	0/49	6/49	1/40	0/40	0/40	0/40					0/40	0/40
Frogs Place selected for comparision purposes	Max. value		nd	nd	6	nd	nd	1	nd	7	nd	nd	3	nd	nd	nd					nd	nd
	Min. value		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd					nd	nd
	Limit of detection		2	2	2	2	1	1	1	1	1	1	2	2	2	2					2	1
			～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5					～5	～2.5
	Frequency of detection		0/40	0/40	5/40	0/40	0/51	1/51	0/51	5/51	0/51	0/51	1/40	0/40	0/40	0/40					0/40	0/40
Whales	Max. value		459	45	1,190	7,570	2,270	6,610	351	30,300	392	4,780	1,930	nd	220	nd	330	60	1,100	300		
	Min. value		nd	nd	nd	nd	12	20	nd	60	nd	20	nd	nd	nd	nd	nd	nd	nd	nd		
	Limit of detection		5	5	5	5	5	5	5	5	5	5	10	5	10	5	20	20	50	200		
				～10													～50	～50	～100	～500		
	Frequency of detection		25/26	19/26	25/26	25/26	26/26	26/26	24/26	26/26	25/26	26/26	24/26	0/26	23/26	0/26	18/26	12/26	16/26	2/26		
Seals	Max. value		7	nd	305	434	6	549	nd	2,530	nd	117	90	nd	70	nd	110	nd	nd	nd		
	Min. value		nd	nd	40	57	nd	30	nd	150	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd		
	Limit of detection		5	5	5	5	5	5	5	5	5	5	10	5	10	5	20	20	50	200		
																	～50	～200	～100	～500		
	Frequency of detection		1/19	0/19	19/19	19/19	1/19	19/19	0/19	19/19	0/19	16/19	7/19	0/19	17/19	0/19	1/19	0/19	0/19	0/19		

(Note) No nd was detected.

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (5)

(Concentration per wet weight)

Substances surveyed		cis-Chlordane	trans-Chlordane	Oxychlordane	trans-Nonachlor	o,p'-DDT	p,p'-DDT	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	Dieldrin	Heptachlor	Heptachlor epoxide	Benzo(a)pyrene	Tributyltin	Triphenyltin	Dibutyltin	Monobutyltin	Atrazine	CAT (Simazine)
No.		4		5	6	7		8				9	10	11	12	13	14	15	16	17	18
SPEED'98 No.		14		15	16	18		19				23	25	26	43	33	34			9	11
		Chlordane				DDT		DDE and DDD													
Unit		μg/kg-wet																			
Common pigeons	Max. value	nd	nd	11	3	nd	2	nd	10	nd	3	3	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Min. value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection	2	2	2	2	2	2	2	2	2	2	2	2	2	2	200	200	1,000	2,000	0.5 ～2	0.5 ～2
	Frequency of detection	0/32	0/32	9/32	1/32	0/32	1/32	0/32	17/32	0/32	1/32	1/32	0/32	0/32	0/32	0/31	0/31	0/31	0/31	0/31	0/31
Black kites	Max. value	119	13	80	322	nd	8	nd	230	nd	18	124	nd	7	nd	8	10	nd	nd		
	Min. value	nd	nd	3.0	10	nd	nd	nd	5.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd		
	Limit of detection	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2 ～200	2 ～200	10 ～1,000	20 ～2,000		
	Frequency of detection	23/26	9/26	26/26	26/26	0/26	16/26	0/26	26/26	0/26	23/26	24/26	0/26	9/26	0/26	2/26	3/26	0/26	0/26		
Birds of prey	Max. value	74	5	510	761	nd	4	nd	5,940	nd	82	506	nd	170	nd	nd	nd	nd	nd		
	Min. value	nd	nd	nd	nd	nd	nd	nd	12	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd		
	Limit of detection	2 ～10	2 ～10	2 ～10	2 ～10	2 ～10	2 ～10	2 ～10	2 ～10	2 ～10	2 ～10	2 ～10	2 ～10	2 ～10	2 ～10	200	200	1,000	2,000		
	Frequency of detection	7/30	1/30	27/30	26/30	0/30	3/30	0/30	30/30	0/30	15/30	20/30	0/30	26/30	0/30	0/30	0/30	0/30	0/30		
Blakiston`s fish owls	Max. value	nd	nd	4	5	nd	6	nd	34	nd	8	nd	nd	nd	nd	nd	3	30	nd		
	Min. value	nd	nd	nd	nd	nd	nd	nd	15	nd	3	nd	nd	nd	nd	nd	nd	nd	nd		
	Limit of detection	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	10	20		
	Frequency of detection	0/5	0/5	2/5	4/5	0/5	2/5	0/5	5/5	0/5	5/5	0/5	0/5	0/5	0/5	0/5	2/5	1/5	0/5		

(Note) No nd was detected.

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (6)

(Concentration per wet weight)

No.		4		5	6	7		8				9	10	11	12	13	14	15	16	17	18
SPEED'98 No.		14		15	16	18		19				23	25	26	43	33	34			9	11
Substances surveyed		Chlordane				DDT		DDE and DDD													
		cis-Chlordane	trans-Chlordane	Oxychlordane	trans-Nonachlor	o,p'-DDT	p,p'-DDT	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	Dieldrin	Heptachlor	Heptachlor epoxide	Benzo(a)pyrene	Tributyltin	Triphenyltin	Dibutyltin	Monobutyltin	Atrazine	CAT (Simazine)
Unit		μg/kg-wet																			
Wood mice	Max. value	nd	nd	nd	nd	nd	nd	nd	2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Min. value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection	2	2	2	2	2	2	2	2	2	2	2	2	2	2	200	200	1,000	2,000	1	1
		～4	～4	～4	～4	～4	～4	～4	～4	～4	～4	～4	～4	～4	～4					～2.5	～2.5
	Frequency of detection	0/30	0/30	0/30	0/30	0/30	0/30	0/30	1/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30
Japanese macaques (except blood)	Max. value	3	nd	28	12	nd	nd	nd	10	nd	3	115	nd	178	nd	nd	nd	nd	nd		
	Min. value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd		
	Limit of detection	2	2	2	2	2	2	2	2	2	2	2	2	2	2	200	200	1,000	2,000		
		～4	～4	～4	～4	～4	～4	～4	～4	～4	～4	～4	～4	～4	～4						
	Frequency of detection	1/41	0/41	24/41	17/41	0/41	0/41	0/41	7/41	0/41	1/41	31/41	0/41	16/41	0/41	0/41	0/41	0/41	0/41		
Bears	Max. value	nd	nd	108	12	nd	nd	nd	23	nd	nd	12	nd	80	nd	nd	nd	nd	nd		
	Min. value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd		
	Limit of detection	2	2	2	2	2	2	2	2	2	2	2	2	2	2	50	50	50	500		
		～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～5	～200	～200	～1,000	～2,000		
	Frequency of detection	0/17	0/17	4/17	1/17	0/17	0/17	0/17	1/17	0/17	0/17	3/17	0/17	2/17	0/17	0/17	0/17	0/17	0/17		
Raccoon dogs	Max. value	nd	nd	196	241	nd	26	nd	60	nd	nd	29	nd	23	nd	nd	nd	nd	nd	nd	nd
	Min. value	nd	nd	12	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection	2	2	2	2	2	2	2	2	2	2	2	2	2	2	50	50	50	500	2	2
		～8	～8	～8	～8	～8	～8	～8	～8	～8	～8	～8	～8	～8	～8	～200	～200	～1,000	～2,000	～50	～50
	Frequency of detection	0/15	0/15	15/15	12/15	0/15	2/15	0/15	6/15	0/15	0/15	8/15	0/15	9/15	0/15	0/15	0/15	0/15	0/15	0/15	0/15

(Note) No nd was detected

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife (7)

(Concentration per wet weight)

Substances surveyd		Trifluralin	Alkyl phenol: Nonyl phenol	Alkyl phenol: 4－t-Octyl phenol	Alkyl phenol: 4－n-Octyl phenol	Bisphenol A	Di-(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Di-n-butyl-phthalate	Diethyl phthalate	Di-2-ethylhexyl adipate	Styrene monomer	Styrene dimers and trimers: Styrene dimers	Styrene dimers and trimers: Styrene trimers
No.		19	20			21	22	23	24	25	26	27	28	
SPEED'98 No.		35	36			37	38	39	40	42	45		66	
Unit		μg/kg-wet												
Carp	Max. value	11	nd	nd	nd	nd	260	nd	79	nd	nd	1.4	nd	nd
	Min. value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection	1	50	5	5	5	25	10	25	10	10	1	1	1
	Frequency of detection	3/145	0/145	0/145	0/145	0/145	88/145	0/145	27/145	0/145	0/145	14/145	0/145	0/145
common pigeons	Max. value	nd	113	5.6	nd	48	3,290	nd	nd	nd	nd	3	nd	nd
	Min. value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection	0.5	15	1.5	1.5	20	100	40	100	40	40	2	4	4
		～2			～2	～80	～400	～160	～400	～160	～160	～8	～20	～20
	Frequency of detection	0/31	16/31	9/31	0/31	1/31	3/31	0/31	0/31	0/31	0/31	2/31	0/30	0/30
Wood mice	Max. value	nd	190	7.2	nd	42	390	nd	nd	nd	nd	56	nd	nd
	Min. value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection	1	15	1.5	1.5	40	200	80	200	80	80	4	8	8
		～2.5			～2.5	～100	～500	～200	～500	～200	～200	～10	～20	～20
	Frequency of detection	0/30	22/30	21/30	0/30	1/30	2/30	0/30	0/30	0/30	0/30	8/30	0/30	0/30
Raccoon dogs	Max. value	nd	2,000	37	nd	nd	363,000	nd	nd	nd	57,230	240	4	339
	Min. value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection	2	15	1.5	1.5	20	40	40	100	40	40	2	4	4
		～50			～7	～320	～640	～640	～1,600	～640	～640	～30	～70	～70
	Frequency of detection	0/15	14/15	6/15	0/15	0/15	10/15	0/15	0/15	0/15	4/15	12/15	1/15	7/15

(Note) No nd was detected.

Results of 1998 Research on Effects of Endocrine Disrupting Chemicals on Wildlife
(Environmenyal Survey 1)

Substances surveyed		Polychlorinated biphenyls (PCBs)											Hexachlorobenzene (HCB)	Hexachlorocyclohexane				
		Chlorinated biphenyl	Dichloro biphenyl	Trichloro biphenyl	Tetrachloro biphenyl	Pentachloro biphenyl	Hexachloro biphenyl	Heptachloro biphenyl	Octachloro biphenyl	Nonachloro biphenyl	Decichloro biphenyl	PCB total		α-HCH	β-HCH	γ-HCH	δ-HCH	HCH total
No.		1											2	3				
SPEED'98 No.		2											4	12				
Unit		Water : μg/L、Sediment : μg/kg-dry																
Environmental survey on carp Water	Max. value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Min. value	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	Limit of detection	0.01 ～0.5	0.01 ～2	0.01 ～0.5	0.01 ～0.5	0.01 ～0.5	0.01 ～0.5	0.01 ～0.5	0.01 ～1.0	0.01 ～1.0	0.01 ～1.0	0.01 ～2	0.025 ～0.05	0.025 ～0.05	0.025 ～0.05	0.05	0.05	0.025 ～0.05
	Frequency of detection	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/8	0/2	0/2	0/8
Environmental survey on carp Sediment	Max. value	nd	0.82	6.6	5.6	5.7	3.4	0.3	0.28	0.13	nd	22	nd	nd	nd	-	-	nd
	Min. value	nd	nd	nd	nd	0.020	nd	nd	nd	nd	nd	0.080	nd	nd	nd	-	-	nd
	Limit of detection	0.02 ～0.1	0.02 ～0.1	0.02 ～0.1	0.02 ～0.1	0.02 ～0.1	0.02 ～0.1	0.02 ～0.1	0.02 ～0.1	0.02 ～0.1	0.02 ～0.1	0.02 ～0.1	5	5	5	-	-	5
	Frequency of detection	0/8	2/8	7/8	7/8	8/8	7/8	3/8	1/8	1/8	0/8	8/8	0/8	0/8	0/8	-	-	0/8

(Note) No nd was detected.