

## **Chapter 6.**

### **Summary of the Survey Results for Organotin Compounds (Fiscal Year 1998)**

## Chapter 6. Summary of the Survey Results for Organotin Compounds (Fiscal Year 1998)

### 1. Purpose of the survey

As a result of the General Inspection Survey of Chemical Substances on Environmental Safety, environmental pollution all over Japan caused by organotin compounds became apparent, so environmental pollution has been monitored in wildlife (fishes and shellfishes and birds) in wildlife monitoring since the fiscal year 1985 for tributyltin compounds and the fiscal year 1989 for triphenyltin compounds. Taking the results of this survey in consideration, 13 tributyltin compounds and 7 triphenyltin compounds were designated as Designated Chemical Substances based on the Chemical Substances Control Law between April, 1988 and March, 1989. Accordingly, surveys for bottom sediments and water have been conducted since the fiscal year 1988, without interruption in the Study and Survey of Designated Chemical Substances etc.

In 1990, bis(tributyltin) oxide (TBTO), which is a tributyltin compound among organotin compounds, was designated as a Class 1 Specified Chemical Substance based on the Chemical Substances Control Law, and the former Designated Chemical Substances of 7 triphenyltin compounds and 13 tributyltin compounds excluding TBTO were designated as Class 2 Specified Chemical Substances based on the said Law.

### 2. Summary of the survey

#### (1) Outline of the fiscal year 1998 Wildlife Monitoring Results (Concerning Organotin Compounds)

##### ① Particulars leading to the survey

Among organotin compounds, tributyltin compounds were detected with relatively high concentration in the fiscal year 1984 Detailed Environmental Survey in bottom sediments and fishes in wide areas, so it became subject to wildlife monitoring since the fiscal year 1985.

Triphenyltin compounds were also detected in wide areas in the fiscal year 1988 chemical substances environmental survey. Some of the detected concentration levels in bottom sediments were high in some points (inside ports). A high detected concentration level was observed in the mouths of rivers and inner bays in fishes, so wildlife monitoring was initiated for triphenyltin compounds since the fiscal year 1989.

##### ② Survey results (Table 6-1~6-4)

Tributyltin compounds were detected in fishes and shellfishes and triphenyltin compounds were detected in fishes only.

(2) Outline of the fiscal year 1998 Study and Survey of Designated Chemical Substances etc.  
(concerning organotin compounds)

① Particulars leading to the survey

The Environmental Persistence Survey in the Study and Survey of Designated Chemical Substances etc. was initiated in the fiscal year 1988 for the purpose of grasping the situation of persistence in the general environment of Designated Chemical Substances and Class 2 Specified Chemical Substances based on the Chemical Substances Control Law. Tributyltin compounds and triphenyltin compounds have been subject to this survey since the fiscal year 1988 and 1989, respectively, for the media of water and bottom sediments.

② Survey Results (Table 6-5~6-8)

Tributyltin compounds and triphenyltin compounds were detected in water and bottom sediments.

### 3. Evaluation of survey results

#### (1) Tributyltin compounds

Tributyltin compounds persist widely in the environment and their pollution levels remain largely at the same level in bottom sediments. And in wildlife and water the pollution levels remain largely at the same level or tend to be improved.

Although the pollution level at present does not seem to be at a harmful level, it is necessary to continue to promote measures against environmental pollution and to monitor the situation of environmental pollution. Furthermore, since the substances are pointed out to be those suspected to have endocrine disrupting effects, it is also necessary to endeavor to collect the toxicological knowledge including other related information.

#### (2) Triphenyltin compounds

Triphenyltin compounds persist widely in the environment, but the persistence in water shows a tendency to be improved and that in wildlife and bottom sediments remains at the same level. If the present production situation\* is considered, the pollution is expected to be improved further. But it is necessary to continue to promote measures against environmental pollution and to monitor the situation of environmental pollution. Furthermore, since the substances are pointed out to be those suspected to have endocrine disrupting effects, it is also necessary to endeavor to collect the toxicological knowledge including other related information.

\* : The situation that there is almost no domestic production/usage intended for use in open systems.

**Table 6-1 Results of Wildlife Monitoring (Tributyltin Compound) (Fiscal Year1998)**

(Unit :  $\mu$  g/g · wet(ppm))

Species	Sampling spot	Samples No.					Max.	Min.	Mean	Median	Detected freq.
		1	2	3	4	5					
Chum salmon	Offshore of Kushiro, Hokkaido	nd	nd	nd	nd	nd	nd	nd	-	nd	0/5
Angry rockfish	Offshore of Kushiro, Hokkaido	nd	nd	nd	nd	nd	nd	nd	-	nd	0/5
Greenling	Yamada Bay	nd	nd	nd	nd	nd	nd	nd	-	nd	0/5
Pacific saury	Offshore of Joban	nd	nd	nd	nd	nd	nd	nd	-	nd	0/5
Cod	Sea of Japan (Offshore of Tohoku)	tr(0.005)	tr(0.003)	tr(0.004)	tr(0.003)	tr(0.007)	tr	tr	-	tr	0/5
Sea bass	Tokyo Bay	tr(0.05)	0.06	tr(0.05)	tr(0.02)	tr(0.04)	0.06	tr	-	tr	1/5
Sea bass	Osaka Bay	0.07	0.06	0.08	0.08	0.09	0.09	0.06	0.076	0.08	5/5
Sea bass	Seto Inland Sea	0.07	tr(0.03)	0.07	0.09	0.09	0.09	tr	-	0.07	4/5
Sea bass	Offshore of Sanin	0.08	0.05	tr(0.047)	tr(0.049)	0.08	0.08	tr	-	0.05	3/5
Sea bass	Mouth of Riv. Shimanto	tr(0.004)	tr(0.018)	tr(0.014)	tr(0.003)	tr(0.009)	tr	tr	-	tr	0/5
Sea bass	Surrounding of Shuugen Island	tr(0.030)	0.05	tr(0.020)	tr(0.020)	tr(0.005)	0.05	tr	-	tr	1/5
Sea bass	West Coast of Satsuma Peninsula	tr(0.03)	0.05	tr(0.04)	0.08	0.05	0.08	tr	-	0.05	3/5
Black porgy	Nakagusuku Bay, Okinawa Pref.	tr(0.02)	nd	nd	tr(0.01)	nd	tr	nd	-	nd	0/5
Dace	Lake Biwa	nd	nd	nd	nd	nd	nd	nd	-	nd	0/5
Fishes							0.09	nd	-	tr	17/70
Common mussel	Yamada Bay	tr(0.02)	tr(0.03)	tr(0.02)	tr(0.02)	tr(0.03)	tr	tr	-	tr	0/5
Common mussel	Miura Peninsula	tr(0.037)	tr(0.035)	tr(0.033)	tr(0.044)	tr(0.043)	tr	tr	-	tr	0/5
Common mussel	Noto Peninsula	nd	nd	nd	nd	nd	nd	nd	-	nd	0/5
Common mussel	Ise Bay	tr(0.003)	tr(0.003)	tr(0.003)	tr(0.003)	tr(0.004)	tr	tr	-	tr	0/5
Common mussel	Shimane Peninsula	0.08	0.08	0.10	0.11	0.11	0.11	0.08	0.096	0.10	5/5
Asiatic mussel	Naruto	0.06	0.10	0.09	0.07	0.07	0.10	0.06	0.078	0.07	5/5
Shellfishes							0.11	nd	-	tr	10/30
Gray starling	Suburbs of Morioka City	nd	nd	nd	nd	nd	nd	nd	-	nd	0/5
Black-tailed gull	Kabushima, Aomori Pref.	nd	nd	nd	nd	nd	nd	nd	-	nd	0/5
Birds							nd	nd	-	nd	0/10
Total(Total Samples 110)							0.11	-	-	tr	27/110

(Note) 1. The values are the equivalent values to TBTO.

2. Conduct of the unified detection limit is treated at  $0.05 \mu$  g/g · wet.

3. nd denotes no detection and tr denotes that the detected values are below the unified detection limit.

**Table 6-2 Results of Wildlife Monitoring (Triphenyltin Compound) (Fiscal Year1998)**

(Unit :  $\mu\text{g/g} \cdot \text{wet}(\text{ppm})$ )

Species	Sampling spot	Samples No.					Max.	Min.	Mean	Median	Detected freq.
		1	2	3	4	5					
Chum salmon	Offshore of Kushiro, Hokkaido	nd	nd	nd	nd	nd	nd	-	nd	0/5	
Angry rockfish	Offshore of Kushiro, Hokkaido	nd	nd	nd	nd	nd	nd	-	nd	0/5	
Greenling	Yamada Bay	nd	nd	nd	0.02	nd	0.02	nd	-	nd	
Pacific saury	Offshore of Joban	nd	nd	nd	nd	nd	nd	nd	-	nd	
Cod	Sea of Japan (Offshore of Tohoku)	tr(0.006)	tr(0.005)	tr(0.013)	tr(0.009)	0.02	0.02	tr	-	tr	
Sea bass	Tokyo Bay	0.03	tr(0.01)	tr(0.01)	tr(0.01)	tr(0.01)	0.03	tr	-	tr	
Sea bass	Osaka Bay	0.03	0.02	0.05	0.02	0.03	0.05	0.02	0.030	0.03	
Sea bass	Seto Inland Sea	0.04	0.02	0.04	0.04	0.04	0.04	0.02	0.036	0.04	
Sea bass	Offshore of Sanin	nd	nd	nd	nd	nd	nd	nd	-	nd	
Sea bass	Mouth of Riv. Shimanto	nd	nd	nd	nd	nd	nd	nd	-	nd	
Sea bass	Surrounding of Shuugen Island	tr(0.005)	nd	nd	nd	nd	tr	nd	-	nd	
Sea bass	West Coast of Satsuma Peninsula	nd	tr(0.01)	tr(0.01)	0.02	nd	0.02	nd	-	tr	
Black porgy	Nakagusuku Bay, Okinawa Pref.	nd	nd	nd	nd	nd	nd	nd	-	nd	
Dace	Lake Biwa	nd	nd	nd	nd	nd	nd	nd	-	nd	
Fishes							0.05	nd	-	nd	14/70
Common mussel	Yamada Bay	nd	nd	nd	nd	nd	nd	nd	-	nd	
Common mussel	Miura Peninsula	tr(0.003)	tr(0.004)	tr(0.006)	tr(0.005)	tr(0.005)	tr	tr	-	tr	
Common mussel	Noto Peninsula	nd	nd	nd	nd	nd	nd	nd	-	nd	
Common mussel	Ise Bay	nd	nd	nd	nd	nd	nd	nd	-	nd	
Common mussel	Shimane Peninsula	tr(0.006)	tr(0.008)	tr(0.008)	tr(0.010)	tr(0.009)	tr	tr	-	tr	
Asiatic mussel	Naruto	nd	nd	nd	nd	nd	nd	nd	-	nd	
Shellfishes							tr	nd	-	nd	0/30
Gray starling	Suburbs of Morioka City	nd	nd	nd	nd	nd	nd	nd	-	nd	
Black-tailed gull	Kabushima, Aomori Pref.	nd	nd	nd	nd	nd	nd	nd	-	nd	
Birds							nd	nd	-	nd	0/10
Total(Total Samples 110)							0.05	nd	-	nd	14/110

(Note) 1. The values are the equivalent values to TPTCl.

2. Conduct of the unified detection limit is treated at  $0.02 \mu\text{g/g} \cdot \text{wet}$ .

3. nd denotes no detection and tr denotes that the detected values are below the unified detection limit.

Table 6-3 Results of Wildlife Monitoring of Tributyltin Compounds (Fiscal Year 1985-1998)

(D.S.=Detected samples)

(Unit :  $\mu$ g/g·wet (ppm))

Species	Sampling spot	1985			1986			1987			1988			1989			1990			1991			1992			1993			1994			1995			1996			1997			1998					
		Max.	Min.	D.S.	Max.	Min.	D.S.	Max.	Min.	D.S.	Max.	Min.	D.S.	Max.	Min.	D.S.	Max.	Min.	D.S.	Max.	Min.	D.S.	Max.	Min.	D.S.	Max.	Min.	D.S.	Max.	Min.	D.S.	Max.	Min.	D.S.	Max.	Min.	D.S.									
Chum salmon	Offshore of Kushiro, Hokkaido	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	tr	tr	0	tr	nd	0	nd	nd	0	nd	nd	0	tr	nd	0	nd	nd	0	nd	nd	0	nd	nd	0			
Angry rockfish	Offshore of Nemuro, Hokkaido	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	tr	tr	0	nd	nd	0	nd	nd	0	nd	nd	0	tr	nd	0	nd	nd	0	nd	nd	0	nd	nd	0			
Greenling	Yamada Bay	nd	nd	0	nd	nd	0	nd	nd	0	tr	nd	0	nd	nd	0	nd	nd	0	tr	tr	0	tr	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0			
Pacific saury	Offshore of Joban	0.06	nd	1	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	0.06	nd	1	tr	tr	0	tr	nd	0	tr	nd	0	tr	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0			
Cod	Offshore of Tohoku, Sea of Japan	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	tr	tr	0	tr	tr	0	tr	tr	0	tr	tr	0	tr	tr	0	tr	tr	0	tr	tr	0	tr	tr	0	tr	tr	0			
Sea bass	Tokyo Bay	0.3	0.12	5	0.18	0.15	5	0.16	0.13	5	0.4	0.22	5	0.33	0.2	5	0.21	0.12	5	0.59	0.28	5	0.25	0.12	5	0.25	0.19	5	0.17	0.12	5	0.06	tr	2	0.12	0.07	5	0.099	0.072	5	0.06	tr	1			
Sea bass	Osaka Bay	0.42	0.3	5	0.34	0.07	5	0.33	0.23	5	0.3	0.2	5	0.5	0.38	5	1.2	0.38	5	0.4	0.21	5	0.43	0.35	5	0.37	0.19	5	0.17	0.1	5	0.54	0.32	5	0.24	0.1	5	0.12	0.08	5	0.09	0.06	5			
Sea bass	Seto Inland Sea	1.7	0.6	5	0.69	0.29	5	1.3	1.1	5	0.66	0.15	5	0.27	0.16	5	-	-	-	-	-	-	0.39	0.19	5	0.14	nd	3	0.13	0.1	5	0.3	tr	3	0.16	0.05	5	0.14	tr	2	0.09	tr	4			
Sea bass	Offshore of Sanin	0.06	nd	2	0.11	0.05	5	0.09	tr	1	0.17	0.07	5	0.08	tr	3	tr	tr	0	tr	tr	0	tr	tr	0	0.06	tr	4	tr	nd	0	0.05	tr	1	0.05	tr	1	tr	tr	0	0.08	tr	3			
Sea bass	Mouth of Riv. Shimanto	nd	nd	0	0.09	nd	2	nd	nd	0	0.05	tr	1	nd	nd	0	0.11	0.05	5	0.29	tr	3	tr	tr	0	0.16	tr	2	tr	tr	0	tr	tr	0	tr	tr	0	0.061	tr	1	tr	tr	0			
Sea bass	Surrounding of Shuugen Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.23	0.07	5	0.49	0.07	5	0.18	tr	3	tr	tr	0	tr	tr	0	0.07	tr	1	0.07	tr	2	tr	tr	0	0.05	tr	1				
Sea bass	West Coast of Satsuma Peninsula	0.37	0.2	5	0.21	0.05	5	0.07	tr	1	0.1	0.05	5	0.36	0.06	5	0.12	0.06	5	0.08	tr	3	0.07	tr	3	0.07	tr	4	tr	tr	0	0.13	nd	1	0.2	0.13	5	tr	tr	0	0.08	tr	3			
Black porgy	Nakagusuku Bay, Okinawa Pref.	-	-	-	-	-	-	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	tr	nd	0	0.07	nd	1	nd	nd	0	tr	nd	0	tr	nd	0	tr	nd	0	tr	nd	0	tr	nd	0			
Dace	Lake Biwa	nd	nd	0	nd	nd	0	nd	nd	0	0.05	nd	1	nd	nd	0	tr	tr	0	tr	tr	0	tr	tr	0	tr	tr	0	tr	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0			
Fishes		1.7	nd	23	0.69	nd	27	1.3	nd	17	0.66	nd	27	0.5	nd	23	1.2	nd	26	0.59	nd	21	0.43	nd	22	0.37	nd	23	0.17	nd	15	0.54	nd	13	0.24	nd	23	0.14	nd	13	0.09	nd	17			
Common mussel	Yamada Bay	0.12	0.1	5	0.24	0.13	5	0.43	0.3	5	0.27	0.22	5	0.34	0.32	5	0.51	0.42	5	0.38	0.11	5	0.45	0.35	5	0.78	0.6	5	0.1	0.07	5	0.15	0.12	5	0.07	0.05	5	0.06	tr	4	tr	tr	0			
Common mussel	Miura Peninsula	0.28	0.05	5	0.06	0.05	5	0.06	0.05	5	0.07	nd	2	0.13	0.07	5	0.09	0.06	5	0.09	0.05	5	0.05	tr	1	tr	tr	0	tr	tr	0	0.06	tr	3	0.09	0.05	5	0.05	tr	4	tr	tr	0			
Common mussel	Noto Peninsula	nd	nd	0	0.1	0.06	5	0.07	0.05	5	nd	nd	0	nd	nd	0	0.06	tr	4	tr	tr	0	0.05	tr	1	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0			
Common mussel	Ise Bay	-	-	-	-	-	-	-	-	-	-	-	-	0.11	0.11	1	0.08	0.05	5	0.16	0.12	5	0.07	0.06	5	tr	tr	0	tr	tr	0	0.06	tr	2	tr	tr	0	tr	tr	0	tr	tr	0			
Common mussel	Shimane Peninsula	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	tr	tr	0	tr	nd	0	0.07	0.05	5	0.05	tr	1	0.35	0.25	5	nd	nd	0	0.24	0.15	5	0.11	0.08	5			
Asiatic mussel	Naruto	0.27	0.19	5	0.48	0.3	5	0.19	0.13	5	0.29	0.2	5	0.75	0.41	5	0.33	0.27	5	0.07	tr	3	0.1	0.07	5	0.07	0.05	5	tr	tr	0	0.08	0.07	5	0.07	0.05	5	0.09	0.08	5	0.10	0.06	5			
Shellfishes		0.28	nd	15	0.48	0.5	20	0.43	0.05	20	0.29	nd	12	0.75	nd	16	0.51	tr	24	0.38	tr	18	0.45	nd	17	0.78	nd	15	0.1	nd	6	0.35	nd	20	0.09	nd	15	0.24	nd	18	0.11	nd	10			
Gray starling	Suburbs of Morioka	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	tr	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0			
Black-tailed gull	Tokyo Bay	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	tr	nd	0	nd	nd	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Black-tailed gull	Kabushima, Aomori Pref.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Birds		nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	tr	nd	0	tr	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0
Detected samples/Total samples		38/90			47/90			37/95			39/95			39/96			50/100			39/105			39/110			38/110			21/105			33/110			38/110			31/110			27/110					

(Note) 1. The values are the equivalent values to TBTO. The unified detection limit is 0.05  $\mu$ g/g·wet (ppm)  
 2. Detected samples denote the numbers of detected samples in each sampling spot.  
 3. nd denotes no detection and tr denotes that the detected values are below the unified detection limit.

4. Black porgy in Nakagusuku Bay, Okinawa Pref., common mussel in Ise Bay, sea bass in surrounding of Shugen Island and common mussel in Shimane Peninsula have been monitored since fiscal year 1987, 1989, 1990 and 1991, respectively.  
 Monitoring of Black-tailed gull in Tokyo Bay was completed in fiscal year 1993.

Monitoring of Black-tailed gull in Kabushima, Aomori Pref. was started in fiscal year 1995.  
 Sea bass in Seto Inland Sea could not be caught in fiscal year 1990 and 1991.  
 Monitoring of Angry rockfish in offshore of Nemuro, Hokkaido was completed in fiscal year 1997  
 Monitoring of Angry rockfish in offshore of Nemuro, Hokkaido was started in fiscal year 1997

**Table 6-4 Results of Wildlife Monitoring of Triphenyltin Compounds (Fiscal Year 1989—1998)**

(D.S.=Detected samples)

(Unit :  $\mu\text{g/g} \cdot \text{wet (ppm)}$ )

Species	Sampling spot	1989			1990			1991			1992			1993			1994			1995			1996			1997			1998		
		Max.	Min.	D.S	Max.	Min.	D.S	Max.	Min.	D.S	Max.	Min.	D.S	Max.	Min.	D.S	Max.	Min.	D.S	Max.	Min.	D.S	Max.	Min.	D.S	Max.	Min.	D.S	Max.	Min.	D.S
Chum salmon	Offshore of Kushiro, Hokkaido	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0
Angry rockfish	Offshore of Nemuro, Hokkaido	nd	nd	0	nd	nd	0	nd	nd	0	0.03	tr	3	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0
Greenling	Yamada Bay	0.46	0.26	5	0.89	0.64	5	0.3	0.09	5	0.24	0.11	5	0.13	0.05	5	0.1	0.05	5	0.07	0.06	5	0.03	nd	1	0.06	0.04	4	0.02	nd	1
Pacific saury	Offshore of Joban	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0
Cod	Offshore of Tohoku, Sea of Japan	0.06	0.03	5	0.03	tr	4	0.03	tr	2	0.03	tr	1	0.02	tr	1	tr	nd	0	tr	nd	0	tr	tr	0	tr	tr	0	0.02	tr	1
Sea bass	Tokyo Bay	2.3	1.3	5	0.45	0.16	5	0.48	0.26	5	0.13	0.11	5	0.1	0.06	5	0.1	0.06	5	nd	nd	0	nd	nd	0	0.03	tr	4	0.03	tr	1
Sea bass	Osaka Bay	1.4	1.2	5	1.9	0.99	5	0.59	0.23	5	0.23	0.2	5	0.34	tr	4	0.28	0.05	5	0.25	0.06	5	0.1	0.06	5	0.077	0.031	5	0.05	0.02	5
Sea bass	Seto Inland Sea	2.6	1.6	5	-	-	-	-	-	-	0.26	0.17	5	0.12	nd	3	0.13	0.08	5	0.19	0.04	5	0.27	0.05	5	0.12	0.03	5	0.04	0.02	5
Sea bass	Offshore of Sanin	0.11	0.05	5	0.08	0.05	5	0.04	0.02	5	0.13	0.07	5	0.05	0.02	5	0.1	nd	2	nd	nd	0	tr	nd	0	nd	nd	0	nd	nd	0
Sea bass	Mouth of Riv. Shimanto	nd	nd	0	0.16	0.02	5	nd	nd	0	tr	nd	0	0.03	nd	2	nd	nd	0	tr	tr	0	nd	nd	0	nd	nd	0	nd	nd	0
Sea bass	Surrounding of Shuugen Island	-	-	-	0.4	0.26	5	0.39	0.08	5	0.25	0.05	5	0.1	tr	4	0.06	0.03	5	0.18	0.04	5	0.06	0.04	5	0.029	tr	1	tr	nd	0
Sea bass	West Coast of Satsuma Peninsula	1.4	0.31	5	0.15	0.12	5	0.04	nd	2	nd	nd	0	0.06	nd	4	0.03	tr	1	0.03	nd	1	0.03	tr	4	nd	nd	0	0.02	nd	1
Black porgy	Nakagusuku Bay, Okinawa Pref.	nd	nd	0	0.03	nd	1	nd	nd	0	0.05	nd	1	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0
Dace	Lake Biwa	0.48	0.15	5	0.8	0.51	5	0.48	0.13	5	0.08	0.03	5	0.09	0.03	5	tr	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0
Fishes		2.6	nd	40	1.9	nd	45	0.59	nd	34	0.26	nd	40	0.34	nd	38	0.28	nd	28	0.25	nd	21	0.27	nd	20	0.12	nd	19	0.05	nd	14
Common mussel	Yamada Bay	0.3	0.19	5	0.13	0.1	5	0.09	0.07	5	0.11	0.08	5	0.07	0.04	5	0.04	0.03	5	nd	nd	0	nd	nd	0	nd	m	0	nd	nd	0
Common mussel	Miura Peninsula	0.45	0.29	5	0.11	0.09	5	0.07	0.05	5	0.05	0.04	5	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	tr	tr	0
Common mussel	Noto Peninsula	0.02	nd	1	nd	nd	0	tr	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0
Common mussel	Ise Bay	0.43	0.43	1	0.15	0.11	5	0.06	0.05	5	tr	tr	0	nd	nd	0	tr	tr	0	tr	tr	0	nd	nd	0	nd	nd	0	nd	nd	0
Common mussel	Shimane Peninsula	-	-	-	-	-	-	0.04	0.02	5	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	0.07	0.05	5	tr	tr	0
Asiatic mussel	Naruto	0.19	0.1	5	0.05	0.03	5	0.02	nd	2	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	5	nd	nd	0
Shellfishes		0.45	nd	17	0.15	nd	20	0.09	nd	22	0.11	nd	10	0.07	nd	5	0.04	nd	5	tr	nd	0	nd	nd	0	0.07	nd	5	tr	nd	0
Gray starling	Suburbs of Morioka City	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0
Black-tailed gull	Tokyo Bay	0.05	0.03	5	0.04	0.02	5	nd	nd	0	nd	nd	0	nd	nd	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black-tailed gull	Kabushima, Aomori Pref.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0
Birds		0.05	nd	5	0.04	nd	5	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0	nd	nd	0
Detected samples/Total samples		62/96			70/100			56/105			50/110			43/110			33/105			21/110			20/110			24/110			14/110		

(Note)1. The values are the equivalent values to TPTCl. The unified detection limit is 0.02 mg/g wet (ppm).  
 2. Detected samples denote the numbers of detected samples in each sampling spot.  
 3. nd denotes no detection and tr denotes that the detected values are below the unified detection limit.

4. Sea bass in surrounding of Shugen Island and common mussel in Shimane Peninsula have been monitored since fiscal year 1990 and 1991, respectively. Monitoring of Black-tailed gull in Tokyo Bay was completed in fiscal year 1993. Monitoring of Black-tailed gull in Kabushima, Aomori Pref. was started in fiscal year 1995. Sea bass in Seto Inland Sea could not be caught in fiscal year 1990 and 1991. Monitoring of Angry rockfish in offshore of Nemuro, Hokkaido was completed in fiscal year 1997. Monitoring of Angry rockfish in offshore of Nemuro, Hokkaido was started in fiscal year 1997

**Table 6-5 Results of the Survey of Tributyltin Compound in Water  
(Based on the Study and Survey of Designated Chemical Substances,etc. in Fiscal Year 1990-1998)**

(Unit:  $\mu$ g/l (ppb))

Sampling spot	1990			1991			1992			1993			1994			1995			1996			1997			1998		
	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3
Mouth of Riv.Ishikari	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Mouth of Riv.Tsutsumi	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Sendai Bay	0.018	0.011	0.004	0.006	nd	nd	nd	nd	nd	0.005	nd	nd	nd	0.007	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Lake Hachiro	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
Onahama Port	0.009	0.007	0.009	0.006	0.008	0.009	0.005	0.01	nd	0.003	nd	0.007	0.004	0.005	nd	nd	nd	nd	nd	0.005	nd	0.005	0.004	0.004	-	-	-
Kasumigaura	nd	nd	nd	nd	0.004	0.003	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Coast of Ichihara and Anegasaki	0.045	0.051	0.042	0.017	0.011	0.016	0.003	0.003	0.003	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	tr(0.0013)	nd	tr(0.00037)
Mouth of Riv.Hanami	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Mouth of Riv.Sumida	0.012	0.012	0.014	0.016	0.028	0.015	0.004	0.004	0.004	0.005	0.006	0.005	0.008	0.007	0.005	0.005	0.005	0.006	0.005	0.004	0.004	0.006	0.008	0.006	0.0060	0.0066	0.0064
Mouth of Riv.Tamagawa	0.009	0.012	0.009	0.003	nd	0.015	nd	0.005	0.004	0.003	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.0046	0.0038	0.0045
Yokohama Port	0.027	0.033	0.046	0.018	0.003	0.018	0.012	0.008	0.006	0.004	0.004	0.004	nd	0.005	0.003	0.004	0.003	nd	0.004	nd	0.003	0.004	nd	nd	0.0043	0.0063	0.0051
Mouth of Riv.Shinano	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Mouth of Riv.Sai	nd	nd	0.03	0.015	nd	nd	0.005	nd	0.034	0.004	nd	0.005	nd	nd	nd	0.005	nd	0.01	nd	nd	nd	nd	0.009	nd	nd	nd	nd
Lake Suwa	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Shimizu Port	0.003	0.007	0.008	nd	nd	nd	nd	0.007	nd	nd	nd	nd	0.005	0.005	nd	nd	nd	nd	0.005	nd	nd	nd	nd	0.004	0.005	-	-
Nagoya Port	0.005	0.005	0.004	0.005	0.008	0.004	0.004	0.004	0.003	0.009	nd	nd	0.006	0.003	0.004	nd	nd	nd	nd	nd	nd	nd	nd	nd	-	-	-
Yokkaichi Port	0.021	-	-	0.01	0.01	0.008	0.014	0.011	0.016	0.006	0.007	0.006	0.025	0.01	0.01	0.006	nd	0.008	0.003	0.004	nd	tr(0.002)	nd	nd	nd	nd	nd
South of Lake Biwa	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
Miyazu Port	0.014	0.009	0.007	0.003	nd	nd	0.006	0.003	0.006	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Miyamae Bridge of Riv.Katsura	nd	nd	nd	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	-	-	-
Mouth of Riv.Yamato	-	-	-	0.005	0.005	0.007	0.022	0.024	0.007	nd	0.004	0.005	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Osaka Port	0.02	0.02	0.02	0.067	0.037	0.062	0.067	0.037	0.062	0.019	0.014	0.014	0.006	0.006	0.006	0.01	0.011	0.013	0.008	0.011	0.008	0.006	0.007	0.006	0.0032	0.0031	0.0031
Offshore of Himeji	0.014	0.013	0.013	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.042	0.016	0.018	nd	0.005	0.009	nd	0.005	nd	nd	nd	nd
Offshore of Mizushima	0.011	0.008	0.015	0.013	0.008	0.008	0.005	0.011	0.009	0.027	0.013	0.013	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Kure Port	0.016	0.024	0.012	0.014	0.013	0.028	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Hiroshima Bay	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	-	-	-
Tokuyama Bay	0.005	0.004	0.005	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Mouth of Riv.Yoshino	-	-	-	0.012	0.004	0.004	0.083	0.084	0.08	0.044	0.047	0.049	nd	nd	nd	nd	nd	nd	nd	0.003	nd	nd	nd	nd	-	-	-
Takamatsu Port	0.025	0.027	0.023	0.034	0.048	0.024	0.014	0.0014	0.005	0.011	0.011	0.007	0.009	0.004	0.004	0.004	0.004	0.006	0.012	0.014	0.003	nd	0.007	0.003	0.0038	0.0067	tr(0.0021)
Mouth of Riv.Shimanto	-	-	-	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Offshore of Omuta	0.004	0.004	0.004	0.013	0.027	0.027	-	-	-	nd	nd	nd	0.03	nd	nd	0.04	0.01	0.01	0.004	0.003	0.004	nd	nd	nd	tr(0.00096)	tr(0.00063)	tr(0.00059)
Hakata Bay	0.01	0.009	0.012	0.006	0.008	0.007	0.026	0.028	0.012	0.02	0.025	0.017	0.006	0.005	0.006	nd	nd	nd	nd	nd	nd	nd	nd	nd	tr(0.0019)	tr(0.0018)	tr(0.0016)
Dokai Bay	0.048	0.029	0.049	0.015	0.02	0.012	0.007	0.011	0.014	0.006	0.006	0.01	0.006	0.022	0.007	0.017	0.013	0.018	0.006	0.005	0.01	0.0051	0.005	0.0051	tr(0.0025)	tr(0.0021)	0.0080
Imari Bay	-	-	-	0.032	0.019	0.008	0.007	0.019	0.008	0.007	0.008	0.007	0.01	0.013	0.01	0.007	0.005	0.005	-	-	-	0.004	0.004	nd	tr(0.0025)	0.0033	tr(0.0021)
Nagasaki Port	0.04	0.02	0.04	0.014	0.011	0.008	0.003	0.003	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.003	nd	nd	nd	nd	nd	nd	0.0068	0.0060	0.0064
Mouth of Riv.Oyodo	0.016	0.005	0.004	0.013	0.011	0.015	0.004	nd	nd	nd	0.003	nd	0.003	nd	nd	0.013	nd	nd	0.006	0.003	nd	0.005	nd	nd	-	-	-
Gotanda Bridge of Riv. Gotanda	nd	nd	nd	0.003	0.003	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	-	-	-
Unified detection limit	0.003			0.003			0.003			0.003			0.003			0.003			0.003			0.003			0.003		
Detected frequency	62/79			60/93			52/99			42/99			35/99			31/105			27/105			21/107			20/76		
Maximum	0.051			0.067			0.084			0.049			0.03			0.042			0.014			0.009			0.0080		
Minimum	nd			nd			nd			nd			nd			nd			nd			nd			nd		
Geometric mean	0.0088			0.0057			0.0044			0.0032			0.0029			0.0025			0.0021			0.0019			0.001		

(Note) 1. The values are the equivalent values to TBTO.

2. nd denotes no detection, "-" denotes not measured and blank column denotes not monitored.

3. The geometric mean is calculated on condition that nd is the half of the detection limit.



**Table 6-6 Results of the Survey of Triphenyltin Compound in Water**  
**(Based on the Study and Survey of Designated Chemical Substances, etc. in Fiscal Year 1990-1998)**

(Unit:  $\mu\text{g/l}$  (ppb))

Sampling spot	1990			1991			1992			1993			1994			1995			1996			1997			1998		
	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3
Mouth of Riv.Ishikari	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	-	-	-
Mouth of Riv.Tsutsumi	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	tr(0.009)	nd	nd	nd	nd	nd	nd	nd	nd
Sendai Bay	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.011	0.005	0.01	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Lake Hachiro	nd	nd	nd	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Onahama Port	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
Kasumigaura	-	-	-	nd	0.013	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Coast of Ichihara and Anegasaki	0.006	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
Mouth of Riv.Hanami	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	-	-	-
Mouth of Riv.Sumida	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
Mouth of Riv.Tamagawa	nd	nd	nd	nd	nd	0.014	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Yokohama Port	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	tr(0.0006)	tr(0.0006)	tr(0.0007)
Mouth of Riv.Shinano	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Mouth of Riv.Sai	nd	nd	nd	nd	nd	nd	nd	nd	0.007	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Lake Suwa	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Shimizu Port	nd	nd	nd	nd	nd	nd	nd	nd	nd	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Nagoya Port	0.005	0.006	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
Yokkaichi Port	-	-	-	-	-	-	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
South of Lake Biwa	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
Miyazu Port	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
Miyamae Bridge of Riv.Katsura	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
Mouth of Riv.Yamato	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
Osaka Port	-	-	-	nd	nd	nd	-	-	-	-	-	-	-	-	-	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd
Offshore of Himeji	nd	nd	nd	nd	nd	nd	nd	nd	nd	-	-	-	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Offshore of Mizushima	0.012	0.014	0.014	nd	nd	nd	0.006	0.008	0.007	0.008	nd	nd	nd	nd	nd	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd
Kure Port	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
Hiroshima Bay	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Tokuyama Bay	0.005	0.005	0.005	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Mouth of Riv.Yoshino	-	-	-	nd	nd	nd	0.04	0.044	0.016	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Takamatsu Port	nd	0.014	0.01	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	tr(0.00083)	0.0015	tr(0.00030)
Mouth of Riv.Shimanto	-	-	-	-	-	-	0.005	0.013	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Offshore of Omuta	nd	nd	nd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd
Hakata Bay	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	tr(0.00046)	tr(0.00055)	tr(0.00055)
Dokai Bay	0.047	0.041	0.048	0.0076	0.0088	nd	-	-	-	nd	nd	nd	0.006	0.007	-	-	-	-	nd	nd	nd	tr(0.0007)	tr(0.0006)	tr(0.0007)	0.0010	0.0012	tr(0.00090)
Imari Bay	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
Nagasaki Port	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	tr(0.00060)	tr(0.00060)	0.0010
Mouth of Riv.Oyodo	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
Gotanda Bridge of Riv. Gotanda	nd	0.01	0.02	nd	nd	nd	nd	0.006	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Unified detection limit	0.005			0.005			0.005			0.005			0.005			0.005			0.01			0.01			0.001		
Detected frequency	16/75			4/87			10/90			2/90			4/92			0/87			0/108			0/108			4/102		
Maximum	0.048			0.014			0.044			0.011			0.01			nd			tr			0.0015					
Minimum	nd			nd			nd			nd			nd			nd			nd			nd					
Geometric mean	0.0034			0.0027			0.0030			0.0026			0.0026			0.0025			0.0027			0.0026			0.00031		

(Note) 1. The values are the equivalent values to TPTCl.

2. nd denotes no detection, "-" denotes not measured and blank column denotes not monitored.

3. The geometric mean is calculated on condition that nd is the half of the detection limit.

**Table 6-7 Results of the Survey of Tributyltin Compound in Bottom Sediments  
(Based on the Study and Survey of Designated Chemical Substances, etc. in Fiscal Year 1990-1998)**

(Unit:  $\mu\text{g/g}\cdot\text{dry}$  (ppb))

Sampling spot	1990			1991			1992			1993			1994			1995			1996			1997			1998			
	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	
Mouth of Riv.Ishikari	0.0011	0.0009	0.0014	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.0013	nd	nd	nd	nd		
Mouth of Riv.Tsutsumi																			0.0015	0.0045	0.0027	0.0087	0.011	0.011	0.0067	0.0055	0.0055	
Sendai Bay	0.034	0.048	0.022	0.0068	0.0060	0.0069	0.0067	0.017	0.021	0.014	0.016	0.016	0.021	0.022	0.025	0.025	0.029	0.025	0.017	0.026	0.021	0.020	0.025	0.013	0.018	0.019	0.019	
Lake Hachiro	nd	nd	nd	0.0014	0.0010	nd	0.0032	nd	nd	nd	nd	nd	nd	nd	0.001	nd	tr(0.0003)	nd	nd	nd	nd	nd	nd	nd	-	-	-	
Onahama Port	0.029	0.042	0.18	0.094	0.051	0.067	0.017	0.034	0.0022	0.019	0.076	0.035	0.034	0.020	0.027	0.023	0.018	0.021	0.006	0.010	0.005	0.059	0.047	0.031	0.020	0.0055	0.0083	
Kasumigaura	-	-	-	0.0030	0.0034	0.0034	0.0020	0.0030	0.0024	0.0022	0.0024	0.0030	0.0024	0.0021	0.0021	0.0035	0.0033	0.0034	0.0052	0.0036	0.0031	0.0032	0.0036	0.0027	0.0058	0.0045	0.0046	
Coast of Ichihara and Anegasak	0.10	0.081	0.059	0.082	0.045	0.010	0.26	0.044	0.42	0.018	0.008	0.050	0.017	0.016	0.021	0.005	0.028	0.082	0.030	0.018	0.064	0.005	0.036	0.093	0.12	0.042	0.15	
Mouth of Riv.Hanami																0.0078	0.0058	0.0065	0.016	0.020	0.0023				0.0036	0.004	0.0051	
Mouth of Riv.Sumida	0.25	0.16	0.46	0.16	0.13	0.08	0.13	0.15	0.10	0.18	0.13	0.10	0.26	0.18	0.15	0.21	0.17	0.15	0.25	0.17	0.26	0.24	0.21	0.23	0.18	0.16	0.18	
Mouth of Riv.Tamagawa	0.14	0.14	0.16	0.16	0.14	0.14	0.14	0.11	0.13	0.12	0.13	0.12	0.038	0.043	0.10	0.074	0.060	0.057	0.11	0.11	0.12	0.095	0.099	0.097	0.10	0.11	0.11	
Yokohama Port	0.25	0.38	0.31	0.28	0.30	0.29	0.039	0.046	0.056	0.10	0.18	0.048	0.074	0.12	0.081	0.14	0.15	0.088	0.051	0.091	0.073	0.096	0.10	0.074	0.22	0.18	0.13	
Mouth of Riv.Shinano	0.040	0.0031	0.0074	0.0093	0.0031	0.0041	0.030	0.033	0.020	0.023	0.015	0.047	0.019	0.020	0.0085	0.0046	0.0072	nd	0.0071	0.013	0.015	0.013	0.011	0.013	0.17	0.24	0.13	
Mouth of Riv.Sai	0.035	0.0022	0.099	0.027	0.0032	0.044	0.055	0.011	0.0036	nd	0.0032	0.080	0.030	0.016	0.11	0.029	0.0026	0.260	0.016	0.089	0.048	0.0044	0.011	0.010	0.0069	0.0085	nd	
Lake Suwa	-	-	-	nd	nd	nd	0.0016	0.0018	0.0018	0.0026	0.0026	0.0028	0.0037	0.0041	0.0038	0.0061	0.0066	0.0069	0.0051	0.0069	0.0068	0.0045	0.0057	0.0045	0.005	0.005	0.006	
Shimizu Port	0.0055	0.0070	0.035	0.031	0.039	0.032	0.017	0.021	0.024	0.012	0.012	0.010	0.022	0.022	0.025	0.012	0.019	0.020	0.0089	0.0083	0.0067	0.011	0.014	0.012	0.020	0.005	0.011	
Nagoya Port	0.097	0.015	0.065	0.098	0.0059	0.16	0.063	0.065	0.011	0.032	0.033	0.025	0.064	0.069	0.077	0.10	0.094	0.026	0.93	0.23	0.21	0.17	0.15	0.13	0.73	0.39	0.065	
Yokkaichi Port	0.14	0.14	0.049	0.16	0.066	0.076	0.042	0.11	0.12	0.038	0.052	0.033	0.077	0.24	0.070	0.030	0.053	0.015	0.019	0.045	0.0064	0.0022	0.049	0.017	0.025	0.044	0.017	
South of Lake Biwa	0.0033	0.034	0.0048	0.0024	-	0.011	0.013	0.029	0.026	0.0022	0.0082	0.0046	0.0047	0.0052	0.0075	0.0047	0.0052	0.0075	0.011	0.0086	0.014	0.0075	0.0089	0.0090	0.0086	0.015	0.020	
Miyazu Port	0.0011	tr(0.0007)	0.0011	0.0034	0.0050	0.0041	0.0014	0.0025	0.0014	0.0056	0.024	0.0075	0.0011	0.0055	0.004	0.0009	0.0015	0.0018	0.0015	0.0010	0.0007	nd	nd	nd	0.0082	0.0028	0.0092	
Miyamae Bridge of Riv.Katsura	tr(0.0006)	tr(0.0005)	nd	tr(0.0006)	0.0012	0.0008	nd	nd	nd	nd	nd	0.0015	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.0008	nd	nd
Mouth of Riv.Yamato	0.009	0.026	0.024	0.039	0.034	0.024	0.017	0.031	0.042	0.014	0.040	0.028	0.012	0.022	0.013	0.002	0.002	-	0.025	0.015	0.046	0.009	0.012	0.021	nd	nd	nd	
Osaka Port	0.88	0.89	0.29	0.27	0.38	0.32	0.12	0.14	0.28	0.29	0.26	0.15	0.20	0.44	0.12	0.50	0.57	0.34	0.22	0.27	0.21	0.18	0.18	0.21	0.12	0.066	0.036	
Offshore of Himeji	0.060	0.035	0.056	0.025	0.013	0.012	0.009	0.035	0.050	0.027	0.014	0.021	0.057	0.039	0.033	0.014	0.004	0.013	0.002	0.001	0.005	0.004	0.004	0.003	nd	nd	nd	
Offshore of Mizushima	0.042	0.072	0.11	0.027	0.035	0.013	0.0041	0.0072	0.0087	0.017	0.013	0.013	0.0069	0.0058	0.0058	0.013	0.012	0.012	0.014	0.012	0.013	0.016	0.015	0.013	0.013	0.017	0.013	
Kure Port	0.24	0.80	0.24	0.28	0.42	0.30																						
Hiroshima Bay							0.066	0.038	0.033	0.058	0.040	0.050	0.074	0.062	0.062	0.068	0.080	0.090	0.038	0.031	0.041	0.025	0.029	0.022	0.035	0.069	0.050	
Tokuyama Bay	0.0021	0.0035	0.0029	0.0040	0.0031	0.0030	0.011	0.015	0.0085	0.0082	0.010	0.0085	0.013	0.0076	0.0089	0.0099	0.0081	0.012	0.01	0.0054	0.015	0.031	0.026	0.026	0.016	0.016	0.020	
Mouth of Riv.Yoshino				0.0044	0.0058	0.0089	0.0083	0.010	0.0099	0.0008	nd	nd	0.0054	tr(0.0006)	0.0020	0.0011	nd	nd	0.0009	0.0010	0.0029	0.0045	nd	nd	tr(0.0007)	0.0008	0.0039	
Takamatsu Port	0.36	0.054	0.038	0.180	0.120	0.071	0.11	0.031	0.029	0.10	0.033	0.022	0.11	0.038	0.042	0.34	0.077	0.072	0.029	0.012	0.018	0.066	0.020	0.034	0.10	0.051	0.054	
Mouth of Riv.Shimanto	0.013	nd	nd	-	-	-	0.0021	nd	0.0006	0.0023	0.0006	0.0007	0.0019	tr(0.0003)	0.012	0.012	tr(0.0003)	0.0019	0.0007	0.0066	0.0064	0.0008	0.0008	tr(0.0001)	0.0028	0.0021	0.0017	
Offshore of Omuta	0.040	0.038	0.009	0.061	0.040	0.037	0.020	0.012	0.014	0.008	0.008	0.011	0.022	0.008	0.012	0.53	0.09	0.11	0.016	0.016	0.012	0.018	0.045	0.0081	0.010	0.0074	0.0069	
Hakata Bay	0.018	0.018	0.016	0.027	0.021	0.016	0.029	0.015	0.016	0.010	0.0087	0.012	0.0082	0.010	0.013	0.010	0.0084	0.014	0.0063	0.0064	0.0070	0.0018	0.0015	0.0013	0.014	0.046	0.021	
Dokai Bay	0.17	0.085	0.25	0.22	0.14	0.33	0.20	0.25	0.28	0.35	0.38	1.6	0.20	0.31	0.16	0.24	0.12	0.037	0.17	0.19	0.055	0.082	0.056	0.072	0.051	0.17	0.092	
Imari Bay							0.19	0.22	0.09	0.12	0.12	0.088	0.16	0.097	0.12	0.073	0.078	0.095	0.127	0.157	0.238	0.098	0.099	0.079	0.041	0.10	0.10	
Nagasaki Port	0.13	0.12	0.11	0.053	0.064	0.062	0.041	0.032	0.046	0.025	0.027	0.021	0.031	0.035	0.016	0.059	0.035	0.083	0.057	0.023	0.034	0.025	0.021	0.028	0.092	0.093	0.090	
Mouth of Riv.Oyodo	0.0013	0.0009	0.0015	0.0027	0.0015	0.0077	nd	nd	0.0046	nd	nd	nd	nd	tr(0.0007)	0.0012	tr(0.0007)	0.0021	nd	0.0016	0.0007	nd	nd	nd	nd	nd	nd	nd	nd
Gotanda Bridge of Riv. Gotanda	nd	0.0016	nd	0.0012	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Unified detection limit	0.0008			0.0008			0.0008			0.0008			0.0008			0.0008			0.0006			0.0008			0.0008			
Detected frequency	79/90			85/95			88/102			85/102			87/102			87/104			94/108			85/105			86/105			
Maximum	0.89			0.42			0.42			1.6			0.44			0.57			0.93			0.24			0.73			
Minimum	nd			nd			nd			nd			nd			nd			nd			nd			nd			
Geometric mean	0.023			0.017			0.015			0.012			0.014			0.013			0.011			0.009			0.013			

(Note) 1. The values are the equivalent values to TBTO.

2. nd denotes not detection, "-" denotes not measured and blank column denotes not monitored.

3. The geometric mean is calculated on condition that nd is the half of the detection limit.

**Table 6-8 Results of the Survey of Triphenyltin Compound in Bottom Sediments  
(Based on the Study and Survey of Designated Chemical Substances, etc. in Fiscal Year 1990-1998)**

(Unit:  $\mu\text{g/g}\cdot\text{dry}$  (ppb))

Sampling spot	1990			1991			1992			1993			1994			1995			1996			1997			1998			
	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	
Mouth of Riv.Ishikari	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	-	-	-	-	-	-		
Mouth of Riv.Tsutsumi																			nd	tr(0.0003)	nd	0.001	nd	nd	nd	nd		
Sendai Bay	0.004	0.004	0.003	0.001	0.002	0.002	0.005	0.005	0.009	0.003	0.005	0.003	0.006	-	-	-	-	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.033	0.002	
Lake Hachiro	nd	nd	nd	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
Onahama Port	0.006	0.045	0.066	0.011	0.017	0.011	nd	nd	nd	nd	0.001	0.001	0.001	0.004	0.003	nd	0.001	0.001	nd	nd	nd	0.008	nd	nd	0.014	0.001	0.002	
Kasumigaura	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
Coast of Ichihara and Anegasaki	0.019	0.030	0.0085	0.018	0.007	0.003	0.021	0.008	0.035	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.003	nd	nd	nd	nd	0.0040	0.0032	0.0036	
Mouth of Riv.Hanami																												
Mouth of Riv.Sumida	0.012	0.015	0.038	0.0025	0.0048	0.0019	0.0034	0.0039	0.0025	0.0032	0.0032	0.0032	0.0068	0.0067	0.0059	0.0027	0.0039	0.0029	0.0045	0.0044	0.0035	0.0019	0.0032	0.0020	0.0023	0.0033	0.0024	
Mouth of Riv.Tamagawa	0.011	0.019	0.015	0.0030	0.0040	0.0052	0.014	0.018	0.016	0.0067	0.0058	0.0066	0.0026	0.0031	0.0041	0.0030	0.0027	0.0042	0.0039	0.0045	0.0030	0.0035	0.0028	0.0041	0.0055	0.0063		
Yokohama Port	0.031	0.039	0.038	0.040	0.087	0.032	0.007	0.003	0.009	0.018	0.024	0.009	0.010	0.018	0.012	0.013	0.014	0.007	0.22	0.028	0.014	0.11	0.028	0.015	0.014	0.019	0.014	
Mouth of Riv.Shinano	0.003	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.0026	nd	nd	0.0026	nd	0.0012	0.0010	0.0010	nd	nd	nd	nd	0.0022	0.0057	
Mouth of Riv.Sai	0.0031	nd	0.0070	nd	nd	0.0014	0.0056	nd	nd	nd	0.0009	0.0027	nd	nd	0.0021	nd	nd	nd	nd	nd	nd	nd	28	nd	nd	0.0025	nd	
Lake Suwa	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
Shimizu Port	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.001	0.001	0.001	0.002	0.001	0.002	0.0012	tr(0.0008)	0.0016	tr(0.0007)	tr(0.0009)	tr(0.0007)	tr(0.0006)	0.001	nd	nd	0.004	0.003	0.001
Nagoya Port	0.011	0.001	0.016	0.006	nd	0.002	0.010	0.006	0.001	0.002	0.003	0.004	nd	0.006	nd	0.0046	0.0065	0.0038	0.013	0.027	0.019	0.006	0.011	0.009	0.017	0.044	0.008	
Yokkaichi Port	0.022	0.007	0.005	0.0099	0.013	0.0080	0.024	0.013	0.016	0.0081	0.0070	0.0071	0.0042	0.019	-	0.015	nd	0.0035	0.023	nd	tr(0.0009)	0.074	tr(0.0009)	0.0024	0.0014	0.0016		
South of Lake Biwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	-	
Miyazu Port	nd	nd	nd	0.0048	nd	nd	0.0019	0.0016	0.0018	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	tr(0.00072)	nd
Miyamae Bridge of Riv.Katsura	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	
Mouth of Riv.Yamato	-	-	-	0.007	0.010	0.010	-	-	-	0.003	0.004	0.002	-	-	-	0.004	0.006	0.006	-	-	-	-	-	-	-	-	-	
Osaka Port	0.13	0.094	0.11	nd	0.34	0.13	0.025	0.013	0.013	0.052	0.066	0.054	0.072	0.013	0.011	-	-	-	-	-	-	-	-	-	nd	nd	nd	
Offshore of Himeji	0.011	0.018	0.024	0.0029	0.0087	0.0084	0.001	nd	0.001	-	-	-	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
Offshore of Mizushima	0.021	0.028	0.058	0.022	0.012	0.050	0.0051	0.0043	0.0039	0.0009	0.0016	0.0006	0.0021	0.0015	nd	0.0017	0.0023	-	nd	nd	nd	nd	nd	nd	0.0027	0.0031	0.0013	
Kure Port	0.038	0.067	0.041	0.038	0.049	0.065																						
Hiroshima Bay																												
Tokuyama Bay	0.001	tr(0.0008)	tr(0.0008)	tr(0.0005)	tr(0.0006)	tr(0.0005)	0.0019	0.0010	0.0010	0.0019	0.0012	0.0015	0.0026	0.0011	0.0015	0.0018	0.0012	0.0015	nd	nd	nd	0.0099	0.0023	0.0021	0.0039	0.0015	-	
Mouth of Riv.Yoshino																												
Takamatsu Port	0.041	0.0091	0.0045	0.0036	0.0023	0.0010	0.0085	0.0032	0.0012	0.0029	0.0018	0.0007	0.0056	0.0031	0.0061	0.0078	0.0030	nd	0.0016	0.0074	0.0026	nd	nd	tr(0.0008)	0.0012	0.0018	0.0019	
Mouth of Riv.Shimanto	nd	nd	nd	-	-	-	nd	nd	0.001	nd	nd	nd	tr(0.0008)	nd	0.013	0.012	nd	tr(0.0008)	nd	nd	nd	nd	nd	nd	nd	nd	-	
Offshore of Omuta	-	-	-	0.0016	-	0.012	0.011	0.023	nd	0.001	0.012	0.004	-	-	0.013	0.019	0.028	0.11	0.001	nd	0.003	0.0082	0.0090	0.017	0.0014	tr(0.0007)	0.0012	
Hakata Bay	0.0035	0.0032	0.0028	0.011	0.014	0.0083	0.0031	0.0033	0.0026	0.0040	0.0033	0.0044	0.0013	0.0013	0.0012	0.0013	0.0013	0.0026	0.0014	0.0015	0.0012	0.002	0.003	0.002	0.0019	0.0027	0.0022	
Dokai Bay	0.056	0.077	0.099	0.019	0.16	0.060	0.090	0.033	-	0.15	0.052	0.022	0.26	0.12	0.04	0.067	0.011	0.0044	0.043	0.018	0.008	-	-	0.011	0.0066	0.065	0.0080	
Imari Bay																												
Nagasaki Port	0.028	0.010	0.007	0.026	0.009	0.012	0.0022	0.0023	0.0097	0.010	0.0079	0.0051	tr(0.0009)	tr(0.0009)	tr(0.0005)	0.0053	0.0038	0.013	0.022	0.010	0.011	0.0082	0.0090	0.017	0.013	0.017	0.020	
Mouth of Riv.Oyodo	nd	nd	nd	nd	nd	0.001	nd	nd	nd	nd	nd	nd	nd	0.001	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
Gotanda Bridge of Riv. Gotanda	nd	nd	nd	0.002	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
Unified detection limit	0.001			0.001			0.001			0.001			0.001			0.001			0.001			0.001			0.001			
Detected frequency	52/81			55/89			57/95			55/96			47/88			48/93			41/99			39/91			54/94			
Maximum	0.13			0.34			0.09			0.15			0.26			0.11			0.22			0.28			0.065			
Minimum	nd			nd			nd			nd			nd			nd			nd			nd			nd			
Geometric mean	0.0048			0.0033			0.0023			0.0018			0.0022			0.0017			0.0014			0.0017			0.0015			

(Note) 1. The values are the equivalent values to TPTCl.  
 2. nd denotes no detection, "-" denotes not measured and blank column denotes not monitored.  
 3. The geometric mean is calculated on condition that nd is the half of the detection limit.