1999 SWAT MONITORING PROGRAM REPORT

PART 1 MARINE AND ESTUARINE

1.1 SHELLFISH TISSUE AND SEDIMENT ANALYSES

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SHELLFISH TISSUE AND SEDIMENT ANALYSES

Shellfish Tissue Analyses

This project addresses multiple needs identified after analysis of historical data collected by SWAT and other studies.

In 1998, interim action levels for shellfish were developed by the State Toxicologist, Bureau of Health that enable data from mussel samples to be evaluated in the context of human health. In the 1980s and early 1990s, blue mussel sample results suggest that human health advisories may be warranted in some areas of the coast due to levels of lead and mercury. Although environmental lead levels have declined nationally in various media since its removal from automotive fuels, it is reasonable to resample these areas to determine if current lead and mercury levels warrant an advisory. When these older samples were taken, organic analyses were not affordable. Many of these areas are near human population centers and/or industry and commerce. To complete the human health assessment, both organic and metal analyses should be conducted.

The Departments of Marine Resources and Environmental Protection have an active program to restore shellfish beds to harvestable conditions by removing sources of human sewage. Once sanitary pollution criteria are met, the DMR can open the area if it is assured that toxic contaminants do not pose a human health threat. In cases where the historical clam population is no longer present, direct sampling of clams makes that assurance impossible. Since a clam restoration project is an expensive commitment, there is a need to have tool available that can predict what tissue levels might likely be once clams have been restored to the area. Blue mussels are found almost everywhere along the coast, even where clams are not. Since mussels can be used to reflect local conditions, it may be possible to develop a relationship between clams, mussels, and perhaps sediment in order to predict levels expected in clams.

In the original Five Year Plan, establishment of benchmark stations to be monitored over time was identified as a high priority. Those stations have been established and sampled at least once.

Finally, areas of the coast have been identified as having elevated levels of PCBs and organo-chlorine pesticides. Mussels have been effectively used to localize sources. The Winter Harbor Landfill is known to have received PCB waste. Wildlife (eagles) in the area contain unexplained levels of PCBs.

During the 1999 sampling season the DEP and DMR sampled clams, mussels, and sediment from 11 sampling stations as indicated below..

Shellfish Tissue and Sediment Stations

Back Cove, Portland

Billings Cove, Sedgewick

Cape Neddick, York

Crockett Point, Rockland Harbor

Fore River, South Portland

Goosefare Brook, Saco

Kennebunk River, Kennebunkport

Mill Cove, Boothbay Harbor

Muscongus Sound, Friendship

Perkins Cove, York

Plummer Island, Scarborough

Round Pond, Bristol

St. George River, St. George

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All shellfish tissue and sediment were analyzed by the Water Research Institute at the Sawyer Environmental Research Center, University of Maine, Orono, Maine

Table 1.1.1 Total PCB in 1999 Blue Mussel Samples (ww)

PCBs

			York/Perkins	York/Perkins	York/Perkins	York/Perkins
DEP ID#			1	2	3	4
WRI ID		**DL (ug/Kg)**	786P	787P	788P	789P
Analytes	IUPAC#					
2,4’-Dichlorobiphenyl	8	1.0	<DL	<DL	<DL	<DL
2,2’,5-Trichlorobiphenyl	18	1.0	<DL	<DL	<DL	<DL
2,4,4’-Trichlorobiphenyl	28	1.0	<DL	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	1.0	<DL	<DL	<DL	<DL
2,2’,3,5’-Tetrachlorobiphenyl	44	1.0	<DL	<DL	<DL	<DL
2,2’,4,6-Tetrachlorobiphenyl	50	1.0	<DL	<DL	<DL	<DL
2,2’,5,5’-Tetrachlorobiphenyl	52	1.0	<DL	<DL	<DL	<DL
2,3’,4,4’-Tetrachlorobiphenyl	66	1.0	<DL	<DL	<DL	<DL
2,2’,3,4,5’-Pentachlorobiphenyl	87	2.0	0.45	<DL	0.60	<DL
2,2’,4,5,5’-Pentachlorobiphenyl	101	2.0	<DL	<DL	<DL	<DL
2,2’,4,6,6’-Pentachlorobiphenyl	104	2.0	<DL	<DL	<DL	<DL
2,2’,3,3’,4,4’-Hexachlorobiphenyl	128	2.0	<DL	<DL	<DL	<DL
2,2’,3,4,4’,5’-Hexachlorobiphenyl	138	2.0	0.51	<DL	<DL	<DL
2,2’,4,4’,5,5’-Hexachlorobiphenyl	153	2.0	<DL	<DL	<DL	<DL
2,2’,4,4’,5,6’-Hexachlorobiphenyl	154	2.0	0.66	0.97	1.26	<DL
2,2’,3,4’,5,5’,6-Heptachlorobiphenyl	187	2.0	1.24	<DL	<DL	<DL
2,2’,3,4’,5,6,6’-Heptachlorobiphenyl	188	2.0	<DL	<DL	<DL	<DL
2,2’,3,3’,4,4’,5,6-Octachlorobiphenyl	195	3.0	<DL	0.66	<DL	<DL
2,2’,3,3’,4,5’,6,6’-Octachlorobiphenyl	200	3.0	0.98	2.04	1.05	<DL
2,2’,3,3’,4,4’,5,5’,6,6’-Decachlorobiphenyl	209	5.0	<DL	1.15	<DL	<DL
Total PCBs			8.75	16.9	11.3	15.5
% Lipids			0.32	0.65	0.35	0.73
Sample weight (g)			25.49	25.25	25.69	25.64
Surrogate Recovery		% rec (65-13	**88.6**	**86.9**	**107**	**81.4**

* due to insufficient sample the % lipid value is an

Table 1.1.1 Total PCB in 1999 Blue Mussel Samples (ww)

PCBs

			York/Cape	York/Cape	York/Cape	York/Cape
DEP ID#			Neddick 1	Neddick 2	Neddick 3	Neddick 4
WRI ID		**DL (ug/Kg)**	790P	791P	792P	793P
Analytes	IUPAC#					
2,4'-Dichlorobiphenyl	8	1.0	<DL	<DL	<DL	<DL
2,2',5-Trichlorobiphenyl	18	1.0	<DL	<DL	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	1.0	<DL	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	1.0	<DL	<DL	<DL	<DL
2,2',3,5'-Tetrachlorobiphenyl	44	1.0	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	1.0	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobiphenyl	52	1.0	<DL	<DL	0.35	<DL
2,3',4,4'-Tetrachlorobiphenyl	66	1.0	<DL	<DL	<DL	<DL
2,2',3,4,5'-Pentachlorobiphenyl	87	2.0	0.51	<DL	0.48	<DL
2,2',4,5,5'-Pentachlorobiphenyl	101	2.0	<DL	<DL	<DL	<DL
2,2',4,6,6'-Pentachlorobiphenyl	104	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiphenyl	128	2.0	<DL	<DL	0.55	0.66
2,2',3,4,4',5'-Hexachlorobiphenyl	138	2.0	0.67	0.95	1.08	<DL
2,2',4,4',5,5'-Hexachlorobiphenyl	153	2.0	<DL	<DL	<DL	<DL
2,2',4,4',5,6'-Hexachlorobiphenyl	154	2.0	<DL	<DL	<DL	<DL
2,2',3,4',5,5',6-Heptachlorobiphenyl	187	2.0	<DL	<DL	<DL	<DL
2,2',3,4',5,6,6'-Heptachlorobiphenyl	188	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorobiphenyl	195	3.0	1.47	<DL	0.96	0.50
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	200	3.0	1.66	2.01	2.28	1.02
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	209	5.0	<DL	<DL	<DL	<DL
Total PCBs			13.2	9.84	15.8	8.75
% Lipids			0.34	0.33	0.34	0.28
Sample weight (g)			26.28	26.21	25.66	24.98
Surrogate Recovery		% rec (65-135)	**89.4**	**88.6**	**84.7**	**75.6**

Table 1.1.1 Total PCB in 1999 Blue Mussel Samples (ww)

PCBs

			Fore River	Fore River	Fore River	Fore River
DEP ID#			1	2	3	4
WRI ID		**DL (ug/Kg)**	825P	826P	828P	829P
Analytes	IUPAC#					
2,4'-Dichlorobiphenyl	8	1.0	<DL	<DL	<DL	<DL
2,2',5-Trichlorobiphenyl	18	1.0	<DL	<DL	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	1.0	1.21	2.24	0.98	0.65
2,4,5-Trichlorobiphenyl	29	1.0	0.87	0.68	<DL	<DL
2,2',3,5'-Tetrachlorobiphenyl	44	1.0	1.02	0.79	0.55	0.41
2,2',4,6-Tetrachlorobiphenyl	50	1.0	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobiphenyl	52	1.0	1.31	1.89	0.59	0.66
2,3',4,4'-Tetrachlorobiphenyl	66	1.0	<DL	<DL	<DL	<DL
2,2',3,4,5'-Pentachlorobiphenyl	87	2.0	<DL	<DL	<DL	<DL
2,2',4,5,5'-Pentachlorobiphenyl	101	2.0	2.06	1.15	<DL	0.75
2,2',4,6,6'-Pentachlorobiphenyl	104	2.0	0.98	0.62	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiphenyl	128	2.0	1.49	2.03	1.57	1.15
2,2',3,4,4',5'-Hexachlorobiphenyl	138	2.0	2.64	1.86	2.09	0.86
2,2',4,4',5,5'-Hexachlorobiphenyl	153	2.0	<DL	<DL	<DL	<DL
2,2',4,4',5,6'-Hexachlorobiphenyl	154	2.0	<DL	<DL	<DL	<DL
2,2',3,4',5,5',6-Heptachlorobiphenyl	187	2.0	2.25	1.31	1.06	1.47
2,2',3,4',5,6,6'-Heptachlorobiphenyl	188	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorobiphenyl	195	3.0	<DL	<DL	<DL	<DL
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	200	3.0	2.26	1.74	2.09	1.14
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	209	5.0	0.98	1.24	1.58	1.06
Total PCBs			38.1	33.6	29.4	21.6
% Lipids			0.61*	0.62	0.62	0.58
Sample weight (g)			25.90	24.48	25.38	25.30
Surrogate Recovery		% rec (65-135)	**83.4**	**87.1**	**87.2**	**76.7**

* due to insufficient sample the % lipid value is an

Table 1.1.1 Total PCB in 1999 Blue Mussel Samples (ww)

PCBs

DEP ID#	IUPAC#	DL	Back Cove 1	Back Cove 2	Back Cove 3	Back Cove 4
Analytes		ug/kg				
2,4’-Dichlorobiphenyl	8	1.0	<DL	<DL	<DL	<DL
2,2’,5-Trichlorobiphenyl	18	1.0	<DL	<DL	<DL	<DL
2,4,4’-Trichlorobiphenyl	28	1.0	0.55	0.47	<DL	0.84
2,4,5-Trichlorobiphenyl	29	1.0	1.15	1.44	0.88	1.36
2,2’,3,5’-Tetrachlorobiphenyl	44	1.0	2.26	2.69	1.24	1.87
2,2’,4,6-Tetrachlorobiphenyl	50	1.0	<DL	<DL	<DL	<DL
2,2’,5,5’-Tetrachlorobiphenyl	52	1.0	2.04	1.57	1.06	2.61
2,3’,4,4’-Tetrachlorobiphenyl	66	1.0	<DL	<DL	<DL	<DL
2,2’,3,4,5’-Pentachlorobiphenyl	87	2.0	<DL	<DL	<DL	<DL
2,2’,4,5,5’-Pentachlorobiphenyl	101	2.0	1.84	1.07	0.75	1.57
2,2’,4,6,6’-Pentachlorobiphenyl	104	2.0	2.61	1.14	0.51	0.69
2,2’,3,3’,4,4’-Hexachlorobiphenyl	128	2.0	2.33	3.06	1.69	2.84
2,2’,3,4,4’,5’-Hexachlorobiphenyl	138	2.0	4.21	3.49	2.25	1.42
2,2’,4,4’,5,5’-Hexachlorobiphenyl	153	2.0	<DL	<DL	<DL	<DL
2,2’,4,4’,5,6’-Hexachlorobiphenyl	154	2.0	<DL	<DL	<DL	<DL
2,2’,3,4’,5,5’,6-Heptachlorobiphenyl	187	2.0	0.95	1.55	2.66	3.03
2,2’,3,4’,5,6,6’-Heptachlorobiphenyl	188	2.0	<DL	<DL	<DL	<DL
2,2’,3,3’,4,4’,5,6-Octachlorobiphenyl	195	3.0	<DL	1.15	<DL	<DL
2,2’,3,3’,4,5’,6,6’-Octachlorobiphenyl	200	3.0	2.33	1.47	2.07	1.45
2,2’,3,3’,4,4’,5,5’,6,6’-Decachlorobiphenyl	209	5.0	1.75	2.66	1.89	3.37
Total PCBs			41.7	45.8	38.7	52.9
% Lipids			0.40	0.55*	0.57	0.70
Sample weight (g)			24.82	22.52	24.58	24.01
Surrogate Recovery %		65-135	**85.3**	**75.9**	**81.2**	**81.3**

* due to insufficient sample the % lipid value is an average of the remaining 3 samples.

Table 1.1.1 Total PCB in 1999 Blue Mussel Samples (ww)

PCBs

DEP ID#		DL	Boothbay 1	Boothbay 2	Boothbay 3	Boothbay 4
Analytes	IUPAC#	ug/kg				
2,4'-Dichlorobiphenyl	8	1.0	<DL	<DL	<DL	<DL
2,2',5-Trichlorobiphenyl	18	1.0	<DL	<DL	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	1.0	<DL	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	1.0	1.05	0.33	<DL	0.68
2,2',3,5'-Tetrachlorobiphenyl	44	1.0	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	1.0	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobiphenyl	52	1.0	<DL	<DL	<DL	<DL
2,3',4,4'-Tetrachlorobiphenyl	66	1.0	0.63	0.81	<DL	0.46
2,2',3,4,5'-Pentachlorobiphenyl	87	2.0	<DL	<DL	<DL	<DL
2,2',4,5,5'-Pentachlorobiphenyl	101	2.0	1.25	0.66	0.35	1.33
2,2',4,6,6'-Pentachlorobiphenyl	104	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiphenyl	128	2.0	<DL	<DL	<DL	<DL
2,2',3,4,4',5'-Hexachlorobiphenyl	138	2.0	5.87	4.22	2.29	4.59
2,2',4,4',5,5'-Hexachlorobiphenyl	153	2.0	<DL	<DL	<DL	<DL
2,2',4,4',5,6'-Hexachlorobiphenyl	154	2.0	1.97	2.26	1.05	1.68
2,2',3,4',5,5',6-Heptachlorobiphenyl	187	2.0	<DL	<DL	<DL	<DL
2,2',3,4',5,6,6'-Heptachlorobiphenyl	188	2.0	1.03	1.15	<DL	0.77
2,2',3,3',4,4',5,6-Octachlorobiphenyl	195	3.0	2.67	<DL	3.01	1.87
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	200	3.0	1.95	3.32	2.18	2.66
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	209	5.0	2.66	1.87	3.39	4.75
Total PCBs			51.6	41.7	38.1	54.7
% Lipids			1.00	1.00	1.02	0.86
Sample weight (g)			24.96	24.35	25.27	25.21
Surrogate Recovery %		65-135	**78.6**	**70.2**	**74.4**	**81.9**

* due to insufficient sample the % lipid value is an average of the remaining 3 samples.

Table 1.1.1 Total PCB in 1999 Blue Mussel Samples (ww)

PCBs

			St. George R Hospital Point	St. George R Hospital Point	St. George R Hospital Point	St. George R Hospital Point
DEP ID#		DL	1	2	3	4
Analytes	IUPAC#	ug kg				
2,4'-Dichlorobiphenyl	8	1.0	<DL	<DL	<DL	<DL
2,2',5-Trichlorobiphenyl	18	1.0	<DL	<DL	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	1.0	0.43	0.81	1.31	2.74
2,4,5-Trichlorobiphenyl	29	1.0	<DL	<DL	<DL	<DL
2,2',3,5'-Tetrachlorobiphenyl	44	1.0	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	1.0	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobiphenyl	52	1.0	0.76	1.03	0.55	2.06
2,3',4,4'-Tetrachlorobiphenyl	66	1.0	<DL	<DL	<DL	<DL
2,2',3,4,5'-Pentachlorobiphenyl	87	2.0	<DL	<DL	<DL	<DL
2,2',4,5,5'-Pentachlorobiphenyl	101	2.0	<DL	<DL	<DL	<DL
2,2',4,6,6'-Pentachlorobiphenyl	104	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiphenyl	128	2.0	0.66	0.48	<DL	1.15
2,2',3,4,4',5'-Hexachlorobiphenyl	138	2.0	<DL	<DL	<DL	<DL
2,2',4,4',5,5'-Hexachlorobiphenyl	153	2.0	<DL	<DL	<DL	<DL
2,2',4,4',5,6'-Hexachlorobiphenyl	154	2.0	<DL	<DL	<DL	<DL
2,2',3,4',5,5',6-Heptachlorobiphenyl	187	2.0	0.51	1.62	0.86	3.57
2,2',3,4',5,6,6'-Heptachlorobiphenyl	188	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorobiphenyl	195	3.0	<DL	<DL	<DL	<DL
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	200	3.0	2.47	2.03	1.52	5.87
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	209	5.0	1.89	1.55	2.16	1.26
Total PCBs			28.0	27.4	21.9	40.3
% Lipids			0.75	0.62	0.67	0.52
Sample weight (g)			25.33	25.06	25.01	25.04
Surrogate Recovery %		65-135	**79.4**	**78.9**	**77.6**	**86.9**

* due to insufficient sample the % lipid value is an average of the remaining 3 samples.

Table 1.1.1 Total PCB in 1999 Blue Mussel Samples (ww)

PCBs

DEP ID# **Analytes**	IUPAC#	DL ug/kg	Billings/ Sedge 1	Billings/ Sedge 2	Billings/ Sedge 3	Billings/ Sedge 4
2,4'-Dichlorobiphenyl	8	1.0	<DL	<DL	<DL	<DL
2,2',5-Trichlorobiphenyl	18	1.0	<DL	<DL	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	1.0	<DL	0.51	0.35	<DL
2,4,5-Trichlorobiphenyl	29	1.0	<DL	<DL	<DL	<DL
2,2',3,5'-Tetrachlorobiphenyl	44	1.0	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	1.0	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobiphenyl	52	1.0	<DL	0.66	<DL	<DL
2,3',4,4'-Tetrachlorobiphenyl	66	1.0	<DL	<DL	<DL	<DL
2,2',3,4,5'-Pentachlorobiphenyl	87	2.0	<DL	<DL	<DL	<DL
2,2',4,5,5'-Pentachlorobiphenyl	101	2.0	<DL	0.45	<DL	<DL
2,2',4,6,6'-Pentachlorobiphenyl	104	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiphenyl	128	2.0	0.61	1.22	0.87	0.55
2,2',3,4,4',5'-Hexachlorobiphenyl	138	2.0	0.45	0.75	0.45	<DL
2,2',4,4',5,5'-Hexachlorobiphenyl	153	2.0	<DL	0.62	0.35	<DL
2,2',4,4',5,6'-Hexachlorobiphenyl	154	2.0	<DL	<DL	<DL	<DL
2,2',3,4',5,5',6-Heptachlorobiphenyl	187	2.0	<DL	1.38	2.26	0.88
2,2',3,4',5,6,6'-Heptachlorobiphenyl	188	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorobiphenyl	195	3.0	<DL	<DL	<DL	<DL
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	200	3.0	<DL	2.07	1.84	0.74
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	209	5.0	1.06	1.66	2.95	1.26
Total PCBs			11.4	27.2	29.4	10.2
% Lipids			0.90	0.71	0.69	0.79
Sample weight (g)			24.23	24.23	25.44	25.36
Surrogate Recovery %		65-135	**82.9**	**88.2**	**78.1**	**83.3**

* due to insufficient sample the % lipid value is an average of the remaining 3 samples.

Table 1.1.1 Total PCB in 1999 Blue Mussel Samples (ww)

PCBs

DEP ID# / **Analytes**	IUPAC#	DL ug/kg	Rockland Hbr. 1	Rockland Hbr. 2	Rockland Hbr. 3	Rockland Hbr. 4
2,4’-Dichlorobiphenyl	8	1.0	<DL	<DL	<DL	<DL
2,2’,5-Trichlorobiphenyl	18	1.0	<DL	<DL	<DL	<DL
2,4,4’-Trichlorobiphenyl	28	1.0	<DL	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	1.0	<DL	<DL	<DL	<DL
2,2’,3,5’-Tetrachlorobiphenyl	44	1.0	<DL	<DL	<DL	<DL
2,2’,4,6-Tetrachlorobiphenyl	50	1.0	<DL	<DL	<DL	<DL
2,2’,5,5’-Tetrachlorobiphenyl	52	1.0	0.41	0.68	0.74	<DL
2,3’,4,4’-Tetrachlorobiphenyl	66	1.0	0.52	0.41	<DL	<DL
2,2’,3,4,5’-Pentachlorobiphenyl	87	2.0	<DL	<DL	<DL	<DL
2,2’,4,5,5’-Pentachlorobiphenyl	101	2.0	0.61	0.75	1.06	0.48
2,2’,4,6,6’-Pentachlorobiphenyl	104	2.0	0.57	1.54	1.69	0.85
2,2’,3,3’,4,4’-Hexachlorobiphenyl	128	2.0	0.61	0.66	1.05	0.47
2,2’,3,4,4’,5’-Hexachlorobiphenyl	138	2.0	1.51	0.77	0.58	0.63
2,2’,4,4’,5,5’-Hexachlorobiphenyl	153	2.0	0.92	0.64	1.18	0.66
2,2’,4,4’,5,6’-Hexachlorobiphenyl	154	2.0	<DL	<DL	<DL	<DL
2,2’,3,4’,5,5’,6-Heptachlorobiphenyl	187	2.0	1.62	2.30	4.01	1.02
2,2’,3,4’,5,6,6’-Heptachlorobiphenyl	188	2.0	<DL	<DL	<DL	<DL
2,2’,3,3’,4,4’,5,6-Octachlorobiphenyl	195	3.0	1.37	<DL	2.31	<DL
2,2’,3,3’,4,5’,6,6’-Octachlorobiphenyl	200	3.0	1.85	2.36	3.07	1.21
2,2’,3,3’,4,4’,5,5’,6,6’-Decachlorobiphenyl	209	5.0	2.89	1.59	1.66	2.37
Total PCBs			42.9	38.7	51.9	30.6
% Lipids			0.37*	0.33	0.39	0.37
Sample weight (g)			25.29	25.17	25.31	24.34
Surrogate Recovery %		65-135	**81.9**	**96.1**	**86.7**	**102**

* due to insufficient sample the % lipid value is an average of the remaining 3 samples.

Table 1.1.1 Total PCB in 1999 Blue Mussel Samples (ww)

PCBs

DEP ID# **Analytes**	IUPAC#	DL ug/kg	Scarborough/Plmr Is 1	Scarborough/ Plmr Is 2	Scarborough/ Plmr Is 3	Scarborough/ Plmr Is 4
2,4'-Dichlorobiphenyl	8	1.0	<DL	<DL	<DL	<DL
2,2',5-Trichlorobiphenyl	18	1.0	<DL	<DL	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	1.0	<DL	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	1.0	<DL	<DL	<DL	<DL
2,2',3,5'-Tetrachlorobiphenyl	44	1.0	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	1.0	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobiphenyl	52	1.0	0.55	<DL	<DL	<DL
2,3',4,4'-Tetrachlorobiphenyl	66	1.0	<DL	<DL	<DL	<DL
2,2',3,4,5'-Pentachlorobiphenyl	87	2.0	<DL	<DL	<DL	<DL
2,2',4,5,5'-Pentachlorobiphenyl	101	2.0	1.65	0.74	1.34	0.87
2,2',4,6,6'-Pentachlorobiphenyl	104	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiphenyl	128	2.0	3.09	2.08	2.81	2.36
2,2',3,4,4',5'-Hexachlorobiphenyl	138	2.0	1.05	<DL	<DL	<DL
2,2',4,4',5,5'-Hexachlorobiphenyl	153	2.0	<DL	<DL	<DL	<DL
2,2',4,4',5,6'-Hexachlorobiphenyl	154	2.0	<DL	<DL	<DL	<DL
2,2',3,4',5,5',6-Heptachlorobiphenyl	187	2.0	1.49	0.69	0.97	1.25
2,2',3,4',5,6,6'-Heptachlorobiphenyl	188	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorobiphenyl	195	3.0	0.75	<DL	<DL	<DL
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	200	3.0	1.95	0.67	0.66	1.14
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	209	5.0	3.47	1.95	2.81	2.63
Total PCBs			42.1	26.3	35.6	30.2
% Lipids			0.77	0.78	0.78	0.86
Sample weight (g)			25.21	25.25	25.38	25.37
Surrogate Recovery		65-135	**91.2**	**78.2**	**82.5**	**85.7**

* due to insufficient sample the % lipid value is an average of the remaining 3 samples.

Table 1.1.1 Total PCB in 1999 Blue Mussel Samples (ww)

PCBs

DEP ID# **Analytes**	IUPAC#	DL ug/kg	Goosefare Brook	Round Pond	Kennebunkport
2,4’-Dichlorobiphenyl	8	1.0	<DL	<DL	<DL
2,2’,5-Trichlorobiphenyl	18	1.0	<DL	<DL	<DL
2,4,4’-Trichlorobiphenyl	28	1.0	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	1.0	<DL	<DL	<DL
2,2’,3,5’-Tetrachlorobiphenyl	44	1.0	<DL	<DL	<DL
2,2’,4,6-Tetrachlorobiphenyl	50	1.0	<DL	<DL	<DL
2,2’,5,5’-Tetrachlorobiphenyl	52	1.0	<DL	<DL	<DL
2,3’,4,4’-Tetrachlorobiphenyl	66	1.0	<DL	<DL	<DL
2,2’,3,4,5’-Pentachlorobiphenyl	87	2.0	<DL	<DL	<DL
2,2’,4,5,5’-Pentachlorobiphenyl	101	2.0	<DL	<DL	<DL
2,2’,4,6,6’-Pentachlorobiphenyl	104	2.0	<DL	<DL	<DL
2,2’,3,3’,4,4’-Hexachlorobiphenyl	128	2.0	0.97	<DL	<DL
2,2’,3,4,4’,5’-Hexachlorobiphenyl	138	2.0	1.15	<DL	1.58
2,2’,4,4’,5,5’-Hexachlorobiphenyl	153	2.0	<DL	<DL	<DL
2,2’,4,4’,5,6’-Hexachlorobiphenyl	154	2.0	<DL	<DL	<DL
2,2’,3,4’,5,5’,6-Heptachlorobiphenyl	187	2.0	0.88	<DL	0.98
2,2’,3,4’,5,6,6’-Heptachlorobiphenyl	188	2.0	<DL	<DL	<DL
2,2’,3,3’,4,4’,5,6-Octachlorobiphenyl	195	3.0	1.25	<DL	<DL
2,2’,3,3’,4,5’,6,6’-Octachlorobiphenyl	200	3.0	1.05	<DL	1.65
2,2’,3,3’,4,4’,5,5’,6,6’-Decachlorobiphenyl	209	5.0	<DL	<DL	2.24
Total PCBs			18.4	7.85	20.4
% Lipids			0.53	0.83	0.75
Sample weight (g)			24.98	25.03	24.97
Surrogate Recovery %		65-135	**71.5**	**88.6**	**86.6**

* due to insufficient sample the % lipid value is an average of the remaining 3 samples.

Table 1.1.1 Total PCB in 1999 Blue Mussel Samples (ww)

PCBs

DEP ID#	IUPAC#	DL	Friendship 1	Friendship 2	Friendship 3	Friendship 4
Analytes		ug/kg				
2,4'-Dichlorobiphenyl	8	1.0	<DL	<DL	<DL	<DL
2,2',5-Trichlorobiphenyl	18	1.0	<DL	<DL	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	1.0	<DL	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	1.0	<DL	<DL	<DL	<DL
2,2',3,5'-Tetrachlorobiphenyl	44	1.0	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	1.0	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobiphenyl	52	1.0	<DL	0.48	<DL	<DL
2,3',4,4'-Tetrachlorobiphenyl	66	1.0	<DL	<DL	<DL	<DL
2,2',3,4,5'-Pentachlorobiphenyl	87	2.0	<DL	<DL	<DL	<DL
2,2',4,5,5'-Pentachlorobiphenyl	101	2.0	<DL	<DL	<DL	<DL
2,2',4,6,6'-Pentachlorobiphenyl	104	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiphenyl	128	2.0	<DL	0.45	<DL	<DL
2,2',3,4,4',5'-Hexachlorobiphenyl	138	2.0	0.66	1.02	<DL	<DL
2,2',4,4',5,5'-Hexachlorobiphenyl	153	2.0	<DL	<DL	<DL	<DL
2,2',4,4',5,6'-Hexachlorobiphenyl	154	2.0	<DL	<DL	<DL	<DL
2,2',3,4',5,5',6-Heptachlorobiphenyl	187	2.0	<DL	<DL	0.65	<DL
2,2',3,4',5,6,6'-Heptachlorobiphenyl	188	2.0	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorobiphenyl	195	3.0	1.05	<DL	0.97	<DL
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	200	3.0	<DL	0.83	1.05	<DL
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	209	5.0	<DL	3.58	<DL	<DL
Total PCBs			14.2	17.3	8.94	10.7
% Lipids			0.89	0.94	0.82	0.61
Sample weight (g)			24.51	25.40	25.20	24.95
Surrogate Recovery %		65-135	**77.5**	**72.7**	**85.2**	**82.1**

* due to insufficient sample the % lipid value is an average of the remaining 3 samples.

Table 1.1.2 Concentrations of Mercury in 1999 Blue Mussel Tissue Samples

	Hg mg/kg ww	Hg mg/kg dw	% Solid	% Moisture
Back Cove #1	0.025	0.300	8.2	91.8
Back Cove #1 dup	0.024	0.290	8.2	91.8
Back Cove #2	0.025	0.276	9.0	91.0
Back Cove #3	0.024	0.282	8.7	91.3
Back Cove #4	0.025	0.258	9.7	90.3
Back Cove #4 dup	0.025	0.257	9.7	90.3
Billings #1	0.007	0.065	11.5	88.5
Billings #2	0.009	0.075	11.9	88.1
Billings #3	0.011	0.096	11.4	88.6
Billings #4	0.008	0.067	11.8	88.2
Boothbay #1	0.028	0.195	14.5	85.5
Boothbay #1 dup	0.028	0.195	14.5	85.5
Boothbay #2	0.027	0.202	13.2	86.8
Boothbay #3	0.026	0.192	13.7	86.3
Boothbay #4	0.024	0.178	13.4	86.6
Fore R. #1	0.023	0.246	9.4	90.6
Fore R. #1 dup	0.025	0.265	9.4	90.6
Fore R. #2	0.026	0.249	10.6	89.4
Fore R. #3	0.026	0.252	10.5	89.5
Fore R. #4	0.024	0.231	10.5	89.5
Friendship #1	0.009	0.075	12.0	88.0
Friendship #2	0.010	0.085	11.3	88.7
Friendship #3	0.009	0.073	12.9	87.1
Friendship #4	0.010	0.077	12.7	87.3
Goosefare	0.008	0.085	9.3	90.7
Goosefare dup	0.007	0.074	9.3	90.7
Kennebunkport	0.016	0.126	12.3	87.7
Rockland #1	0.015	0.170	8.7	91.3
Rockland #1 dup	0.010	0.112	8.7	91.3
Rockland #2	0.010	0.119	8.4	91.6
Rockland #3	0.010	0.125	7.9	92.1
Rockland #4	0.010	0.118	8.5	91.5
Round Pd.	0.010	0.073	14.0	86.0
Scarb. #1	0.010	0.082	12.6	87.4
Scarb. #2	0.008	0.066	12.8	87.2
Scarb. #3	0.010	0.079	12.1	87.9
Scarb. #4	0.009	0.072	12.6	87.4
St. George #1	0.014	0.140	10.1	89.9
St. George #2	0.015	0.141	10.3	89.7
St. George #3	0.013	0.128	10.1	89.9
St. George #4	0.015	0.149	9.8	90.2
York/Ned #1	0.013	0.162	8.0	92.0
York/Ned #2	0.012	0.150	7.9	92.1
York/Ned #3	0.013	0.169	8.0	92.0
York/Ned #4	0.012	0.167	7.3	92.7
York/Perk #1	0.009	0.103	8.5	91.5
York/Perk #2	0.010	0.093	11.1	88.9
York/Perk #3	0.012	0.141	8.5	91.5
York/Perk #4	0.010	0.084	12.4	87.6

Table 1.1.3 Heavy Metals in 1999 Blue Mussel Tissue Samples (ww)

Station	Ag ug/g	Al ug/g	Cd ug/g	Cr ug/g	Cu ug/g	Fe ug/g	Ni ug/g	Pb ug/g	Zn ug/g	% Solid
	DL	DL	DL	DL	DL	DL	DL	DL	DL	
	0.10	***0.50***	***0.03***	***0.10***	***0.50***	***1.25***	***0.10***	***0.05***	***1***	
Back Cove #1	<0.10	80.02	0.19	0.32	3.55	100.66	0.81	0.81	7.16	8.2
Back Cove #2	<0.10	63.31	0.18	0.26	2.56	91.28	0.47	0.71	9.19	9.0
Back Cove #3	<0.10	66.84	0.19	0.26	3.63	87.06	1.00	0.78	8.12	8.7
Back Cove #4	<0.10	75.52	0.18	0.26	2.92	90.92	0.44	0.77	8.69	9.7
Billings #1	<0.10	8.18	0.18	<0.10	2.19	13.79	0.51	0.17	8.07	11.5
Billings #2	<0.10	9.75	0.17	<0.10	1.89	15.27	0.18	0.19	6.76	11.9
Billings #3	<0.10	8.97	0.17	<0.10	2.24	15.46	0.35	0.17	6.29	11.4
Billings #4	<0.10	8.69	0.15	<0.10	2.01	14.90	0.12	0.19	6.47	11.8
Boothbay #1	<0.10	19.16	0.18	0.18	3.59	35.70	0.49	1.79	17.13	14.5
Boothbay #2	<0.10	14.74	0.15	0.15	3.53	29.51	0.31	1.63	12.94	13.2
Boothbay #3	<0.10	15.93	0.14	0.14	3.00	29.85	0.20	1.31	12.34	13.7
Boothbay #4	<0.10	14.55	0.13	0.11	3.75	28.64	0.20	1.21	12.15	13.4
Fore R. #1	<0.10	102.15	0.20	0.38	4.75	129.56	2.71*	0.78	14.85	9.4
Fore R. #2	<0.10	98.97	0.19	0.54	4.86	134.37	0.53	0.83	12.95	10.6
Fore R. #3	<0.10	70.32	0.15	0.24	3.07	92.74	0.37	0.64	11.86	10.5
Fore R. #4	<0.10	73.39	0.16	0.22	4.02	97.29	0.48	0.68	11.71	10.5
Friendship #1	<0.10	22.21	0.13	0.11	2.22	27.84	0.76	0.38	8.66	12.0
Friendship #2	<0.10	56.73	0.13	0.15	2.67	78.97	0.36	0.47	8.73	11.3
Friendship #3	<0.10	21.22	0.15	0.12	3.92	29.95	0.44	0.40	9.88	12.9
Friendship #4	<0.10	19.39	0.12	0.11	2.38	28.54	0.36	0.33	9.56	12.7
Goosefare	<0.10	15.84	0.15	0.19	2.59	33.73	0.47	0.15	5.34	9.3
Kennebunkport	<0.10	14.80	0.23	0.12	3.57	27.76	0.31	0.34	8.43	12.3
Rockland #1	<0.10	12.52	0.13	0.15	3.13	25.27	0.52	0.41	7.46	8.7
Rockland #2	<0.10	9.53	0.12	0.14	2.80	21.86	0.88	0.36	6.52	8.4
Rockland #3	<0.10	12.13	0.12	0.11	2.76	27.29	0.13	0.42	7.50	7.9
Rockland #4	<0.10	10.00	0.09	0.10	2.26	18.99	0.48	0.29	6.38	8.5
Round Pd.	<0.10	36.52	0.14	0.13	3.09	47.93	0.77	0.35	12.23	14.0
Scarb. #1	<0.10	18.21	0.21	0.14	2.87	35.45	0.41	<0.05	7.74	12.6
Scarb. #2	<0.10	15.02	0.21	0.14	2.38	35.51	0.19	0.16	7.53	12.8
Scarb. #3	<0.10	16.74	0.20	0.15	2.37	32.61	0.29	0.09	7.66	12.1
Scarb. #4	<0.10	22.68	0.20	0.26	2.61	39.23	0.28	0.16	9.32	12.6
St. George #1	<0.10	54.21	0.16	0.19	3.44	69.97	0.69	0.23	6.93	10.1
St. George #2	<0.10	42.77	0.17	0.16	2.37	61.26	0.73	0.23	7.44	10.3
St. George #3	<0.10	55.22	0.17	0.20	3.65	65.16	0.41	0.26	6.93	10.1
St. George #4	<0.10	53.13	0.17	0.20	3.20	67.02	0.44	0.28	7.04	9.8
York/Ned #1	<0.10	9.31	0.13	0.13	2.20	19.33	0.38	0.17	4.85	8.0
York/Ned #2	<0.10	9.71	0.14	0.12	2.35	21.07	0.35	0.18	5.66	7.9
York/Ned #3	<0.10	9.67	0.14	0.15	2.28	20.88	0.76	0.19	6.67	8.0
York/Ned #4	<0.10	11.68	0.13	0.15	1.94	22.39	0.51	0.19	5.15	7.3
York/Perk #1	<0.10	9.79	0.17	0.14	2.06	19.13	0.48	0.18	4.69	8.5
York/Perk #2	<0.10	25.97	0.14	0.16	2.28	31.97	0.27	0.33	10.45	11.1
York/Perk #3	<0.10	15.46	0.18	0.30	2.33	20.48	0.29	0.10	5.11	8.5
York/Perk #4	<0.10	20.20	0.12	0.13	2.29	26.96	0.19	0.37	8.78	12.4

Table 1.1.4 Heavy Metals in 1999 Blue Mussel Tissue Samples (dw)

Station	Ag ug/g	Al ug/g	Cd ug/g	Cr ug/g	Cu ug/g	Fe ug/g	Ni ug/g	Pb ug/g	Zn ug/g	% Solid
	DL	DL	DL	DL	DL	DL	DL	DL	DL	
	0.10	0.50	0.03	0.10	0.50	1.25	0.10	0.05	1	
Back Cove #1	<1.22	975.27	2.33	3.87	43.27	1226.77	9.89	9.81	87.32	8.2
Back Cove #2	<1.11	702.44	1.94	2.86	28.40	1012.77	5.23	7.92	101.97	9.0
Back Cove #3	<1.15	770.77	2.22	2.97	41.88	1003.97	11.57	9.03	93.68	8.7
Back Cove #4	<1.04	781.96	1.84	2.71	30.20	941.41	4.60	8.01	89.98	9.7
Billings #1	<0.87	71.11	1.53	<0.87	19.04	119.91	4.44	1.45	70.11	11.5
Billings #2	<0.84	81.91	1.42	<0.84	15.87	128.23	1.50	1.56	56.77	11.9
Billings #3	<0.88	78.75	1.45	<0.88	19.65	135.64	3.05	1.46	55.22	11.4
Billings #4	<0.85	73.86	1.28	<0.85	17.11	126.73	1.05	1.64	54.97	11.8
Boothbay #1	<0.69	131.98	1.22	1.26	24.74	245.92	3.36	12.35	118.01	14.5
Boothbay #2	<0.76	111.59	1.17	1.11	26.76	223.44	2.38	12.32	97.99	13.2
Boothbay #3	<0.73	116.66	1.06	1.00	21.99	218.63	1.49	9.59	90.42	13.7
Boothbay #4	<0.75	108.72	0.98	0.84	28.05	214.04	1.50	9.03	90.77	13.4
Fore R. #1	<1.07	1092.46	2.11	4.06	50.84	1385.66	29.01*	8.39	158.80	9.4
Fore R. #2	<0.94	929.68	1.74	5.05	45.65	1262.17	4.97	7.83	121.64	10.6
Fore R. #3	<0.95	670.92	1.46	2.28	29.30	884.77	3.53	6.14	113.13	10.5
Fore R. #4	<0.95	699.71	1.50	2.05	38.30	927.48	4.62	6.50	111.66	10.5
Friendship #1	<0.84	185.81	1.10	0.88	18.61	232.88	6.33	3.20	72.43	12.0
Friendship #2	<0.89	504.08	1.17	1.37	23.76	701.70	3.18	4.16	77.62	11.3
Friendship #3	<0.77	164.31	1.14	0.93	30.33	231.86	3.41	3.09	76.49	12.9
Friendship #4	<0.79	152.70	0.98	0.87	18.72	224.73	2.85	2.57	75.30	12.7
Goosefare	<1.08	170.54	1.62	2.02	27.85	363.01	5.02	1.64	57.50	9.3
Kennebunkport	<0.81	119.97	1.90	0.94	28.91	224.96	2.50	2.73	68.35	12.3
Rockland #1	<1.15	144.04	1.46	1.71	35.99	290.66	5.93	4.76	85.82	8.7
Rockland #2	<1.20	114.14	1.41	1.62	33.51	261.68	10.52	4.29	78.04	8.4
Rockland #3	<1.27	153.87	1.47	1.39	34.94	346.08	1.70	5.34	95.18	7.9
Rockland #4	<1.18	118.28	1.06	1.23	26.75	224.63	5.67	3.42	75.49	8.5
Round Pd.	<0.71	260.39	0.98	0.91	22.02	341.71	5.50	2.50	87.17	14.0
Scarb. #1	<0.79	144.53	1.68	1.08	22.74	281.35	3.29	<0.40	61.39	12.6
Scarb. #2	<0.78	117.74	1.61	1.11	18.62	278.40	1.50	1.29	59.06	12.8
Scarb. #3	<0.82	137.85	1.67	1.20	19.54	268.56	2.41	0.72	63.10	12.1
Scarb. #4	<0.79	179.78	1.59	2.03	20.72	311.02	2.20	1.24	73.87	12.6
St. George #1	<0.99	536.64	1.57	1.88	34.08	692.57	6.83	2.23	68.60	10.1
St. George #2	<0.97	413.61	1.67	1.55	22.92	592.43	7.05	2.24	71.91	10.3
St. George #3	<0.99	548.23	1.67	2.02	36.27	646.93	4.03	2.57	68.83	10.1
St. George #4	<1.02	540.95	1.76	2.06	32.56	682.34	4.46	2.82	71.66	9.8
York/Ned #1	<1.24	115.85	1.62	1.57	27.40	240.50	4.75	2.14	60.27	8.0
York/Ned #2	<1.26	122.34	1.73	1.54	29.62	265.46	4.42	2.33	71.37	7.9
York/Ned #3	<1.26	121.56	1.78	1.92	28.68	262.47	9.57	2.41	83.87	8.0
York/Ned #4	<1.36	159.12	1.74	1.99	26.39	305.05	6.89	2.61	70.15	7.3
York/Perk #1	<1.17	114.53	1.98	1.61	24.07	223.77	5.64	2.12	54.84	8.5
York/Perk #2	<0.90	233.88	1.23	1.43	20.52	287.94	2.43	2.93	94.13	11.1
York/Perk #3	<1.18	182.00	2.17	3.56	27.40	241.09	3.42	1.22	60.18	8.5
York/Perk #4	<0.81	163.28	1.00	1.06	18.49	217.85	1.56	2.95	70.93	12.4

Table 1.1.5 Heavy Metals in 1999 Clam Tissue Samples (ww)

SITE CODES:
MCBH=Mill Cove Boothbay Harbor
HST.R=Hospital Point St. George R
FRSP=Fore River South Portland
BCP=Back Cove Portland
PISR=Plummer Island Scarborough R

	Al mg/kg	Cd mg/kg	Cr mg/kg	Fe mg/kg	Pb mg/kg	Zn mg/kg
	DL mg/kg 1	DL mg/kg 0.05	DL mg/kg 0.20	DL mg/kg 2.5	DL mg/kg 1.00	DL mg/kg 2.00
MCBH	259	0.13	1.72	519	2.89	15.7
MCBH	205	0.16	1.26	652	2.95	16.6
MCBH	208	0.11	1.42	461	2.75	15.9
MCBH	210	0.14	3.26	450	2.84	14.8
MCBH	174	0.12	1.29	368	2.43	17.0
MCBH	189	0.11	1.45	387	2.61	17.4
MCBH	100	0.11	1.47	184	1.55	17.8
MCBH	90	0.10	0.75	166	1.32	14.9
MCBH	58	0.13	0.37	118	1.37	14.8
MCBH	64	0.10	0.66	114	1.13	14.1
MCBH	80	0.10	0.47	167	1.52	15.1
MCBH	77	0.09	0.51	159	1.69	15.3
MCBH	1401	<0.05	28.28	4108	18.07	23.0
MCBH	1288	<0.05	45.08	3643	16.98	24.8
MCBH	1701	<0.05	14.44	3635	19.43	27.2
MCBH	1750	<0.05	24.31	3805	19.94	23.8
MCBH	1285	<0.05	29.43	3442	15.40	20.0
MCBH	1284	<0.05	29.81	3462	15.51	19.9
HST.R	584	0.36	2.97	2949	1.27	11.7
HST.R	576	0.32	2.12	2422	6.45	11.5
HST.R	571	0.32	2.75	2689	1.27	11.3
HST.R	619	0.38	2.22	2885	1.35	12.3
HST.R	545	0.32	3.44	2527	1.11	11.5
HST.R	579	0.37	3.65	2779	1.16	12.3
HST.R	116	0.13	0.82	218	0.25	11.3
HST.R	136	0.14	1.35	295	0.18	10.6
HST.R	126	0.14	1.68	228	0.28	11.2
HST.R	139	0.16	0.86	279	0.30	12.3
HST.R	178	0.14	0.90	367	0.18	12.3
HST.R	184	0.14	0.91	359	0.36	12.0
HST.R	2937	<0.05	13.00	15243	7.42	17.4
HST.R	3237	0.17	12.05	20700	8.99	19.3
HST.R	3713	0.07	13.61	22538	9.52	20.4
HST.R	3203	0.12	12.06	17732	8.28	18.1
HST.R	2863	<0.05	10.35	14527	7.31	15.1
FRSP	323	0.15	2.70	641	1.48	11.9
FRSP	342	0.13	2.77	624	1.48	13.2
FRSP	305	0.13	1.66	575	1.33	12.1
FRSP	298	0.16	1.57	573	1.33	12.4
FRSP	340	0.16	5.33	712	1.54	13.8
FRSP	296	0.14	1.39	670	1.29	12.5
FRSP	85	0.09	1.01	125	0.22	12.5
FRSP	186	0.15	1.60	451	0.97	12.9
FRSP	217	0.14	2.05	498	0.75	13.8
FRSP	141	0.13	2.95	257	0.50	13.0

Table 1.1.5 Heavy Metals in 1999 Clam Tissue Samples (ww)

SITE CODES:
MCBH=Mill Cove Boothbay Harbor
HST.R=Hospital Point St. George R
FRSP=Fore River South Portland
BCP=Back Cove Portland
PISR=Plummer Island Scarborough R

	Al mg/kg	Cd mg/kg	Cr mg/kg	Fe mg/kg	Pb mg/kg	Zn mg/kg
	DL mg/kg 1	DL mg/kg 0.05	DL mg/kg 0.20	DL mg/kg 2.5	DL mg/kg 1.00	DL mg/kg 2.00
FRSP	106	0.14	1.27	157	0.49	13.5
FRSP	187	0.11	1.01	280	0.45	13.3
FRSP	2206	<0.05	16.18	6289	12.67	20.0
FRSP	3027	<0.05	17.04	7643	15.46	25.6
FRSP	1015	<0.05	5.28	2775	6.20	9.5
FRSP	1035	<0.05	1.74	2968	5.89	8.6
FRSP	1186	<0.05	2.09	3781	6.67	10.1
FRSP	959	<0.05	6.75	2974	6.49	10.8
BCP	428	0.19	3.06	907	3.06	14.2
BCP	364	0.19	3.68	759	3.70	14.5
BCP	418	0.18	4.62	803	3.00	15.4
BCP	411	0.17	4.99	884	3.24	14.8
BCP	468	0.19	6.04	918	3.74	15.5
BCP	228	0.16	2.22	331	0.96	14.9
BCP	225	0.18	2.08	335	1.28	14.7
BCP	172	0.15	3.10	264	1.04	15.1
BCP	156	0.18	1.30	204	0.91	14.5
BCP	118	0.16	1.13	169	0.67	15.3
BCP	150	0.16	1.46	188	0.60	14.3
BCP	1465	<0.05	16.58	4034	16.28	16.5
BCP	815	0.10	2.26	1906	8.49	9.3
BCP	881	<0.05	2.14	2024	9.58	9.5
BCP	1732	<0.05	26.04	3944	14.57	16.8
BCP	1821	<0.05	21.29	4136	16.27	17.8
BCP	2087	<0.05	39.40	3959	18.43	17.7
PISR	240	0.18	3.45	625	0.56	13.3
PISR	217	0.17	2.75	621	1.05	12.4
PISR	209	0.17	1.92	634	0.63	12.8
PISR	236	0.19	2.47	703	0.80	13.1
PISR	193	0.15	1.54	590	0.71	12.8
PISR	121	0.16	1.17	243	0.36	13.0
PISR	133	0.14	1.14	260	0.33	13.2
PISR	112	0.15	1.01	204	0.28	13.3
PISR	77	0.13	0.70	138	0.21	12.8
PISR	80	0.14	0.48	128	0.16	12.9
PISR	107	0.16	0.72	193	0.06	13.8
PISR	876	0.05	13.79	2969	3.27	6.1
PISR	882	0.08	16.47	2990	3.04	6.6
PISR	940	<0.05	3.27	4630	4.19	9.5
PISR	1098	<0.05	14.28	3712	3.62	8.9
PISR	933	<0.05	2.24	2775	2.68	7.5

Table 1.1.6 Heavy Metals in 1999 Clam Tissue Samples (dw)

SITE CODES:
MCBH=Mill Cove Boothbay Harbor
HST.R=Hospital Point St. George R
FRSP=Fore River South Portland
BCP=Back Cove Portland
PISR=Plummer Island Scarborough R

	Al	Cd	Cr	Fe	Pb	Zn
	DL mg/kg 1	DL mg/kg 0.05	DL mg/kg 0.20	DL mg/kg 2.5	DL mg/kg 1.00	DL mg/kg 2.00
MCBH	801	0.40	5.32	1606	8.95	48.6
MCBH	671	0.51	4.14	2138	9.67	54.4
MCBH	656	0.36	4.48	1455	8.68	50.1
MCBH	686	0.45	10.66	1469	9.29	48.5
MCBH	573	0.39	4.24	1211	8.01	55.9
MCBH	623	0.37	4.78	1272	8.60	57.2
MCBH	310	0.34	4.53	567	4.78	55.0
MCBH	296	0.33	2.47	546	4.33	48.9
MCBH	192	0.42	1.23	392	4.55	49.3
MCBH	212	0.33	2.18	375	3.70	46.4
MCBH	251	0.31	1.49	528	4.81	47.5
MCBH	243	0.28	1.62	502	5.34	48.3
MCBH	3882	<DL	78.35	11380	50.06	63.8
MCBH	3125	<DL	109.41	8841	41.22	60.3
MCBH	4901	<DL	41.60	10475	55.99	78.4
MCBH	4888	<DL	67.91	10629	55.69	66.5
MCBH	3511	<DL	80.41	9404	42.08	54.7
MCBH	3508	<DL	81.44	9460	42.38	54.3
HST.R	2347	1.45	11.91	11841	5.09	46.9
HST.R	2009	1.10	7.38	8441	22.48	40.1
HST.R	2032	1.15	9.79	9570	4.53	40.2
HST.R	2310	1.44	8.29	10764	5.03	46.0
HST.R	1976	1.16	12.45	9154	4.01	41.7
HST.R	2097	1.34	13.21	10069	4.19	44.5
HST.R	417	0.46	2.95	782	0.90	40.6
HST.R	401	0.42	3.98	870	0.54	31.4
HST.R	443	0.49	5.90	800	0.97	39.4
HST.R	491	0.58	3.02	984	1.04	43.5
HST.R	620	0.47	3.13	1275	0.61	42.7
HST.R	637	0.50	3.16	1247	1.24	41.6
HST.R	6169	<DL	27.31	32024	15.58	36.5
HST.R	6660	0.35	24.79	42594	18.51	39.7
HST.R	8055	0.15	29.52	48890	20.66	44.2
HST.R	6673	0.25	25.12	36942	17.25	37.7
HST.R	6041	<DL	21.83	30648	15.42	31.9
FRSP	1138	0.53	9.49	2256	5.22	42.0
FRSP	1186	0.45	9.62	2166	5.13	45.7
FRSP	1041	0.45	5.65	1961	4.54	41.2
FRSP	1016	0.53	5.37	1955	4.54	42.3
FRSP	1186	0.57	18.58	2480	5.38	48.3
FRSP	1014	0.49	4.77	2295	4.43	42.8
FRSP	276	0.28	3.27	405	0.72	40.6
FRSP	629	0.50	5.41	1527	3.29	43.8

Table 1.1.6 Heavy Metals in 1999 Clam Tissue Samples (dw)

SITE CODES:
MCBH=Mill Cove Boothbay Harbor
HST.R=Hospital Point St. George R
FRSP=Fore River South Portland
BCP=Back Cove Portland
PISR=Plummer Island Scarborough R

	Al	Cd	Cr	Fe	Pb	Zn
	DL mg/kg 1	DL mg/kg 0.05	DL mg/kg 0.20	DL mg/kg 2.5	DL mg/kg 1.00	DL mg/kg 2.00
FRSP	736	0.46	6.96	1690	2.55	46.9
FRSP	494	0.45	10.36	900	1.74	45.7
FRSP	373	0.48	4.47	552	1.73	47.5
FRSP	618	0.38	3.33	924	1.48	43.9
FRSP	4352	<DL	31.91	12404	24.99	39.4
FRSP	4545	<DL	25.58	11476	23.22	38.4
FRSP	2813	<DL	14.63	7686	17.18	26.4
FRSP	3028	<DL	5.08	8680	17.23	25.2
FRSP	3469	<DL	6.10	11056	19.49	29.5
FRSP	2516	<DL	17.71	7806	17.04	28.4
BCP	1518	0.69	10.84	3216	10.83	50.2
BCP	1287	0.68	13.01	2682	13.06	51.4
BCP	1446	0.62	15.99	2779	10.40	53.4
BCP	1357	0.55	16.47	2917	10.69	48.8
BCP	1518	0.61	19.61	2982	12.14	50.3
BCP	763	0.55	7.44	1108	3.22	49.9
BCP	753	0.60	6.96	1122	4.29	49.1
BCP	564	0.48	10.17	865	3.39	49.5
BCP	529	0.61	4.42	693	3.09	49.3
BCP	416	0.55	4.01	596	2.36	54.1
BCP	498	0.55	4.85	625	1.98	47.5
BCP	4740	<DL	53.64	13054	52.69	53.4
BCP	2605	0.33	7.22	6088	27.12	29.6
BCP	2816	<DL	6.82	6465	30.62	30.3
BCP	5697	<DL	85.67	12973	47.92	55.2
BCP	5115	<DL	59.80	11619	45.71	50.0
BCP	5641	<DL	106.48	10700	49.81	47.8
PISR	805	0.60	11.59	2098	1.88	44.8
PISR	737	0.57	9.37	2111	3.57	42.1
PISR	716	0.58	6.58	2173	2.17	43.9
PISR	765	0.63	8.01	2283	2.60	42.5
PISR	665	0.52	5.30	2035	2.46	44.0
PISR	388	0.51	3.76	782	1.16	41.9
PISR	426	0.46	3.65	836	1.05	42.5
PISR	361	0.47	3.24	655	0.91	42.8
PISR	270	0.47	2.46	488	0.74	45.0
PISR	270	0.46	1.63	433	0.53	43.7
PISR	341	0.51	2.32	616	0.20	44.1
PISR	3010	0.15	47.39	10202	11.23	20.9
PISR	3268	0.28	61.01	11074	11.26	24.3
PISR	3242	<DL	11.28	15967	14.45	32.9
PISR	4158	<DL	54.11	14059	13.72	33.5
PISR	3560	<DL	8.56	10592	10.23	28.6

Table 1.1.7 Concentrations of Mercury in 1999 Clam Tissue samples

SITE CODES:
MCBH=Mill Cove Boothbay Harbor
HST.R=Hospital Point St. George R
FRSP=Fore River South Portland
BCP=Back Cove Portland
PISR=Plummer Island Scarborough R

	Sample ID	**Hg (mg/kg ww)**	**Hg (mg/kg dw)**	**Percent Solids**
MCBH	A1-1	0.062	0.193	32.3
MCBH	A2-1	0.055	0.179	30.5
MCBH	A3-1	0.073	0.230	31.7
MCBH	A4-1	0.060	0.196	30.6
MCBH	A5-1	0.048	0.157	30.4
MCBH	A6-1	0.069	0.214	32.4
MCBH	A7-1	0.058	0.191	30.4
MCBH	A8-1	0.052	0.174	30.1
MCBH	A9-1	0.057	0.188	30.4
MCBH	A10-1	0.056	0.177	31.7
MCBH	A11	0.056	0.154	36.1
MCBH	A12	0.066	0.161	41.2
MCBH	A13	0.074	0.214	34.7
MCBH	A14	0.069	0.193	35.8
MCBH	A15	0.065	0.178	36.6
HST.R	B1	0.032	0.127	24.9
HST.R	B2	0.037	0.127	28.7
HST.R	B3	0.036	0.128	28.1
HST.R	B4	0.034	0.128	26.8
HST.R	B5	0.036	0.130	27.6
HST.R	B6	0.041	0.146	27.9
HST.R	B7	0.041	0.122	33.9
HST.R	B8	0.043	0.150	28.5
HST.R	B9	0.044	0.156	28.4
HST.R	B10	0.047	0.162	28.8
HST.R	B11	0.007	0.014	47.6
HST.R	B12	0.008	0.015	48.6
HST.R	B13	0.007	0.015	46.1
HST.R	B14	0.008	0.017	48.0
HST.R	B15	0.008	0.016	47.4
FRSP	C1	0.044	0.153	28.4
FRSP	C2	0.046	0.159	28.8
FRSP	C3	0.042	0.143	29.3
FRSP	C4	0.046	0.159	28.7
FRSP	C5	0.041	0.141	29.2
FRSP	C6	0.047	0.154	30.9
FRSP	C7	0.052	0.177	29.5
FRSP	C8	0.050	0.174	28.5

Table 1.1.7 Concentrations of Mercury in 1999 Clam Tissue samples

SITE CODES:
MCBH=Mill Cove Boothbay Harbor
HST.R=Hospital Point St. George R
FRSP=Fore River South Portland
BCP=Back Cove Portland
PISR=Plummer Island Scarborough R

	Sample ID	Hg (mg/kg ww)	Hg (mg/kg dw)	Percent Solids
Cont:				
FRSP	C9	0.050	0.176	28.5
FRSP	C10	0.052	0.172	30.3
FRSP	C11	0.011	0.022	50.7
FRSP	C12	0.012	0.018	66.6
FRSP	C13	0.007	0.020	36.1
FRSP	C14	0.008	0.024	34.2
FRSP	C15	0.011	0.029	38.1
BCP	D1	0.061	0.217	28.2
BCP	D2	0.062	0.218	28.3
BCP	D3	0.063	0.216	28.9
BCP	D4	0.074	0.244	30.3
BCP	D5	0.071	0.231	30.8
BCP	D6	0.070	0.232	29.9
BCP	D7	0.071	0.233	30.5
BCP	D8	0.082	0.278	29.5
BCP	D9	0.065	0.230	28.3
BCP	D10	0.067	0.222	30.1
BCP	D11	0.028	0.090	30.9
BCP	D12	0.023	0.075	31.3
BCP	D13	0.029	0.094	30.4
BCP	D14	0.024	0.068	35.6
BCP	D15	0.032	0.087	37.0
PISR	E1	0.025	0.083	29.8
PISR	E2	0.022	0.074	29.4
PISR	E3	0.022	0.075	29.2
PISR	E4	0.023	0.075	30.8
PISR	E5	0.023	0.080	29.0
PISR	E6	0.025	0.082	31.1
PISR	E7	0.025	0.082	31.1
PISR	E8	0.027	0.094	28.4
PISR	E9	0.024	0.083	29.5
PISR	E10	0.027	0.088	31.3
PISR	E11	0.005	0.017	29.1
PISR	E12	0.006	0.021	27.0
PISR	E13	0.006	0.022	29.0
PISR	E14	0.006	0.023	26.4
PISR	E15	0.007	0.028	26.2

Table 1.1.8 Heavy Metals in 1999 Sediment Samples

SITE CODES:
MCBH=Mill Cove Boothbay Harbor
HST.R=Hospital Point St. George R
FRSP=Fore River South Portland
BCP=Back Cove Portland
PISR=Plummer Island Scarborough

All Values are dry weight	AL	CD	DR	FE	PB	ZN	HG	Moisture	TOC
	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	%	%
SITE									
MCBH #1	8431	0.150	15.3	16257	28.6	64.7	210	28.3	1.15
MCBH #2	7644	0.256	22.5	12713	53.1	87.9	285	40.5	2.28
MCBH #3	7562	0.273	17.6	9877	81.4	126.9	225	29.2	2.67
MCBH #3 dup	n/a	n/a	n/a	n/a	n/a	n/a	213		
MCBH #4	4401	0.317	12.5	6344	60.3	535.3	274	30.5	1.71
MCBH #5	9872	0.231	25.2	13629	55.2	91.1	268	34.9	3.82
BCP #1	22729	0.359	50.7	29474	59.3	111.9	591	61.5	2.92
BCP #1 dup	24182	0.372	50.4	28610	57.8	109.7	n/a		
BCP #2	23068	0.384	51.0	29649	59.5	109.8	555	60.6	2.82
BCP #3	25105	0.350	52.9	30126	59.8	113.1	515	63.0	2.95
BCP #4	25763	0.351	52.9	29625	57.2	110.1	322	59.8	2.93
BCP #5	23421	0.375	51.2	27966	58.2	108.6	528	59.4	2.76
FRSP #1	3093	0.042	5.3	3989	4.8	16.8	21.0	20.6	0.19
FRSP #1 dup	3394	0.043	7.0	4651	4.9	23.1	n/a		
FRSP #2	4064	0.019	5.7	4588	5.8	20.5	29.7	22.9	0.22
FRSP #3	2016	0.067	6.4	3739	5.2	16.7	16.9	21.5	0.24
FRSP #4	5281	0.077	11.7	9522	7.9	39.7	19.9	24.1	0.31
FRSP #5	5501	0.106	8.8	6569	7.2	25.8	31.6	22.2	0.26
FRSP #5 dup	n/a	n/a	n/a	n/a	n/a	n/a	30.5		
PISR #1	3573	0.120	7.5	5082	3.1	20.2	15.2	31.7	0.22
PISR #2	2345	0.120	5.1	3205	2.0	13.0	10.4	28.2	0.46
PISR #3	6796	0.248	13.7	8621	5.1	32.3	20.8	35.3	1.05
PISR #4	4502	0.110	11.3	7030	4.6	26.8	16.9	30.1	0.71
PISR #5	2300	0.121	4.7	3051	1.9	12.3	10.5	26.8	0.23
HST.R #1	36320	0.004	59.7	38590	23.1	84.0	67.8	61.7	2.47
HST.R #2	29909	0.005	54.9	36705	24.3	87.3	78.9	59.1	2.5
HST.R #2 dup	n/a	n/a	n/a	n/a	n/a	n/a	61.5		
HST.R #3	31840	0.027	56.2	38560	23.7	85.9	70.5	57.4	2.52
HST.R #4	36467	0.017	62.7	38128	24.0	86.4	72.0	61.5	2.54
HST.R #5	35671	0.000	58.1	39279	23.4	87.0	62.7	63.1	2.5

1.2

ESTUARINE SEDIMENT CHARACTERIZATION

Estuarine Sediment Characterization

Recent hazardous waste site assessments in lower river systems and estuaries have demonstrated the need for a better understanding of toxic contaminant levels in estuarine sediments. These areas, neither river nor marine, and a transition zone between erosional and depositional areas are not well characterized. Waste discharge license limits are based on ambient concentrations of a toxicant after mixing. Due to stoichiometric changes between fresh and salt water, many contaminants settle shortly after reaching saline conditions. The amount of contaminants deposited in these areas is a reflection of the actual load delivered from the river (and treatment plants) and is largely independent of ambient concentrations. Concern has been raised that although concentrations may be decreasing, loading may be actually increasing due to increased discharge flows.

Some estuarine sediment chemistry has been conducted, but most work has been in euryhaline areas. In the 1999-2003 five year plan, we intend to characterize sediments in the major estuarine areas at a rate of one estuary area each year. The Friends of Merrymeeting Bay helped collect samples from Merrymeeting Bay in 1999. Results are as follows.

STATIONS

AB	Abagadasset River near Bald Head	N43:59.787, W69:51.073.
AR	Androscoggin River near Bayshore Road	N43:57.446 W69:51.591
KR	Kennebec River near Abagadasset Point	N43:59.915 W69:49.826
MR	Muddy River near Pleasant Point	N43:58.205, W69:52.871
SI	Swan's Island south end	N43: 59.787 W69:51.073
WC	Whiskeag Creek mouth	N43:56.169 W69:49.827

Table 1.2.1 Heavy Metals in 1999 Merrymeeting Bay Sediment Samples (dw)

Station	AS	PB	ZN	HG	moisture	TOC
	ug/g	ug/g	ug/g	ug/g	%	%
AB-1	7.89	24.9	108.1	257.4	57.7	3.04
AB-2	8.32	27.0	117.9	328.4	60.5	3.50
AB-3	7.58	27.8	117.3	306.6	62.3	3.43
AR-1	6.84	24.9	123.1	354.7	58.9	4.01
AR-1 dup	n/a	n/a	n/a	362.3		
AR-2	5.64	21.4	112.3	321.5	54.3	2.83/3.13
AR-3	4.98	17.4	94.8	321.5	46.7	2.70
KR-1	9.46	23.4	102.0	231.0	59.7	3.59
KR-1 dup	n/a	n/a	n/a	230.1		
KR-2	8.28	20.7	90.8	211.2	56.1	3.08
KR-3	8.99	21.2	91.5	247.2	57.0	3.03/3.10
MR-1	8.53	32.3	130.8	417.5	69.3	2.96
MR-2	7.57	32.9	127.4	406.1	66.6	6.52
MR-3	8.42	30.4	125.5	363.4	72.1	4.81
MR-3 dup	8.03	30.8	125.6	n/a		
SI-1	7.18	20.3	90.6	196.1	56.1	2.76
SI-1 dup	6.83	19.0	85.1	n/a		
SI-2	8.22	20.8	95.7	195.4	56.1	2.57
SI-3	8.99	22.6	100.7	216.2	61.8	3.51
WC-1	7.34	33.9	129.1	400.7	70.3	5.76
WC-1 dup	7.34	34.2	131.6	n/a		
WC-2	7.66	31.1	133.8	449.8	67.7	4.69
WC-3	7.86	30.3	125.9	451.1	61.0	4.53
Dig. Blank	0.08	0.0	0.4			
Dig. Blank	0.00	0.0	0.3			

Table 1.2.2 Total PCB in 1999 Merrymeeting Bay Sediment Samples (dw)

DEP ID#			MR-1	MR-2	MR-3	WC-1	WC-2	WC-3	KR-1	KR-2	KR-3
WRI ID #			947P	948P	949P	950P	951P	952P	954P	955P	956P
Compound	**IUPAC#**	**DL (ng/g)**									
2,4'-Dichlorobiphenyl	8	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',5-Trichlorobiphenyl	18	0.5	<DL	<DL	<DL	<DL	<DL	<DL	3.60	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	0.5	<DL	<DL	<DL	<DL	<DL	<DL	6.35	<DL	<DL
2,4,5-Trichlorobiphenyl	29	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,5'-Tetrachlorobipheny	44	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobipheny	52	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,3',4,4'-Tetrachlorobipheny	66	0.5	<DL	<DL	<DL	<DL	<DL	<DL	0.24	<DL	<DL
2,2',3,4,5'-Pentachlorobiphe	87	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',4,5,5'-Pentachlorobiphe	101	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',4,6,6'-Pentachlorobiphe	104	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiph	128	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,4,4',5'-Hexachlorobiph	138	1.0	0.78	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',4,4',5,5'-Hexachlorobiph	153	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',4,4',5,6'-Hexachlorobiph	154	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,4',5,5',6-Heptachlorob	187	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,4',5,6,6'-Heptachlorob	188	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorob	195	1.0	0.60	0.67	0.35	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,5',6,6'-Octachlorol	200	1.0	<DL	<DL	<DL	0.72	<DL	<DL	<DL	0.68	<DL
2,2',3,3',4,4',5,5',6,6'-Decacl	209	2.0	2.24	<DL	1.63	1.33	<DL	1.67	1.47	<DL	1.81
Total PCB concentration (homologue)			8.51	11.3	8.44	6.44	5.91	8.51	36.7	21.3	28.6
Total PCB concentration (Aroclor)			7.66	8.57	10.3	8.55	6.27	6.69	43.8	29.6	32.4
Sample weight (g) dry weight			24.71	25.03	24.91	25.00	24.90	25.10	25.08	24.93	25.41
(sample weights have been adjusted using the % solids to give 25g dry weight)											
% Solids			30.7	33.4	27.9	29.7	32.3	39.0	40.3	43.9	43.0
Surrogate recovery TCMX (% rec.)			74.0	66.4	94.6	81.1	64.2	63.4	108	88.3	70.5
All samples contained multiple target compounds below the lowest standard.											
Any concentrations below the detection limit are estimated values and are for informational purposes only.											

Table 1.2.2 Total PCB in 1999 Merrymeeting Bay Sediment Samples (dw)

DEP ID#			AR-1	AR-2	AR-3	AB-1	AB-2	AB-3	SI-1	SI-2	SI-3
WRI ID #			957P	958P	959P	961P	962P	963P	964P	965P	966P
Compound	**IUPAC#**	**DL (ng/g)**									
2,4'-Dichlorobiphenyl	8	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',5-Trichlorobiphenyl	18	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,5'-Tetrachlorobipheny	44	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobipheny	52	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,3',4,4'-Tetrachlorobipheny	66	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,4,5'-Pentachlorobiphe	87	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',4,5,5'-Pentachlorobiphe	101	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',4,6,6'-Pentachlorobiphe	104	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiph	128	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,4,4',5'-Hexachlorobiph	138	1.0	1.56	2.98	1.04	1.55	<DL	<DL	<DL	<DL	<DL
2,2',4,4',5,5'-Hexachlorobiph	153	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',4,4',5,6'-Hexachlorobiph	154	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,4',5,5',6-Heptachlorob	187	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,4',5,6,6'-Heptachlorob	188	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorob	195	1.0	2.26	1.14	0.84	<DL	<DL	<DL	3.67	<DL	<DL
2,2',3,3',4,5',6,6'-Octachlorol	200	1.0	1.75	0.79	1.05	0.60	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,5',6,6'-Decacl	209	2.0	2.25	0.91	1.88	1.66	<DL	1.69	<DL	<DL	<DL
Total PCB concentration (homologue)			25.6	32.7	42.7	18.3	25.7	14.3	14.1	7.24	4.81
Total PCB concentration (Aroclor)			21.9	35.6	49.8	17.6	18.7	16.3	11.5	5.25	7.36
Sample weight (g) dry weight			25.09	24.97	25.19	24.69	24.83	24.82	25.11	24.66	25.02
(sample weights have been adjusted using the % solids to give 25g dry weight)											
% Solids			41.1	45.7	53.3	42.3	39.5	37.8	43.9	43.9	38.2
Surrogate recovery TCMX (% rec.)			90.1	89.6	65.2	94.7	66.1	73.4	72.5	84.2	71.6
All samples contained multiple target compounds below the lowest standard.											
Any concentrations below the detection limit are estimated values and are for informational purposes only.											

Table 1.2.3 Pesticides in 1999 Merrymeeting Bay Sediment Samples (dw)

DEP ID#	DL	MR-1	MR-2	MR-3	WC-1	WC-2	WC-3	KR-1	KR-2	KR-3
Compound	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**
Hexachlorobenzene	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Lindane	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Heptachlor	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Aldrin	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Heptachlor Epoxide	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,4-DDE	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Endosulfan I	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
a-Chlordane	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Nonachlor	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
4,4-DDE	1.0	<DL	0.51	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Dieldrin	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,4-DDD	1.0	<DL	0.60	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Endosulfan II	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
4,4-DDD	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,4-DDT	1.0	<DL	<DL	<DL	<DL	0.32	1.64	<DL	<DL	<DL
4,4-DDT	1.0	<DL	0.66	<DL	<DL	<DL	<DL	0.27	<DL	0.75
Mirex	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Sample weight (g) dry w		24.71	25.03	24.91	25.00	24.90	25.10	25.08	24.93	25.41
% Solids		30.69	33.4	27.91	29.66	32.33	39.02	40.29	43.94	43.02

Table 1.2.3 Pesticides in 1999 Merrymeeting Bay Sediment Samples (dw)

DEP ID#	DL	AR-1	AR-2	AR-3	AB-1	AB-2	AB-3	SI-1	SI-2	SI-3
Compound	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**	**ng/l**
Hexachlorobenzene	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Lindane	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Heptachlor	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Aldrin	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Heptachlor Epoxide	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,4-DDE	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Endosulfan I	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
a-Chlordane	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Nonachlor	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
4,4-DDE	1.0	<DL	<DL	<DL	0.40	<DL	<DL	<DL	<DL	<DL
Dieldrin	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2,4-DDD	1.0	<DL	<DL	<DL	0.18	<DL	<DL	<DL		
Endosulfan II	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
4,4-DDD	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL		
2,4-DDT	1.0	<DL	0.92	<DL	1.13	<DL	1.08	<DL	1.15	1.68
4,4-DDT	1.0	<DL	<DL	<DL	<DL	<DL	0.28	<DL		
Mirex	1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
Sample weight (g) dry w		25.09	24.97	25.19	24.69	24.83	24.82	25.11	24.66	25.02
% Solids		41.09	45.71	53.33	42.32	39.53	37.75	43.86	43.86	38.17

1.3

MARINE SPORTFISH HEALTH ADVISORY

1.3

MARINE SPORTFISH HEALTH ADVISORY

In 1995 bluefish and striped bass were found to contain levels of PCBs and Hg that warranted consumption advisories. There were limited numbers of samples of each species and the fish were from only the Kennebec estuary. Furthermore, new regulations on striped bass have reduced the legal size of bass to between 20 and 26 inches and the availability of the smaller fish may change the level of human exposure. Because of all of these new factors, additional information is needed to be used in a new risk analysis and also look at other areas of the coast. Sampling in 1997 and 1998 did not collect the desired number of fish and needs to be completed in 1999. We attempted to collect 20 striped bass of two sizes, within the slot limit, 20-26 ", and greater than 40", at each of 3 stations, Androscoggin, Kennebec, and a coastal site. We also attempted to collect twenty bluefish of 2 size classes, snappers and adults, from the Kennebec estuary or Casco Bay. We were successful in collecting only 20 striped bass from the Kennebec River at Augusta. The fish were analyzed individually for mercury and as four composites of five fish each for PCBs.

Table 1.3.1 Mercury Concentrations in 1999 Striped Bass Samples

Sample ID	**HG mg/kg**
KAG-STB-1	0.360
KAG-STB-2	0.460
KAG-STB-3	0.333
KAG-STB-4	0.376
KAG-STB-5	0.354
KAG-STB-6	0.191
KAG-STB-7	0.304
KAG-STB-8	0.363
KAG-STB-9	0.379
KAG-STB-10	0.265
KAG-STB-11	0.236
KAG-STB-12	0.178
KAG-STB-13	0.450
KAG-STB-14	0.783
KAG-STB-15	0.096
KAG-STB-16	0.279
KAG-STB-17	0.254
KAG-STB-18	0.239
KAG-STB-19	0.129
KAG-STB-20	0.292
mean	**0.316**

Table 1.3.2 PCB Concentrations in 1999 Striped Bass Samples

DEP ID#			KAG-STB-1	KAG-STB-2	KAG-STB-3	KAG-STB-4	KAG-STB-5
WRI ID #			99-40	99-41	99-42	99-43	99-44
	IUPAC	DL	704	705	706	707	708
Compound	**#**	**ng/g**					
2,4'-Dichlorobiphenyl	8	0.5	0.25	1.64	0.26	0.70	0.46
2,2',5-Trichlorobiphenyl	18	0.5	<DL	<DL	<DL	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	0.5	<DL	<DL	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	0.5	0.15	1.13	1.44	0.22	0.27
2,2',3,5'-Tetrachlorobiphenyl	44	0.5	<DL	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	0.5	<DL	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobiphenyl	52	0.5	0.47	0.55	0.65	0.41	0.62
2,3',4,4'-Tetrachlorobiphenyl	66	0.5	0.58	<DL	<DL	0.95	<DL
2,2',3,4,5'-Pentachlorobiphen	87	0.5	0.31	<DL	0.69	<DL	0.51
2,2',4,5,5'-Pentachlorobiphen	101	0.5	0.52	0.41	<DL	<DL	<DL
2,2',4,6,6'-Pentachlorobiphen	104	0.5	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiphe	128	1.0	0.75	1.01	0.84	1.23	0.51
2,2',3,4,4',5'-Hexachlorobiphe	138	1.0	1.61	1.05	1.23	1.08	0.98
2,2',4,4',5,5'-Hexachlorobiphe	153	1.0	5.21	2.15	2.52	0.40	1.48
2,2',4,4',5,6'-Hexachlorobiphe	154	1.0	<DL	<DL	<DL	<DL	<DL
2,2',3,4',5,5',6-Heptachlorobip	187	1.0	<DL	<DL	<DL	<DL	<DL
2,2',3,4',5,6,6'-Heptachlorobip	188	1.0	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorobi	195	1.0	<DL	<DL	1.44	2.87	0.86
2,2',3,3',4,5',6,6'-Octachlorob	200	1.0	<DL	<DL	<DL	2.06	<DL
2,2',3,3',4,4',5,5',6,6'-Decachl	209	2.0	<DL	<DL	<DL	<DL	<DL
Total PCB concentration			10.3	12.6	15.3	16.9	9.65
Surrogate recovery TCMX (% rec.)			86.3	95.2	93.6	91.4	85.9
Sample weight (g)			25.72	25.61	24.58	25.33	25.25

Table 1.3.2 PCB Concentrations in 1999 Striped Bass Samples

DEP ID#			KAG-STB-6	KAG-STB-7	KAG-STB-8	KAG-STB-9	KAG-STB-10
WRI ID #			99-45	99-46	99-47	99-48	99-49
	IUPAC	DL	709	711	712	713	714
Compound	#	ng/g					
2,4'-Dichlorobiphenyl	8	0.5	0.93	2.72	1.84	1.41	0.53
2,2',5-Trichlorobiphenyl	18	0.5	<DL	<DL	<DL	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	0.5	<DL	<DL	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	0.5	2.09	<DL	<DL	<DL	<DL
2,2',3,5'-Tetrachlorobiphenyl	44	0.5	<DL	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	0.5	<DL	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobiphenyl	52	0.5	0.70	0.56	<DL	0.56	0.60
2,3',4,4'-Tetrachlorobiphenyl	66	0.5	<DL	0.61	<DL	0.46	<DL
2,2',3,4,5'-Pentachlorobiphen	87	0.5	0.50	0.52	0.56	0.48	<DL
2,2',4,5,5'-Pentachlorobiphen	101	0.5	<DL	<DL	<DL	<DL	<DL
2,2',4,6,6'-Pentachlorobiphen	104	0.5	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiphe	128	1.0	0.69	1.04	<DL	0.88	<DL
2,2',3,4,4',5'-Hexachlorobiphe	138	1.0	1.15	1.31	0.74	0.82	0.66
2,2',4,4',5,5'-Hexachlorobiphe	153	1.0	0.93	1.16	1.20	2.28	1.06
2,2',4,4',5,6'-Hexachlorobiphe	154	1.0	<DL	<DL	0.48	0.48	<DL
2,2',3,4',5,5',6-Heptachlorobip	187	1.0	<DL	<DL	0.87	0.88	<DL
2,2',3,4',5,6,6'-Heptachlorobip	188	1.0	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorobi	195	1.0	<DL	2.24	<DL	3.08	<DL
2,2',3,3',4,5',6,6'-Octachlorob	200	1.0	<DL	0.95	<DL	1.55	<DL
2,2',3,3',4,4',5,5',6,6'-Decachl	209	2.0	<DL	<DL	<DL	<DL	<DL
Total PCB concentration			13.0	18.3	9.25	16.1	6.33
Surrogate recovery TCMX (% rec.)			88.2	102	95.6	98.7	106
Sample weight (g)			25.79	25.11	25.20	25.08	24.83

Table 1.3.2 PCB Concentrations in 1999 Striped Bass Samples

DEP ID#			KAG-STB-11	KAG-STB-12	KAG-STB-13	KAG-STB-14	KAG-STB-15
WRI ID #			99-50	99-51	99-52	99-53	99-54
	IUPAC	DL	715	716	718	719	720
Compound	#	ng/g					
2,4'-Dichlorobiphenyl	8	0.5	0.93	4.07	<DL	<DL	<DL
2,2',5-Trichlorobiphenyl	18	0.5	<DL	<DL	<DL	0.32	<DL
2,4,4'-Trichlorobiphenyl	28	0.5	<DL	<DL	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	0.5	0.29	0.80	<DL	7.70	2.86
2,2',3,5'-Tetrachlorobiphenyl	44	0.5	<DL	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	0.5	<DL	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobiphenyl	52	0.5	<DL	0.88	<DL	0.60	0.65
2,3',4,4'-Tetrachlorobiphenyl	66	0.5	<DL	<DL	<DL	<DL	<DL
2,2',3,4,5'-Pentachlorobipher	87	0.5	<DL	0.56	0.47	0.48	0.49
2,2',4,5,5'-Pentachlorobipher	101	0.5	<DL	<DL	<DL	<DL	<DL
2,2',4,6,6'-Pentachlorobipher	104	0.5	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiphe	128	1.0	0.55	<DL	<DL	<DL	<DL
2,2',3,4,4',5'-Hexachlorobiphe	138	1.0	<DL	<DL	<DL	<DL	<DL
2,2',4,4',5,5'-Hexachlorobiphe	153	1.0	0.87	1.61	0.70	2.47	0.72
2,2',4,4',5,6'-Hexachlorobiphe	154	1.0	<DL	<DL	<DL	<DL	<DL
2,2',3,4',5,5',6-Heptachlorobip	187	1.0	<DL	0.84	<DL	<DL	0.85
2,2',3,4',5,6,6'-Heptachlorobip	188	1.0	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorobi	195	1.0	<DL	<DL	<DL	<DL	1.06
2,2',3,3',4,5',6,6'-Octachlorob	200	1.0	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,5',6,6'-Decachl	209	2.0	<DL	<DL	<DL	<DL	<DL
Total PCB concentration			5.97	13.2	4.78	15.7	9.47
Surrogate recovery TCMX (% rec.)			89.6	84.3	88.6	92.0	96.7
Sample weight (g)			25.24	24.87	25.38	25.05	24.68

Table 1.3.2 PCB Concentrations in 1999 Striped Bass Samples

DEP ID#			KAG-STB-16	KAG-STB-17	KAG-STB-18	KAG-STB-19	KAG-STB-20
WRI ID#			99-55	99-56	99-57	99-58	99-59
	IUPAC	DL	721	722	723	725	726
Compound	#	**ng/g**					
2,4'-Dichlorobiphenyl	8	0.5	<DL	<DL	0.76	1.25	1.64
2,2',5-Trichlorobiphenyl	18	0.5	<DL	<DL	<DL	<DL	<DL
2,4,4'-Trichlorobiphenyl	28	0.5	<DL	<DL	<DL	<DL	<DL
2,4,5-Trichlorobiphenyl	29	0.5	0.29	<DL	<DL	<DL	<DL
2,2',3,5'-Tetrachlorobiphenyl	44	0.5	<DL	<DL	<DL	<DL	<DL
2,2',4,6-Tetrachlorobiphenyl	50	0.5	<DL	<DL	<DL	<DL	<DL
2,2',5,5'-Tetrachlorobiphenyl	52	0.5	0.52	0.44	0.61	<DL	<DL
2,3',4,4'-Tetrachlorobiphenyl	66	0.5	<DL	<DL	<DL	<DL	<DL
2,2',3,4,5'-Pentachlorobipheny	87	0.5	<DL	<DL	<DL	0.48	0.45
2,2',4,5,5'-Pentachlorobipheny	101	0.5	<DL	<DL	<DL	<DL	<DL
2,2',4,6,6'-Pentachlorobipheny	104	0.5	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4'-Hexachlorobiphe	128	1.0	<DL	<DL	<DL	<DL	<DL
2,2',3,4,4',5'-Hexachlorobiphe	138	1.0	<DL	<DL	<DL	<DL	<DL
2,2',4,4',5,5'-Hexachlorobiphe	153	1.0	0.61	0.87	0.66	0.57	<DL
2,2',4,4',5,6'-Hexachlorobiphe	154	1.0	0.51	<DL	<DL	<DL	<DL
2,2',3,4',5,5',6-Heptachlorobip	187	1.0	0.86	<DL	<DL	<DL	<DL
2,2',3,4',5,6,6'-Heptachlorobip	188	1.0	<DL	<DL	<DL	<DL	<DL
2,2',3,3',4,4',5,6-Octachlorobip	195	1.0	<DL	1.47	2.66	0.74	1.51
2,2',3,3',4,5',6,6'-Octachlorobi	200	1.0	<DL	<DL	1.81	<DL	0.68
2,2',3,3',4,4',5,5',6,6'-Decachl	209	2.0	<DL	<DL	<DL	<DL	<DL
Total PCB concentration			7.74	4.69	10.3	5.51	8.65
Surrogate recovery TCMX (% rec.)			108	95.4	91.7	88.8	83.6
Sample weight (g)			25.67	25.06	24.90	24.80	24.40

1.4

MERCURY IN HARBOR SEAL PUPS

MERCURY IN HARBOR SEAL PUPS

Mercury has been well documented as a threat to wildlife in Maine. One of the objectives of SWAT is to assess the extent and severity of contamination. Past work has looked at various trophic levels (filter feeding mussels, benthic feeding lobsters, and piscivorous cormorants) to determine whether locally elevated concentrations of contaminants such as mercury contribute to a broader geographic and/or trophic scale elevation.

This past year, we learned of a small study of mercury in hair of stranded harbor seal pups, conducted by David Harris of the University of Southern Maine. Initial results indicate a pattern that reflects findings described thus far by SWAT and other studies.

This study began in the summer of 1998 and will continue for a period of five years. We measure the mercury levels in the hair of harbor seal pups that strand on the Maine coast. The data we collect will: 1) identify areas with elevated mercury levels in the Maine coastal environment, 2) provide a picture of how mercury contamination in the Gulf of Maine food chain is changing with time, 3) determine the level of mercury contamination to which harbor seals are exposed during the most sensitive time period in their development and 4) provide a baseline to which future measurements can be compared.

Preliminary Results: These are the preliminary findings for the first two years of this five-year project.

Year	1998	1999
n	21	27
Mean (mg/kg)	2.78	1.54
95% C.I.	0.62	0.28
Minimum (mg/kg)	0.94	0.41
Maximum (mg/kg)	5.77	3.56
% 0 - 2 mg/kg	38	85
% 2 - 4 mg/kg	43	15
% 4 - 6 mg/kg	19	0

Conclusions: There is no obvious temporal trend in these preliminary results. It is notable that 19% of the measurements in 1998 exceeded 4 mg/kg but none of the measurements from 1999 fell into this range.

Raw Data: These are the raw data values for the above analysis.

Year	**1998**	**1999**
Hg (mg/kg)	0.94	1.26
	4	0.95
	5.11	1.15
	1.99	1.4
	1.14	1.83
	3.27	1.24
	1.79	1.82
	2.6	0.68
	1.22	1.98
	2.31	0.86
	5.77	1.66
	2.7	1.93
	1.9	1.14
	1.53	1.41
	3.69	0.41
	1.79	2.58
	5.15	0.87
	2.09	1.34
	2.97	1.74
	3.74	0.77
	2.69	2.4
		1.52
		1.72
		0.88
		3.56
		2.92
		1.68

1999 SWAT MONITORING PROGRAM REPORT

PART 2 LAKES

2.1 MERCURY DEPOSITION NETWORK

PRINCIPAL INVESTIGATORS	Barry Mower
	Cathy Richardson
	Bob Breen, ANP
TECHNICAL ASSISTANTS	William Gawley, ANP
	Peter Lowell, LEA
	Richard Mailey
	Don Prince
	John Reynolds

2.2 INDICATOR SPECIES

PRINCIPAL INVESTIGATOR	Barry Mower
	Andrew Smith, DHS
TECHNICAL ASSISTANTS	John Reynolds
	Andrew Merrill
	Charles Penney

2.3 MERCURY DOWNWIND OF MWIs

PRINCIPAL INVESTIGATOR	David Courtemanch
TECHNICAL ASSISTANTS	John Reynolds
	Andrew Merrill

2.4 LOON EFFECTS STUDY

PRINCIPAL INVESTIGATOR	David Evers, BRI

2.5 MERCURY TRENDS

PRINCIPAL INVESTIGATOR	Terry Haines, UM

2.1

MERCURY DEPOSITION NETWORK

MERCURY DEPOSITION NETWORK

Atmospheric deposition is thought to be a significant source of mercury to Maine surface waters. In order to determine the relative significance of sources throughout Maine and the Northeast region, Maine has joined the Mercury Deposition Network (MDN). The MDN was created as an adjunct to the National Atmospheric Deposition Program (NADP), that has been monitoring the effects of atmospheric deposition of other contaminants, including acid rain, across the US for over 10 years. Maine has 4 NADP stations, one each at Bridgton, Acadia National Park (ANP), Greenville, and Caribou.

The MDN measures mercury in wet deposition on a weekly basis and provides a measurement of annual deposition at each station. All stations use similar equipment, the same protocol, and all samples will be analyzed by the same lab. There is also a Northeast regional network of MDN and other types of stations that measures wet deposition, as well as dry and gaseous mercury in some locations, in the New England states and the Canadian Maritime provinces.

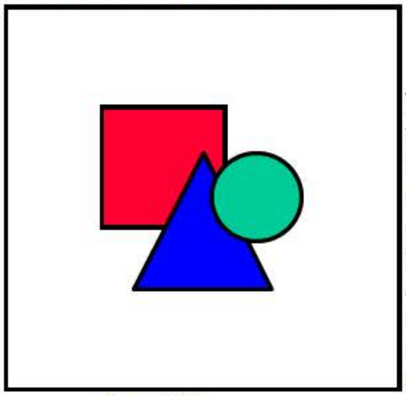
One goal of MDN is to continue monitoring for at least 5 years. In Maine there are currently MDN stations at Acadia National Park (ANP, since fall 1995), Bridgeton (since July 1997), Greenville (since September 1996), and Freeport (since 1998). The ANP station is supported equally by the National Park Service (NPS) and DEP through SWAT ($6000). The Greenville station is funded entirely by SWAT ($16500). The Bridgeton station is funded primarily by an EPA REMAP grant, with DEP providing the station operator and mailing of the samples ($3150 SWAT). The Freeport station is supported entirely by a grant from EPA.

Annual deposition is greatest for the Freeport station followed in decreasing order by Acadia National Park, Bridgton and Greenville for both years (1998 and 1999) where data are available for all four stations. Mean volume weighted concentration generally follows the same pattern. Ratios of annual deposition to mean concentration show that higher deposition along the coast is not entirely due to higher concentrations, but also due to increased precipitation.

Home AIRMoN MDN Search

Contacts Site Map Site List Data Access

Mercury Deposition Network: a NADP Network



(.pdf)

MDN Objectives

The objective of the MDN is to develop a national database of weekly concentrations of total mercury in precipitation and the seasonal and annual flux of total mercury in wet deposition. The data will be used to develop information on spatial and seasonal trends in mercury deposited to surface waters, forested watersheds, and other sensitive receptors. Analysis of precipitation samples for total- and methylmercury is performed by Frontier Geosciences, Inc., Seattle WA, USA. Frontier Geosciences provides the environmental sciences community with uncompromisingly high-quality contract research, project design and management, and analytical chemistry services concerned with the sources, fate and effects of trace metals.

The MDN began a transition network of 13 sites in 1995. Beginning in 1996, MDN became an official network in NADP with 26 sites in operation. Over 50 sites were in operation during 2000 (see site map). The MDN is anticipated to operate for a minimum of five years and will be managed at the NADP Coordination Office. The network uses standardized methods for collection and analyses. **Weekly** precipitation samples are collected in a modified Aerochem Metrics model 301 collector. The "wet-side" sampling glassware is removed from the collector every Tuesday and mailed to the **Hg Analytical Laboratory (HAL)** at Frontier Geosciences in Seattle, WA for analysis by cold vapor atomic fluorescence. The MDN provides data for total mercury, but also includes methylmercury if desired by a site sponsor. Data are available via this Web page for the transition network (1995) and for 1996 through the second quarter of 2000.

The following journal articles and presentations describe the network design, including the sampling and analytical protocols, used in the MDN:

Lindberg, S. and Vermette, S. 1995. Workshop on Sampling Mercury in Precipitation for the National Atmospheric Deposition Program. Atmospheric Environment. 29, 1219-1220.

Vermette, S., Lindberg, S., and Bloom, N. 1995. Field Tests for a Regional Mercury Deposition Network - Sampling Design and Preliminary Test Results. Atmospheric Environment. 29, 1247-1251.

Welker, M. and Vermette, S.J., 1996. Mercury Deposition Network: QA/QC Protocols. Paper 96-RP129.01, Proceedings of the 89th Annual Meeting of the Air and Waste Management Association, A&WMA, Pittsburgh, PA.

Sweet, C.W. and Prestbo, E. 1999. Wet Deposition of Mercury in the U.S. and Canada. Presented at "Mercury in the Environment Specialty Conference", September 15-17, 1999, Minneapolis, MN. Proceedings published by Air and Waste Management Association, Pittsburgh, PA.

(Available from NADP Program Office)

Image credit: Mackerel On Mercury by Scot F. Hacker , 1995.

MDN DATA FIELDS

SITE CODE: 2-letter state or province designator plus SAROAD county code (US) or sequential number (Canada).

START DATE: (mm/dd/yyyy)

END DATE: (mm/dd/yyyy)

SUBPPT: Rain Gauge (RG) precipitation amount in mm if available, otherwise precipitation amount in mm is calculated from the net rain volume caught in the sample bottle.

PPT: Precipitation amount in mm from the rain gauge (RG), if blank, no RG data.

HG CONC: total mercury concentration reported by the lab in ng/L.

DEPOSITION: product of SUBPPT and HG CONC, units are ng/m2.

Quality rating (QR) CODE: A = fully qualified with no problems

B = valid data with minor problems, used for summary statistics

C = invalid data, not used for summary statistics

BLANK= no sample submitted for this time period

SAMPLE TYPE:

W = wet sample, measurable precipitation (> or = 0.03 in.) on the rain gauge (RG) or net bottle catch (BC) = or > 10.0 mL if RG data are missing. Concentration and deposition data are reported unless the QR Code = C.

D = dry sample, no indication of sampler openings on the RG or net BC < 1.5 mL if RG event recorder data are missing. No concentration data are reported. ppt, subppt, and deposition are set to zero.

T = trace sample, RG shows openings or a trace precipitation amount (<0.03 inches). If the RG data are missing, a net BC between 1.5 and 10.0 mL (inclusive) will be coded as a T sample type. Concentration data may or may not be reported depending whether the BC is 1.5 mL or higher. If BC = 1.5 mL or higher, then ppt is blank , Subppt = BC, and deposition is based on the BC. If BC < 1.5 mL, then ppt subppt and deposition are all set to zero.

Q = sampler was used for a Quality assurance (QA) sample, no ambient sample submitted. No concentration values are reported (QA values will be published in the QA report). Deposition is only reported where the value is zero (D or T samples with no measurable precipitation).

NOTES:	QR CODE	Valid for Summaries (Y/N)
s = short sample time (< 6days)	B	Y
e = extended sample time (>	B	Y

8days)		
d = debris present (previously x)	B	Y
m = missing information (previously, r, no event recorder, and p, missing RG precipitation record)	B	Y
z = site operations problems	B	Y
h = sample handling problems (z and h include equipment and handling problems that don’t seriously compromise the sample)	B	Y
i = low volume sample (1.49mL < net BC < 10.00mL) (Hg conc. data are reported but they are less certain than those for samples with a net BC of at least 10 mL)	B	Y
b = bulk sample (wet side open the whole time)	C	N
v = RG indicates precipitation occurred but BC < 1 mL or < 10% of indicated RG precipitation amount.	C	N
u = undefined sample (wet side open during dry periods)	C	N
f = serious problems in field operations that compromise sample integrity.	C	N
l = laboratory error	C	N
c = sample compromised due to contamination	C	N
p = no ppt data from either RG or BC	C	N
n = no sample submitted	--	N

Calculation of Deposition:

1. If a valid precipitation amount can be read from the rain gauge chart (RG >= 0.03 inches), the sample type is set to “W” (wet); and the value from the RG chart is used to calculate deposition (RG amount in mm times Hg concentration in ng/mL). If the RG chart event recorder shows no sampler openings, sample type is set to “D” (dry) and precipitation amount and deposition are set to 0.
2. If the precipitation amount from the RG chart is not available, the net bottle catch (BC) will be used to calculate deposition as long as BC > 1.49mL. If the BC < 1.5 mL, the precipitation amount will be set to 0 and the sample type set to “D” (dry). If the BC is between 1.5 and 10.0 mL, the sample type will be set to “T” (trace) and the

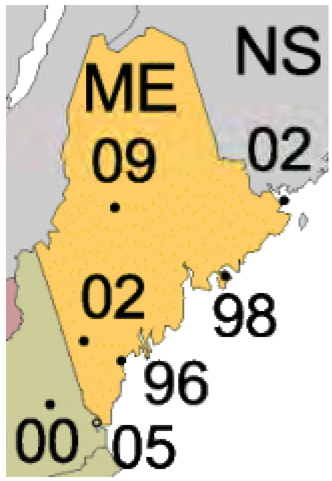
BC used to calculate deposition. These samples are also coded with an “i” in the Notes field and downgraded to a “B” Quality Rating to indicate uncertainty due to low volume. If the BC is > 10 mL, the sample type will be set to “W” (wet) and the BC will be used to calculate deposition.

3. If the RG indicates sampler openings, but the precipitation amount can’t be determined accurately from the RG chart (RG < 0.03 inches) the sample type will be coded “T” (trace) and the BC will be used to calculate deposition as long as the BC is >= 1.5mL. If the BC is < 10mL, samples will be coded for low volume as in 2. If the BC is < 1.5mL, no concentration will be reported and the ppt, subppt, and deposition will be set to 0.

4. In cases where there is a valid precipitation amount from either RG or BC but invalid or missing concentration data, seasonal or annual summary deposition values will be calculated using the site-specific, seasonal, volume-weighted average concentration. This deposition value will not be displayed for individual weeks in the WEB database, but it will be used only for the calculation seasonal and annual average concentrations and deposition amounts on maps and other summary products.

Mercury Deposition Network

Mercury Deposition Network   Maine stations



Site ID	Site Name	Start Date	End Date	Elevation (meters)
Active Sites				
ME02	Bridgton	06/04/1997		222
ME09	Greenville Station	09/03/1996		322
ME96	Freeport	01/01/1998		15
ME98	Acadia National Park - McFarland Hill	09/26/1995		129
Inactive Sites				

Table 2.1 ANNUAL MERCURY DEPOSITION AT MAINE MDN STATIONS

TABLE 2.1 ANNUAL MERCURY DEPOSITION AT MAINE MDN STATIONS

		ANNUAL DEPOSITION (ug/m2)			
STATION	ID	1996	1997	1998	1999
Bridgton	MEO2			6.9	6.7
Greenville	ME09	5.5e	5.5	6.8	6.6
Freeport	ME96			11.0e	8.6
ANP	ME98	8.4	7.7	9.0	7.1

		MEAN CONCENTRATION (ng/l)			
STATION	ID	1996	1997	1998	1999
Bridgton	MEO2			6.5	6.6
Greenville	ME09	4.0e	5.9	6.0	5.6
Freeport	ME96			8.6	7.5
ANP	ME98	6.0e	6.8	6.1	6.8

e=estimated since station began during the year

National Atmospheric Deposition Program/MDN

Weekly Mercury Concentrations and Depositions

Bridgton ME02

Site	Date On	Date Off	Subppt	Pptrec	HgConc	HgDep	QR	Sample Type	Notes
			mm	Mm	Ng/L	ng/m²			
ME02	12/29/1998	01/05/1999	24.1	24.1	1.8	43.1	A	W	
ME02	01/05/1999	01/12/1999	19.4	--	1.5	29.6	B	W	m
ME02	01/12/1999	01/19/1999	69.6	69.6	3.8	262.6	B	W	m
ME02	01/19/1999	01/26/1999	22.9	22.9	5.2	117.9	B	W	h
ME02	01/26/1999	02/02/1999	2.3	2.3	--	--	C	W	v
ME02	02/02/1999	02/09/1999	36.1	36.1	3.2	115.4	A	W	
ME02	02/09/1999	02/16/1999	4.8	4.8	14.6	70.4	B	W	d
ME02	02/16/1999	02/23/1999	12.7	12.7	6.5	81.9	A	W	
ME02	02/23/1999	03/02/1999	45.0	45.0	3.7	163.9	B	W	d
ME02	03/02/1999	03/09/1999	36.3	--	6.1	222.3	B	W	dm
ME02	03/09/1999	03/16/1999	8.9	8.9	6.2	55.5	B	W	hd
ME02	03/16/1999	03/23/1999	38.9	38.9	7.2	279.9	B	W	d
ME02	03/23/1999	03/30/1999	10.9	10.9	11.1	120.9	B	W	d
ME02	03/30/1999	04/06/1999	0.8	0.8	22.8	17.4	B	W	di
ME02	04/06/1999	04/13/1999	1.2	1.2	25.2	29.5	B	W	d
ME02	04/13/1999	04/20/1999	1.3	1.3	19.7	25.0	B	W	d
ME02	04/20/1999	04/27/1999	0.0	0.0	--	0.0	B	T	d
ME02	04/27/1999	05/04/1999	0.0	0.0	--	0.0	B	D	d
ME02	05/04/1999	05/11/1999	31.2	31.2	13.2	411.9	B	W	d
ME02	05/11/1999	05/18/1999	0.0	0.0	--	0.0	B	D	d
ME02	05/18/1999	05/25/1999	38.9	38.9	10.3	398.5	A	W	
ME02	05/25/1999	06/01/1999	1.8	1.8	10.8	19.3	B	W	d
ME02	06/01/1999	06/08/1999	12.7	12.7	11.8	150.0	B	W	d
ME02	06/08/1999	06/15/1999	4.2	4.2	8.4	35.4	A	W	
ME02	06/15/1999	06/22/1999	5.6	5.6	20.3	113.5	A	W	
ME02	06/22/1999	06/29/1999	27.4	27.4	17.3	473.8	B	W	d
ME02	06/29/1999	07/06/1999	40.9	40.9	5.4	220.3	B	W	d
ME02	07/06/1999	07/13/1999	17.3	17.3	12.5	215.5	B	W	d
ME02	07/13/1999	07/20/1999	5.6	5.6	12.8	71.5	A	W	
ME02	07/20/1999	07/27/1999	19.3	19.3	10.7	206.7	B	W	d
ME02	07/27/1999	08/03/1999	0.0	0.0	--	0.0	A	T	

ME02	08/03/1999	08/10/1999	34.2	34.2	9.6	327.5	B	W	d
ME02	08/10/1999	08/17/1999	35.6	35.6	8.7	307.5	B	W	d
ME02	08/17/1999	08/24/1999	12.7	12.7	8.5	107.6	B	W	d
ME02	08/24/1999	08/31/1999	1.5	1.5	29.8	45.4	B	W	d
ME02	08/31/1999	09/07/1999	11.4	11.4	7.1	81.2	B	W	d
ME02	09/07/1999	09/14/1999	86.0	86.0	3.0	254.8	B	W	d
ME02	09/14/1999	09/21/1999	141.0	141.0	3.1	434.8	B	W	d
ME02	09/21/1999	09/28/1999	10.8	10.8	12.6	135.5	B	W	d
ME02	09/28/1999	10/05/1999	21.3	21.3	6.1	130.2	A	W	
ME02	10/05/1999	10/12/1999	1.5	1.5	7.4	11.2	A	W	
ME02	10/12/1999	10/19/1999	14.0	14.0	7.0	98.2	A	W	
ME02	10/19/1999	10/26/1999	59.7	--	2.1	123.8	B	W	dm
ME02	10/26/1999	11/02/1999	0.0	0.0	--	0.0	A	T	
ME02	11/02/1999	11/09/1999	25.4	25.4	6.4	161.3	B	W	d
ME02	11/09/1999	11/16/1999	11.8	11.8	8.0	94.9	B	W	d
ME02	11/16/1999	11/23/1999	9.7	9.7	7.5	72.4	B	W	d
ME02	11/23/1999	11/30/1999	23.4	23.4	9.0	210.0	B	W	d
ME02	11/30/1999	12/07/1999	10.4	10.4	6.4	66.6	B	W	dm
ME02	12/07/1999	12/14/1999	5.3	5.3	9.9	52.9	B	W	dm
ME02	12/14/1999	12/21/1999	26.4	26.4	5.9	157.0	B	W	dm
ME02	12/21/1999	12/28/1999	0.0	0.0	--	0.0	B	D	hdm
ME02	12/28/1999	01/04/2000	12.7	12.7	12.1	153.7	B	W	d

National Atmospheric Deposition Program/MDN

Weekly Mercury Concentrations and Depositions

Greenville ME09

Site	Date On	Date Off	Subppt	Pptrec	HgConc	HgDep	QR	Sample Type	Notes
			mm	Mm	ng/L	ng/m²			
ME09	12/29/1998	01/05/1999	31.8	31.8	1.0	30.4	A	W	
ME09	01/05/1999	01/12/1999	18.0	18.0	--	--	C	W	uz
ME09	01/12/1999	01/19/1999	80.8	80.8	2.6	209.6	B	W	z
ME09	01/19/1999	01/26/1999	16.0	16.0	4.9	77.7	A	W	
ME09	01/26/1999	02/02/1999	0.0	0.0	--	0.0	B	D	z
ME09	02/02/1999	02/09/1999	18.3	18.3	2.8	51.7	B	W	z
ME09	02/09/1999	02/16/1999	4.6	4.6	10.2	46.8	A	W	
ME09	02/16/1999	02/23/1999	8.4	8.4	9.2	76.9	B	W	hz
ME09	02/23/1999	03/02/1999	41.1	41.1	2.4	96.7	A	W	
ME09	03/02/1999	03/09/1999	39.1	39.1	3.8	148.7	B	W	hd
ME09	03/09/1999	03/16/1999	39.1	39.1	--	--	C	W	fzdm
ME09	03/16/1999	03/23/1999	36.8	36.8	2.5	93.0	B	W	d
ME09	03/23/1999	03/30/1999	5.3	5.3	6.5	34.8	A	W	
ME09	03/30/1999	04/06/1999	2.8	2.8	10.3	28.8	B	W	d
ME09	04/06/1999	04/13/1999	13.7	13.7	9.1	124.4	B	W	d
ME09	04/13/1999	04/20/1999	0.0	0.0	--	0.0	B	T	d
ME09	04/20/1999	04/27/1999	1.3	1.3	15.8	20.9	A	W	
ME09	04/27/1999	05/04/1999	0.0	0.0	--	0.0	B	D	d
ME09	05/04/1999	05/11/1999	23.1	23.1	4.6	105.7	B	W	hd
ME09	05/11/1999	05/18/1999	0.0	0.0	--	0.0	A	T	
ME09	05/18/1999	05/25/1999	28.0	28.0	12.2	342.1	B	W	hd
ME09	05/25/1999	06/01/1999	20.3	20.3	10.6	214.8	B	W	hd
ME09	06/01/1999	06/08/1999	35.3	35.3	18.5	651.8	B	W	d
ME09	06/08/1999	06/15/1999	67.6	67.6	6.9	466.7	B	W	d
ME09	06/15/1999	06/22/1999	2.0	2.0	7.1	14.4	B	W	d
ME09	06/22/1999	06/29/1999	17.0	17.0	18.2	309.3	B	W	d
ME09	06/29/1999	07/06/1999	38.1	38.1	4.9	184.7	B	W	d
ME09	07/06/1999	07/13/1999	26.7	26.7	6.1	161.6	B	W	d
ME09	07/13/1999	07/20/1999	0.0	0.0	--	0.0	A	T	
ME09	07/20/1999	07/27/1999	3.8	3.8	27.4	104.4	B	W	d
ME09	07/27/1999	08/03/1999	8.1	8.1	17.0	138.4	B	W	d
ME09	08/03/1999	08/10/1999	47.0	47.0	10.1	473.8	B	W	hd
ME09	08/10/1999	08/17/1999	22.4	22.4	5.5	123.8	B	W	d

ME09	08/17/1999	08/24/1999	7.4	7.4	10.1	74.4	B	W	d
ME09	08/24/1999	08/31/1999	1.8	1.8	3.2	5.7	B	W	d
ME09	08/31/1999	09/07/1999	0.0	0.0	--	0.0	B	T	d
ME09	09/07/1999	09/14/1999	77.8	77.8	3.8	295.3	B	W	d
ME09	09/14/1999	09/21/1999	146.3	146.3	3.5	506.5	B	W	d
ME09	09/21/1999	09/28/1999	26.0	26.0	12.7	330.9	B	W	d
ME09	09/28/1999	10/05/1999	40.4	40.4	2.8	113.7	B	W	d
ME09	10/05/1999	10/12/1999	5.8	5.8	8.5	49.7	A	W	
ME09	10/12/1999	10/19/1999	40.9	40.9	2.5	100.3	B	W	hd
ME09	10/19/1999	10/26/1999	43.2	43.2	2.0	87.6	B	W	hd
ME09	10/26/1999	11/02/1999	5.1	5.1	6.0	30.6	A	W	
ME09	11/02/1999	11/09/1999	39.6	39.6	3.7	145.1	B	W	d
ME09	11/09/1999	11/16/1999	18.4	18.4	4.9	89.5	A	W	
ME09	11/16/1999	11/23/1999	10.1	10.1	7.7	77.8	B	W	d
ME09	11/23/1999	11/30/1999	37.3	37.3	3.8	141.0	B	W	hd
ME09	11/30/1999	12/07/1999	2.8	2.8	4.1	11.4	B	W	d
ME09	12/07/1999	12/14/1999	45.1	45.1	3.0	135.8	B	W	hd
ME09	12/14/1999	12/21/1999	21.6	21.6	3.1	65.9	B	W	d
ME09	12/21/1999	12/28/1999	0.0	0.0	--	0.0	A	D	

National Atmospheric Deposition Program/MDN

Weekly Mercury Concentrations and Depositions

Freeport ME96

Site	Date On	Date Off	Subppt	Pptrec	HgConc	HgDep	QR	Sample Type	Notes
			mm	mm	ng/L	ng/m²			
ME96	12/29/1998	01/05/1999	28.9	--	2.0	58.1	B	W	m
ME96	01/05/1999	01/12/1999	33.8	33.8	5.2	174.5	B	W	h
ME96	01/12/1999	01/19/1999	84.8	84.8	5.3	448.0	A	W	
ME96	01/19/1999	01/26/1999	10.9	10.9	6.4	70.2	A	W	
ME96	01/26/1999	02/02/1999	0.0	0.0	--	0.0	A	T	
ME96	02/02/1999	02/08/1999	54.1	54.1	4.3	229.9	B	W	h
ME96	02/08/1999	02/16/1999	0.5	0.5	16.6	8.4	B	T	i
ME96	02/16/1999	02/23/1999	20.8	20.8	4.6	95.9	A	W	
ME96	02/23/1999	03/02/1999	63.8	63.8	3.8	243.8	B	W	d
ME96	03/02/1999	03/09/1999	19.3	19.3	9.9	191.6	B	W	d
ME96	03/09/1999	03/16/1999	18.3	18.3	2.9	53.8	B	W	d
ME96	03/16/1999	03/22/1999	29.2	29.2	12.0	349.3	B	W	d
ME96	03/23/1999	03/30/1999	46.2	--	5.9	271.5	B	W	dm
ME96	03/30/1999	04/06/1999	1.3	1.3	13.4	17.1	B	W	d
ME96	04/06/1999	04/13/1999	0.8	0.8	30.3	23.1	B	W	id
ME96	04/13/1999	04/20/1999	0.7	--	29.0	20.3	B	T	id
ME96	04/20/1999	04/27/1999	3.6	3.6	18.6	67.2	B	W	d
ME96	04/27/1999	05/04/1999	0.0	0.0	--	0.0	B	T	d
ME96	05/04/1999	05/11/1999	45.1	45.1	10.6	476.7	B	W	d
ME96	05/11/1999	05/18/1999	0.0	0.0	--	0.0	B	D	d
ME96	05/18/1999	05/25/1999	80.6	80.6	8.3	667.3	B	W	d
ME96	05/25/1999	06/01/1999	2.5	2.5	17.4	44.2	A	W	
ME96	06/01/1999	06/08/1999	6.9	6.9	18.5	127.0	B	W	d
ME96	06/08/1999	06/15/1999	2.5	2.5	--	--	C	W	fdz
ME96	06/15/1999	06/22/1999	0.1	--	28.2	2.8	B	T	dmi
ME96	06/22/1999	06/29/1999	16.3	16.3	17.4	284.0	B	W	dm
ME96	06/29/1999	07/06/1999	9.9	9.9	15.8	156.9	B	W	hm
ME96	07/06/1999	07/13/1999	13.8	--	--	--	C	W	uhdmz
ME96	07/13/1999	07/20/1999	11.4	11.4	19.0	217.1	A	W	
ME96	07/20/1999	07/27/1999	9.9	9.9	16.3	161.1	B	W	d
ME96	07/27/1999	08/03/1999	0.0	0.0	--	0.0	A	D	
ME96	08/03/1999	08/10/1999	28.2	28.2	9.9	278.1	B	W	d
ME96	08/10/1999	08/17/1999	22.9	22.9	17.2	393.6	B	W	d

ME96	08/17/1999	08/24/1999	8.4	--	9.4	78.9	B	W	dm
ME96	08/24/1999	08/31/1999	4.3	4.3	5.1	22.0	B	W	d
ME96	08/31/1999	09/07/1999	14.6	14.6	6.0	86.9	B	W	d
ME96	09/07/1999	09/14/1999	81.5	81.5	6.5	526.1	B	W	d
ME96	09/14/1999	09/21/1999	120.7	120.7	8.2	993.4	B	W	d
ME96	09/21/1999	09/28/1999	11.3	11.3	8.7	98.0	B	W	d
ME96	09/28/1999	10/05/1999	28.4	28.4	6.8	192.3	A	W	
ME96	10/05/1999	10/12/1999	6.6	6.6	8.7	57.4	A	W	
ME96	10/12/1999	10/19/1999	20.1	20.1	9.6	191.9	B	W	d
ME96	10/19/1999	10/26/1999	79.0	79.0	2.0	157.7	B	W	d
ME96	10/26/1999	11/02/1999	0.0	0.0	--	0.0	A	T	
ME96	11/02/1999	11/09/1999	23.6	23.6	3.4	79.3	B	W	d
ME96	11/09/1999	11/16/1999	17.5	17.5	12.0	210.2	A	W	
ME96	11/16/1999	11/23/1999	7.6	7.6	6.7	50.9	B	W	hd
ME96	11/23/1999	11/30/1999	18.5	18.5	11.6	215.3	B	W	hd
ME96	11/30/1999	12/07/1999	16.3	16.3	4.8	77.8	B	W	dm
ME96	12/07/1999	12/14/1999	7.1	7.1	7.6	54.3	B	W	d
ME96	12/14/1999	12/21/1999	28.2	28.2	3.1	87.7	B	W	d
ME96	12/21/1999	12/28/1999	0.0	0.0	--	0.0	A	D	
ME96	12/28/1999	01/04/2000	3.8	3.8	15.4	58.5	B	W	d

National Atmospheric Deposition Program/MDN

Weekly Mercury Concentrations and Depositions

Acadia National Park

Site	Date On	Date Off	Subppt	Pptrec	HgConc	HgDep	QR	Sample Type	Notes
			mm	mm	ng/L	ng/m²			
ME98	12/29/1998	01/05/1999	37.6	37.6	1.8	68.1	B	W	hm
ME98	01/05/1999	01/12/1999	34.0	34.0	4.6	154.9	A	W	
ME98	01/12/1999	01/19/1999	67.8	67.8	3.6	243.1	B	W	h
ME98	01/19/1999	01/26/1999	16.8	16.8	4.2	69.8	B	W	h
ME98	01/26/1999	02/02/1999	0.0	0.0	--	0.0	A	D	
ME98	02/02/1999	02/09/1999	80.0	80.0	2.7	218.2	A	W	
ME98	02/09/1999	02/16/1999	8.1	8.1	8.0	65.2	B	W	d
ME98	02/16/1999	02/23/1999	20.1	20.1	5.3	106.3	B	W	d
ME98	02/23/1999	03/02/1999	54.1	54.1	4.4	236.0	B	W	dm
ME98	03/02/1999	03/09/1999	19.1	19.1	6.1	115.3	B	W	d
ME98	03/09/1999	03/16/1999	50.8	50.8	2.1	104.2	B	W	d
ME98	03/16/1999	03/23/1999	12.7	12.7	10.1	128.8	B	W	d
ME98	03/23/1999	03/30/1999	43.4	43.4	5.5	240.8	B	W	d
ME98	03/30/1999	04/06/1999	5.1	5.1	8.0	40.5	B	W	d
ME98	04/06/1999	04/13/1999	2.8	2.8	18.1	50.7	B	W	d
ME98	04/13/1999	04/20/1999	0.0	0.0	--	0.0	B	D	d
ME98	04/20/1999	04/27/1999	2.8	2.8	14.5	40.7	B	W	d
ME98	04/27/1999	05/04/1999	0.0	0.0	--	0.0	A	D	
ME98	05/04/1999	05/11/1999	23.4	23.4	15.5	363.3	B	W	d
ME98	05/11/1999	05/18/1999	0.0	0.0	--	0.0	B	D	d
ME98	05/18/1999	05/25/1999	50.8	50.8	6.2	316.4	B	W	d
ME98	05/25/1999	06/01/1999	0.0	0.0	--	0.0	B	T	d
ME98	06/01/1999	06/08/1999	9.9	9.9	27.3	270.1	B	W	d
ME98	06/08/1999	06/15/1999	11.9	11.9	26.4	315.0	B	W	d
ME98	06/15/1999	06/22/1999	0.0	0.0	--	0.0	B	D	d
ME98	06/22/1999	06/29/1999	24.6	24.6	10.6	261.8	B	W	d
ME98	06/29/1999	07/06/1999	14.0	14.0	8.0	111.1	B	W	d
ME98	07/06/1999	07/13/1999	17.8	17.8	15.7	279.4	B	W	d
ME98	07/13/1999	07/20/1999	3.6	3.6	17.0	60.9	A	W	
ME98	07/20/1999	07/27/1999	1.5	1.5	20.2	30.8	A	W	
ME98	07/27/1999	08/03/1999	0.0	0.0	--	0.0	A	D	
ME98	08/03/1999	08/10/1999	20.8	20.8	8.6	179.7	B	W	d
ME98	08/10/1999	08/17/1999	12.4	12.4	9.7	119.6	B	W	d

ME98	08/17/1999	08/24/1999	1.5	1.5	12.0	18.3	B	W	d
ME98	08/24/1999	08/31/1999	1.0	1.0	28.1	28.5	B	W	di
ME98	08/31/1999	09/07/1999	0.0	0.0	--	0.0		T	n
ME98	09/07/1999	09/14/1999	26.3	26.3	4.3	113.8	B	W	d
ME98	09/14/1999	09/21/1999	102.9	102.9	12.5	1287.4	B	W	d
ME98	09/21/1999	09/28/1999	98.3	98.3	4.4	429.8	B	W	d
ME98	09/28/1999	10/05/1999	23.4	23.4	6.9	160.7	A	W	
ME98	10/05/1999	10/12/1999	15.2	15.2	--	--	C	W	f
ME98	10/12/1999	10/19/1999	52.6	52.6	3.8	198.1	A	W	
ME98	10/19/1999	10/26/1999	54.9	54.9	5.3	288.2	B	W	d
ME98	10/26/1999	11/02/1999	0.0	0.0	--	0.0	A	T	
ME98	11/02/1999	11/09/1999	57.2	57.2	3.7	210.1	B	W	d
ME98	11/09/1999	11/16/1999	48.3	48.3	4.4	212.0	B	W	d
ME98	11/16/1999	11/23/1999	17.8	17.8	6.4	114.2	B	W	d
ME98	11/23/1999	11/30/1999	40.0	40.0	4.1	164.7	B	W	hd
ME98	11/30/1999	12/07/1999	44.8	44.8	5.7	253.1	B	W	d
ME98	12/07/1999	12/14/1999	47.0	47.0	2.7	127.2	A	W	
ME98	12/14/1999	12/21/1999	32.8	32.8	4.4	145.0	B	W	d
ME98	12/21/1999	12/28/1999	0.0	0.0	--	0.0		D	hn
ME98	12/28/1999	01/04/2000	14.2	14.2	20.2	286.6	B	W	dh

2.2

INDICATOR SPECIES

INDICATOR SPECIES

The current Statewide FCA for mercury making a distinction between coldwater and warmwater fish is based on limited data. The Maine Bureau of Health (BOH) has requested additional data in order to verify the appropriateness of the current advisories and to enable additional refinements. In addition, BOH would like to be able to provide to the public specific information on as many individual lakes as possible. In addition, a recommendation of the Maine Land and Water Resources Council 1997 annual report, Appendix A titled 'Mercury in Maine', is to expand fish sampling for mercury analysis to meet this need.

In order to make this effort cost-effective, it is necessary identify indicator species of fish, to avoid the need for testing multiple species in the full program in future years. Although previous studies have indicated how mercury concentrations vary among species, those species were collected from different lakes. Since the lakes were numerous and randomly selected, differences in concentrations were ascribed to species, but may have been a result of a lake effect rather than a species effect. Most of these studies also relied on composite samples of a number of fish rather than individuals, which confounds interpretation of the results.

To begin to sort out lake effects from species effects, in 1998 multiple species were collected from the same lakes. Lakes were divided into 2 groups, coldwater and warmwater lakes. Within each group three lakes were selected. A minimum of 2 species, white perch and black bass, were to be collected from the warmwater lakes and a minimum of 4 species, black bass, white perch, lake trout and landlocked salmon, were to be collected from coldwater lakes. Edible filets of 15 fish of each species were to be analyzed individually for mercury.

In 1998 we were able to collect only 2 species from 2 warmwater lakes and 2-3 species from 4 coldwater lakes. Sample sizes ranged from 1-10. These data are insufficient to identify indicator species. Therefore, in 1999 we attempted to conduct the entire study and collect 4 species in 3 lakes and 2 species from 3 lakes in 1999. The target sample sizes were 10 fish from each lake.

In 1999 we were able to collect fish from an additional 2 warmwater lakes and 3 coldwater lakes. Only at Sebago were we able to get all 4 species. We have now collected fish from 11 lakes over the two years combined. From coldwater lakes we have data on 4 species from 1 lake, 3 species from 4 lakes, and 2 species from 2 lakes. We have 2 species from 4 warmwater lakes. Results were highly variable with one species having highest concentrations of all species sampled in some lakes and another species having the highest concentrations in other lakes. No single indicator species was identified for either type of lake.

TABLE 2.2.1 MERCURY LEVELS IN INDICATOR SPECIES FROM SOME MAINE LAKES

SPECIES	**Branch L**	**Echo L**	**Moose P**	**Panther P**	**Pleasant L**	**Sebago L**	**Sheepscot L**	**Sandy P**	**Webber P**	**McCurdy P**	**3-Mile P**
	LK4328	**LK5814**	LK3134	LK3694	LK3446	**LK5786**	**LK4896**	**LK5174**	**LK5408**	Lk5712	LK5416
	COLDWATER LAKES							WARMWATER LAKES			
								LMB			LMB
SMB-01	0.62	0.546	0.77	0.75	0.99	0.506	1.12	0.459	0.708	0.28	0.88
SMB-02	0 95	0.425	0.79	0.69	1.45	0.400	1.80	0.528	0.584	0.30	0.48
SMB-03	0.66	0.907	0.54	0 97	0.79	0.280	1.09	0.356	0.664	0.45	0.63
SMB-04	0.77	0.428	0.87	0.68	0.62	0.427	1.13	0.577	0.166	0.30	0.21
SMB-05	1 07	0.530	0.96	0.55	1.23	0.429	1.19	0.322	0.592	0.57	0.70
SMB-06	0.75		0.94	0 92	0.42	0.699	1.20	0.306	0.625	0.35	0.46
SMB-07	0.62		1.47	0.84	0.73	0.501	0.913	0.260	0.519	0.24	0.78
SMB-08	0.36			0.76		0.427	1.59	0.317	0.342		0.86
SMB-09	0.55			0.61		0.348	1.47	0.179	0.683		0.47
SMB-10	1.12			0.41		0.489	1.03	0.333	0.921		0.39
MEAN	**0.74**	**0.57**	**0.90**	**0.72**	**0.89**	**0.45**	**1.25**	**0.36**	**0.58**	**0.36**	**0.58**
WHP-01	0 26	0.711	0.28	0.36	0.79	0.439		0.179	0.301	0.54	1.01
WHP-02		0.470	0.54	0.69	0.58	1.34		0.186	0.236	0.40	0.93
WHP-03		0.739	0.55	0.73	0.80	0.360		0.344	0.183	0.52	0.38
WHP-04		1.74	0.49	0.51	0.92	0.420		0.222	0.253	0.54	0.30
WHP-05		0.862	0.48	0.72	0.91	0.877		0.171	0.238	0.45	0.40
WHP-06		0.448	0.21	0.78	0.75	0.714		0.120	0.253	0.31	0.51
WHP-07		0.638		0.80	0.97	0.593		0.154	0.174	0.44	0.54
WHP-08		1.19		0.41	1.06	0.808		0.445	0.378	0.47	0.74
WHP-09		0.657			0.79	0.502		0.160	0.171	0.56	0.37
WHP-10					0.77	0.446		0.261	0.187	0.47	0.61
								0.186			
MEAN		**0.83**	**0.43**	**0.62**	**0.83**	**0.65**		**0.22**	**0.24**	**0.47**	**0.58**
LKT-01	0.88	0.550				0.391	0.966				
LKT-02	0.61	0.629				0.429	1.01				
LKT-03	0.53	0.473				0.402	0.989				
LKT-04	0.73	0.298				0.460	0.447				
LKT-05	0.52	0.653				0.405	0.735				
LKT-06	0.50	0.423				0.405	0.967				
LKT-07	0.78					0.262					
LKT-08	0.56					0.386					
LKT-09	0.61					0.449					
LKT-10	0.49					0.475					
MEAN	**0.62**	**0.50**				**0.41**	**0.85**				
LLS-01	0.39		0.51	0.32	0.65	0.657	0.762				
LLS-02	0 28		0.40	0 28	0.24	0.419	0.505				
LLS-03			0.36	0 20	0.32	0.318	0.206				
LLS-04			0.33	0.12	0.13	0.379					
LLS-05			0.37	0.32	0.22	0.289					
LLS-06			0.30	0 25	0.17	0.245					
LLS-07			0.31	0.35	0.27	0.411					
LLS-08			0.51	0.34	0.27	0.396					
LLS-09			0.41	0.30	0.16	0.398					
LLS-10			0.43	0 29	0.29	0.224					
MEAN	**0.34**		**0.39**	**0.28**	**0.27**	**0.37**	**0.49**				

2.3

MERCURY IN FISH DOWNWIND OF MUNICIPAL WASTE INCINERATORS

MERCURY IN FISH DOWNWIND OF MUNICIPAL WASTE INCINERATORS

This study is a continuation of the work conducted on the Orrington-Bucksport area lakes to determine differential mercury content in tissue and sediments from lakes associated with local emission sources. Lakes presumed to receive mercury depositions from the RWS and MMWC waste incinerators will be selected for study. Methods similar to the Orrington study will be employed. This effort began in 1998, but fish were successfully captured at only 2 lakes and sediments were collected from only 4 lakes. In 1999 fish and sediments were collected from 3 lakes, making the total of 5 lakes where both fish and sediments were collected.

TABLE 2.3 MERCURY CONCENTRATIONS (mg/kg) IN FISH (ww) AND SEDIMENT (dw) FROM LAKES DOWNWIND OF MUNICIPAL WASTE INCINERATORS

SPECIES	Taylor Pond LK-3750	Sabattus Pond LK-3796	Forest L LK-3712	Highland L LK-3734	L Sebago L LK-3714
WHP-01	0.731	0.136	0.535	0.661	0.226
WHP-02	0.515	0.323	0.507	0.849	0.176
WHP-03	0.706	0.110	0.360	0.731	0.191
WHP-04	0.525	0.100	0.633	0.565	0.188
WHP-05		0.090	0.430	0.764	0.114
WHP-06		0.092	0.355	0.665	0.113
WHP-07			0.519	0.584	0.086
WHP-08			0.462	0.735	0.105
WHP-09				0.539	0.176
WHP-10				0.598	0.122
MEAN	**0.619**	**0.142**	**0.475**	**0.669**	**0.150**
SEDIMENT	**0.199**	**0.103**	**0.310**	**0.252**	**0.252**

2.4

LOON EFFECTS STUDY

LOON EFFECTS STUDY

Beginning in 1994, studies of exposure of common loons in Maine lakes to mercury by BioDiversity Research Institute (BRI) and collaborators indicate that 40% of eggs are potentially impacted. From mercury concentrations in blood and feather samples, BRI estimates that 28% of the adult breeding population is also at risk based on risk categories developed from their studies and the literature.

In 1999 a study was initiated to look for actual impacts on individuals and the population by measuring (1) overall productivity, (2) adult incubating behavior (3) egg development (4) chick behavior (5) juvenile survival and (6) overall health. Results documented that eggs from high-risk pairs were significantly smaller and hatched 50% fewer chicks than those from low-risk pairs. One extra high-risk male spent significantly less time incubating eggs and significantly more time brooding instead of searching for food than low-risk birds, similar to findings from other studies. There was greater asymmetry in feather mercury concentrations in high-risk loons than in low-risk loons indicating developmental instability. The stress hormone, corticosterone, was highly correlated with mercury concentrations. Mercury concentrations seem to be increasing approximately 9% in males and 5.6% in females each year. Additional work is needed to increase the sample size and valid these findings.

Anthropogenic inputs of mercury (Hg) into the environment have significantly increased in the past few decades. In conjunction, the current availability of methylmercury (MeHg) in aquatic systems has increased to levels posing risks to human and ecological health. Risk levels vary considerably in response to MeHg availability, which is affected by lake hydrology, biogeochemistry, topography, and proximity to airborne sources. We selected the Common Loon as the most suitable bioindicator of aquatic Hg toxicity, based on ecological, logistical, and other criteria, including public valuations of natural resources. Opportunistic sampling efforts from 1994-99 indicate New England's breeding loon population is at unacceptable levels of risk to Hg contamination, particularly in Maine. Based on risk categories developed from the literature and *in situ* studies by BioDiversity Research Institute and their collaborators, 28% of the breeding loon population in Maine is estimated to be at risk, while 40% of the eggs laid are potentially impacted.

This is a summary of the full report available from the Department of Environmental Protection, Augusta, Maine, as listed below.

BRI, 2000. Assessing the impacts of methylmercury on the piscivorous wildlife as indicated by the common loon. BioDiversity Research Institute, Falmouth, Maine. 41pp

2.5

MERCURY TRENDS

MERCURY TRENDS

Temporal Changes in Fish Mercury Concentration in Maine Lakes. Terry A. Haines, Department of Biological Sciences University of Maine, 5751 Murray Hall, Orono, ME 04469-5751

Notification that funding was approved for this project was received on 22 October, 1999, which was too late to schedule any field sampling for 1999. The winter was spent locating and organizing records of previous fish collections that were analyzed for mercury. There were 12 lakes for which data were collected between 1978 and 1986 (see attached spreadsheet). East Chairback Pond was acidic (pH about 5) and had a sparse population of large brook trout when initially sampled. This lake was netted by Paul Johnson in 1999, unknown to me, and seems to be unchanged. Paul requested that the lake not be netted again because of the small fish population. St. Froid Lake was surveyed by Dave Basley in August 2000 from which we collected fish samples. The best candidate lake for sediment coring with the presently-available equipment is Cliff Lake. A coring trip occurred mid-July. Sampling trips to net selected trout and sucker lakes occurred during June. Data will be reported in the 2000 SWAT report.

1999 SWAT MONITORING PROGRAM REPORT

PART 3 RIVERS AND STREAMS

3.1 COPLANAR PCB IN FISH

PRINCIPAL INVESTIGATOR	Barry Mower
TECHNICAL ASSISTANTS	John Reynolds
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3.2 DDT IN FISH

PRINCIPAL INVESTIGATOR	Barry Mower
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3.3 EFFECTS-BASED FISH STUDY

PRINCIPAL INVESTIGATOR	Barry Mower
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3.4 PCB IN RIVERS AND STREAMS

PRINCIPAL INVESTIGATOR	Donald Hague
TECHNICAL ASSISTANT	Barry Mower

3.5 XENOESTROGENS

PRINCIPAL INVESTIGATOR	Rebecca VanBeneden, UM

3.6 AMBIENT BIOLOGICAL MONITORING

PRINCIPAL INVESTIGATORS	Susan Davies
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3.1

COPLANAR PCB IN FISH

COPLANAR PCB IN FISH

In 1999 the SWAT program was again integrated with the Dioxin Monitoring Program (DMP). Coplanar PCBs were measured from all 19 stations in the DMP in most all samples of bass and suckers. Coplanar toxic equivalents often matched or exceeded dioxin levels in fish at sites above and below known point sources of dioxin and contribute significantly to fish consumption advisories. Concentrations varied within an order of magnitude from those of previous years on the Penobscot, Sebasticook and St. Croix rivers, mostly following lipid concentrations. Concentrations were more variable at some stations on the Androscoggin River and less explained by lipid content. Sampling should continue in 2000 at all stations.

STATION LOCATIONS

STATION	SPECIES
Androscoggin R	
Gilead	bass, sucker
Rumford	bass, sucker
Riley	bass, sucker
Liv Fls(Otis imp)	bass, sucker
Turner (GIP)	bass
Lisbon Falls	bass
Androscoggin Lake	bass, white perch
Kennebec R	
Norridgewock	bass, sucker
Fairfield	bass, sucker
Augusta	bass
Penobscot R	
Woodville	bass, sucker
S Lincoln	bass, sucker
Milford	bass, sucker
Veazie	bass, sucker
Bangor	eel
Presumpscot R	
Windham	bass, sucker
Westbrook	bass, sucker
Salmon Falls R	
S Berwick	bass
Sebasticook R	
W Br Palmyra	bass
St. Croix	
Woodland (above)	bass,suckers
Woodland (below)	bass,suckers

TABLE 3.1 SUMMARY OF COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

WATER/STATION	SPECIES	DTEh	CTEh	TTEh
ANDROSCOGGIN R				
Gilead	rainbow trout	2.0	2.6	2.6
	brown trout	1.2	0.9	2.1
	bass	1.4	0.7	2.1
	sucker	3.1	4.0	7.1
Rumford	bass	1.7	0.9	2.6
	sucker	3.0	1.3	1.3
Riley	bass	0.8	2.9	3.7
	sucker	2.7	1.4	4.1
Livermore Falls	bass	1.0	1.3	1.3
	sucker	2.4	1.9	4.3
Auburn-GIP	bass sm	1.7	1.1	2.8
Lisbon Falls	bass	1.9	4.0	5.9
Androscoggin L	bass	0.5	0.1	0.6
	w perch	0.6	0.3	0.9
	sucker			
KENNEBEC R				
Norridgewock	bass	0.4	0.4	0.8
	sucker	0.4	0.3	0.7
Fairfield	bass	0.7	0.1	0.8
	sucker	0.7	0.5	1.2
Augusta	bass	0.7	0.2	0.9
PENOBSCOT R				
Woodville	bass	0.4	0.6	1.0
	sucker	0.4	1.4	1.8
S Lincoln	bass	0.8	3.1	3.9
	sucker	1.5	2.2	3.7
Milford	bass	0.6	1.5	2.1
	sucker	1.6	1.6	3.2
Veazie	bass	0.6	1.2	1.8
	sucker	1.5	1.5	3.0
SALMON FALLS R				
S Berwick	sm bass	0.4	0.7	1.1
	lm bass	0.6	0.7	1.3
SEBASTICOOK R				
W Br Palmyra	bass	0.7	0.1	0.8
ST CROIX				
Woodland	bass	0.4	1.5	1.9
	sucker	0.4	0.8	1.2
Baring	bass	0.4	0.6	1.0
	sucker	0.4	1.1	1.5

Coplanar PCB (CTE), Dioxin (DTE) and total (TTE) toxic eqiivalents using WHO 98 toxic equivalency factors (TEF) at ND=1/2 MDL.

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	ARP-SMB-1	ARP-SMB-2	ARP-SMB-3	ARP-SMB-4	ARP-SMB-5
3,3',4,4'-TCB	77	0.5	**	10.50	14.30	12.30	16.10
2',3,4,4',5-PeCB	123	0.5		18.90	29.60	16.90	28.70
2,3',4,4',5-PeCB	118	0.5		224.00	395.00	257.00	374.00
2,3,4,4',5-PeCB	114	0.5		4.03	6.65	5.35	6.91
2,3,3',4,4'-PeCB	105	0.5		38.90	58.90	41.60	60.20
3,3',4,4',5-PeCB	126	0.5		4.22	7.33	4.01	5.99
2,3',4,4',5,5'-HxCB	167	1.0		7.11	11.20	8.96	12.60
2,3,3',4,4',5-HxCB	156	1.0		69.70	114.00	81.40	127.00
2,3,3',4,4',5'-HxCB	157	1.0		3.27	7.32	4.28	5.06
3,3',4,4',5,5'-HxCB	169	1.0		0.65	1.61	1.02	1.24
2,3,3',4,4',5,5'-HpCB	189	1.0		7.31	14.70	8.46	13.60
Total TEQ (ND=0)				0.497	0.864	0.490	0.730
Total TEQ (ND=DL)				0.497	0.864	0.490	0.730
% Lipids			2.86	0.62	0.81	0.76	1.02
Sample weight (g)			50.2	50.0	50.2	50.2	50.2

DEP ID congener	IUPAC#	DL ng/kg	ARP-SMB-6 99-315	ARP-SMB-7 99-316	ARP-SMB-8 99-317	ARP-SMB-9 99-318	ARP-SMB-10 99-319
3,3',4,4'-TCB	77	0.5	13.60	11.70	15.80	12.50	16.70
2',3,4,4',5-PeCB	123	0.5	24.70	20.60	34.50	27.30	33.20
2,3',4,4',5-PeCB	118	0.5	291.00	259.00	351.00	284.00	388.00
2,3,4,4',5-PeCB	114	0.5	5.88	7.00	6.23	5.52	7.06
2,3,3',4,4'-PeCB	105	0.5	64.30	48.90	71.40	53.60	67.90
3,3',4,4',5-PeCB	126	0.5	4.56	5.71	7.02	6.27	6.41
2,3',4,4',5,5'-HxCB	167	1.0	12.90	9.61	13.60	10.50	14.30
2,3,3',4,4',5-HxCB	156	1.0	118.00	86.70	95.70	71.40	135.00
2,3,3',4,4',5'-HxCB	157	1.0	5.52	4.03	4.91	5.36	6.25
3,3',4,4',5,5'-HxCB	169	1.0	0.68	1.32	1.55	1.17	0.98
2,3,3',4,4',5,5'-HpCB	189	1.0	11.90	9.75	11.60	8.91	12.60
Total TEQ (ND=0)			0.568	0.668	0.819	0.719	0.777
Total TEQ (ND=DL)			0.568	0.668	0.819	0.719	0.777
% Lipids			0.93	0.83	1.04	0.80	1.08
Sample weight (g)			49.9	50.2	50.0	50.2	50.2

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	ARF-SMB-1	ARF-SMB-2	ARF-SMB-3	ARF-SMB-4	ARF-SMB-5
3,3',4,4'-TCB	77	0.5	18.60	10.90	19.60	13.70	16.80
2',3,4,4',5-PeCB	123	0.5	48.70	27.60	42.10	32.60	22.50
2,3',4,4',5-PeCB	118	0.5	445.00	269.00	431.00	304.00	288.00
2,3,4,4',5-PeCB	114	0.5	8.26	4.86	7.66	5.92	6.01
2,3,3',4,4'-PeCB	105	0.5	85.40	57.60	82.30	64.20	70.50
3,3',4,4',5-PeCB	126	0.5	7.63	6.72	9.61	7.01	5.19
2,3',4,4',5,5'-HxCB	167	1.0	12.50	10.70	11.60	9.24	7.11
2,3,3',4,4',5-HxCB	156	1.0	130.00	142.00	121.00	86.10	102.00
2,3,3',4,4',5'-HxCB	157	1.0	8.12	5.94	8.31	6.72	8.07
3,3',4,4',5,5'-HxCB	169	1.0	2.95	1.35	2.59	1.72	1.48
2,3,3',4,4',5,5'-HpCB	189	1.0	20.60	13.30	18.60	15.70	14.80
Total TEQ (ND=0)			0.928	0.800	1.115	0.811	0.633
Total TEQ (ND=DL)			0.928	0.800	1.115	0.811	0.633
% Lipids			1.32	0.71	1.10	0.74	0.75
Sample weight (g)			50.1	50.1	49.9	50.1	50.0

DEP ID congener	IUPAC#	DL ng/kg	ARF-SMB-6	ARF-SMB-7	ARF-SMB-8	ARF-SMB-9	ARF-SMB-10
3,3',4,4'-TCB	77	0.5	15.30	10.60	21.60	17.40	9.97
2',3,4,4',5-PeCB	123	0.5	30.10	28.30	35.90	28.90	17.30
2,3',4,4',5-PeCB	118	0.5	325.00	285.00	401.00	359.00	221.00
2,3,4,4',5-PeCB	114	0.5	6.62	5.21	8.02	7.88	4.23
2,3,3',4,4'-PeCB	105	0.5	54.70	36.90	75.30	79.40	41.80
3,3',4,4',5-PeCB	126	0.5	8.31	4.35	10.60	8.81	5.95
2,3',4,4',5,5'-HxCB	167	1.0	7.63	5.67	9.95	11.10	6.33
2,3,3',4,4',5-HxCB	156	1.0	115.00	67.90	136.00	147.00	78.70
2,3,3',4,4',5'-HxCB	157	1.0	6.51	4.26	7.91	7.52	5.02
3,3',4,4',5,5'-HxCB	169	1.0	2.49	1.87	3.65	3.15	2.03
2,3,3',4,4',5,5'-HpCB	189	1.0	16.80	11.40	19.20	18.40	10.60
Total TEQ (ND=0)			0.964	0.530	1.228	1.044	0.689
Total TEQ (ND=DL)			0.964	0.530	1.228	1.044	0.689
% Lipids			0.84	0.53	1.16	0.91	0.51
Sample weight (g)			50.0	50.2	49.9	50.2	50.0

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	ARY-SMB-1	ARY-SMB-2	ARY-SMB-3	ARY-SMB-4	ARY-SMB-5
3,3',4,4'-TCB	77	0.5	14.20	25.70	15.60	31.40	17.30
2',3,4,4',5-PeCB	123	0.5	26.30	42.10	21.70	55.20	25.60
2,3',4,4',5-PeCB	118	0.5	224.00	328.00	184.00	361.00	175.00
2,3,4,4',5-PeCB	114	0.5	14.60	23.60	12.40	42.80	20.60
2,3,3',4,4'-PeCB	105	0.5	78.90	94.80	59.80	102.00	52.30
3,3',4,4',5-PeCB	126	0.5	18.30	36.30	17.60	41.60	21.70
2,3',4,4',5,5'-HxCB	167	1.0	15.10	29.80	13.20	52.00	22.80
2,3,3',4,4',5-HxCB	156	1.0	132.00	221.00	121.00	253.00	175.00
2,3,3',4,4',5'-HxCB	157	1.0	15.90	31.50	16.70	35.70	20.60
3,3',4,4',5,5'-HxCB	169	1.0	0.99	1.25	<DL	1.53	0.75
2,3,3',4,4',5,5'-HpCB	189	1.0	7.61	13.70	6.39	16.20	10.60
Total TEQ (ND=0)			1.956	3.831	1.864	4.398	2.314
Total TEQ (ND=DL)			1.956	3.831	1.874	4.398	2.314
% Lipids			0.45	1.00	0.49	1.35	0.66
Sample weight (g)			50.3	50.2	40.6	49.7	49.9

DEP ID congener	IUPAC#	DL ng/kg	ALV-SMB-1	ALV-SMB-2	ALV-SMB-3	ALV-SMB-4	ALV-SMB-5
3,3',4,4'-TCB	77	0.5	28.60	31.60	24.60	14.20	15.40
2',3,4,4',5-PeCB	123	0.5	66.20	91.50	75.10	50.60	47.30
2,3',4,4',5-PeCB	118	0.5	289.00	352.00	306.00	251.00	232.00
2,3,4,4',5-PeCB	114	0.5	11.60	10.80	8.35	5.19	6.60
2,3,3',4,4'-PeCB	105	0.5	59.70	78.90	69.80	48.60	53.20
3,3',4,4',5-PeCB	126	0.5	8.69	18.60	15.30	8.33	9.85
2,3',4,4',5,5'-HxCB	167	1.0	22.10	34.10	26.70	20.20	18.60
2,3,3',4,4',5-HxCB	156	1.0	86.70	121.00	98.90	71.40	63.70
2,3,3',4,4',5'-HxCB	157	1.0	14.90	15.60	13.50	11.60	8.33
3,3',4,4',5,5'-HxCB	169	1.0	1.15	1.02	0.88	<DL	0.71
2,3,3',4,4',5,5'-HpCB	189	1.0	7.33	10.30	8.71	8.33	5.21
Total TEQ (ND=0)			0.982	2.001	1.648	0.915	1.067
Total TEQ (ND=DL)			0.982	2.001	1.648	0.925	1.067
% Lipids			0.74	0.92	0.69	0.41	0.42
Sample weight (g)			50.1	49.7	50.1	44.5	40.8

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	AGI-SMB-1	AGI-SMB-2	AGI-SMB-3	AGI-SMB-4	AGI-SMB-5
3,3',4,4'-TCB	77	0.5	14.60	18.50	13.70	22.60	11.60
2',3,4,4',5-PeCB	123	0.5	83.20	91.30	71.30	102.00	75.30
2,3',4,4',5-PeCB	118	0.5	181.00	195.00	155.00	233.00	169.00
2,3,4,4',5-PeCB	114	0.5	28.30	20.60	32.60	41.70	25.20
2,3,3',4,4'-PeCB	105	0.5	63.90	69.80	48.10	55.60	53.60
3,3',4,4',5-PeCB	126	0.5	7.75	9.01	8.66	11.30	10.20
2,3',4,4',5,5'-HxCB	167	1.0	12.60	15.60	9.59	10.90	13.60
2,3,3',4,4',5-HxCB	156	1.0	91.70	101.00	71.60	79.60	86.50
2,3,3',4,4',5'-HxCB	157	1.0	18.30	22.30	13.30	19.40	15.40
3,3',4,4',5,5'-HxCB	169	1.0	1.41	1.36	1.02	1.48	1.26
2,3,3',4,4',5,5'-HpCB	189	1.0	26.80	25.30	21.90	27.30	22.90
Total TEQ (ND=0)			0.895	1.027	0.966	1.259	1.130
Total TEQ (ND=DL)			0.895	1.027	0.966	1.259	1.130
% Lipids			0.59	0.61	0.49	0.71	0.49
Sample weight (g)			50.3	50.2	50.1	50.2	50.2

DEP ID congener	IUPAC#	DL ng/kg	ALS-SMB-1	ALS-SMB-2	ALS-SMB-3	ALS-SMB-4	ALS-SMB-5
3,3',4,4'-TCB	77	0.5	25.60	22.10	39.40	28.40	29.70
2',3,4,4',5-PeCB	123	0.5	61.30	68.90	125.00	71.20	88.30
2,3',4,4',5-PeCB	118	0.5	245.00	301.00	395.00	271.00	296.00
2,3,4,4',5-PeCB	114	0.5	24.70	31.60	49.60	26.90	38.60
2,3,3',4,4'-PeCB	105	0.5	65.90	72.40	131.00	116.00	108.00
3,3',4,4',5-PeCB	126	0.5	24.50	31.40	51.60	36.70	47.70
2,3',4,4',5,5'-HxCB	167	1.0	18.70	19.30	33.40	21.40	26.90
2,3,3',4,4',5-HxCB	156	1.0	88.60	110.00	154.00	132.00	141.00
2,3,3',4,4',5'-HxCB	157	1.0	16.30	14.20	33.60	22.10	26.70
3,3',4,4',5,5'-HxCB	169	1.0	0.99	1.75	1.55	1.36	1.22
2,3,3',4,4',5,5'-HpCB	189	1.0	37.20	28.60	51.60	41.70	47.60
Total TEQ (ND=0)			2.568	3.285	5.369	3.827	4.943
Total TEQ (ND=DL)			2.568	3.285	5.369	3.827	4.943
% Lipids			0.69	0.89	1.19	0.79	1.09
Sample weight (g)			49.9	49.8	50.2	50.2	49.8

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	ALW-SMB-1	ALW-SMB-2	ALW-SMB-3	ALW-SMB-4	ALW-SMB-5
3,3',4,4'-TCB	77	0.5	6.69	12.50	4.26	15.90	10.50
2',3,4,4',5-PeCB	123	0.5	28.90	48.70	15.90	57.60	28.40
2,3',4,4',5-PeCB	118	0.5	67.80	115.00	40.20	148.00	95.30
2,3,4,4',5-PeCB	114	0.5	1.05	2.33	0.88	3.94	1.66
2,3,3',4,4'-PeCB	105	0.5	13.90	24.70	12.90	34.70	18.70
3,3',4,4',5-PeCB	126	0.5	0.41	0.75	<DL	1.00	0.58
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	30.60	51.60	18.90	81.30	61.30
2,3,3',4,4',5'-HxCB	157	1.0	8.81	14.20	3.61	20.40	12.70
3,3',4,4',5,5'-HxCB	169	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5,5'-HpCB	189	1.0	2.66	5.01	3.09	8.84	5.69
Total TEQ (ND=0)			0.073	0.130	0.019	0.179	0.112
Total TEQ (ND=DL)			0.083	0.140	0.079	0.189	0.122
% Lipids			0.58	1.12	0.27	1.68	1.01
Sample weight (g)			50.0	49.9	49.9	50.2	49.9

DEP ID congener	IUPAC#	DL ng/kg	ALW-WHP-1	ALW-WHP-2	ALW-WHP-3	ALW-WHP-4	ALW-WHP-5
3,3',4,4'-TCB	77	0.5	17.30	7.91	14.10	9.24	5.23
2',3,4,4',5-PeCB	123	0.5	153.00	88.30	124.00	86.70	42.70
2,3',4,4',5-PeCB	118	0.5	301.00	163.00	294.00	225.00	119.00
2,3,4,4',5-PeCB	114	0.5	17.60	10.50	22.60	15.90	6.34
2,3,3',4,4'-PeCB	105	0.5	35.60	18.30	27.50	21.70	15.90
3,3',4,4',5-PeCB	126	0.5	2.41	1.33	2.63	1.96	1.08
2,3',4,4',5,5'-HxCB	167	1.0	17.90	8.24	15.50	10.30	5.54
2,3,3',4,4',5-HxCB	156	1.0	226.00	115.00	237.00	186.00	121.00
2,3,3',4,4',5'-HxCB	157	1.0	13.70	7.66	15.10	9.58	7.38
3,3',4,4',5,5'-HxCB	169	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5,5'-HpCB	189	1.0	8.66	5.27	7.69	5.97	3.64
Total TEQ (ND=0)			0.421	0.228	0.447	0.337	0.194
Total TEQ (ND=DL)			0.431	0.238	0.457	0.347	0.204
% Lipids			5.28	3.35	5.31	4.65	2.52
Sample weight (g)			49.9	49.8	50.1	50.0	50.0

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	ALW-WHP-6	ALW-WHP-7	ALW-WHP-8	ALW-WHP-9	ALW-WHP-10
3,3',4,4'-TCB	77	0.5	8.65	7.31	4.28	6.67	6.19
2',3,4,4',5-PeCB	123	0.5	74.20	42.80	46.90	62.80	58.70
2,3',4,4',5-PeCB	118	0.5	165.00	159.00	91.40	129.00	142.00
2,3,4,4',5-PeCB	114	0.5	9.63	5.32	5.21	7.15	8.81
2,3,3',4,4'-PeCB	105	0.5	15.80	17.70	7.81	16.30	14.60
3,3',4,4',5-PeCB	126	0.5	1.42	0.96	0.85	0.94	1.03
2,3',4,4',5,5'-HxCB	167	1.0	8.89	5.35	5.69	5.09	6.95
2,3,3',4,4',5-HxCB	156	1.0	124.00	95.60	62.10	83.70	107.00
2,3,3',4,4',5'-HxCB	157	1.0	7.27	5.48	3.04	7.06	6.21
3,3',4,4',5,5'-HxCB	169	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5,5'-HpCB	189	1.0	4.16	2.65	2.29	2.95	2.26
Total TEQ (ND=0)			0.239	0.172	0.135	0.165	0.186
Total TEQ (ND=DL)			0.249	0.182	0.145	0.175	0.196
% Lipids			3.13	2.45	1.49	2.77	2.31
Sample weight (g)			50.2	50.2	50.0	50.1	50.0

DEP ID congener	IUPAC#	DL ng/kg	AGL-RBT-C1	AGL-BNT-C1	ARP-WHS-C1	ARP-WHS-C2	ARF-WHS-C1
3,3',4,4'-TCB	77	0.5	56.90	37.40	96.40	81.70	31.40
2',3,4,4',5-PeCB	123	0.5	42.10	10.50	36.90	42.60	92.10
2,3',4,4',5-PeCB	118	0.5	406.00	165.00	487.00	453.00	577.00
2,3,4,4',5-PeCB	114	0.5	62.30	25.60	29.30	24.20	18.20
2,3,3',4,4'-PeCB	105	0.5	41.80	11.80	83.70	71.60	316.00
3,3',4,4',5-PeCB	126	0.5	24.00	8.69	35.20	40.10	12.90
2,3',4,4',5,5'-HxCB	167	1.0	7.64	2.11	15.40	16.90	56.60
2,3,3',4,4',5-HxCB	156	1.0	233.00	68.90	212.00	198.00	94.20
2,3,3',4,4',5'-HxCB	157	1.0	4.12	1.06	7.58	6.32	7.33
3,3',4,4',5,5'-HxCB	169	1.0	0.85	<DL	1.64	1.47	1.12
2,3,3',4,4',5,5'-HpCB	189	1.0	47.90	15.70	74.20	80.30	13.90
Total TEQ (ND=0)			2.618	0.941	3.739	4.212	1.465
Total TEQ (ND=DL)			2.618	0.951	3.739	4.212	1.465
% Lipids			3.01	4.54	8.73	8.48	14.70
Sample weight (g)			50.1	50.1	49.3	49.3	50.0

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	ARF-WHS-C2	ARY-WHS-C1	ARY-WHS-C2	ALV-WHS-C1	ALV-WHS-C2
3,3',4,4'-TCB	77	0.5	21.40	64.90	53.70	48.60	61.40
2',3,4,4',5-PeCB	123	0.5	74.20	244.00	226.00	231.00	295.00
2,3',4,4',5-PeCB	118	0.5	488.00	491.00	465.00	574.00	630.00
2,3,4,4',5-PeCB	114	0.5	12.60	21.30	15.90	13.30	14.80
2,3,3',4,4'-PeCB	105	0.5	274.00	116.00	103.00	248.00	275.00
3,3',4,4',5-PeCB	126	0.5	10.60	9.94	10.50	15.90	17.70
2,3',4,4',5,5'-HxCB	167	1.0	41.70	48.70	39.40	24.60	21.60
2,3,3',4,4',5-HxCB	156	1.0	75.40	304.00	288.00	142.00	167.00
2,3,3',4,4',5'-HxCB	157	1.0	3.61	35.70	21.60	18.70	17.10
3,3',4,4',5,5'-HxCB	169	1.0	0.85	14.20	6.71	3.36	5.26
2,3,3',4,4',5,5'-HpCB	189	1.0	8.74	13.90	7.22	10.40	14.80
Total TEQ (ND=0)			1.201	1.410	1.366	1.822	2.050
Total TEQ (ND=DL)			1.201	1.410	1.366	1.822	2.050
% Lipids			12.08	11.45	9.43	6.89	9.14
Sample weight (g)			49.9	50.2	50.3	50.4	50.0

DEP ID congener	IUPAC#	DL ng/kg	KNW-SMB-3	KNW-SMB-4	KNW-SMB-6	KNW-SMB-7	KNW-SMB-9
3,3',4,4'-TCB	77	0.5	2.61	4.06	2.13	3.66	1.25
2',3,4,4',5-PeCB	123	0.5	6.32	8.32	4.22	5.94	3.19
2,3',4,4',5-PeCB	118	0.5	49.7	86.7	41.3	36.8	25.6
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	4.06	6.39	4.87	5.79	3.01
3,3',4,4',5-PeCB	126	0.5	2.85	4.02	3.98	3.19	1.44
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	94.2	158	106	121	51.7
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	0.88	1.95	0.63	2.01	<DL
2,3,3',4,4',5,5'-HpCB	189	1.0	8.63	17.6	6.26	10.6	5.26
Total TEQ (ND=0)			0.348	0.513	0.463	0.406	0.174
Total TEQ (ND=DL)			0.349	0.514	0.464	0.407	0.184
% Lipids			0.71	1.35	0.43	0.55	0.32
Sample weight (g)			50.5	50.1	50.2	49.7	49.9

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	KFF-SMB-1	KFF-SMB-2	KFF-SMB-3	KFF-SMB-4	KFF-SMB-5
3,3',4,4'-TCB	77	0.5	6.09	3.41	1.57	2.06	2.85
2',3,4,4',5-PeCB	123	0.5	5.87	6.89	2.21	0.87	3.97
2,3',4,4',5-PeCB	118	0.5	89.6	105	36.7	42.1	56.3
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	5.29	6.35	2.58	1.89	3.05
3,3',4,4',5-PeCB	126	0.5	0.75	0.87	<DL	<DL	0.44
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	105	95.6	38.9	52.8	48.7
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	2.66	2.14	0.89	1.35	1.21
2,3,3',4,4',5,5'-HpCB	189	1.0	8.59	11.6	3.61	4.22	5.31
Total TEQ (ND=0)			0.166	0.170	0.033	0.045	0.088
Total TEQ (ND=DL)			0.166	0.170	0.134	0.146	0.088
% Lipids			1.12	0.59	0.38	0.38	0.62
Sample weight (g)			49.9	49.9	50.2	50.2	50.0

DEP ID congener	IUPAC#	DL ng/kg	KNW-WHS-2	KNW-WHS-3	KNW-WHS-7	KNW-WHS-8	KNW-WHS-9
3,3',4,4'-TCB	77	0.5	11.8	8.61	7.75	6.12	8.94
2',3,4,4',5-PeCB	123	0.5	10.2	7.22	5.68	4.87	8.33
2,3',4,4',5-PeCB	118	0.5	78.6	45.7	25.9	39.2	57.9
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	5.68	3.05	4.81	3.61	4.26
3,3',4,4',5-PeCB	126	0.5	3.51	2.89	3.06	2.17	2.55
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	65.9	47.1	39.4	29.8	33.5
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	5.26	3.69	2.88	2.37	3.09
2,3,3',4,4',5,5'-HpCB	189	1.0	8.48	5.29	5.02	4.26	5.91
Total TEQ (ND=0)			0.448	0.356	0.359	0.261	0.311
Total TEQ (ND=DL)			0.449	0.357	0.360	0.262	0.312
% Lipids			3.19	2.24	1.90	1.84	2.53
Sample weight (g)			50.1	50.0	50.0	50.2	50.3

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	KNW-WHSS-1	KNW-WHSS-2	KNW-WHSS-3	KNW-WHSS-4	KNW-WHSS-5
3,3',4,4'-TCB	77	0.5	6.48	4.26	7.06	10.6	8.12
2',3,4,4',5-PeCB	123	0.5	5.21	3.84	4.91	9.95	7.25
2,3',4,4',5-PeCB	118	0.5	78.9	52.9	71.3	148	125
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL1.0)	<DL(0.75)
2,3,3',4,4'-PeCB	105	0.5	6.21	5.64	8.95	13.6	10.2
3,3',4,4',5-PeCB	126	0.5	3.98	4.21	6.55	8.35	7.96
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL(2.0)	<DL(1.5)
2,3,3',4,4',5-HxCB	156	1.0	75.4	53.6	101	126	115
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL(2.0)	<DL(1.5)
3,3',4,4',5,5'-HxCB	169	1.0	3.69	2.55	6.94	7.54	8.06
2,3,3',4,4',5,5'-HpCB	189	1.0	8.57	4.95	12.3	16.3	14.6
Total TEQ (ND=0)			0.483	0.480	0.785	0.993	0.951
Total TEQ (ND=DL)			0.484	0.481	0.786	0.995	0.952
% Lipids			3.38	2.72	3.50	6.40	4.03
Sample weight (g)			50.3	50.2	50.2	21.8	36.2

DEP ID congener	IUPAC#	DL ng/kg	KFF-WHS-4	KFF-WHS-6	KFF-WHS-7	KFF-WHS-8	KFF-WHS-9
3,3',4,4'-TCB	77	0.5	2.25	2.56	1.06	2.01	1.59
2',3,4,4',5-PeCB	123	0.5	3.68	2.03	2.58	3.45	3.04
2,3',4,4',5-PeCB	118	0.5	39.8	28.9	21.7	33.5	40.2
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	3.46	2.88	1.56	3.02	2.34
3,3',4,4',5-PeCB	126	0.5	4.59	2.74	3.27	4.15	5.03
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	84.1	42.8	38.1	52.4	61.2
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	3.24	2.05	1.26	2.66	1.59
2,3,3',4,4',5,5'-HpCB	189	1.0	14.6	6.91	8.69	13.5	10.7
Total TEQ (ND=0)			0.540	0.320	0.362	0.473	0.555
Total TEQ (ND=DL)			0.541	0.321	0.363	0.474	0.556
% Lipids			3.98	2.16	1.97	2.37	2.27
Sample weight (g)			49.9	50.1	50.0	49.8	50.1

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	KFF-WHSS-1	KFF-WHSS-2	KFF-WHSS-3	KFF-WHSS-4	KFF-WHSS-5
3,3',4,4'-TCB	77	0.5	5.81	6.08	6.78	5.12	4.71
2',3,4,4',5-PeCB	123	0.5	7.36	9.59	9.01	8.32	5.68
2,3',4,4',5-PeCB	118	0.5	89.7	106	77.2	91.7	69.3
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	4.21	6.33	5.96	5.26	4.75
3,3',4,4',5-PeCB	126	0.5	8.56	13.7	12.4	10.8	6.68
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	130	145	129	106	89.5
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	6.19	8.32	7.94	5.26	7.32
2,3,3',4,4',5,5'-HpCB	189	1.0	28.8	35.9	39.4	41.7	21.8
Total TEQ (ND=0)			0.996	1.542	1.398	1.201	0.797
Total TEQ (ND=DL)			0.997	1.543	1.398	1.202	1.297
% Lipids			4.66	6.97	5.53	5.79	3.91
Sample weight (g)			50.0	50.5	49.7	49.7	49.8

DEP ID congener	IUPAC#	DL ng/kg	KAG-SMB-1	KAG-SMB-2	KAG-SMB-3	KAG-SMB-4	KAG-SMB-5
3,3',4,4'-TCB	77	0.5	2.71	1.45	3.06	3.95	4.21
2',3,4,4',5-PeCB	123	0.5	4.82	2.66	4.15	5.21	4.86
2,3',4,4',5-PeCB	118	0.5	24.6	13.2	20.6	26.3	18.7
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	2.25	1.84	2.88	4.81	3.61
3,3',4,4',5-PeCB	126	0.5	0.89	0.51	0.75	1.06	1.22
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	66.9	32.9	94.2	101	84.7
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	2.27	1.05	1.84	2.33	2.56
2,3,3',4,4',5,5'-HpCB	189	1.0	8.19	4.54	11.6	13.5	6.91
Total TEQ (ND=0)			0.149	0.080	0.145	0.185	0.194
Total TEQ (ND=DL)			0.150	0.081	0.145	0.186	0.195
% Lipids			0.60	0.34	0.62	1.10	1.01
Sample weight (g)			50.0	49.8	50.1	49.8	48.9

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	PBW-SMB-1	PBW-SMB-2	PBW-SMB-3	PBW-SMB-4	PBW-SMB-5
3,3',4,4'-TCB	77	0.5	5.03	6.33	5.21	3.69	4.91
2',3,4,4',5-PeCB	123	0.5	4.81	6.91	3.95	4.78	4.26
2,3',4,4',5-PeCB	118	0.5	112	142	85.7	56.9	95.4
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	5.09	3.84	3.61	4.22	3.06
3,3',4,4',5-PeCB	126	0.5	4.21	5.21	2.59	3.85	2.88
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	123	169	102	71.6	89.4
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	4.35	5.88	3.04	1.91	3.85
2,3,3',4,4',5,5'-HpCB	189	1.0	4.81	5.29	2.77	2.01	4.26
Total TEQ (ND=0)			0.539	0.681	0.351	0.447	0.382
Total TEQ (ND=DL)			0.540	0.681	0.351	0.448	0.383
% Lipids			0.35	0.65	0.31	0.16	0.34
Sample weight (g)			50.0	50.2	49.9	50.0	50.1

DEP ID congener	IUPAC#	DL ng/kg	PBW-SMB-6	PBW-SMB-7	PBW-SMB-8	PBW-SMB-9	PBW-SMB-10
3,3',4,4'-TCB	77	0.5	7.26	7.68	6.41	5.71	5.26
2',3,4,4',5-PeCB	123	0.5	8.01	6.32	7.11	5.66	6.01
2,3',4,4',5-PeCB	118	0.5	164	159	127	131	114
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	6.59	6.01	5.37	4.23	4.68
3,3',4,4',5-PeCB	126	0.5	5.48	5.42	4.78	4.78	3.95
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	184	166	135	158	149
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	6.39	5.98	4.71	5.24	4.32
2,3,3',4,4',5,5'-HpCB	189	1.0	7.15	6.63	5.5	6.09	4.15
Total TEQ (ND=0)			0.723	0.703	0.608	0.625	0.526
Total TEQ (ND=DL)			0.724	0.704	0.608	0.625	0.527
% Lipids			0.71	0.61	0.61	0.55	0.46
Sample weight (g)			50.2	49.7	50.2	49.8	50.0

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	PBL-SMB-1	PBL-SMB-2	PBL-SMB-3	PBL-SMB-4	PBL-SMB-5
3,3',4,4'-TCB	77	0.5	13.6	10.8	12.1	13.0	9.75
2',3,4,4',5-PeCB	123	0.5	29.8	18.9	30.4	24.7	21.9
2,3',4,4',5-PeCB	118	0.5	316	251	288	297	224
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	42.7	29.6	41.6	38.6	33.7
3,3',4,4',5-PeCB	126	0.5	30.6	28.7	32.9	24.1	21.6
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	347	267	321	297	268
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	21.6	16.3	19.4	20.1	15.7
2,3,3',4,4',5,5'-HpCB	189	1.0	18.4	22.2	20.6	17.3	12.1
Total TEQ (ND=0)			3.492	3.200	3.684	2.799	2.481
Total TEQ (ND=DL)			3.492	3.201	3.685	2.799	2.482
% Lipids			1.36	1.13	1.18	1.21	0.85
Sample weight (g)			49.7	50.2	50.1	50.3	49.9

DEP ID congener	IUPAC#	DL ng/kg	PBL-SMB-6	PBL-SMB-7	PBL-SMB-8	PBL-SMB-9	PBL-SMB-10
3,3',4,4'-TCB	77	0.5	10.5	14.7	12.8	15.1	13.2
2',3,4,4',5-PeCB	123	0.5	19.7	21.6	26.7	31.8	25.7
2,3',4,4',5-PeCB	118	0.5	201	275	293	310	284
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	31.6	35.9	26.4	37.9	40.6
3,3',4,4',5-PeCB	126	0.5	29.8	20.7	26.6	30.4	27.9
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	291	322	306	274	351
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	14.3	18.7	20.6	17.4	21.2
2,3,3',4,4',5,5'-HpCB	189	1.0	10.3	14.5	16.3	13.2	19.4
Total TEQ (ND=0)			3.296	2.454	3.057	3.392	3.216
Total TEQ (ND=DL)			3.297	2.455	3.057	3.393	3.217
% Lipids			0.90	0.89	0.94	1.00	1.04
Sample weight (g)			50.2	49.8	49.6	49.8	49.7

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	PBC-SMB-1	PBC-SMB-2	PBC-SMB-3	PBC-SMB-4	PBC-SMB-5
3,3',4,4'-TCB	77	0.5	8.26	13.6	12.4	6.33	10.7
2',3,4,4',5-PeCB	123	0.5	9.12	18.4	14.6	6.12	11.7
2,3',4,4',5-PeCB	118	0.5	178	288	321	135	301
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	11.6	15.1	12.4	5.21	17.3
3,3',4,4',5-PeCB	126	0.5	5.29	11.3	8.95	3.03	15.4
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	285	325	311	148	226
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	16.7	22.4	18.4	9.51	13.4
2,3,3',4,4',5,5'-HpCB	189	1.0	19.4	28.9	21.6	10.6	25.9
Total TEQ (ND=0)			0.861	1.553	1.273	0.488	1.824
Total TEQ (ND=DL)			0.862	1.554	1.273	0.489	1.824
% Lipids			1.00	1.80	1.20	0.41	1.11
Sample weight (g)			50.0	50.0	49.9	49.7	50.4

DEP ID congener	IUPAC#	DL ng/kg	PBC-SMB-6	PBC-WHS-C1	PBC-WHS-C2	PBV-WHS-C1	PBV-WHS-C2
3,3',4,4'-TCB	77	0.5	7.81	12.6	14.6	18.1	16.3
2',3,4,4',5-PeCB	123	0.5	26.3	15.7	19.1	26.7	25.4
2,3',4,4',5-PeCB	118	0.5	247	326	355	589	547
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	35.6	17.2	16.7	21.9	26.9
3,3',4,4',5-PeCB	126	0.5	27.1	13.1	11.3	9.47	8.33
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	286	242	267	524	495
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	15.2	20.4	23.7	26.8	24.6
2,3,3',4,4',5,5'-HpCB	189	1.0	17.6	19.5	18.4	17.7	15.0
Total TEQ (ND=0)			3.038	1.674	1.543	1.544	1.390
Total TEQ (ND=DL)			3.039	1.675	1.544	1.545	1.390
% Lipids			0.94	8.12	9.38	4.63	3.86
Sample weight (g)			50.0	49.7	49.6	49.6	49.8

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	PBV-SMB-1	PBV-SMB-2	PBV-SMB-3	PBV-SMB-4	PBV-SMB-5
3,3',4,4'-TCB	77	0.5	22.1	26.7	12.7	24.7	20.6
2',3,4,4',5-PeCB	123	0.5	36.2	38.7	16.9	31.6	29.8
2,3',4,4',5-PeCB	118	0.5	324	381	167	345	297
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	22.3	25.4	9.95	21.6	18.6
3,3',4,4',5-PeCB	126	0.5	10.7	13.6	4.63	10.4	9.85
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	316	378	165	322	266
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	14.9	16.9	8.33	15.7	13.1
2,3,3',4,4',5,5'-HpCB	189	1.0	30.6	38.7	15.4	35.1	24.7
Total TEQ (ND=0)			1.421	1.769	0.651	1.404	1.288
Total TEQ (ND=DL)			1.421	1.770	0.652	1.405	1.289
% Lipids			0.90	1.19	0.37	0.95	0.78
Sample weight (g)			49.7	49.9	50.0	50.1	50.3

DEP ID congener	IUPAC#	DL ng/kg	PBV-SMB-6	PBV-SMB-7	PBV-SMB-8	PBV-SMB-9	PBV-SMB-10
3,3',4,4'-TCB	77	0.5	16.1	18.7	19.6	22.6	15.7
2',3,4,4',5-PeCB	123	0.5	22.3	26.4	28.3	30.4	18.9
2,3',4,4',5-PeCB	118	0.5	297	301	316	316	267
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	13.2	15.9	16.4	23.6	11.3
3,3',4,4',5-PeCB	126	0.5	6.22	7.31	8.77	10.1	8.33
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	221	207	238	351	247
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	10.6	13.3	14.6	13.7	11.3
2,3,3',4,4',5,5'-HpCB	189	1.0	21.4	25.6	22.9	30.9	18.9
Total TEQ (ND=0)			0.876	1.006	1.182	1.365	1.103
Total TEQ (ND=DL)			0.876	1.007	1.183	1.366	1.103
% Lipids			0.50	0.69	0.77	0.96	0.51
Sample weight (g)			50.2	49.8	49.6	48.2	49.7

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	PBW-WHS-C1	PBW-WHS-C2	PBL-WHS-C1	PBL-WHS-C2
3,3',4,4'-TCB	77	0.5	13.6	10.8	19.6	14.2
2',3,4,4',5-PeCB	123	0.5	20.1	14.7	20.4	16.9
2,3',4,4',5-PeCB	118	0.5	294	254	298	245
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	12.4	13.6	25.7	20.7
3,3',4,4',5-PeCB	126	0.5	11.9	9.55	16.1	18.3
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	291	244	324	281
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	16.3	14.7	26.3	24.3
2,3,3',4,4',5,5'-HpCB	189	1.0	12.9	13.1	21.9	20.9
Total TEQ (ND=0)			1.534	1.255	2.074	2.245
Total TEQ (ND=DL)			1.535	1.255	2.074	2.246
% Lipids			5.68	3.13	10.14	8.43
Sample weight (g)			50.3	50.1	49.9	50.0

DEP ID congener	IUPAC#	DL ng/kg	SFS-SMB-1	SFS-LMB-1	SFS-LMB-2	SFS-LMB-3	SFS-LMB-4
3,3',4,4'-TCB	77	0.5	13.60	20.10	18.60	16.70	12.10
2',3,4,4',5-PeCB	123	0.5	36.40	15.90	25.80	21.90	19.30
2,3',4,4',5-PeCB	118	0.5	42.60	33.70	29.40	22.50	21.60
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	18.90	11.40	14.20	13.60	10.30
3,3',4,4',5-PeCB	126	0.5	5.89	6.21	7.34	8.01	5.22
2,3',4,4',5,5'-HxCB	167	1.0	15.60	10.20	6.94	5.64	4.01
2,3,3',4,4',5-HxCB	156	1.0	21.40	18.30	16.80	13.20	14.90
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	7.63	8.06	4.21	3.66	5.33
2,3,3',4,4',5,5'-HpCB	189	1.0	15.20	14.10	12.60	10.70	9.85
Total TEQ (ND=0)			0.689	0.720	0.795	0.853	0.590
Total TEQ (ND=DL)			0.690	0.721	0.795	0.854	0.591
% Lipids			0.67	0.98	1.18	0.97	0.79
Sample weight (g)			50.2	50.2	50.2	50.1	50.3

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	SWP-SMB-1	SWP-SMB-2	SWP-SMB-3	SWP-SMB-4	SWP-SMB-5
3,3',4,4'-TCB	77	0.5	2.53	6.08	4.62	5.06	6.88
2',3,4,4',5-PeCB	123	0.5	13.80	12.40	10.80	8.41	14.20
2,3',4,4',5-PeCB	118	0.5	12.70	13.90	12.90	10.90	13.70
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	5.51	5.84	5.14	6.33	6.02
3,3',4,4',5-PeCB	126	0.5	<DL	<DL	<DL	<DL	<DL
2,3',4,4',5,5'-HxCB	167	1.0	7.26	7.17	6.31	4.29	7.75
2,3,3',4,4',5-HxCB	156	1.0	24.30	28.60	24.20	18.60	31.60
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	5.07	4.63	3.62	2.58	5.11
2,3,3',4,4',5,5'-HpCB	189	1.0	3.45	3.16	2.09	3.61	2.47
Total TEQ (ND=0)			0.067	0.065	0.052	0.039	0.071
Total TEQ (ND=DL)			0.117	0.116	0.103	0.089	0.122
% Lipids			0.95	0.98	1.00	0.84	1.29
Sample weight (g)			50.0	50.2	50.1	49.9	50.1

DEP ID congener	IUPAC#	DL ng/kg	SCW-SMB-1	SCW-SMB-2	SCW-SMB-3	SCW-SMB-4	SCW-SMB-5
3,3',4,4'-TCB	77	0.5	15.60	24.60	21.40	23.70	19.80
2',3,4,4',5-PeCB	123	0.5	13.90	22.50	15.70	20.90	18.60
2,3',4,4',5-PeCB	118	0.5	82.40	129.00	97.40	115.00	81.30
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	16.70	28.60	18.40	24.70	22.50
3,3',4,4',5-PeCB	126	0.5	12.80	14.30	13.60	15.10	12.20
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	115.00	131.00	124.00	148.00	125.00
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	4.21	6.65	3.87	6.02	5.91
2,3,3',4,4',5,5'-HpCB	189	1.0	16.90	29.80	18.30	27.60	20.20
Total TEQ (ND=0)			1.394	1.585	1.478	1.665	1.358
Total TEQ (ND=DL)			1.395	1.586	1.479	1.666	1.358
% Lipids			0.96	1.87	1.03	1.24	1.05
Sample weight (g)			49.7	49.9	50.2	50.2	50.3

TABLE 3.2 COPLANAR PCB AND DIOXIN TOXIC EQUIVALENTS IN 1999 FISH SAMPLES

DEP ID congener	IUPAC#	DL ng/kg	SCB-SMB-1	SCB-SMB-2	SCB-SMB-3	SCB-SMB-4	SCB-SMB-5
3,3',4,4'-TCB	77	0.5	15.90	16.40	23.50	26.30	18.70
2',3,4,4',5-PeCB	123	0.5	9.98	13.80	11.50	17.10	10.60
2,3',4,4',5-PeCB	118	0.5	26.40	48.90	41.70	54.20	31.90
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	3.11	2.84	2.56	3.31	2.06
3,3',4,4',5-PeCB	126	0.5	5.02	5.68	4.95	6.09	4.71
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	61.40	72.40	78.30	84.20	56.80
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	2.87	3.27	3.61	4.14	2.95
2,3,3',4,4',5,5'-HpCB	189	1.0	7.33	8.06	8.95	10.70	6.36
Total TEQ (ND=0)			0.568	0.646	0.579	0.704	0.536
Total TEQ (ND=DL)			0.568	0.647	0.580	0.704	0.537
% Lipids			0.57	0.76	0.80	0.90	0.53
Sample weight (g)			50.1	50.1	50.1	50.2	50.1

DEP ID congener	IUPAC#	DL ng/kg	SCW-WHS-C1	SCW-WHS-C2	SCB-WHS-C1	SCB-WHS-C2
3,3',4,4'-TCB	77	0.5	22.70	20.80	38.10	35.40
2',3,4,4',5-PeCB	123	0.5	7.93	8.58	29.70	31.60
2,3',4,4',5-PeCB	118	0.5	69.80	79.60	63.90	51.90
2,3,4,4',5-PeCB	114	0.5	<DL	<DL	<DL	<DL
2,3,3',4,4'-PeCB	105	0.5	4.99	5.41	15.40	13.20
3,3',4,4',5-PeCB	126	0.5	7.06	6.72	8.11	10.10
2,3',4,4',5,5'-HxCB	167	1.0	<DL	<DL	<DL	<DL
2,3,3',4,4',5-HxCB	156	1.0	58.30	69.70	113.00	98.70
2,3,3',4,4',5'-HxCB	157	1.0	<DL	<DL	<DL	<DL
3,3',4,4',5,5'-HxCB	169	1.0	8.85	9.41	13.70	12.30
2,3,3',4,4',5,5'-HpCB	189	1.0	14.20	17.30	15.20	14.90
Total TEQ (ND=0)			0.836	0.814	1.021	1.197
Total TEQ (ND=DL)			0.836	0.815	1.021	1.198
% Lipids			7.84	8.27	11.10	9.24
Sample weight (g)			50.3	50.3	49.9	50.0

TABLE 3.3 LENGTHS AND WEIGHTS OF 1999 COPLANAR PCB FISH SAMPLES

field ID	Date	Length mm	Weight gm.
ANDROSCOGGIN RIVER			
Gilead			
AGL-RBT-1	06/03/1999	287	300
AGL-RBT-2	06/03/1999	260	190
AGL-RBT-3	06/03/1999	320	380
AGL-RBT-4	06/03/1999	290	290
AGL-RBT-5	06/15/1999	320	390
AGL-RBT-6	06/15/1999	325	360
AGL-RBT-7	06/15/1999	290	250
AGL-BNT-1	06/15/1999	275	240
AGL-BNT-2	06/15/1999	268	220
AGL-BNT-3	06/15/1999	280	230
AGL-BNT-4	06/15/1999	320	410
AGL-BNT-5	06/15/1999	277	250
ARP-SMB-1	07/19/1999	292	460
ARP-SMB-2	07/22/1999	298	490
ARP-SMB-3	07/22/1999	295	480
ARP-SMB-4	07/22/1999	290	470
ARP-SMB-5	07/22/1999	285	430
ARP-SMB-6	07/22/1999	337	740
ARP-SMB-7	07/22/1999	328	700
ARP-SMB-8	07/22/1999	367	990
ARP-SMB-9	07/22/1999	315	600
ARP-SMB-10	07/22/1999	335	780
ARP-WHS-1	07/20/1999	440	1340
ARP-WHS-2	07/20/1999	440	1330
ARP-WHS-3	07/20/1999	445	1480
ARP-WHS-4	07/20/1999	433	1340
ARP-WHS-5	07/20/1999	442	1450
ARP-WHS-6	07/20/1999	432	1320
ARP-WHS-7	07/20/1999	441	1410
ARP-WHS-8	07/20/1999	450	1510
ARP-WHS-9	07/20/1999	430	1230
ARP-WHS-10	07/20/1999	434	1220
Rumford			
ARF-SMB-1	07/14/1999	295	420
ARF-SMB-2	07/14/1999	305	410
ARF-SMB-3	07/14/1999	284	430
ARF-SMB-4	07/14/1999	292	400
ARF-SMB-5	07/14/1999	289	390
ARF-SMB-6	07/14/1999	295	390
ARF-SMB-7	07/14/1999	302	440
ARF-SMB-8	07/14/1999	283	380
ARF-SMB-9	07/14/1999	286	400
ARF-SMB-10	07/14/1999	282	340

TABLE 3.3 LENGTHS AND WEIGHTS OF 1999 COPLANAR PCB FISH SAMPLES

field ID	Date	Length mm	Weight gm.
Rumford			
ARF-WHS-1	07/15/1999	424	1210
ARF-WHS-2	07/15/1999	433	1320
ARF-WHS-3	07/15/1999	430	1300
ARF-WHS-4	07/15/1999	425	1090
ARF-WHS-5	07/15/1999	422	1220
ARF-WHS-6	07/15/1999	425	1120
ARF-WHS-7	07/15/1999	421	1120
ARF-WHS-8	07/15/1999	443	1500
ARF-WHS-9	07/15/1999	449	1380
ARF-WHS-10	07/15/1999	424	1260
Riley			
ARY-SMB-1	07/08/1999	365	750
ARY-SMB-2	07/08/1999	324	550
ARY-SMB-3	07/08/1999	304	410
ARY-SMB-4	07/08/1999	300	560
ARY-SMB-5	07/08/1999	284	400
ARY-WHS-1	07/08/1999	432	1300
ARY-WHS-2	07/09/1999	440	1400
ARY-WHS-3	07/09/1999	440	1350
ARY-WHS-4	07/09/1999	422	1240
ARY-WHS-5	07/09/1999	423	940
ARY-WHS-6	07/15/1999	444	1580
ARY-WHS-7	07/15/1999	440	1300
ARY-WHS-8	07/15/1999	430	1350
ARY-WHS-9	07/15/1999	444	1520
ARY-WHS-10	07/15/1999	440	1250
Livermore Falls			
ALV-SMB-1	07/08/1999	302	430
ALV-SMB-2	07/08/1999	297	450
ALV-SMB-3	07/27/1999	302	480
ALV-SMB-4	07/27/1999	288	440
ALV-SMB-5	07/27/1999	296	450
ALV-WHS-1	07/27/1999	440	1780
ALV-WHS-2	07/27/1999	443	1710
ALV-WHS-3	07/27/1999	434	1640
ALV-WHS-4	07/27/1999	422	1600
ALV-WHS-5	07/27/1999	420	1440
ALV-WHS-6	07/27/1999	430	1530
ALV-WHS-7	07/27/1999	440	1720
ALV-WHS-8	07/27/1999	437	1680
ALV-WHS-9	07/27/1999	439	1420
ALV-WHS-10	07/27/1999	428	1640

TABLE 3.3 LENGTHS AND WEIGHTS OF 1999 COPLANAR PCB FISH SAMPLES

field ID	Date	Length mm	Weight gm.
Androscoggin Lake			
ALW-SMB-1	07/29/1999	280	440
ALW-SMB-2	07/29/1999	330	660
ALW-SMB-3	08/03/1999	412	1180
ALW-SMB-4	08/03/1999	371	1010
ALW-SMB-5	08/03/1999	420	1380
ALW-WHP-1	07/29/1999	289	500
ALW-WHP-2	07/29/1999	287	460
ALW-WHP-3	07/29/1999	290	550
ALW-WHP-4	07/29/1999	291	540
ALW-WHP-5	07/29/1999	282	490
ALW-WHP-6	07/29/1999	292	560
ALW-WHP-7	07/29/1999	293	560
ALW-WHP-8	07/29/1999	291	490
ALW-WHP-9	07/29/1999	303	550
ALW-WHP-10	07/29/1999	305	610
ALW-WHS-1	07/29/1999	425	1260
ALW-WHS-2	07/29/1999	428	1380
ALW-WHS-3	07/29/1999	437	1480
Turner			
AGI-SMB-1	07/30/1999	300	490
AGI-SMB-2	07/30/1999	295	510
AGI-SMB-3	07/30/1999	285	380
AGI-SMB-4	07/30/1999	299	490
AGI-SMB-5	07/30/1999	327	650
Lisbon Falls			
ALS-SMB-1		322	610
ALS-SMB-2		302	570
ALS-SMB-3		315	660
ALS-SMB-4		398	1180
ALS-SMB-5		358	890
KENNEBEC RIVER			
Norridgewock			
KNW-SMB-3	09/08/1999	319	600
KNW-SMB-4	09/08/1999	322	580
KNW-SMB-6	09/08/1999	319	560
KNW-SMB-7	09/08/1999	310	620
KNW-SMB-9	09/08/1999	327	600
KNW-WHS-2	09/08/1999	440	1500
KNW-WHS-3	09/08/1999	438	1500
KNW-WHS-7	09/08/1999	442	1340
KNW-WHS-8	09/08/1999	424	1550
KNW-WHS-9	09/08/1999	424	1500

TABLE 3.3 LENGTHS AND WEIGHTS OF 1999 COPLANAR PCB FISH SAMPLES

field ID	Date	Length mm	Weight gm.
Norridgewock			
small suckers			
KNW-WHSS-1		216	180
KNW-WHSS-2	09/09/1999	202	90
KNW-WHSS-3	09/09/1999	137	25
KNW-WHSS-4	09/09/1999	156	40
KNW-WHSS-5	09/09/1999	205	100
Fairfield			
KFF-SMB-1	09/05/1999	320	580
KFF-SMB-2	09/06/1999	312	540
KFF-SMB-3	09/06/1999	305	500
KFF-SMB-4	09/06/1999	305	500
KFF-SMB-5	09/06/1999	313	415
KFF-WHS-4	09/06/1999	435	1040
KFF-WHS-6	09/06/1999	441	1090
KFF-WHS-7	09/06/1999	437	1210
KFF-WHS-8	09/06/1999	436	1010
KFF-WHS-9	09/06/1999	420	1020
small suckers	09/06/1999		
KFF-WHS-11	09/06/1999	259	220
KFF-WHS-12	09/06/1999	240	160
KFF-WHS-13	09/06/1999	240	150
KFF-WHS-14	09/06/1999	215	100
KFF-WHS-15	09/06/1999	200	90
Augusta			
KAG-SMB-1	08/09/1999	329	660
KAG-SMB-2	08/09/1999	333	680
KAG-SMB-3	08/09/1999	326	580
KAG-SMB-4	08/09/1999	300	560
KAG-SMB-5	08/09/1999	321	620
PENOBSCOT RIVER			
Woodville			
PBW-SMB-1	08/26/1999	351	485
PBW-SMB-2	08/26/1999	426	900
PBW-SMB-3	09/21/1999	334	490
PBW-SMB-4	09/21/1999	360	520
PBW-SMB-5	09/21/1999	365	550
PBW-SMB-6	09/22/1999	340	550
PBW-SMB-7	09/22/1999	330	520
PBW-SMB-8	09/22/1999	332	440
PBW-SMB-9	09/22/1999	351	560
PBW-SMB-10	09/23/1999	351	560

TABLE 3.3 LENGTHS AND WEIGHTS OF 1999 COPLANAR PCB FISH SAMPLES

field ID	Date	Length mm	Weight gm.
Woodville			
PBW-WHS-1	08/26/1999	418	790
PBW-WHS-2	08/26/1999	402	750
PBW-WHS-3	08/26/1999	404	750
PBW-WHS-4	08/26/1999	401	650
PBW-WHS-5	08/26/1999	419	720
PBW-WHS-6	08/26/1999	385	610
PBW-WHS-7	08/26/1999	390	620
PBW-WHS-8	09/04/1999	457	1050
PBW-WHS-9	09/21/1999	429	800
PBW-WHS-10	09/21/1999	392	660
Lincoln			
PBL-SMB-1	08/25/1999	352	620
PBL-SMB-2	08/25/1999	350	560
PBL-SMB-3	08/25/1999	330	530
PBL-SMB-4	09/01/1999	347	640
PBL-SMB-5	09/02/1999	385	850
PBL-SMB-6	09/02/1999	380	800
PBL-SMB-7	09/02/1999	380	750
PBL-SMB-8	09/02/1999	410	890
PBL-SMB-9	09/29/1999	338	540
PBL-SMB-10	09/30/1999	362	680
PBL-WHS-1	08/25/1999	248	190
PBL-WHS-2	08/25/1999	220	125
PBL-WHS-3	08/26/1999	303	320
PBL-WHS-4	08/26/1999	301	360
PBL-WHS-5	09/01/1999	369	600
PBL-WHS-6	09/01/1999	384	700
PBL-WHS-7	09/02/1999	410	800
PBL-WHS-8	09/02/1999	400	780
PBL-WHS-9	09/02/1999	350	510
PBL-WHS-10	09/02/1999	370	660
Costigan			
PBC-SMB-1	08/31/1999	445	1050
PBC-SMB-2	08/31/1999	465	1400
PBC-SMB-3	09/01/1999	385	830
PBC-SMB-4	09/03/1999	335	510
PBC-SMB-5	09/03/1999	435	1100
PBC-SMB-6	09/03/1999	325	490

TABLE 3.3 LENGTHS AND WEIGHTS OF 1999 COPLANAR PCB FISH SAMPLES

field ID	Date	Length mm	Weight gm.
Costigan			
PBC-WHS-1	08/31/1999	500	1300
PBC-WHS-2	08/31/1999	455	1150
PBC-WHS-3	08/31/1999	460	1050
PBC-WHS-4	08/31/1999	470	1050
PBC-WHS-5	08/31/1999	520	1250
PBC-WHS-6	08/31/1999	375	600
PBC-WHS-7	08/31/1999	487	1050
PBC-WHS-8	08/31/1999	527	1325
PBC-WHS-9	08/31/1999	470	1175
PBC-WHS-10	08/31/1999	426	900
Veazie			
PBV-SMB-1	08/20/1999	305	330
PBV-SMB-2	08/31/1999	310	350
PBV-SMB-3	08/31/1999	365	505
PBV-SMB-4	08/31/1999	392	520
PBV-SMB-5	08/31/1999	348	540
PBV-SMB-6	09/01/1999	300	300
PBV-SMB-7	09/01/1999	300	310
PBV-SMB-8	09/02/1999	313	390
PBV-SMB-9	09/03/1999	309	360
PBV-SMB-10	09/03/1999	328	440
PBV-WHS-1	08/31/1999	270	230
PBV-WHS-2	09/01/1999	333	320
PBV-WHS-3	09/02/1999	308	380
PBV-WHS-4	09/03/1999	300	320
PBV-WHS-5	09/03/1999	340	520
PBV-WHS-6	09/03/1999	266	240
PBV-WHS-7	09/15/1999	342	460
PBV-WHS-8	09/15/1999	334	510
PBV-WHS-9	09/16/1999	353	510
PBV-WHS-10	09/17/1999	334	510
SALMON FALLS RIVER			
S. Berwick			
SFS-SMB-1	07/01/1999	268	320
SFS-SMB-2	07/02/1999	375	860
SFS-LMB-1	09/21/1999	350	590
SFS-LMB-2	09/21/1999	307	470
SFS-LMB-3	09/21/1999	268	310
SFS-LMB-4	09/21/1999	258	240
SFS-PKL-1	07/07/1999	565	1480
SFS-WHS-1	07/02/1999	440	1120
SFS-WHS-2	07/02/1999	484	1550

TABLE 3.3 LENGTHS AND WEIGHTS OF 1999 COPLANAR PCB FISH SAMPLES

field ID	Date	Length mm	Weight gm.
SEBASTICOOK RIVER			
W BR -Palmyra			
SWP-SMB-1	09/08/1999	416	840
SWP-SMB-2	09/08/1999	310	390
SWP-SMB-3	09/08/1999	300	320
SWP-SMB-4	09/08/1999	310	400
SWP-SMB-5	09/08/1999	325	450
ST CROIX R			
Woodland above			
SCW-SMB-1	08/23/1999	329	580
SCW-SMB-2	08/23/1999	304	400
SCW-SMB-3	08/23/1999	311	460
SCW-SMB-4	08/23/1999	353	620
SCW-SMB-5	08/23/1999	366	760
SCW-WHS-1	08/23/1999	454	1010
SCW-WHS-2	08/23/1999	446	1040
SCW-WHS-3	08/23/1999	451	1000
SCW-WHS-4	08/23/1999	450	1080
SCW-WHS-5	08/23/1999	744	990
SCW-WHS-6	08/23/1999	452	1110
SCW-WHS-7	08/23/1999	453	1080
SCW-WHS-8	08/23/1999	450	1050
SCW-WHS-9	08/23/1999	453	1080
SCW-WHS-10	08/23/1999	449	1080
Baring			
SCB-SMB-1	8/24/99	320	660
SCB-SMB-2	8/24/99	325	680
SCB-SMB-3	8/24/99	331	740
SCB-SMB-4	8/24/99	316	640
SCB-SMB-5	8/24/99	321	680
SCB-WHS-1	8/24/99	453	2000+
SCB-WHS-2	8/24/99	440	1790
SCB-WHS-3	8/24/99	452	2000+
SCB-WHS-4	8/24/99	446	1760
SCB-WHS-5	8/24/99	454	1990
SCB-WHS-6	8/24/99	450	1920
SCB-WHS-7	8/24/99	440	1860
SCB-WHS-8	8/24/99	454	1910
SCB-WHS-9	8/24/99	430	1620
SCB-WHS-10	8/24/99	460	2000+

3.2

DDT IN FISH

DDT IN FISH

Results from previous SWAT fish tissue monitoring found significant levels of DDT and metabolites in fish from 4 streams in Aroostook County. While some more intensive sampling has been conducted on 3 of those, additional sampling is needed to determine the extent of contamination in other rivers and streams in the St. John River watershed. Ten omnivorous fish and 10 piscivorous fish were to be collected from each of 10 rivers and streams in the county and analyzed as 2 composite samples each for DDT and metabolites. We were unable to collect fish from any river or stream. This study will be conducted in 2000.

3.3

EFFECTS-BASED FISH STUDY

EFFECTS-BASED FISH STUDY

This study was to examine direct cummulative effects to fish of long term exposure to relatively low levels of contaminants. These responses to pollutant challenge are often within the same magnitude as natural variation and therefore difficult to measure with the methods that are currently used. Many new techniques have been developed to measure some of these effects.

In 1999 Environment Canada (EC) initiated a large 3 year study of the St John River watershed with focus on the upper river from the headwaters to Grand Falls during the first year. A variety of studies were performed, including 1. On-station flow-through bioassay with fathead minnows, 2. A invertebrate mesocosm study, 3. Laboratory studies of the responses of fish to changes in effluents before and after process changes, and 4. In-stream invertebrate and fish monitoring.

In cooperation with the EC study of the St John River, DEP chose the North Branch of Presque Isle Stream and Prestile Stream in Maine for in-depth studies of fish populations. Due to high rainfall and resulting stream flows we were unable to collect enough fish from the latter two streams. Later in the fall, working with Environment Canada, we were able to collect slimy sculpins from the St. John River downstream of the Fraser Paper Inc. paper mill in Madawaska, where whole effluent toxicity (WET) test data indicate a discharge highly toxic to the water flea, *Ceriodaphnia dubia,* one of DEP's two standard test species. Environment Canada performed all evaluations, including assessments of population age, growth, and sex structure, condition factors, gonadosomatic indices, hepatosomatic indices, circulating sex-steroids and detoxification (mixed function oxidase- MFO) enzymes.

The sex steroid and MFO data are not yet available. The only possible negative impacts measured in sculpins so far were an increased liver size in males and decreased gonad size in females compared to the St. Hilaire reference station and other Canadian reference stations. A reference station near Ft Kent reference station showed similar effects to that downstream of the paper mill suggesting possible sources of toxic contaminants in the upper river. Therefore, in 2000, this study will be conducted at stations on the St John River upstream of Ft. Kent to try to determine other sources. In addition DEP and EC will attempt to perform these studies on the two streams unsuccessfully sampled in 1999.

TABLE 3.3.1 Length, weight, and age of adult slimy sculpin at 3 reference sites upstream and a study site downstream of Fraser Paper pulp mill discharge to the St John River in Edmundston, NB (mean +- sem, n letters denote significant differences at p=0.05)

SEX	SITE	LENGTH mm	WEIGHT g	AGE y
male	ref 3	67.0+-2.0 (23)A	2.80+-0.44 (23)A	1.3+-0.2 (21)A
	ref 2	68.9+-1.1 (71)A	3.13+-0.15 (62)A	1.5+-0.1 (62)A
	ref1	85.1+-2.1 (19)B	6.43+-0.44 (19)B	2.3+-0.2 (19)B
	study	76.0+-1.5 (21)C	4.53+-0.22 (21)C	1.5+-0.2 (17)A
female	ref 3	62.4+-1.8 (21)A	2.09+-0.17 (21)A	1.4+-0.1 (18)A
	ref 2	60.9+-1.3 (42)A	2.02+-0.12 (42)A	0.6+-0.1 (36)B
	ref1	73.5+-1.9 (22)B	3.60+-0.25 (22)B	1.5+-0.2 (19)A
	study	65.5+-1.5 (26)A	2.84+-0.18 (26)C	0.8+-0.1 (26)B

TABLE 3.3.2 LSI, GSI, and K of adult slimy sculpin at 3 reference sites upstream and a study site downstream of Fraser Paper pulp mill discharge to the St John River in Edmundston, NB (mean +- sem, n letters denote significant differences at p=0.05)

SEX	SITE	LSI	GSI	K
male	ref 3	0.98+-0.05 (23)A	1.17+-0.06 (23)A	0.85+-0.02 (23)A
	ref 2	0.92+-0.06 (66)A	1.29+-0.06 (66)A	0.91+-0.01 (66)A
	ref1	1.17+-0.04 (19)AB	1.46+-0.07 (19)A	1.01+-0.02 (19)B
	study	1.48+-0.09 (17)B	1.24+-0.08 (17)A	1.02+-0.02 (17)B
female	ref 3	2.40+-0.78 (21)A	1.38+-0.10 (21)*	0.83+-0.02 (21)A
	ref 2	2.08+-0.16 (36)A	2.49+-0.24 (36)*	0.87+-0.02 (36)A
	ref1	2.96+-0.14 (19)A	4.53+-0.50 (19)*	0.97+-0.02 (19)B
	study	2.87+-0.19 (26)A	2.78+-0.34 (26)*	0.98+-0.02 (26)B

LSI=100(liver weight/body weight
GSI=100(gonad weight/body weight

TABLE 3.3.3 Length, weight, and age of adult slimy sculpin at 2 reference sites upstream and a study site downstream of Fraser Paper paper mill discharge to the St John River in Madawaska, Maine (mean +- sem, n letters denote significant differences at p=0.05)

SEX	SITE	LENGTH mm	WEIGHT g	AGE y
male	ref 3	67.0+-2.0 (23)A	2.80+-0.44 (23)A	1.3+-0.2 (21)A
	ref 2	68.9+-1.1 (71)A	3.13+-0.15 (71)A	1.5+-0.1 (62)A
	study	67.2+-3.3 (19)A	3.22+-0.50 (19)A	1.1+-0.3 (19)A
female	ref 3	62.4+-1.8 (21)A	2.09+-0.17 (21)A	1.4+-0.1 (18)A
	ref 2	60.9+-1.3 (42)A	2.02+-0.12 (42)A	0.6+-0.1 (36)B
	study	63.3+-2.2 (12)A	2.28+-0.23 (12)A	0.3+-0.2 (12)B

TABLE 3.3.4 LSI, GSI, and K of adult slimy sculpin at 2 reference sites upstream and a study site downstream of Fraser Paper paper mill discharge to the St John River in Madawaska, Maine (mean +- sem, n letters denote significant differences at p=0.05)

SEX	SITE	LSI	GSI	K
male	ref 3	0.96+-0.05 (23)AB	1.17+-0.06 (23)A	0.85+-0.02 (23)A
	ref 2	0.92+-0.06 (66)A	1.29+-0.06(66)A	0.91+-0.01 (66)AB
	study	1.37+-0.15 (19)B	1.28+-0.16 (19)A	0.93+-0.02 (19)B
female	ref 3	2.40+-0.78 (21)A	1.38+-0.10 (21)AC	0.83+-0.02 (21)A
	ref 2	2.08+-0.16 (36)A	2.55+-0.24 (35)B	0.87+-0.02 (36)A
	study	1.54+-0.14 (12)A	1.28+-0.12 (12)C	0.87+-0.02 (12)A

LSI=100(liver weight/body weight
GSI=100(gonad weight/body weight

3.4

PCB IN RIVERS AND STREAMS

PCB IN RIVERS AND STREAMS

Previous SWAT studies measured high PCB concentrations in fish from some river and streams. To help identify sources we have been using an ELISA procedure to assay for PCBs in sediments from sites that are suspect. This assay reacts with other Aroclors with the same(1260) or lesser sensitivity. In sediment samples, the assay detects 50 to 500 ppb of Aroclor 1254; the detection limit for other Aroclors is lower. It is particularly useful as a screening assay because the costs of $10-20/ sample is much less than a chemical assay and allows one to survey suspect areas with chemical assay follow-up as indicated.

In past years we have assayed samples of sediment from Portland Harbor at the mouth of the Fore river and found levels from 116 to 790 ppb. Soils in areas of residential access contaminated at these levels would likely be recommended for remediation. PCBs are highly bioaccumulative, so we expect that benthic feeders would be taking them up. We also ran samples of sediments from Boothbay Harbor in response to a concern that storage of electrical transformers in a structure near the bay might have resulted in contamination. However, levels here ran from 45 to 125 ppb, too low to be judged a problem without further testing.

In 1999 we sampled sediment from Goosefare Brook, Great Works River, and the Salmon Fall River, where fish had relatively high levels of PCBs. None of the sediment samples were above background. We also sampled the Kennebec River and tribs in the Augusta area. We have previously found the highest levels of contamination in freshwater fish in Maine from the Kennebec, that resulted in a no consumption fish advisory. None of the trib sediment samples were greater than background. However, two samples taken from the Kennebec River near shore at the Augusta public boat ramp on the east side of the river were elevated. One sample was in excess of 0.5 ppm. Given the fact that the sediment is not dried-only pressed between paper towels-and the sediment extraction efficiency is about 85% on average, the true level may approach one ppm. This impressed us particularly because the sample was largely sand--- and PCBs bind to organic material, not to minerals. Additional samples will be collected from the river in 2000 and analyzed to map contamination in sediments.

It is suspected that elevated PCB levels in coastal eagles in Maine may be contributing to a lowered reproductive rate in these animals. One of the sites that may be contributing PCB contaminated fish to these eagles is a former U.S.Navy installation in the Winter Harbor area. We sampled sediment in six brooks in strategic areas encompassing the navy site. All of these samples were below the detection level of this assay.

3.5

XENOESTROGENS

XENOESTROGENS

The following report is for preliminary work conducted at no charge in 1999. Funds allocated for this study have been reallocated for a study, 'Investigation of the Estrogenic potential of Agrochemicals and their effect on Altlantic salmon (*Salmo salar*)'.

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Introduction: Endocrine disruptors are exogenous compounds which mimic the effects of steroid hormones, and have been shown to have detrimental effects on wildlife (fishes, birds, reptiles) and humans. Included in this group are the dioxins (which act as estrogen antagonists), some PCBs, DDE (a metabolite of DDT) and numerous other compounds used in quantity in many industries. Environmental estrogens have biological activity qualitatively similar to that of endogenous estrogens. Exposure to these compounds is known to affect the development and sexual maturation of vertebrates and, like dioxins, these have also been implicated as cancer promoters.

Vitellogenin (VTG), a serum phospholipoprotein precursor to yolk proteins, is a widely-used biomarker for the presence of environmental estrogens. Vitellogenin is synthesized and secreted by the liver in response to circulating estrogens in maturing females. It is not normally expressed in males, nor in the plasma of immature females. The use of vitellogenin as a biomarker has been explored in several fish species and both *in vitro* and *in vivo* assays have been developed.

Methods: White sucker *(Catostomus commersoni*) were collected from the Penobscot River at three sites: (1) south of Lincoln; (2) south of Weldon Dam; (3) Greenbush at Costigan, an upstream control for the James River Plant. The Lincoln site is just south of the Lincoln Paper Mill. Weldon Dam is a reference site. The Greenbush site is upstream of the James River plant, about 20 miles downstream of Lincoln. Fish were measured (head to tail), weighed and their gender recorded. Blood was collected from individual fish into syringes containing anticoagulants and protease inhibitors. Blood cells were removed by low-speed centrifugation and the plasma frozen at -80^{0}C in the presence of protease inhibitors.

Determination of VTG levels was done using a capture ELISA. Antibodies (AA-1 and BN-5) to VTG were obtained from Biosense (Bergen, Norway); HL1473 and HL1149 from Dr. N. Denslow, University of Florida (Gainesville, FL). AA-1 is a polyclonal antibody made against Atlantic salmon (*Salmo salar*)VTG; BN-5 is an affinity-purified monoclonal Ab also made to Atlantic salmon; HL1473 was made to brown bullhead and HL1149 to carp. The positive control was plasma from estradiol-induced Atlantic salmon (Biosense). Antibodies were diluted at 1:100, 1:1000 or 1:10,000. In the capture ELISA method, the plate was first coated with a primary antibody, then the VTG sample added, followed by a second primary antibody. Finally, the secondary antibody, conjugated to horseradish peroxidase is added. The presence of VTG is indicated by a colorimetric change at 492nm on using an ELISA plate reader.

Results and Discussion: Data are summarized in Table I. Twenty-four fish were analyzed, including five males and nineteen females. Values were low for all samples. No significant gender-specific differences were observed. We also looked for correlations of VTG levels with specific sites. Levels of VTG were lowest in fish collected south of the Weldon Dam (SWD) for both males and females. Sample size, however, was very small here (1 male and 3 females). In an attempt to optimize the ELISAs, mABs HL1473 and HL1149 were used in place of the BN-5 antibody. Both gave values of zero with the Atlantic salmon positive control, indicating that these antibodies from brown bullhead and carp do not cross react with salmon.

Our hypothesis was that the highest levels of VTG would be found in gravid female fish and that male fish collected south of Lincoln would have elevated levels of VTG relative to males from reference sites. Our data indicate that levels are very low in all the fish and not significantly different among sites or between males and females. It is likely that the use of a heterologous antibody did not allow for optimum detection of the white sucker VTG. Although these proteins are fairly well conserved, previous studies suggest that there is low Ab cross reactivity between species. A second explanation may be that VTG is being expressed in males at both the SL and GBC sites, both of which are downstream of Lincoln Pulp and Paper. However, since the sample numbers are low and the data are so variable, we are not able to confidently interpret these data.

Table I. Results of Capture ELISAs on plasma from Penobscot River White Sucker (*Catostomus clarkii*)

Sample	Description	Absorbance at 492 nm (ELISA)
SL2-092397	male	0.011
SL8-092397	male	0.023
SL6-092397	female	0.024
SL10-092397	female	0.018
SL3-092397	female, gravid	0.025
SL4-092397	female, gravid	0.034
SL5-092397	female, gravid	0.033
SL7-092397	female, gravid	0.013
SL9-092397	female, gravid	0.021
SL11-092397	female, gravid	0.018
GBC6-090997	male	0.025
GBC7-090997	male	0.016
GBC8-090997	female	0.036
GBC1-090997	female, gravid	0.012
GBC2-090997	female, gravid	0
GBC9-090997	female, gravid	0.038
GBC10-090997	female, gravid	0.003
GBC11-090997	female, gravid	0.015
GBC12-090997	female, gravid	0.006
GBC13-090997	female, gravid	0.011
SWD2-090497	male	0
SWD1-090497	female, gravid	0.010
SWD3-090497	female, gravid	0.005
SWD4-090497	female, gravid	0

SL, south of Lincoln; GBC, Greenbush at Costigan; SWD, south of the Weldon dam. The Lincoln site is just south of the Lincoln Paper Mill. Weldon Dam is a reference site. The Greenbush site is upstream of the James River plant, about 20 miles downstream of Lincoln.

3.6

AMBIENT BIOLOGICAL MONITORING

Ambient Biological Monitoring

Thirty-eight stations were sampled during the 1999 field season to evaluate benthic macroinvertebrate communities for evidence of impairment due to toxic contamination. Biological monitoring in 1999 was concentrated in the St. John and Presumpscot River Basins, in keeping with the Land and Water Bureau Five- Year Basin sampling rotation. The station list is essentially unchanged from that proposed in the 1999 SWAT Workplan, except for minor substitutions. These substitutions include a selection of small agricultural streams located in the St. John Basin.

Table 3.6.1 summarizes the results of biological monitoring activities for the 1999 SWAT Program, which are sorted by waterbody name. Since waterbodies are sometimes sampled in more than one location, each sampling event was assigned a "LOG" number and each sampling location was assigned a "Station Number", which are listed on Table 3.6.1. Table 3.6.1 also includes a "Map" number for each sampling event. Using the "Map" number and the "Station Number", locations of each sampling location can be found on Maps 1 – 12. Individual data reports for each sampling event (Key Reports) a presented following the summary table and maps. Use the "LOG" number of each sampling event to identify the correct Key Report. NPS denotes non-point source runoff or pollution.

Results Summary

- Thirty-eight stations were assessed for the condition of the benthic macroinvertebrate community.
- Twelve of the thirty-eight stations fail to attain the minimum aquatic life standards of their assigned class.
- Four of the twelve non-attainment sites have a probable urban non-point source toxic problems.
- Probable causes explaining the remaining eight non-attainment sites include: non-point source enrichment, possible non-toxic problems, hazardous waste contamination, and one station with a probable agricultural non-point source toxic problem.
- Twenty-six of the thirty-eight sampled stations meet or exceed the aquatic life standards of their legally assigned class.
- Seven of the sampled stations exhibit natural aquatic communities (Class A).

TABLE 3.6.1 - 1999 SWAT Benthic Macroinvertebrate Biomonitoring Results

Waterbody	Map	Station	LOG	Town	Location	Issue*	Legal Class/ Model Class	Attains Class	Probable Cause*
Aroostook River	1	S369	766	Caribou	above	Control	C/B	Y	Exceeds Class
Aroostook River	1	S370	767	Caribou	below	Municipal	C/C	Y	
Barberry Brook	6	S387	799	S. Portland	below	Urban NPS	C/NA	**N**	**NPS Toxics**
Capisic Brook	6	S256	792	Portland	above	Control	B/C	**N**	
Capisic Brook	6	S257	793	Portland	below	Urban NPS	B/NA	**N**	**NPS Toxics**
Caribou Stream	1	S96	769	Caribou	above	Control	B/A	Y	Exceeds Class
Caribou Stream	1	S95	770	Caribou	below	Urban NPS	B/B	Y	Note: unusually high wat during sampling
Cole Brook	12	S316	809	Gray	above	Control	B/A	Y	Exceeds Class
Cole Brook	12	S317	810	Gray	below	Agric NPS	B/C	**N**	NPS Enrichment; Possib Toxics
Dennys River	9	S297	814	Meddybemps	below	HazMat site	AA/C	**N**	Possible NPS Toxics; La Outlet
Dudley Brook	10	S215	768	Chapman	below	Agric NPS	B/C	**N**	Possible NPS Toxics
Fish River	3	S373	771	Wallagrass	above	Reference	B/B	Y	
Fish River	3	S371	773	Fort Kent	below	Urban NPS	B/B	Y	
Fish River	3	S372	772	Wallagrass	below	Reference	B/B	Y	
Hardwood Brook	11	S378	781	Presque Isle	below	Agric NPS	B/A	Y	Exceeds Class
Mousam River	7	S388	800	Sanford	above	Control	C/B	Y	Exceeds Class
Mousam River	7	S259	801	Sanford	below	Landfill; NPS	C/C	Y	
Mousam River	7	S275	804	Sanford	below	Municipal; NPS	C/C	Y	
Mousam River	7	S390	802	Sanford	below	Urban NPS	C/B	Y	Exceeds Class
Mousam River	7	S391	803	Sanford	below	Municipal; NPS	C/A	Y	Exceeds Class
Ohio St. Stream	5	S312	790	Bangor	below	Urban NPS	B/C	**N**	**NPS Toxics**
Ohio St. Stream	5	S384	791	Bangor	below	Urban NPS	B/NA	**N**	**NPS Toxics**
Prestile Stream	4	S99	774	Mars Hill	above	NPS	B/B	Y	
Prestile Stream	4	S3	775	Blaine	below	NPS; Municipal	B/B	Y	
Prestile Stream	4	S4	815	Easton	below	Waste water	A/C	**N**	NPS Enrichment
Pretty Brook	4	S374	776	Westfield	above	Control	A/A	Y	
Pretty Brook	4	S458	777	Mars Hill	below	Agric NPS	A/B	**N**	Possible NPS Enrichme
Red Brook	6	S218	796	Scarborough	above	Control	C/B	Y	Exceeds Class
Red Brook	6	S219	797	Scarborough	below	Landfill; NPS	C/NA	**N**	Possible NPS Toxics
Rocky Brook	4	S375	778	Mars Hill	below	Agric NPS	B/B	Y	
Sheepscot River	8	S74	808	N. Whitefield	above	Reference	AA/A	Y	
St. John River	2	S187	762	Grand Isle	above	Industrial	C/B	Y	Exceeds Class
St. John River	3	S8	764	Fort Kent	above	Control	A/B	**N**	Possible NPS Enrichme
St. John River	2	S186	761	Van Buren	below	Industrial/ Municipal	C/C	Y	
St. John River	2	S368	763	Madawaska	below	Industrial	C/B	Y	Exceeds Class
St. John River	3	S9	765	Fort Kent	below	Municipal	B/B	Y	
Trout Brook	6	S302	798	S. Portland	below	Urban NPS	C/C	Y	Note: Best Professiona Judgement
W.Br. Sheepscot	8	S268	807	Weeks Mills	above	Reference	AA/A	Y	

1999 SWAT MONITORING PROGRAM REPORT

PART 4 SPECIAL STUDIES

4.1 KINGFISHERS AS A UNIVERSAL INDICATOR

PRINCIPAL INVESTIGATORS	David Evers, BRI
	Oxana Lane, BRI
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4.2 EEL STUDY

PRINCIPAL INVESTIGATOR	Barry Mower

4.3 SPMDS

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4.4 LANDSCAPE CONTROL OF MERCURY

PRINCIPAL INVESTIGATOR	STEVE KAHL, WRI, UM

4.1

KINGFISHER AS A UNIVERSAL INDICATOR

KINGFISHERS AS A UNIVERSAL INDICATOR OF EXOSURE ASSESSING METHYLMERCURY AVAILABILITY IN MAINE'S AQUATIC SYSTEMS WITH THE BELTED KINGFISHER, 1998-99.

David Evers and Oxana Lane, BioDiversity Research Institute

Mercury and other aquatic-based persistent bioaccumulative toxic contaminants are prevalent in Maine's freshwater and marine environments. Making comparisons between various ecosystems over a large geographic range requires the use of a standardized method. Species accumulate contaminants differently and, to date, the state of Maine has not identified either a single species or method that enables a fair comparison of all environments.

1. Kingfisher natural history: The Belted Kingfisher (*Ceryle alcyon*) is a relatively common and widely distributed obligate piscivore. It inhabits a diversity of breeding habitats ranging from small streams to large rivers, ponds to large lakes and reservoirs, emergent wetlands, estuaries, and marine environs. It feeds on small prey items that are generally 14 cm or less. Adult male kingfishers may be permanent residents on territories with yearround water access (e.g., rivers and estuaries). In ice-locked territories, females generally return first after migration. Maine nesting pairs inhabit their breeding territory from mid April into early August. Nesting and foraging territories are strongly defended by both sexes against conspecifics (Davis 1982). Territory size depends on nest and food availability and juxtaposition of feeding areas. Nest burrows are in open banks and can be accessed for repeated sampling of the young. Both sexes share the 24 day incubation of 5-7 eggs. Nesting typically begins in early to mid May. Hatching occurs by early to mid June and within another 4 weeks young leave the nest burrow. The average brood of 4 fledglings typically remain within 300-500 m of the nest burrow for the next 3-4 weeks, frequently being fed by their parents (D. Albano, pers. comm.).

2. Mercury exposure to kingfishers: The diet of fish and crayfish puts the Belted Kingfisher at-risk from persistent bioaccumulative toxins such as mercury. The co-authors have collected small cyprinnids (5-15 cm) from 4 reservoirs and 4 natural lakes in northwestern Maine. Their mean Hg levels were 0.3 ppm and some individuals contained over 1 ppm (i.e., Flagstaff Lake) (Evers and Reaman 1998). Blood Hg levels measured for kingfishers on Flagstaff and Chesuncook reservoirs (2.12 ppm) were 60% higher than those found on Maine natural lakes (1.26 ppm) (BioDiversity Research Institute unpubl. data).

The USEPA estimates a high intake of methylmercury (MeHg) for kingfishers (40 ug of MeHg per kg of body weight per day) - nearly 3x higher than the Osprey (*Pandion haliaetus*) and the Bald Eagle (*Haliaeetus leucocephalus*) (USEPA 1997). These estimates are based on average fish Hg levels of 0.08 ppm and a daily uptake of 75 g of fish. Mean Maine fish Hg levels are generally well above this and D. Albano (pers. com.) estimates that daily food uptake may be as much as 75-150 g of fish. Therefore, kingfishers are suitable indicators of MeHg availability and potentially other bioaccumulative contaminants.

Results: We captured Belted Kingfishers and their prey at 4 major habitat types: marine, estuary, riverine, and upper watershed lakes (separated into natural and impoundments). From May to July, 1998-99 we sampled from 46 nests and captured and collected blood samples from 38 adult and 106 juvenile kingfishers (Table 1). A total of 32 prey fish were collected at the burrow during capture of a parent. These prey items provided insight into species and size of prey for later prey capture in the kingfisher's territory.

Table 1. Sampling efforts for kingfishers, 1998-99.

Habitat Type	***No. nests sampled***		***No. Belted Kingfisher[4]***				***No. Prey Items***			
			Adult[1]		***Juvenile[2]***		***nest***		***territory***	
	98	99	98	99	98	99	98	99	98	99
Marine (Casco Bay)	2	2	2	2	6	2	1	1	20	0[3]
Estuary (Mmtg Bay)	6	2	8	1	27	8	12	1	123	0[3]
Riverine (Andro/Ken)	3	13	3	9	2	20	0	12	0	31
Natural Lakes	1	3		2	7	1	0	3	0	22
Reservoirs (Flag/Azis.)	8	6	8	3	23	10	0	2	6[3]	0
Total	**20**	**26**	**21**	**17**	**65**	**41**	**13**	**19**	**143**	**55**

[1]Represents the number of adults for which blood and feather samples were collected.
[2]Represents the number of blood samples collected from juveniles, several of these sampled are pooled within a brood
[3]Prey were collected in kingfisher territories in past years for a loon-Hg study by BioDiversity Research Institute
[4]A total of 9 kingfisher eggs were also collected.

The mean adult and juvenile blood mercury for reservoir and riverine sample sites (both from a known high mercury site in the Flagstaff Lake area) tended to be higher than marine and estuarine sites. Mean juvenile blood mercury levels in upper watershed lakes were six times higher than coastal areas (Table 2). Juvenile blood mercury levels averaged seven times lower than adults and most likely reflect differences in prey size. Generally larger, older prey have more mercury than smaller, less piscivorous prey. Blood Hg risk thresholds are unknown for kingfishers. Feathers were sampled only from adults because juvenile feathers were still in sheath. Unlike blood, feather mercury levels show chronic body burden and probably provide some insight into individual age. The mean feather mercury level was 10 ppm with three individuals nearing known thresholds of high risk (i.e., >20 ppm) (USEPA 1997).

Table 2. Mean (+/- sd) mercury levels (ppm) in kingfisher matrices, 1998.

Habitat Type	Ad-blood	Ad-feather	Juv-blood	A/J Ratio*
Marine (Casco Bay)	0.24 +/- 0.16	10.0+/-0.85	0.04 +/- 0.01	6.0
Estuarine (Merrymtg Bay)	0.77 +/- 0.39	9.78 +/-6.20	0.13 +/- 0.04	5.9
Riverine	1.21 +/- 0.52	-	0.13 +/- 0.06	9.3
Natural Lakes	-	-	0.24 +/- 0.01	-
Reservoirs (Flagstaff L)	1.57 +/- 1.11	-	0.24 +/-0.06	6.8

* Ratio of adult (A) and juvenile (J) blood to show age differences in mercury levels.

A total of 14 species of fish and crayfish were collected from adults bringing prey to their young. The average size was 10.5 cm (range 6.1 to 17.1 cm) in length and a weight of 13.4 g (range, 2.7 to 27.1 g). Fish size does increase with chick age and is not accounted for in Appendix 1. The mercury levels in fish ranged from 0.028 to over an order of magnitude higher in the upper Androscoggin River near Mexico (0.378 for a 9.7 cm brook trout).

Literature Cited:

Davis, W. J. 1982. Territory size in Megaceryle alcyon along a stream habitat. Auk 99:353-362.

Evers, D. C. and P. S. Reaman. 1998. A comparison of mercury exposure between artificial impoundments and natural lakes measured in Common Loons and their prey. Submitted to Central Maine Power Company, Augusta, Maine by BioDiversity Research Institute, Freeport, Maine.

Evers, D. C., J. D. Kaplan, M W. Meyer, P. S. Reaman, W. E. Braselton, A. Major, N. Burgess, and A. M. Scheuhammer. 1998. Geographic trend in mercury measured in Common Loon feathers and blood. Environ. Toxicol. Chem. 17(2):173-183.

4.2

EEL STUDY

EEL STUDY

Limited data from previous years show that eels from rivers are often among the species most highly contaminated with a number of contaminants. There are two principle fisheries for adult eels in Maine, a river fishery and a lake fishery. Most of the eels are sold outside Maine in U.S. and international markets, although some are consumed in Maine. Contaminant levels in eels from lakes are unknown. To characterize contaminant levels in each type of water, we attempted to collect eels from 3 lakes and 3 industrial rivers (Androscoggin, Kennebec, and Penobscot) with commercial fisheries. In 1998 eels were captured from 3 lakes. Concentrations were generally lower than those in eels from rivers including eels from 3 relatively pristine coastal rivers studied by Leeman (1999). We were unable to get eels from the 3 industrial rivers in either 1998 or 1999. Therefore, in 2000, we will try again to collect eels from these rivers.

Leeman, N.G.G., 1999. Mercury contamination in the silver stage of American eel, Anguilla rostrata, from three rivers in Maine. MS thesis, U of Maine, Orono, Maine.

4.3

SPMDS

SPMDS

Some SWAT funds were appropriated to augment a grant received by the Water Research Institute at the University of Maine to study semipermeable membrane devices (SPMDs). SPMDs are integrative sampling devices which combine membrane diffusion and liquid-liquid partitioning to concentrate low to moderate molecular mass hydrophobic compounds from water (Huckins et al, 1996). SPMDs have some features which give them some advantages over monitoring contaminants in fish. SPMDs can be deployed in water to accumulate single, pulsed, or continuous contaminant releases over time. SPMDs are anchored to sample at specific locations, thereby avoiding any question of origin of contaminants caused by fish movement. SPMDs do not change function under stress, unlike gills of fish. There are no biotransformations or elimination like that in fish. There are, however, a number of conditions, such as temperature, DOC, solids which can effect the efficiency of these devices. And accumulation of contaminants does not occur by the same process of uptake in fish, thereby potentially limiting their use to accumulation in a relative sense.

Made of low density polyethylene lay-flat tubing (2.5 cm wide by 91.4 cm long), containing a thin film of neutral triolein and placed inside stainless steel canisters, SPMDs are deployed in the waterbody where they accumulate contaminants until retrieved. Laboratory handling of the SPMDs after field deployment involves the removal of biofouling, which is exterior debris and periphyton, before extraction. After this initial cleanup, the devices are then spiked with a cocktail of surrogates consisting of C-13 labeled analogs of the toxic native dioxin congeners in order to monitor recovery. After surrogate addition, individual SPMDs are dialyzed and the collected dialysates are cleaned by gel permeation chromatography followed by Florisil solid phase extraction. The extracts from the three SPMDs in each deployment site canister are then combined to enhance detection and each resulting sample is concentrated to ten microliters for HR GC/MS analysis.

In order to assess the potential of SPMDs to determine if mills are discharging dioxin, WRI initiated a study in 1999 on the Penobscot River as described below.

Phase I: 1999 Field Season on the Penobscot River

Objective: To develop viable SPMD sampling techniques.

Methods: With the focus being method development, WRI tested a variety of field conditions in order to be prepared for phase II of the project which involves using SPMDs to monitor sites on the Androscoggin River in 2000.

- With the field season lasting from June to October,WRI was able to test during both low and high levels of the river. WRI deployed SPMDs at a total of nine sites and the deployments are itemized below:

Set	***Deployment Date***	***Retrieval Date***	***Sites***
1	6/18/99	7/16/99	❖ Site 1: Just upstream of Lincoln Sanitary District Discharge ❖ Site 2: In between Lincoln Sanitary District Discharge and Eastern Paper Discharge ❖ Site 3: 200 feet below Eastern Paper Discharge
2	7/21/99	8/18/99	❖ Site 3: 2 sets of SPMD were deployed so that WRI Could check for reproducibility ❖ Site 4: Near the southern tip of Mattanawcook Island ❖ Site 5: South Lincoln
3	8/20/99	9/16/99	❖ Site 3: Lincoln ❖ Site 5: South Lincoln ❖ Site 6: South Lincoln—on the opposite side of the Northern tip of Mahockanock Island as site 5 ❖ Site 7: Near the Northwestern tip of Mattanawcook Island
4	9/28/99	10/28/99	❖ Site 3: Lincoln ❖ Site 5: South Lincoln ❖ Site 8: Costigan ❖ Site 9: Grindstone

- combined to one sample for cleanup and analysis.
- Early analyses revealed that cleanup methods were inadequate. Therefore, WRI altered the methods and SPMDs were cleaned separately and the three were combined into one sample only after cleanup and just before analysis.
- Some retention time shifts still occurred after the cleanup method alterations, thus chromatographic techniques were altered. Instead of examining all homologue groups at one time WRI had separate tetra-penta and hexa-hepta runs.
- WRI is left with only small amounts of samples for further analyses. However, objectives for Phase I of the project have been met:

➢ WRI has seen that the SPMDs do scavenge for dioxins and that surrogate recoveries are within acceptable ranges.

➢ Appropriate cleanup methods have been developed and followed with some success.

- Development of the analytical capability will continue. Results are expected prior to the 2000 field season.

4.4

LANDSCAPE CONTROL OF MERCURY

Landscape Controls on Mercury in Streams on Mount Desert Island

Objectives: To determine if the amount of mercury in stream water is controlled by landscape. In particular, to determine if there a significant difference in mercury concentrations between those areas burned in 1947 and those not burned.

Methods: Stream water was collected from actively flowing stream at 52 locations (17 in burn zone and 35 in unburned). Samples were collected under baseflow conditions in November 1999 (low baseflow), April 2000 (low baseflow), and late April/early May 2000 (high baseflow).

Results: Sample locations and results tables are attached. The mean mercury concentration was different between the burned area (1.48 ng/L) and the unburned area (1.69 ng/L), but this difference is not statistically significant. The range of values is greater for the unburned samples (Figure 1). There is a positive correlation between dissolved organic carbon (DOC) and mercury (Figure 2). There is a slightly greater mercury to DOC ratio for the burned area, but this is not a statistically significant difference. A simple interpretation of these results is that an equal amount of mercury is being added to the landscape and the unburned areas, having more organic matter can accumulate more mercury. More mercury is exported under spring baseflow than fall baseflow. In some streams the high spring baseflow had five times the mercury concentrations of low spring baseflow.

Figure 1. Mercury

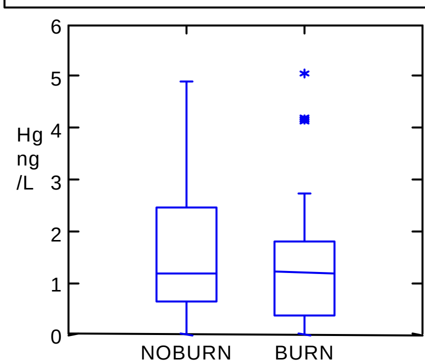
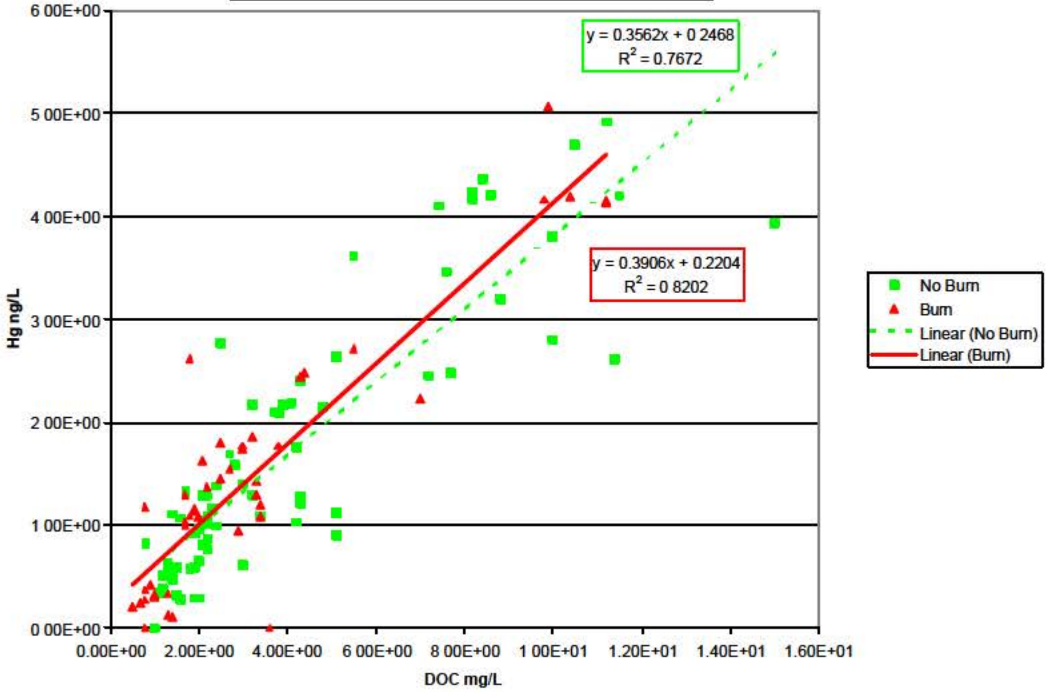


Figure 2. Mercury



LANDSCAPE CONTROLS ON MERCURY IN STREAMS ON MOUNT DESERT ISLAND   Water Research Institute, UMaine
Sample Locations: Mount Desert Island Mercury Sampling

Sample	**Location**
Canada Hollow	South side of access road to south end of Echo Lake
Canon Brook/Cadillac	South of peak at ~1250 feet elevation
Aunt Betty Pond Inlet	East side of carriage trail
Breakneck Brook	0.25 miles south of Park boundary
Canon Brook West	West branch of Canon ~300 feet elevation
Canon Brook/Rte. 3	West of Route 3 by Park boundary
CB-1	Confluence of Canon-Cadillac by Canon Brook trail
Chasm Brook A	Below falls to south of carriage trail
Cromwell Brook	Below Great Meadow (11/99) and by Sieur de Monts spring (4/00)
Duck Brook	By falls and carriage trail bridge below pond
Duck Cove Brook	North of Route 102 and houses
Duck Pond Inlet	Inlet on south side of Duck Pond and north of road
Duck Pond Outlet	Outlet of Duck Pond
Eagle Lake East/North	Unnamed stream (north branch) east side of Eagle Lake 100' east from loop road
Eagle Lake East/South	Unnamed stream (south branch) east side of Eagle Lake 100' and east from loop road
Eagle Lake West	Unnamed stream west side, near mid-lake, west of carriage trail
Gilmore Brook	100 feet north of carriage trail crossing
Great Brook	Lower end near Long Pond
Hadlock Brook	Above Upper Hadlock Pond and lower carriage trail crossing
HB-1	Near USGS stream gauge
HBB	Small tributary in upper Hadlock drainage to east
HBC	Small tributary in upper Hadlock drainage near foot trail
HBE	Small tributary in upper Hadlock drainage to west of Maple Spring
Hodgdon Brook	Lower end near Hodgdon Pond
Hunters Brook South	To east of Park Loop Road crossing and north of Route 3
Little Harbor Brook	0.25 miles north of Route 3 above tidal zone
Little Hunters Brook	500 feet north of Park Loop Road
Lower Old Mill	75' south of intersection of Hull's Cove and Salibury Cove Roads
Marshall Brook	End of seasonal road by Park Boundary and Tremont town line
North Deer Brook	0.25 miles north of Jordan Pond at ~300 feet elevation
Norwood Cove	0.25 miles east of Route 102 at point where brook turns east, near houses

Oak Hill Stream	1 mile west of Somesville, north of Somes Pond and road by dry hydrant
Parkman Brook	North of carriage trail crossing
Sample Locations: Mount Desert Island Mercury Sampling-Continued	
Pemetic Brook	Drainage off of pemetic Mountain to west of carriage trail crossing
Richardson Brook	150 feet east of Route 3 by small falls
Sargent Brook	100 feet east of Route 3 upstream of houses
South Kebo Brook	Main stem of Kebo Stream 300 feet south of Park Loop Road
Squid Cove Brook	100 feet east of Pretty Marsh Road and east of Squid Cove
Stanley Brook	East side of Park Road, 1 mile north of Route 3
Steward Brook	By end of stream and Seal Cove Pond
Stony Brook	300 feet east of road across from pond
The Reservoir	Upstream of reservoir, south side of Bernard Mountain
Upper Little Harbor	Carriage trail crossing ~200 feet elevation
Upper Old Mill	South of east-west dirt road, ~ 100 feet elevation
West Kebo Brook	West branch of Kebo Stream 0.5 miles south of Park Loop Road ~ 200 feet elev.
Whalesback	300 feet east of Route 102, ~1 mile north of intersection with Route 3

Summary of Mercury in Stream Water Results.

	Nov-99	Apr-00	Apr-00
Mercury in Streams Mount Desert Island	**Hg (ng/L)**	**Hg (ng/L)**	**Hg (ng/L)**
Canada Hollow	1.21	1.15	NS
Canon Brook/Cadillac	1.29	NS	2.72
Aunt Betty Pond Inlet	2.23	NS	2.48
Aunt Betty Pond Inlet-Dup.	NS	NS	2.44
Breakneck Brook	ND	0.96	1.59
Canon Brook West	0.29	NS	1.29
Canon Brook West	0.32	NS	NS
Canon Brook/Rte. 3	1.85	1.80	1.54
CB-1	0.11	0.27*	0.94
CB-1-Dup.	NS	0.33*	NS
Chasm Brook A	0.12	0.38*	0.64
Cromwell Brook	4.15	NS	1.62
Cromwell Brook-Dup.	4.13	NS	NS
Duck Brook	1.42	1.73	1.08
Duck Brook-Dup.	1.29	1.68	1.16
Duck Cove	3.80	4.10	NS
Duck Pond Brook	1.11	1.76	NS
Duck Pond Brook-Dup.	0.90	1.76	NS
Duck Pond Inlet	0.61	1.76	NS
Eagle Lake East/North	0.57	0.59	1.09
Eagle Lake East/South	1.29	0.91	1.69
Eagle Lake West	1.45	1.77	2.61
Gilmore Brook	0.32*	NS	1.38
Gilmore Brook-Dup.	0.31*	NS	NS
Great Brook	0.29*	0.52	NS
Great Brook-Dup.	NS	0.44*	NS
Hadlock Brook	1.11	0.47*	1.40
HB-1	0.28*	0.48*	1.33
HBB	2.80	NS	3.20
HBC	0.65	NS	1.51
HBE	2.18	NS	2.17
Hogdon Brook	2.62	4.21	NS
Hunters Brook South	1.07	0.56	1.04
Little Harbor Brook	0.81	NS	1.02
Little Harbor Brook	NS	NS	0.99
Little Hunters Brook	NS	2.63	4.17

	Nov-99	Apr-00	Apr-00
Mercury in Streams Mount Desert Island	**Hg (ng/L)**	**Hg (ng/L)**	**Hg (ng/L)**
Little Hunters Brook-Dup.	NS	2.72	4.24
Lower Old Mill	3.62	NS	2.08
Marshall Brook	NS	2.45	NS
North Deer Brook	1.14	1.09	1.03
North Deer Brook-Dup.	NS	0.99	1.03
Norwood Cove	2.48	2.05	NS
Norwood Cove-Dup.	2.47	NS	NS
Oak Hill Stream	NS	4.92	4.20
Parkman Brook	ND	NS	0.57
Pemetic Brook	0.87	0.59	2.77
Richardson	NS	2.15	4.37
Sargent Brook	0.29*	0.60	2.40
South Kebo Brook	ND	0.2*	0.37*
South Kebo Brook-Dup.	ND	NS	NS
Squid Cove Brook	3.96	NS	NS
Stanley Brook	1.09	1.28	2.10
Steward Brook	NS	0.76	NS
Stony Brook	3.94	4.69	3.46
Stony Brook-Dup.	NS	4.63	NS
The Reservoir	0.4*	NS	NS
Upper Little Harbor	NS	0.34*	0.82
Upper Old Mill	1.08	1.37	1.77
Upper Old Mill-Dup.	1.20	NS	NS
West Kebo Brook	1.17	0.25*	0.42*
Whalesback	NS	5.06	4.16
Whalesback-Dup.	NS	NS	4.19

Notes: * = estimated; ND = none detected @ 0.02 ng/L; NS = not sampled.