DEPLW0693

SURFACE WATER AMBIENT TOXIC MONITORING PROGRAM

FINAL REPORT
EXECUTIVE SUMMARY
2002-2003

DIVISION OF ENVIRONMENTAL ASSESSMENT
MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
AUGUSTA, MAINE 04333

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INTRODUCTION

This 2002-2003 Surface Water Ambient Toxic (SWAT) monitoring program final report is a combined report for the years 2002 and 2003. It is organized into this Executive Summary (with introduction and table of contents) and 4 modules, 1) Marine and Estuarine, 2) Lakes, 3) Rivers and Streams, and 4) Special Studies. Results are presented for each module for both years. There are also separate appendices with fish lengths and weights for all modules for each year.

The full report is available on DEP's website at http://www.maine.gov/dep/blwq/docmonitoring/swat/index.htm

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Most 2002 chemical analyses were performed by the Senator George J. Mitchell Center for Environmental and Watershed Research Environmental Chemistry Laboratory at the University of Maine. Some 2002 and all 2003 chemical analyses were performed by Pace Analytical Services, Minneapolis, Minnesota or other laboratories as listed in reports in individual sections.

EXECUTIVE SUMMARY

Maine's Surface Water Ambient Toxics (SWAT) monitoring program was established in 1993 (38 MRSA §420-B) to determine the nature, scope and severity of toxic contamination in the surface waters and fisheries of the State. The program must be designed to comprehensively monitor the lakes, rivers and streams and marine and estuarine waters of the State on an ongoing basis. The program must incorporate testing for suspected toxic contamination in biological tissue and sediment, may include testing of the water column and must include biomonitoring and the monitoring of the health of individual organisms that may serve as indicators of toxic contamination. This program must collect data sufficient to support assessment of the risks to human and ecological health posed by the direct and indirect discharge of toxic contaminants.

The Commissioner of the Department of Environmental Protection (DEP) must prepare a 5-year conceptual workplan that outlines monitoring approach for the following 5 years. The Commissioner must also develop annual workplans that define the work to be accomplished each year. A Technical Advisory Group (TAG), composed of 10 individuals with scientific backgrounds representing various interests and 1 legislator, is established to advise the Commissioner on the development of the 5-year framework and annual workplans.

The first 5-year framework, for the period 1994-1998, was an initial sampling of all watersheds in the state. The 5-year plan for the period 1999-2003 was focused on problems discovered in the initial sampling and was designed to confirm the initial findings and establish background conditions. Once those are established and a sufficient amount of time has elapsed, 5-10 years depending on what if any action has occurred to solve the problem, repeat sampling may be conducted to determine if the problem has been solved. The program also explores new issues as they are identified.

The SWAT program is divided into 4 modules, 1) Marine and Estuarine, 2) Lakes, 3) Rivers and Streams, and 4) Special Studies. This annual report follows the outline of the 2002 and 2003 workplans. Following is a summary of key findings from the 2002 and 2003 SWAT programs for each module.

1. MARINE AND ESTUARINE

- Tissue monitoring of blue mussels occurred at 6 and 10 stations along the coast in 2002 and 2003 respectively. In 2002 mussels from the Fore River in Portland had elevated levels of lead, zinc, mercury, and highly elevated PAHs. In Fore River mussels, PCBs were approaching elevated levels. PAHs in mussels were slightly elevated in the St. Croix River estuary and approaching elevated in Maquoit Bay in Brunswick. The 2003 data have yet to be evaluated due to the need for some additional analysis of samples by the lab.

- Sampling of striped bass and bluefish from many Maine estuaries indicated that levels of PCBs are significantly higher than measured previously and similar to those from southern New England states. Additional sampling is necessary to properly assess Maine's fish consumption advisory for these species.

- Mercury levels in Maine harbor seals from Mt. Dessert Rock were measured at levels similar to those in various seal species from contaminated environments in the US and Europe. Yet with low sample size and high variability, these results are preliminary and more sampling is needed. Mercury levels in a number of fish species consumed by seals were low compared to highly predatory fish like swordfish, tilefish, king mackerel, and the larger tunas.

2. LAKES

- Fieldwork for development of a wildlife criterion for mercury was a three-year effort completed in 2003. Studies included determining a safe dose for both fish-eating birds (primarily common loons) and mammals (mink and otter) and bioaccumulation factors. Analysis of the data will be used to develop a final wildlife criterion, which will be proposed for adoption by rule by the Department.

- Studies of loons showed that there is a 40% reduction in the production of young among loons with high mercury levels. The effect is that 22% of Maine's loons are at risk and a regional population model predicts that the overall production is below the level necessary to sustain the population. That the Maine Audubon Society's annual loon survey does not show a reduction may be due to the limited nature of the survey, the fact that the buffer of young loons is filling empty territories, or that the population model is too general.

- Studies of mammals showed that 45% of mink and 59% of otter sampled have fur mercury levels exceeding published thresholds for adverse effects. There was a significant negative correlation between corpora lutea scars in the ovary, as an indicator of reproduction, and brain mercury levels in otter in 2002, but not in 2003, perhaps because most of the otter were not yet sexually mature.

- Sampling of sediments in Androscoggin Lake and the Dead River showed that levels of dioxin in the sediments appear to be relatively low, similar to that found in 1999.

3. RIVERS AND STREAMS

- Coplanar PCB were lower than in previous years, but still caused or contributed significantly to total dioxin equivalents that exceeded the Bureau of Health's Fish Tissue action levels in one or more species at Rumford Point and Gulf Island Pond on the Androscoggin River, Woodville and South Lincoln and Veazie on the Penobscot River and South Berwick on the Salmon Falls River.

- Mercury concentrations in fish from Maine rivers continue to exceed the Bureau of Health's Fish Tissue Action Level warranting fish consumption advisories in most waters. PCB concentrations in fish also exceed the Fish Tissue Action Level in many waters, and greatly so in fish from the Kennebec River at Augusta and downstream locations.

- Ambient biological monitoring of rivers and streams using macroinvertebrates found that 51% and 44% of the waters failed to meet state water quality standards in 2002 and 2003 respectively.

- A cumulative effects assessment of suckers from the Androscoggin River did not find evidence of endocrine disruption, but did document organic and nutrient enrichment of the river below point source discharges. Indications of a potential immune system effect warrant further investigation.

- A 2002 Semi-Permeable Membrane Device (SPMD) study above and below the MeadWestvaco pulp and paper mill in Rumford found higher concentrations of the dioxin-like furan (2378-tetrachlorodibenzofuran) above the mill than below, as was also found with bass and suckers in the Dioxin Monitoring Program. A 2003 SPMD study above and below the SAPPI Somerset mill in Hinckley on the Kennebec River did not measure any differences in dioxin or furan above and below the mill as was the case with smallmouth bass; but white suckers below the mill contained more dioxin than those above.

- A 2003 caged mussel study above and below the SAPPI Somerset mill on the Kennebec River did not measure any differences in dioxin above and below the mill. From the Dioxin Monitoring Program, there were no differences in concentrations in smallmouth bass either, but white suckers below the mill contained more dioxin than those above. The caged mussels did detect a significant induction of vitellin, a reproductive protein indicative of endocrine disruption, and reduction of growth below the mill.

4. SPECIAL STUDIES

- Studies of androgenic and estrogenic potential of various fungicides, herbicides, and pesticides used in blueberry culture were investigated by the A-Screen and E-Screen assays at the University of Maine. Limited studies found Velpar, hexazinone, and 2,4-D not to be androgenic at environmental concentrations. Compounds that tested positive for partial estrogen-like activity include: methoxychlor, Diazinon 50W (diazinon), propiconizole, terbacil, Sinbar, and carbendazim. Velpar and active compound hexazinone were marginally positive, but the combination of Velpar, Orbit, 2,4-D was positive for partial estrogen-like activity. More investigation is needed of various formulations and active compounds, particularly for androgen-like activity.

- Concentrations of Poly-Brominated Diphenyl Ethers (PBDEs), a major component of brominated flame retardants found in computer cabinets and other plastics, fabrics and other consumer goods, were found in Maine wastewater treatment plant influent and effluent and fish similar to those levels found elsewhere in the US and Europe. Concentrations of PBDEs in most game fish were below a safe target concentration, except in white suckers where concentrations exceeded the target level. More monitoring of fish and birds is needed.

- In a 2002 interlaboratory study of dioxin in fish samples between the University of Maine Environmental Chemistry Lab (ECL) and a commercial lab, Alta Analytical Perspectives, with established expertise in analyzing samples for dioxin, results compared reasonably well between the labs. The ECL lab then ceased dioxin analysis in 2003.

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MODULE 1 MARINE

1.1

SHELLFISH TISSUE ANALYSIS

2002 SHELLFISH TISSUE ANALYSIS

THE FOLLOWING SITES WERE SAMPLED IN 2002: THE FORMER NAVY PIER, HARPSWELL NECK, CASCO BAY; INNER FORE RIVER, UPSTREAM OF THE I-295 BRIDGE, CASCO BAY; MAQUOIT BAY, BRUNSWICK, CASCO BAY; MOUTH OF HARPSWELL COVE (OFF MARE BROOK), CASCO BAY; SEAL COVE, MOUNT DESERT ISLAND; WESTERN PASSAGE, ST. CROIX RIVER. ALL SAMPLES CONSISTED OF FOUR REPLICATE SAMPLES. SITES WERE SAMPLED ON THE FOLLOWING DATES:

Location	Date Sampled
Navy Pier, Harpswell	10/17/02
Inner Fore River	10/29/02
Maquoit Bay	11/14/02
Mare Brook, Harpswell Cove	10/30/02
Seal Cove, Mount Desert Island	10/17/02
St. Croix River	10/29/02

The following text and table give results for metals in 2002 and compare those results to previous samples taken in the late 1980s. The samples from the late 1980s consisted of a single sample while the 2002 results are based on four replicate samples. Levels of metals are compared to the normal baseline range for Maine. Aluminum and iron are not included in the analysis and are reported as elevated in the table to give an indication of the amount of sediment in the gut of the mussel.

Elevated Metals (X) in Mussels Sampled in 2002

	Al	As	Cd	Cr	Cu	Fe	Ni	Pb	Zn	Ag	Hg
Navy Pier, Harpswell											
Inner Fore River	X					X		X	X		X
Maquoit Bay	X										
Mare Brook, Harpswell Cove	X					X					
Seal Cove, MDI											
St. Croix River	X										

Metals (arsenic, cadmium, chromium, copper, nickel, lead, zinc, silver and mercury) were in the normal range in all locations except the inner Fore River. Mare Brook and the inner Fore River had elevated levels of aluminum and iron and Maquoit Bay and the St. Croix Bay had elevated levels of aluminum.

The inner Fore River had elevated levels of lead. Also, zinc was at the high end of the Maine coastal norm and mercury was over the high concentration level reported in the National Oceanic and Atmospheric Administration (NOAA) 1998 (on-line) "Chemical Contaminants in Oysters and Mussels" by Tom O'Conner. NOAA's State of the Coast Report. Silver Spring, MD: NOAA. In the one sample taken in 1988, zinc was elevated compared to the 2002 sample. Lead has more than doubled in the 2002 sample. Mercury is in a similar range as it was in 1988.

Mare Brook, Maquoit Bay and the St. Croix River have never been sampled before. Metals at the former Navy Pier, Harpswell Neck were in the normal range in 2002 and 1988. Metals at Mount Desert Island were in the normal range in 2002 and 1991.

PAHs were highly elevated at the inner Fore River site and slightly elevated at the St. Croix site. PAHs were approaching elevated at the Maquoit Bay site. PAHs, PCBs and pesticides were in the normal range at all other sites. PCBs in the Fore River site were approaching elevated.

TABLE 1.2.1 LEVELS OF MERCURY AND % SOLIDS
IN 2002 MUSSEL TISSUE SAMPLES

Mercury analyzed by CVAAS

Sample ID	Hg wet(mg/kg)	Hg dry(mg/kg)	% solid
Harpswell-1	0.0124	0.1100	11.3
Harpswell-2	0.0125	0.1076	11.6
Harpswell-3	0.0121	0.1085	11.2
Harpswell-4	0.0123	0.1026	12.0
Inner Fore-1	0.0186	0.2430	7.7
Inner Fore-2	0.0262	0.3259	8.0
Inner Fore-3	0.0203	0.2212	9.2
Inner Fore-4	0.0193	0.2186	8.8
Maquoit Bay-1	0.0201	0.1164	17.3
Maquoit Bay-2	0.0162	0.0941	17.2
Maquoit Bay-3	0.0146	0.0828	17.6
Maquoit Bay-4	0.0181	0.1047	17.3
Mare Brook-1	0.0163	0.1461	11.2
Mare Brook-2	0.0151	0.1471	10.3
Mare Brook-3	0.0164	0.1460	11.2
Mare Brook-4	0.0157	0.1428	11.0
Seal Cove-1	0.0076	0.0879	8.6
Seal Cove-2	0.0070	0.0725	9.7
Seal Cove-3	0.0079	0.0818	9.7
Seal Cove-4	0.0073	0.0821	8.9
St. Croix River-1	0.0109	0.0825	13.2
St. Croix River-2	0.0105	0.0863	12.2
St. Croix River-3	0.0111	0.0878	12.6

TABLE 1.2.2 LEVELS OF HEAVY METALS IN 2002 MUSSEL TISSUE SAMPLES

Values on a dry weight basis

Analyzed by ICP-AES (Al, As, Cd, Cr, Cu,Fe, Pb, Zn) and GFAAS (N, Ag)

	Al mg/kg	As mg/kg	Cd mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Pb mg/kg	Zn mg/kg	Ag mg/kg	N mg/kg
Harpswell-1	184.5	7.78	1.41	1.46	4.46	288.7	2.56	68.17	<DL	0.79
Harpswell-2	171.4	7.73	1.25	1.06	<DL	260.4	2.14	63.89	<DL	0.79
Harpswell-3	202.2	8.12	1.47	1.14	4.72	299.7	2.84	69.60	<DL	0.80
Harpswell-4	188.0	7.95	1.12	1.10	<DL	233.3	1.85	69.05	<DL	0.75
Inner Fore-1	659.7	11.64	1.33	2.29	9.61	950.6	10.18	127.79	<DL	1.36
Inner Fore-2	465.0	11.13	1.24	1.70	7.00	705.1	7.66	108.53	<DL	1.25
Inner Fore-3	486.9	10.53	1.14	1.55	7.70	686.2	7.28	111.75	<DL	<DL
Inner Fore-4	627.4	10.99	1.21	2.00	7.10	911.3	7.60	108.53	<DL	1.03
Maquoit Bay-1	420.1	7.40	1.05	1.39	2.89	468.1	2.47	75.62	<DL	0.96
Maquoit Bay-2	351.1	7.28	0.87	1.20	4.01	393.9	0.52	71.65	<DL	0.75
Maquoit Bay-3	483.0	6.82	0.83	1.26	4.39	658.6	1.87	85.45	<DL	0.86
Maquoit Bay-4	398.1	7.92	1.02	1.42	5.06	456.0	2.61	94.69	<DL	0.70
Mare Brook-1	622.7	7.07	0.89	1.84	5.06	715.1	2.83	78.74	<DL	1.00
Mare Brook-2	677.5	7.12	1.03	2.03	5.83	781.1	3.76	87.17	<DL	0.93
Mare Brook-3	675.7	7.19	1.02	1.86	5.40	750.8	2.98	76.51	<DL	0.83
Mare Brook-4	662.1	7.29	0.94	1.71	6.99	725.9	2.95	73.60	<DL	1.01
Seal Cove-1	128.7	8.51	1.48	1.22	<DL	236.4	3.85	46.16	<DL	<DL
Seal Cove-2	127.0	9.70	1.16	1.02	5.01	227.2	1.64	65.57	<DL	<DL
Seal Cove-3	110.6	8.09	1.16	1.00	<DL	215.4	2.79	57.15	<DL	<DL
Seal Cove-4	111.1	8.47	1.42	1.26	5.55	249.0	4.03	58.32	<DL	0.86
St. Croix River-1	391.1	7.76	1.06	1.41	6.81	451.0	1.98	51.09	<DL	0.80
St. Croix River-2	378.7	7.81	1.10	1.34	6.04	481.0	1.50	55.26	<DL	0.67
St. Croix River-3	348.7	8.59	1.04	1.31	5.78	450.6	1.31	50.38	<DL	1.03
St. Croix River-4	445.7	7.96	1.08	1.56	6.87	568.2	1.42	53.42	<DL	1.06

<DL=less than detection limit

TABLE 1.2.3 LEVELS OF HEAVY METALS IN 2002 MUSSEL TISSUE SAMPLES

Analyzed by ICP-AES (Al, As, Cd, Cr, Cu,Fe, Pb, Zn) and GFAAS (Ni, Ag)

Results are on a wet weight basis

	Al mg/kg	As mg/kg	Cd mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Pb mg/kg	Zn mg/kg	Ag mg/kg	Ni mg/kg
*reporting limit**	*0.4*	*0.08*	*0.10*	*0.08*	*0.40*	*0.2*	*0.08*	*0.20*	*0.020*	*0.08*
Harpswell-1	20.8	0.88	0.16	0.16	0.50	32.5	0.29	7.68	<0.020	0.09
Harpswell-2	19.9	0.90	0.15	0.12	<0.40	30.2	0.25	7.42	<0.020	0.09
Harpswell-3	22.6	0.91	0.16	0.13	0.53	33.4	0.32	7.76	<0.020	0.09
Harpswell-4	22.5	0.95	0.13	0.13	<0.40	28.0	0.22	8.28	<0.020	0.09
Inner Fore-1	50.5	0.89	0.10	0.18	0.74	72.8	0.78	9.78	<0.020	0.10
Inner Fore-2	37.4	0.89	0.10	0.14	0.56	56.7	0.62	8.73	<0.020	0.10
Inner Fore-3	44.7	0.97	0.10	0.14	0.71	63.0	0.67	10.26	<0.020	<0.08
Inner Fore-4	55.4	0.97	0.11	0.18	0.63	80.4	0.67	9.58	<0.020	0.09
Maquoit Bay-1	72.5	1.28	0.18	0.24	0.50	80.8	0.43	13.06	<0.020	0.17
Maquoit Bay-2	60.4	1.25	0.15	0.21	0.69	67.8	0.09	12.33	<0.020	0.13
Maquoit Bay-3	85.2	1.20	0.15	0.22	0.77	116.2	0.33	15.08	<0.020	0.15
Maquoit Bay-4	68.8	1.37	0.18	0.25	0.88	78.8	0.45	16.37	<0.020	0.12
Mare Brook-1	69.5	0.79	0.10	0.21	0.56	79.8	0.32	8.78	<0.020	0.11
Mare Brook-2	69.5	0.73	0.11	0.21	0.60	80.2	0.39	8.95	<0.020	0.10
Mare Brook-3	75.9	0.81	0.11	0.21	0.61	84.3	0.33	8.59	<0.020	0.09
Mare Brook-4	72.8	0.80	0.10	0.19	0.77	79.8	0.32	8.09	<0.020	0.11
Seal Cove-1	11.1	0.74	0.13	0.11	<0.40	20.4	0.33	3.99	<0.020	<0.08
Seal Cove-2	12.3	0.94	0.11	0.10	0.48	21.9	0.16	6.33	<0.020	<0.08
Seal Cove-3	10.7	0.78	0.11	0.10	<0.40	20.8	0.27	5.52	<0.020	<0.08
Seal Cove-4	9.9	0.75	0.13	0.11	0.49	22.1	0.36	5.18	<0.020	0.08
St. Croix River-1	51.7	1.02	0.14	0.19	0.90	59.6	0.26	6.75	<0.020	0.11
St. Croix River-2	46.1	0.95	0.13	0.16	0.73	58.5	0.18	6.72	<0.020	0.08
St. Croix River-3	44.1	1.09	0.13	0.17	0.73	57.0	0.17	6.37	<0.020	0.13
St. Croix River-4	57.9	1.03	0.14	0.20	0.89	73.8	0.18	6.94	<0.020	0.14

*Reporting limit for trace metals is based on 2.5 g. wet mussel tissue digested into 100 mL acid

TABLE 1.2.4 LEVELS OF PESTICIDES IN 2002 MUSSEL TISSUES

		Inner Fore 1		Inner Fore 2		Inner Fore 3		Inner Fore 4	
	MDL								
Dry Weight		2.00		1.99		1.87		1.79	
Wet Weight		15.25		15.09		15.13		15.84	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		13.1		13.2		12.4		11.3	
% Lipid		7.5		5.9		8.0		10.6	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Pesticides		**Conc**		**Conc**		**Conc**		**Conc**	
Chlorinated Benzenes									
Tetrachlorobenzene 1,2,4,5	0.15	2 30	B	4.52	B	3.32	B	7.05	B
Tetrachlorobenzene 1,2,3,4	0.19	0.00	ND	0.12	J	0.12	J	0 34	J
Pentachlorobenzene	0.20	3.74	B	4.51	B	5.27	B	4.78	
Hexachlorobenzene	0.10	0 16	J	0.00	ND	0.00	ND	0 14	
Hexachlorocyclohexanes									
Alpha HCH	0.05	0.00	ND	0.00	ND	0.00	ND	0.42	
Beta HCH	0.09	0.00	ND	0.00	ND	0.00	ND	1 14	
Gamma HCH	0.03	0.00	ND	0.00	ND	0.00	ND	0.03	J
Delta HCH	0.03	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Chlordane-related Compounds									
Heptachlor	0.06	0 50		0.00	ND	0.60		0.82	
Heptachlor Epoxide	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Oxychlordane	0.12	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Alpha Chlordane	0.09	3 56		3.65		3.51		1.80	
Gamma Chlordane	0.10	2 32		2.46		2.55		1.04	
Cis-Nonachlor	0.10	1 95		2.01		2.39		1 20	
Trans-Nonachlor	0.17	3 27		3.37		3.62		1.08	
Other Cyclodiene Pesticides									
Aldrin	0.10	12.14		0.00	ND	0.00	ND	7 54	
Dieldrin	0.25	0.00	ND	0.00	ND	0.00	ND	2.69	
Endrin	0.18	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Pesticides		**Conc**		**Conc**		**Conc**		**Conc**	
Other Chlorinated Pesticides									
Pentachloroanisole	0.04	0 92		0.83		0.87		0.42	
Chlorpyrifos	0.25	2.45		2.07		2.40		1 18	
Mirex	0.07	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Endosulfan II	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
DDTs and Related Compounds									
2,4' DDE	0.07	0.00	ND	0.00	ND	0.00	ND	0 54	
4,4' DDE	0.29	19.07		0.00	ND	21.20		9.65	
2,4' DDD	0.33	4.84		4.20		4.70		1.60	
4,4' DDD	0.07	19.00		18.56		22.20		8 57	
2,4' DDT	0.02	0.00	ND	0.00	ND	2.61		0 55	
4,4' DDT	0.04	0.00	ND	0.00	ND	0.00	ND	3 34	

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified “J” and those analytes not detected are qualified “ND”. Concentrations that exceeded the calibration limits are qualified “EC”. The concentrations that are determined by analyses of a diluted aliquot are qualified “D”. If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified “I” to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified “B” to denote this possible contamination.

TABLE 1.2.4 LEVELS OF PESTICIDES IN 2002 MUSSEL TISSUES (CONTINUED)

	MDL	St Croix 1		St Croix 2			St Croix 3		St Croix 4	
Dry Weight		2 53		2.07			1.87		2 28	
Wet Weight		15.79		15.39			15.02		15.25	
Sample Size Units		Grams		Grams			Grams		Grams	
% solid		16.0		13.4			12 5		14.9	
% Lipid		7.7		9.5			7.9		9.0	
Reporting Units	ng/g	ng/g		ng/g			ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry			Dry		Dry	
Pesticides		**Conc**		**Conc**			**Conc**		**Conc**	
Chlorinated Benzenes										
Tetrachlorobenzene 1,2,4,5	0.15	2.60	B	3.22	B		5.65	B	3 59	B
Tetrachlorobenzene 1,2,3,4	0.19	0.69		0.00	ND		0.00	ND	0.69	
Pentachlorobenzene	0.20	4.03		0.00	ND		5.82	B	1 21	B
Hexachlorobenzene	0.10	0 26		0.24		0.0	0.00	ND	0.00	ND
Hexachlorocyclohexanes										
Alpha HCH	0.05	0.46		0.36			0.00	ND	0.00	ND
Beta HCH	0.09	1.78		0.00	ND		0.00	ND	0.00	ND
Gamma HCH	0.03	0.05	J	0.00	ND		0.00	ND	0.00	ND
Delta HCH	0.03	0.00	ND	0.00	ND		0.00	ND	0.00	ND
Chlordane-related Compounds										
Heptachlor	0.06	1 22		2.39			0.66		1 21	
Heptachlor Epoxide	0.10	0.00	ND	0.00	ND		0.00	ND	0.00	ND
Oxychlordane	0.12	0.89		1.55			1.49		1.45	
Alpha Chlordane	0.09	1.63		1.39			2.46		3.03	
Gamma Chlordane	0.10	0 50		0.00	ND		0.00	ND	0.00	ND
Cis-Nonachlor	0.10	0.47		3.39			2.93		3 55	
Trans-Nonachlor	0.17	1.07		0.84			0.58		0.41	
Other Cyclodiene Pesticides										
Aldrin	0.10	29.45		2.07			1.45		20.66	
Dieldrin	0.25	0 58		2.09			0.00	ND	0.00	ND
Endrin	0.18	1.04		4.50			0.00	ND	0.00	ND
Pesticides		**Conc**					**Conc**		**Conc**	
Other Chlorinated Pesticides				**Conc**						
Pentachloroanisole	0.04	0.47		0.30			0.50		0.44	
Chlorpyrifos	0.25	0.45		0.70		0.0	0.00	ND	1 38	
Mirex	0.07	0.00	ND	0.00	ND		0.00	ND	0.00	ND
Endosulfan II	0.10	0.00	ND	0.00	ND		0.00	ND	0.00	ND
DDTs and Related Compounds										
2,4' DDE	0.07	0 28		0.00	ND		0.00	ND	0.00	ND
4,4' DDE	0.29	4 99		2.81			0.00	ND	0.00	ND
2,4' DDD	0.33	0.81	J	0.00	ND		0.00	ND	0.00	ND
4,4' DDD	0.07	3 34		0.00	ND		0.00	ND	0.00	ND
2,4' DDT	0.02	0.40		1.03			0.00	ND	0.00	ND
4,4' DDT	0.04	3.88		0.00	ND		0.00	ND	0.00	ND

Laboratory Qualifiers

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TABLE 1.2.4 LEVELS OF PESTICIDES IN 2002 MUSSEL TISSUES (CONTINUED)

	MDL	Seal Cove 1		Seal Cove 2		Seal Cove 3		Seal Cove 4	
Dry Weight		2.42		2.29		2.19		2 25	
Wet Weight		15.28		15.08		15.24		15.31	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		15.9		15.2		14.4		14.7	
% Lipid		5.9		7.2		7.2		6.8	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Pesticides		**Conc**		**Conc**		**Conc**		**Conc**	
Chlorinated Benzenes									
Tetrachlorobenzene 1,2,4,5	0.15	3.76	B	1.52	B	3.83	B	1 95	B
Tetrachlorobenzene 1,2,3,4	0.19	0.00	ND	0.00	ND	0.10	J	0 26	J
Pentachlorobenzene	0.20	3 55	B	2.70	B	3.75	B	3 21	B
Hexachlorobenzene	0.10	2.64		1.83		2.22		4 13	
Hexachlorocyclohexanes									
Alpha HCH	0.05	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Beta HCH	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Gamma HCH	0.03	0 58		0.17	J	0.00	ND	0.45	
Delta HCH	0.03	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Chlordane-related Compounds									
Heptachlor	0.06	0.49		0.67		0.23		0 16	J
Heptachlor Epoxide	0.10	0.00	ND	0.13	J	0.26	J	0 24	J
Oxychlordane	0.12	0 57		0.70		0.95		0.78	
Alpha Chlordane	0.09	3 52		2.41		2.37		4.08	
Gamma Chlordane	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Cis-Nonachlor	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Trans-Nonachlor	0.17	2 34		2.90		2.32		2 22	
Other Cyclodiene Pesticides									
Aldrin	0.10	0.76		1.25		0.62		0.62	
Dieldrin	0.25	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Endrin	0.18	0.00	ND	0.00	ND	5.48		4 29	
Pesticides		**Conc**		**Conc**		**Conc**		**Conc**	
Other Chlorinated Pesticides									
Pentachloroanisole	0.04	0.42		0.58		0.50		0 56	
Chlorpyrifos	0.25	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Mirex	0.07	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Endosulfan II	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
DDTs and Related Compounds									
2,4' DDE	0.07	0.00	ND	0.00	ND	0.00	ND	0.00	ND
4,4' DDE	0.29	2 95		3.64		3.30		2 98	
2,4' DDD	0.33	0.00	ND	0.00	ND	0.00	ND	0.00	ND
4,4' DDD	0.07	0.00	ND	0.00	ND	0.00	ND	0.00	ND
2,4' DDT	0.02	0.00	ND	0.00	ND	0.00	ND	0.00	ND
4,4' DDT	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.4 LEVELS OF PESTICIDES IN 2002 MUSSEL TISSUES (CONTINUED)

	MDL	Mare Brook 1		Mare Brook 2		Mare Brook 3		Mare Brook 4	
Dry Weight		1 94		1.85		1.89		1.75	
Wet Weight		15.01		15.20		15.22		15.21	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		12.9		12.2		12.4		11.5	
% Lipid		7.1		8.3		7.0		6.5	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Pesticides		**Conc**		**Conc**		**Conc**		**Conc**	
Chlorinated Benzenes									
Tetrachlorobenzene 1,2,4,5	0.15	2 97	B	2.45	B	4.65	B	4.78	B
Tetrachlorobenzene 1,2,3,4	0.19	0.79		0.40	J	0.26	J	0 11	J
Pentachlorobenzene	0.20	3 27	B	2.69	B	3.48	B	4 10	B
Hexachlorobenzene	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Hexachlorocyclohexanes									
Alpha HCH	0.05	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Beta HCH	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Gamma HCH	0.03	0.00	ND	0.00	ND	0.25	J	0.00	ND
Delta HCH	0.03	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Chlordane-related Compounds									
Heptachlor	0.06	0.43		0.61		0.50		0 28	
Heptachlor Epoxide	0.10	1.04	J	0.00	ND	0.00	ND	0.00	ND
Oxychlordane	0.12	0.61		1.19		0.79		0.79	
Alpha Chlordane	0.09	1.78		1.89		2.39		1 94	
Gamma Chlordane	0.10	0.70		0.88		0.78		1 15	
Cis-Nonachlor	0.10	0.67		0.68		0.58		0.00	ND
Trans-Nonachlor	0.17	1 27		1.44		1.54		1.04	
Other Cyclodiene Pesticides									
Aldrin	0.10	0.00	ND	1.29		0.00	ND	0.00	ND
Dieldrin	0.25	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Endrin	0.18	0 59		0.75		0.67		0.00	ND
Pesticides		**Conc**		**Conc**		**Conc**		**Conc**	
Other Chlorinated Pesticides									
Pentachloroanisole	0.04	0 57		0.71		0.62		0.63	
Chlorpyrifos	0.25	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Mirex	0.07	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Endosulfan II	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
DDTs and Related Compounds									
2,4' DDE	0.07	0.00	ND	0.00	ND	0.00	ND	0 57	
4,4' DDE	0.29	0.00	ND	0.00	ND	0.00	ND	0.00	ND
2,4' DDD	0.33	0.00	ND	0.00	ND	0.00	ND	0.00	ND
4,4' DDD	0.07	1.76		1.89		1.78		1 22	
2,4' DDT	0.02	0.00	ND	0.00	ND	0.00	ND	0.00	ND
4,4' DDT	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified “J” and those analytes not detected are qualified “ND”. Concentrations that exceeded the calibration limits are qualified “EC”. The concentrations that are determined by analyses of a diluted aliquot are qualified “D”. If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified “I” to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified “B” to denote this possible contamination.

TABLE 1.2.4 LEVELS OF PESTICIDES IN 2002 MUSSEL TISSUES (CONTINUED)

	MDL	Harpswell 1		Harpswell 2		Harpswell 3		Harpswell 4	
Dry Weight		1 96		1.62		1.71		1.85	
Wet Weight		15.28		15.09		15.67		15.67	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		12.8		10.8		10 9		11.8	
% Lipid		7.4		10.0		9.2		10.0	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Pesticides		**Conc**		**Conc**		**Conc**		**Conc**	
Chlorinated Benzenes									
Tetrachlorobenzene 1,2,4,5	0.15	0.64		1.68		1.99		2 34	
Tetrachlorobenzene 1,2,3,4	0.19	0 18	J	0.23	J	0.10	J	0 18	J
Pentachlorobenzene	0.20	0 33		0.07	J	0.55		0.07	J
Hexachlorobenzene	0.10	0 21		0.12	J	0.31		0 21	
Hexachlorocyclohexanes									
Alpha HCH	0.05	0.83		0.60		0.77		0.70	
Beta HCH	0.09	0 12		0.20		0.26		0 27	
Gamma HCH	0.03	0 35		0.24		0.27		0 24	
Delta HCH	0.03	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Chlordane-related Compounds									
Heptachlor	0.06	0.77		1.07		0.72		0.65	
Heptachlor Epoxide	0.10	0.60		0.32		0.43		0 34	
Oxychlordane	0.12	0.74		0.49		0.83		0 52	
Alpha Chlordane	0.09	1 98		3.47		2.33		2.07	
Gamma Chlordane	0.10	0.41		0.97		0.85		0.69	
Cis-Nonachlor	0.10	0 38		0.52		0.51		0.74	
Trans-Nonachlor	0.17	2 36		3.58		3.21		2.60	
Other Cyclodiene Pesticides									
Aldrin	0.10	1 93		2.10		0.41		2 31	
Dieldrin	0.25	1 98		3.07		2.22		1.78	
Endrin	0.18	0.61		0.82		1.41		1 93	
Pesticides		**Conc**		**Conc**		**Conc**		**Conc**	
Other Chlorinated Pesticides									
Pentachloroanisole	0.04	0 55		0.66		0.78		0.78	
Chlorpyrifos	0.25	2 50		3.18		3.19		2 58	
Mirex	0.07	0 26		0.55		0.96		0.83	
Endosulfan II	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
DDTs and Related Compounds									
2,4' DDE	0.07	0 39		0.20		0.32		0 18	
4,4' DDE	0.29	6 95		8.51		7.72		6.78	
2,4' DDD	0.33	0 16	J	1.07		0.25	J	0 18	J
4,4' DDD	0.07	2.01		3.22		1.49		3 16	
2,4' DDT	0.02	0.47		0.57		0.74		1 15	
4,4' DDT	0.04	4 26		9.84		4.58		4 91	

Laboratory Qualifiers

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TABLE 1.2.4 LEVELS OF PESTICIDES IN 2002 MUSSEL TISSUES (CONTINUED)

	MDL	Maquoit Bay 1		Maquoit Bay 2		Maquoit Bay 3		Maquoit Bay 4
Dry Weight		2.46		2.21		2.54		1 97
Wet Weight		15.21		15.27		15.34		15.15
Sample Size Units		Grams		Grams		Grams		Grams
% solid		16.2		14.5		16.6		13.0
% Lipid		8.2		10.8		10 2		10.8
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry
Pesticides		**Conc**		**Conc**		**Conc**		**Conc**
Chlorinated Benzenes								
Tetrachlorobenzene 1,2,4,5	0.15	0.64		0.56		0.52		0.42
Tetrachlorobenzene 1,2,3,4	0.19	0.64		0.18	J	0.09	J	0.40
Pentachlorobenzene	0.20	0 21		0.39		0.31		0 27
Hexachlorobenzene	0.10	0.44		0.43		0.39		0.46
Hexachlorocyclohexanes								
Alpha HCH	0.05	0 57		0.53		0.83		0.71
Beta HCH	0.09	0 21		0.11		0.11		0.06
Gamma HCH	0.03	0 18		0.13		0.43		1 24
Delta HCH	0.03	0.00	ND	0.00	ND	0.00	ND	0.00
Chlordane-related Compounds								
Heptachlor	0.06	0 58		0.65		0.77		0.65
Heptachlor Epoxide	0.10	0 21		1.21		0.42		0.49
Oxychlordane	0.12	0.62		0.91		1.27		1 25
Alpha Chlordane	0.09	1 96		3.23		2.18		2 34
Gamma Chlordane	0.10	1 18		0.49		0.72		0.87
Cis-Nonachlor	0.10	0.80		0.31		0.80		1 34
Trans-Nonachlor	0.17	2 26		2.36		3.66		3 19
Other Cyclodiene Pesticides								
Aldrin	0.10	2 97		0.70		1.47		3 23
Dieldrin	0.25	1 32		1.05		1.00		0 97
Endrin	0.18	1.02		2.05		1.91		1 95
Pesticides		**Conc**		**Conc**		**Conc**		**Conc**
Other Chlorinated Pesticides								
Pentachloroanisole	0.04	0.67		1.00		0.68		0.82
Chlorpyrifos	0.25	0 32		1.83		2.00		2 11
Mirex	0.07	0.06		0.31		0.31		0.75
Endosulfan II	0.10	0.00	ND	0.00	ND	0.00	ND	0.00
DDTs and Related Compounds								
2,4' DDE	0.07	0.04	J	0.39		0.24		0 19
4,4' DDE	0.29	5 58		6.13		5.44		7.01
2,4' DDD	0.33	0.46		0.17	J	0.08	J	0.84
4,4' DDD	0.07	5 10		2.83		4.64		4 58
2,4' DDT	0.02	0 53		0.58		1.65		1.69
4,4' DDT	0.04	1.44		3.52		2.77		1 37

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified “J” and those analytes not detected are qualified “ND”. Concentrations that exceeded the calibration limits are qualified “EC”. The concentrations that are determined by analyses of a diluted aliquot are qualified “D”. If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified “I” to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified “B” to denote this possible contamination.

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE

		Inner Fore		Inner Fore		Inner Fore		Inner Fore	
	MDL	1		2		3		4	
Dry Weight		2.00		1.99		1.87		1.79	
Wet Weight		15 25		15.09		15.13		15.84	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		13.1		13 2		12.4		11.3	
% Lipid		7 5		5.9		8.0		10.6	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB1*	0.09	1.73		2.14		1.47		0 91	
PCB7/9*	0.09	0.00	ND	2.80		0.00	ND	0.46	J
PCB8/5	0.10	1.61		1.50		1.54		0 53	
PCB30*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB18/17	0.09	0.82		1.14		1.05		0.67	J
PCB15*	0.09	0.00	ND	0.00	ND	0.00	ND	0.02	J
PCB24/27*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB16/32*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB29	0.08	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB26*	0.09	0.00	ND	3.06		4.69		11.14	
PCB25*	0.09	0.00	ND	0.00	ND	1.77		0.67	J
PCB31*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB28	0.09	3.18		4.19		3.70		2 56	
PCB33/20*	0.09	0.00	ND	0.00	ND	0.00	ND	1 55	
PCB53*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB22/51*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB45*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB46 *	0.09	0.00	ND	0.00	ND	0.00	ND	1 99	
PCB39*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB69*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB52	0.09	10.09		10.84		17.26		4 13	
PCB49*	0.09	12.63		12.65		15.86		3.74	
PCB47/75*	0.09	0.00	ND	0.00	ND	0.00	ND	1 31	
PCB48*	0.09	0.00	ND	0.00	ND	0.00	ND	1.61	
PCB44	0.11	5.84		6.19		6.54		2 55	
PCB42/59/37*	0.09	2.02		0.00	ND	1.03		0.00	ND
PCB72*	0.09	0.00	ND	0.00	ND	0.00	ND	1.75	
PCB41/64*	0.09	7.58	B	28.73		12.41		2.87	B
PCB40*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB67*	0.09	0.00	ND	0.00	ND	0.00	ND	3.09	

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Inner Fore 1		Inner Fore 2		Inner Fore 3		Inner Fore 4	
	MDL								
Dry Weight		2.00		1.99		1.87		1.79	
Wet Weight		15 25		15.09		15.13		15.84	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		13.1		13 2		12.4		11.3	
% Lipid		7 5		5.9		8.0		10.6	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB63*	0.09	0.00	ND	0.00	ND	0.00	ND	0.62	J
PCB74/61*	0.09	1.09		2.86		3.09		1.45	
PCB70*	0.09	4.98		4.92		5.50		3 19	
PCB66	0.09	0.00	ND	0.00	ND	0.00	ND	1.61	
PCB95/80*	0.09	18 94		20.25		22.07		10.52	
PCB55/91*	0.09	2.23		2.01		2.26		1 22	
PCB56/60*	0.09	7.25		3.50		3.87		2.44	
PCB92*	0.09	10.86		5.15		6.44		0.74	
PCB84*	0.09	5.91		1.89		3.59		1 37	
PCB101/90	0.08	23 92		22.83		25.39		12.44	
PCB99*	0.09	14.03		13.98		15.50		6.84	
PCB119*	0.09	0.36	J	0.42	J	0.93		0.48	J
PCB83*	0.09	2.58		4.82		5.09		2.44	
PCB97*	0.09	7.65		8.53		9.20		4.68	
PCB81*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB87/115	0.15	6.11		6.87		7.43		7 92	
PCB85*	0.09	0.00	ND	16.42		0.00	ND	1 10	
PCB136*	0.09	0.00	ND	0.00	ND	0.00	ND	0 31	J
PCB110/77	0.10	14.82		13.35		17.42		5.42	
PCB82*	0.09	2.86		0.00	ND	3.83		2 36	
PCB151*	0.09	2.69		3.38		1.99		0 39	J
PCB135*	0.09	4.80		4.58		5.59		1 99	
PCB107*	0.09	1.20		1.37		1.51		0.72	
PCB149/123*	0.09	19.63		18.15		21.49		8.08	
PCB118	0.08	19.44		18.76		22.32		13.16	
PCB114*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB146*	0.09	5.54		6.03		5.83		3.82	
PCB153/132	0.22	48 21		47.96		56.65		18.17	
PCB105	0.04	0.00	ND	0.00	ND	0.00	ND	4.08	
PCB141/179*	0.09	0.00	ND	0.00	ND	0.00	ND	1.03	
PCB130*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Inner Fore 1		Inner Fore 2		Inner Fore 3		Inner Fore 4	
	MDL								
Dry Weight		2.00		1.99		1.87		1.79	
Wet Weight		15 25		15.09		15.13		15.84	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		13.1		13 2		12.4		11.3	
% Lipid		7 5		5.9		8.0		10.6	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB176/137*	0.09	4.38		4.83		4.84		3 22	
PCB138 /160	0.12	35 16		36.95		42.60		16.27	
PCB158*	0.09	2.69		0.00	ND	0.00	ND	0 52	J
PCB129*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB126*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB178*	0.09	2.33		2.02		3.26		0.00	ND
PCB166*	0.09	0.31	J	0.00	ND	0.54	J	3.65	
PCB175*	0.09	1.48		1.68		1.64		1.42	
PCB187	0.08	14.76		16.32		17.57		1 96	
PCB183 *	0.09	5.13		4.95		6.02		1 92	
PCB128	0.07	5.55		4.84		6.19		2 32	
PCB167*	0.09	1.55		1.39		1.95		0.62	J
PCB185 *	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB174*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB177*	0.09	5.75		6.13		6.64		2.40	
PCB171/202*	0.09	1.62		1.81		1.88		2 51	
PCB156*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB201/157/173*	0.07	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB172*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB197*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB180	0.06	6.63		5.56		7.07		3.03	
PCB193*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB191*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB200*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB169*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB170/190	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB199*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB203/196*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB189*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB195/208	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB207*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Inner Fore 1		Inner Fore 2		Inner Fore 3		Inner Fore 4	
	MDL								
Dry Weight		2.00		1.99		1.87		1.79	
Wet Weight		15 25		15.09		15.13		15.84	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		13.1		13 2		12.4		11.3	
% Lipid		7 5		5.9		8.0		10.6	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB194*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB205 *	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB206	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB209	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Total PCBs		357.94		387.76		414.51		418.08	

Laboratory Qualifiers
All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

	MDL	St Croix 1		St Croix 2		St Croix 3		St Croix 4	
Dry Weight		2.53		2.07		1.87		2.28	
Wet Weight		15.79		15.39		15.02		15 25	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		16.0		13.4		12.5		14.9	
% Lipid		7.7		9.5		7.9		9.0	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB1*	0.09	0.32	J	5.95		2.30		2.85	
PCB7/9*	0.09	6.17		0.00	ND	0.00	ND	0.00	ND
PCB8/5	0.10	2.02		0.17		0.0 0.00	ND	0 27	J
PCB30*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB18/17	0.09	0.80		1.46		1.48		1.43	
PCB15*	0.09	0.27	J	0.00	ND	0.00	ND	0.00	ND
PCB24/27*	0.09	2.19		0.00	ND	0.00	ND	0.00	ND
PCB16/32*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB29	0.08	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB26*	0.09	0.25	J	0.00	ND	0.00	ND	0.00	ND
PCB25*	0.09	2.48		0.59		0.00	ND	0.85	
PCB31*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB28	0.09	2.84		0.41		4.71		4.84	
PCB33/20*	0.09	1.30		0.38		0.00	ND	0.00	ND
PCB53*	0.09	0.00	ND	2.24		0.78		0.83	
PCB22/51*	0.09	0.87		0.00	ND	1.68		1.74	
PCB45*	0.09	0.00	ND	0.00	ND	0.95		0.47	J
PCB46 *	0.09	2.72		0.28		0.00	ND	0.00	ND
PCB39*	0.09	0.00	ND	4.14		0.00	ND	0.00	ND
PCB69*	0.09	0.00	ND	0.00	ND	3.22		1.47	
PCB52	0.09	1.74		1.02		6.88		2.05	
PCB49*	0.09	3.76		3.33		8.27		5 95	
PCB47/75*	0.09	0.81		1.95		0.00	ND	0.00	ND
PCB48*	0.09	1.23		0.00	ND	0.00	ND	0.00	ND
PCB44	0.11	0.87	B	1.18		4.49		5.03	
PCB42/59/37*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB72*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB41/64*	0.09	19 94	I	6.50		10.52	B	15 24	
PCB40*	0.09	0.41	J	0.00	ND	0.00	ND	0.00	ND
PCB67*	0.09	7.31		0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

	MDL	St Croix 1		St Croix 2		St Croix 3		St Croix 4	
Dry Weight		2.53		2.07		1.87		2.28	
Wet Weight		15.79		15.39		15.02		15 25	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		16.0		13.4		12.5		14.9	
% Lipid		7.7		9.5		7.9		9.0	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB63*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB74/61*	0.09	1.36		0.00	ND	0.00	ND	0.00	ND
PCB70*	0.09	0.55		2.81		2.38		2.89	
PCB66	0.09	1.23		1.30		0.00	ND	0.00	ND
PCB95/80*	0.09	3.77		5.55		7.41		7.17	
PCB55/91*	0.09	1.29		0.00	ND	0.00	ND	0 51	J
PCB56/60*	0.09	3.25		0.00	ND	6.55		6.09	
PCB92*	0.09	0.00	ND	0.35		0.00	ND	0.00	ND
PCB84*	0.09	1.34		0.71		0.00	ND	0.00	ND
PCB101/90	0.08	4.31		5.17		6.05		5.48	
PCB99*	0.09	3.07		2.08		2.44		2.69	
PCB119*	0.09	0.28	J	0.00	ND	0.00	ND	0.00	ND
PCB83*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB97*	0.09	2.38		3.83		4.00		4 32	
PCB81*	0.09	0.00	ND	0.00	ND	7.85		0.00	ND
PCB87/115	0.15	0.00	ND	5.84		0.00	ND	0.00	ND
PCB85*	0.09	0.57		3.59		5.78		5 29	
PCB136*	0.09	0.12	J	0.00	ND	0.00	ND	0.00	ND
PCB110/77	0.10	3.11		2.31		3.40		2.86	
PCB82*	0.09	0.00	ND	0.00	ND	0.00	ND	1.72	
PCB151*	0.09	0.67		0.00	ND	0.82		0 18	J
PCB135*	0.09	0.86		1.07		1.41		1 17	
PCB107*	0.09	0.60		0.00	ND	0.00	ND	0.00	ND
PCB149/123*	0.09	7.01		3.63		15.87		13.42	
PCB118	0.08	6.42		0.00	ND	0.00	ND	3 38	
PCB114*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB146*	0.09	2.79		2.68		3.68		2.05	
PCB153/132	0.22	10 32		11.43		14.34		11.87	
PCB105	0.04	1.25		1.40		0.00	ND	0.00	ND
PCB141/179*	0.09	3.08		3.49		3 27		0.00	ND
PCB130*	0.09	0.58		1.52		0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

	MDL	St Croix 1		St Croix 2		St Croix 3		St Croix 4	
Dry Weight		2.53		2.07		1.87		2.28	
Wet Weight		15.79		15.39		15.02		15 25	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		16.0		13.4		12.5		14.9	
% Lipid		7.7		9.5		7.9		9.0	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB176/137*	0.09	1.88		3.62		3.48		3.74	
PCB138 /160	0.12	9.83		4.54		6 31		5.63	
PCB158*	0.09	1.31		0.00	ND	0.00	ND	0.00	ND
PCB129*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB126*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB178*	0.09	0.65		0.00	ND	0.00	ND	0.00	ND
PCB166*	0.09	1.30		1.07		0.00	ND	0.00	ND
PCB175*	0.09	0.67		1.64		1.55		1.67	
PCB187	0.08	1.62		3.84		11.13		9.70	
PCB183 *	0.09	2.16		2.01		2.45		2 15	
PCB128	0.07	0.38		0.00	ND	0.00	ND	0.00	ND
PCB167*	0.09	0.49		0.97		1.33		0.00	ND
PCB185 *	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB174*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB177*	0.09	2.55		3.94		3.76		3.48	
PCB171/202*	0.09	1.94		0.00	ND	0.51	J	0.00	ND
PCB156*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB201/157/173*	0.07	0.68		0.00	ND	0.00	ND	0.00	ND
PCB172*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB197*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB180	0.06	4.75		5.21		4.08		4.07	
PCB193*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB191*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB200*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB169*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB170/190	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB199*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB203/196*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB189*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB195/208	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB207*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

	MDL	St Croix 1		St Croix 2		St Croix 3		St Croix 4	
Dry Weight		2.53		2.07		1.87		2.28	
Wet Weight		15.79		15.39		15.02		15 25	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		16.0		13.4		12.5		14.9	
% Lipid		7.7		9.5		7.9		9.0	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB194*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB205 *	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB206	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB209	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Total PCBs		87 53		115 20		165.14		144.54	

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Seal Cove		Seal Cove		Seal Cove		Seal Cove	
	MDL	1		2		3		4	
Dry Weight		2.42		2.29		2.19		2 25	
Wet Weight		15 28		15.08		15.24		15 31	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		15.9		15 2		14.4		14.7	
% Lipid		5 9		7.2		7.2		6.8	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB1*	0.09	3.17		0.00	ND	4.24		3 14	
PCB7/9*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB8/5	0.10	0.58		1.45		1.53		0.00	ND
PCB30*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB18/17	0.09	0.43	J	0.53	J	0.55	J	0.61	
PCB15*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB24/27*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB16/32*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB29	0.08	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB26*	0.09	0.00	ND	0.00	ND	0.52	J	0.79	
PCB25*	0.09	0.63		0.76		0.65		0.67	
PCB31*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB28	0.09	1.18		2.05		1.31		1 19	
PCB33/20*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB53*	0.09	0.31	J	0.48	J	0.00	ND	0.00	ND
PCB22/51*	0.09	1.04		2.28		2.09		0.00	ND
PCB45*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB46 *	0.09	0.84		0.00	ND	1.43		1 21	
PCB39*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB69*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB52	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB49*	0.09	10 50		10.05		14.21		11.05	
PCB47/75*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB48*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB44	0.11	1.10		2.20		2.38		1 19	
PCB42/59/37*	0.09	1.51		1.77		1.54		1.77	
PCB72*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB41/64*	0.09	7.75	B	11.26		9.89		11.79	
PCB40*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB67*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Seal Cove		Seal Cove		Seal Cove		Seal Cove	
	MDL	1		2		3		4	
Dry Weight		2.42		2.29		2.19		2 25	
Wet Weight		15 28		15.08		15.24		15 31	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		15.9		15 2		14.4		14.7	
% Lipid		5 9		7.2		7.2		6.8	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB63*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB74/61*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB70*	0.09	3.59		4.24		3.85		4 11	
PCB66	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB95/80*	0.09	4.09		4.86		4.16		4 30	
PCB55/91*	0.09	0.85		0.91		0.83		1 20	
PCB56/60*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB92*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB84*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB101/90	0.08	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB99*	0.09	1.41		0.60		0.61		0.67	
PCB119*	0.09	0.00	ND	1.06		0.94		0.00	ND
PCB83*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB97*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB81*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB87/115	0.15	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB85*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB136*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB110/77	0.10	5.86		7.97		7.90		7 52	
PCB82*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB151*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB135*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB107*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB149/123*	0.09	0.00	ND	0.00	ND	1.54		0.00	ND
PCB118	0.08	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB114*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB146*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB153/132	0.22	1.44		2.10		0.00	ND	0.00	ND
PCB105	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB141/179*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB130*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Seal Cove		Seal Cove		Seal Cove		Seal Cove	
	MDL	1		2		3		4	
Dry Weight		2.42		2.29		2.19		2 25	
Wet Weight		15 28		15.08		15.24		15 31	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		15.9		15 2		14.4		14.7	
% Lipid		5 9		7.2		7.2		6.8	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB176/137*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB138 /160	0.12	1.71		1.86		1.94		1.70	
PCB158*	0.09	2.01		2.50		2.96		2.42	
PCB129*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB126*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB178*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB166*	0.09	0.54		1.15		1.08		0.62	
PCB175*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB187	0.08	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB183 *	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB128	0.07	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB167*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB185 *	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB174*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB177*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB171/202*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB156*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB201/157/173*	0.07	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB172*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB197*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB180	0.06	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB193*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB191*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB200*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB169*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB170/190	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB199*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB203/196*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB189*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB195/208	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB207*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Seal Cove		Seal Cove		Seal Cove		Seal Cove	
	MDL	1		2		3		4	
Dry Weight		2.42		2.29		2.19		2 25	
Wet Weight		15 28		15.08		15.24		15 31	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		15.9		15 2		14.4		14.7	
% Lipid		5 9		7.2		7.2		6.8	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB194*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB205 *	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB206	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB209	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Total PCBs		50 53		60.08		66.15		55.96	

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

	MDL	Mare Brook 1		Mare Brook 2		Mare Brook 3		Mare Brook 4	
Dry Weight		1.94		1.85		1.89		1.75	
Wet Weight		15.01		15.20		15.22		15 21	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		12.9		12 2		12.4		11.5	
% Lipid		7 1		8.3		7.0		6 5	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB1*	0.09	4.09		2.17		2 16		1.56	
PCB7/9*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB8/5	0.10	0.54		0.65		0 58		1.68	
PCB30*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB18/17	0.09	1.74		1.37		1 19		0.93	
PCB15*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB24/27*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB16/32*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB29	0.08	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB26*	0.09	5.30		6.76		5.08		5.74	
PCB25*	0.09	5.18		5.92		5.07		3.19	
PCB31*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB28	0.09	5.57		6.04		6 31		0.00	ND
PCB33/20*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB53*	0.09	0.35	J	0.42	J	0.44	J	0.36	J
PCB22/51*	0.09	2.36		2.93		2 26		2.51	
PCB45*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB46 *	0.09	0.45	J	0.55	J	0.44	J	0.00	ND
PCB39*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB69*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB52	0.09	4.79		9.58		0.80		8.04	
PCB49*	0.09	8.08		10.23		7 24		10.76	
PCB47/75*	0.09	0.00	ND	0.00	ND	6 36		0.00	ND
PCB48*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB44	0.11	3.94		4.59		3.73		5.87	
PCB42/59/37*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB72*	0.09	1.49		3.05		3.83		1.32	
PCB41/64*	0.09	13.83		0.00	ND	21.82		23 38	
PCB40*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB67*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

	MDL	Mare Brook 1		Mare Brook 2		Mare Brook 3		Mare Brook 4	
Dry Weight		1.94		1.85		1.89		1.75	
Wet Weight		15.01		15.20		15.22		15 21	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		12.9		12 2		12.4		11.5	
% Lipid		7 1		8.3		7.0		6 5	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB63*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB74/61*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB70*	0.09	0.60	J	0.00	ND	0 26	J	3.71	
PCB66	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB95/80*	0.09	8.31		9.31		8 19		8.55	
PCB55/91*	0.09	0.00	ND	0.00	ND	0.00	ND	0.45	J
PCB56/60*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB92*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB84*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB101/90	0.08	3.80		4.60		6.48		5.00	
PCB99*	0.09	2.82		3.29		3 58		3.26	
PCB119*	0.09	0.17	J	0.00	ND	0 17	J	0.00	ND
PCB83*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB97*	0.09	3.28		3.98		3.44		3.90	
PCB81*	0.09	0.00	ND	10.68		8.80		0.00	ND
PCB87/115	0.15	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB85*	0.09	7.80		9.92		8.74		8.61	
PCB136*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB110/77	0.10	2.23		3.43		3 55		3.67	
PCB82*	0.09	1.99		2.47		2.01		0.00	ND
PCB151*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB135*	0.09	1.70		2.21		2 11		0.52	J
PCB107*	0.09	0.26	J	0.00	ND	0.00	ND	0.00	ND
PCB149/123*	0.09	2.38		3.00		3.74		3.68	
PCB118	0.08	2.08		2.43		2.45		2.35	
PCB114*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB146*	0.09	3.33		4.30		3.81		4.46	
PCB153/132	0.22	10.86		12.74		11.55		10 99	
PCB105	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB141/179*	0.09	2.08		2.89		2 19		0.00	ND
PCB130*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

	MDL	Mare Brook 1		Mare Brook 2		Mare Brook 3		Mare Brook 4	
Dry Weight		1.94		1.85		1.89		1.75	
Wet Weight		15.01		15.20		15.22		15 21	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		12.9		12 2		12.4		11.5	
% Lipid		7 1		8.3		7.0		6 5	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB176/137*	0.09	2.57		3.17		2 52		3.82	
PCB138 /160	0.12	6.79		8.35		24.86		2.23	
PCB158*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB129*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB126*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB178*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB166*	0.09	0.00	ND	0.00	ND	0.44	J	0.00	ND
PCB175*	0.09	1.34		1.42		1 23		1.87	
PCB187	0.08	9.52		11.66		9 93		10.65	
PCB183 *	0.09	1.76		2.13		2 18		1.47	
PCB128	0.07	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB167*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB185 *	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB174*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB177*	0.09	4.35		4.73		4 57		4.93	
PCB171/202*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB156*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB201/157/173*	0.07	0.00	ND	0.00	ND	5.40		0.00	ND
PCB172*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB197*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB180	0.06	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB193*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB191*	0.09	0.55	J	0.66		0.61	J	0.60	J
PCB200*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB169*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB170/190	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB199*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB203/196*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB189*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB195/208	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB207*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

	MDL	Mare Brook 1		Mare Brook 2		Mare Brook 3		Mare Brook 4	
Dry Weight		1.94		1.85		1.89		1.75	
Wet Weight		15.01		15.20		15.22		15 21	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		12.9		12 2		12.4		11.5	
% Lipid		7 1		8.3		7.0		6 5	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB194*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB205 *	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB206	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB209	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Total PCBs		138.28		161.65		190.12		150.07	

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Harpswell		Harpswell		Harpswell		Harpswell	
	MDL	1		2		3		4	
Dry Weight		1.96		1.62		1.71		1.85	
Wet Weight		15 28		15.09		15.67		15.67	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		12.8		10.8		10.9		11.8	
% Lipid		7.4		10.0		9.2		10.0	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB1*	0.09	0.80		0.78		0.58		0 11	
PCB7/9*	0.09	1.74		0.65		1.60		1 37	
PCB8/5	0.10	0.14		0.35		0.16		0 16	
PCB30*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB18/17	0.09	0.86		1.77		1.12		1 25	
PCB15*	0.09	0.00	ND	0.11	J	0.00	ND	0.41	
PCB24/27*	0.09	0.33		0.31		0.65		0 56	
PCB16/32*	0.09	0.31		0.25		0.33		0.00	ND
PCB29	0.08	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB26*	0.09	0.44		0.70		0.64		0 29	
PCB25*	0.09	3.31		1.83		1.79		1.48	
PCB31*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB28	0.09	3.42		2.73		1.79		2 94	
PCB33/20*	0.09	0.53		0.29		0.17		0.41	
PCB53*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB22/51*	0.09	0.00	ND	2.85		0.00	ND	0.00	ND
PCB45*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB46 *	0.09	0.71		0.61		0.74		0 58	
PCB39*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB69*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB52	0.09	2.37		2.41		3.11		1 52	
PCB49*	0.09	4.20		5.21		4.64		4 34	
PCB47/75*	0.09	1.38		0.98		1.52		1 35	
PCB48*	0.09	0.00	ND	0.00	ND	1.70		0.00	ND
PCB44	0.11	1.87		3.92		2.04		1.74	
PCB42/59/37*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB72*	0.09	4.85		5.47		6.17		1 33	
PCB41/64*	0.09	1.80	B	1.93	B	1.28	B	0 51	B
PCB40*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB67*	0.09	1.89		2.52		3.17		1 98	

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Harpswell		Harpswell		Harpswell		Harpswell	
	MDL	1		2		3		4	
Dry Weight		1.96		1.62		1.71		1.85	
Wet Weight		15 28		15.09		15.67		15.67	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		12.8		10.8		10.9		11.8	
% Lipid		7.4		10.0		9.2		10.0	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB63*	0.09	1.09		0.52		1.39		0.87	
PCB74/61*	0.09	0.88		1.39		0.94		0.82	
PCB70*	0.09	1.15		0.52		1.11		0.78	
PCB66	0.09	0.74		1.39		0.84		0.72	
PCB95/80*	0.09	3.83		5.52		4.27		3 39	
PCB55/91*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB56/60*	0.09	1.26		1.01		0.00	ND	1 11	
PCB92*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB84*	0.09	0.88		0.95		0.96		0 57	
PCB101/90	0.08	4.23		5.15		3.12		2 58	
PCB99*	0.09	4.39		8.10		6.30		5 33	
PCB119*	0.09	0.82		0.49		0.81		0.43	
PCB83*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB97*	0.09	2.96		3.53		3.42		2.85	
PCB81*	0.09	4.53		4.90		5.17		3 95	
PCB87/115	0.15	2.65		2.82		2.54		2.43	
PCB85*	0.09	0.14		0.11	J	0.14		0.06	J
PCB136*	0.09	0.18		0.37		0.26		0 28	
PCB110/77	0.10	2.10		3.64		3.11		1.88	
PCB82*	0.09	0.00	ND	2.16		0.00	ND	0.00	ND
PCB151*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB135*	0.09	0.17		1.01		0.61		0.73	
PCB107*	0.09	1.23		0.55		0.73		0.71	
PCB149/123*	0.09	1.86		6.61		3.81		4 50	
PCB118	0.08	2.59		2.53		2.15		2.08	
PCB114*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB146*	0.09	1.38		1.28		3.11		1 37	
PCB153/132	0.22	5.79		6.97		7.22		5.45	
PCB105	0.04	0.18		0.68		0.46		0.45	
PCB141/179*	0.09	1.89		1.12		3.37		3.49	
PCB130*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Harpswell		Harpswell		Harpswell		Harpswell	
	MDL	1		2		3		4	
Dry Weight		1.96		1.62		1.71		1.85	
Wet Weight		15 28		15.09		15.67		15.67	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		12.8		10.8		10.9		11.8	
% Lipid		7.4		10.0		9.2		10.0	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB176/137*	0.09	1.84		2.61		2.11		1.65	
PCB138 /160	0.12	2.02		5.21		1.79		1.65	
PCB158*	0.09	1.03		2.29		1.22		0.70	
PCB129*	0.09	0.48		0.48		0.70		0 56	
PCB126*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB178*	0.09	0.14		0.21		0.00	ND	0.00	ND
PCB166*	0.09	4.05		1.86		2.44		2.06	
PCB175*	0.09	0.64		1.05		0.79		0.66	
PCB187	0.08	6.23		9.09		2.65		1.89	
PCB183 *	0.09	2.79		3.74		5.19		5 36	
PCB128	0.07	0.28		0.74		0.61		0.67	
PCB167*	0.09	0.79		1.06		1.48		1 18	
PCB185 *	0.09	1.19		1.52		1.92		1 55	
PCB174*	0.09	0.47		0.61		0.90		0 99	
PCB177*	0.09	2.94		5.03		5.62		4 95	
PCB171/202*	0.09	0.35		1.04		0.42		0 30	
PCB156*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB201/157/173*	0.07	3.72		5.92		4.24		4.89	
PCB172*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB197*	0.09	0.15		0.33		0.00	ND	0 19	
PCB180	0.06	0.83		1.32		1.20		1 24	
PCB193*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB191*	0.09	0.33		0.31		0.42		0 34	
PCB200*	0.09	3.50		3.81		4.34		3 50	
PCB169*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB170/190	0.10	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB199*	0.09	0.15		0.19		0.28		0 33	
PCB203/196*	0.09	0.00	ND	0.20		0.30		0 29	
PCB189*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB195/208	0.04	0.00	ND	0.00	ND	0.54		0.00	ND
PCB207*	0.09	0.13		0.02	J	0.00	ND	0 12	

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Harpswell		Harpswell		Harpswell		Harpswell	
	MDL	1		2		3		4	
Dry Weight		1.96		1.62		1.71		1.85	
Wet Weight		15 28		15.09		15.67		15.67	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		12.8		10.8		10.9		11.8	
% Lipid		7.4		10.0		9.2		10.0	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB194*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB205 *	0.09	0.38		0.47		0.00	ND	0 34	
PCB206	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB209	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Total PCBs		112.28		148 13		128.23		104.58	

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

	MDL	Maquoit Bay 1		Maquoit Bay 2		Maquoit Bay 3		Maquoit Bay 4	
Dry Weight		2.46		2.21		2.54		1 97	
Wet Weight		15 21		15.27		15.34		15 15	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		16.2		14 5		16.6		13.0	
% Lipid		8 2		10.8		10.2		10.8	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB1*	0.09	0.42		1.00		0.50		0.60	
PCB7/9*	0.09	0.20		1.66		1.23		1 54	
PCB8/5	0.10	1.16		0.60		1.07		1 18	
PCB30*	0.09	0.00	ND	0.00	ND	0.00	ND	0.02	J
PCB18/17	0.09	1.20		1.91		1.43		0.85	
PCB15*	0.09	0.16		0.00	ND	0.00	ND	0.00	ND
PCB24/27*	0.09	0.37		0.82		0.96		1 25	
PCB16/32*	0.09	0.00	ND	0.35		0.40		0.00	ND
PCB29	0.08	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB26*	0.09	0.07	J	0.51		0.85		0 20	
PCB25*	0.09	0.65		1.23		2.83		0 97	
PCB31*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB28	0.09	1.75		3.02		4.11		2 10	
PCB33/20*	0.09	0.00	ND	1.12		0.49		0.61	
PCB53*	0.09	0.22		0.00	ND	0.00	ND	0.00	ND
PCB22/51*	0.09	1.19		0.00	ND	0.00	ND	0.00	ND
PCB45*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB46 *	0.09	0.28		0.51		0.47		0 59	
PCB39*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB69*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB52	0.09	1.65		3.74		3.00		3 31	
PCB49*	0.09	3.26		4.88		3.83		3.75	
PCB47/75*	0.09	0.47		2.23		1.78		1.75	
PCB48*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB44	0.11	1.43		0.93		1.13		1.43	
PCB42/59/37*	0.09	1.34		0.00	ND	0.00	ND	0.00	ND
PCB72*	0.09	0.58		3.99		2.70		4 59	
PCB41/64*	0.09	4.22	B	1.05	B	0.84	B	1.64	B
PCB40*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB67*	0.09	0.28		0.22		0.29		1.48	

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

	MDL	Maquoit Bay 1		Maquoit Bay 2		Maquoit Bay 3		Maquoit Bay 4	
Dry Weight		2.46		2.21		2.54		1 97	
Wet Weight		15 21		15.27		15.34		15 15	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		16.2		14 5		16.6		13.0	
% Lipid		8 2		10.8		10.2		10.8	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB63*	0.09	0.33		0.93		1.32		1 16	
PCB74/61*	0.09	1.35		1.15		1.46		1 38	
PCB70*	0.09	1.49		0.38		0.45		1 25	
PCB66	0.09	0.63		1.29		1.50		1 17	
PCB95/80*	0.09	3.08		5.16		4.94		5.83	
PCB55/91*	0.09	0.76		0.00	ND	0.00	ND	0.00	ND
PCB56/60*	0.09	1.10		3.48		4.01		4 90	
PCB92*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB84*	0.09	1.21		0.64		1.53		0 96	
PCB101/90	0.08	3.32		4.25		4.20		4.86	
PCB99*	0.09	4.34		4.15		7.05		7.07	
PCB119*	0.09	0.55		0.24		0.62		0.48	
PCB83*	0.09	0.61		0.00	ND	0.00	ND	0.00	ND
PCB97*	0.09	1.38		2.28		1.98		3 11	
PCB81*	0.09	0.83		3.75		2.43		2.89	
PCB87/115	0.15	0.63		1.10		0.34		0 53	
PCB85*	0.09	0.08		0.12		0.05	J	0 19	
PCB136*	0.09	0.16		2.40		0.37		0 35	
PCB110/77	0.10	4.61		6.41		6.02		6 52	
PCB82*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB151*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB135*	0.09	0.49		0.25		0.41		0 38	
PCB107*	0.09	0.49		0.78		1.40		0 59	
PCB149/123*	0.09	4.30		3.14		1.28		2.42	
PCB118	0.08	1.92		0.89		1.79		1.88	
PCB114*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB146*	0.09	0.47		1.68		2.51		3.48	
PCB153/132	0.22	4.76		6.42		5.39		5.04	
PCB105	0.04	0.70		0.48		0.42		0.61	
PCB141/179*	0.09	0.98		1.93		2.59		3.87	
PCB130*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

	MDL	Maquoit Bay 1		Maquoit Bay 2		Maquoit Bay 3		Maquoit Bay 4	
Dry Weight		2.46		2.21		2.54		1 97	
Wet Weight		15 21		15.27		15.34		15 15	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		16.2		14 5		16.6		13.0	
% Lipid		8 2		10.8		10.2		10.8	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB176/137*	0.09	0.16		0.94		0.22		0 31	
PCB138 /160	0.12	4.78		3.06		4.57		6 22	
PCB158*	0.09	1.04		0.86		2.04		2 27	
PCB129*	0.09	0.10		0.59		0.37		0.49	
PCB126*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB178*	0.09	0.40		0.15		1.42		1 95	
PCB166*	0.09	2.13		5.71		7.17		4.47	
PCB175*	0.09	0.18		0.30		0.11		0 51	
PCB187	0.08	1.97		6.49		3.95		6 19	
PCB183 *	0.09	1.64		2.39		3.61		2.71	
PCB128	0.07	0.47		0.14		0.70		0 25	
PCB167*	0.09	0.85		0.75		0.79		0 55	
PCB185 *	0.09	0.72		0.75		1.05		1.05	
PCB174*	0.09	0.14		0.55		0.95		1.89	
PCB177*	0.09	2.02		2.59		2.78		3.40	
PCB171/202*	0.09	0.80		0.59		0.51		0 51	
PCB156*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB201/157/173*	0.07	3.81		4.17		3.81		3 34	
PCB172*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB197*	0.09	0.32		0.19		0.40		3.89	
PCB180	0.06	0.80		1.09		1.45		1 30	
PCB193*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB191*	0.09	0.00	J	0.31		0.31		0 39	
PCB200*	0.09	0.00	ND	3.02		2.08		2.83	
PCB169*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB170/190	0.10	0.00	ND	1.01		0.00	ND	0.00	ND
PCB199*	0.09	0.03	J	0.38		0.77		0 51	
PCB203/196*	0.09	0.04	J	0.00	ND	2.39		10.71	
PCB189*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB195/208	0.04	0.00	ND	0.45		0.27		0 57	
PCB207*	0.09	0.51		0.11		0.29		0 11	

TABLE 1.2.5 LEVELS OF PCBs IN 2002 MUSSEL TISSUE (CONTINUED)

		Maquoit		Maquoit		Maquoit		Maquoit	
	MDL	Bay 1		Bay 2		Bay 3		Bay 4	
Dry Weight		2.46		2.21		2.54		1 97	
Wet Weight		15 21		15.27		15.34		15 15	
Sample Size Units		Grams		Grams		Grams		Grams	
% solid		16.2		14 5		16.6		13.0	
% Lipid		8 2		10.8		10.2		10.8	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)		Dry		Dry		Dry		Dry	
Individual PCBs		**Conc**		**Conc**		**Conc**		**Conc**	
PCB194*	0.09	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB205 *	0.09	0.00	ND	0.28		0.54		0.43	
PCB206	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
PCB209	0.04	0.00	ND	0.00	ND	0.00	ND	0.00	ND
Total PCBs		84 36		119 94		124.52		145.65	

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE

		Inner Fore	Inner Fore	Inner Fore	Inner Fore
Sample ID	Tissues Dry	1	2	3	4
Dry Weight	2.2	2.00	1.99	1.87	1.73
Wet Weight	2.2	15.25	15.09	15.13	15.26
Sample Size Units	Grams	Grams	Grams	Grams	Grams
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue
% solid	21.7	13.1	13.2	12.4	11.3
% Lipid	1.4	7.5	5.9	8.0	10.6
Reporting Units	ng/g	ng/g	ng/g	ng/g	ng/g
Calculation Basis (dry/wet)	Dry	Dry	Dry	Dry	Dry
Method	GCMS	GCMS	GCMS	GCMS	GCMS
Surrogate Compounds	0.0	**%Recovery**	**%Recovery**	**%Recovery**	**%Recovery**
d8-Naphthalene	0.0	44.0	60.5	49.6	64.9
d10-Acenaphthene	0.0	70.9	89.1	76.0	92.5
d10-Phenanthrene	0.0	71.1	82.1	82 1	89.4
d12-Chrysene	0.0	70.3	77.3	78 2	80.4
d12-Perylene	0.0	62.9	72.0	71 9	82.0
Total PAHs	0.0	**Conc**	**Conc**	**Conc**	**Conc**
Total PAHs with Perylene	0.0	3196.8	3247.3	3581.5	1417 1
Total PAHs without Perylene	0.0	3160.4	3211.4	3540.8	1403 2
	0.0				
PAH Compounds	MDLs	**Conc**	**Conc**	**Conc**	**Conc**
Naphthalene	2.4	10.9	7.0	10 3	6.7
C1-Naphthalenes	4.2	14.1	9.7	12 3	7.6
C2-Naphthalenes	2.4	14.7	11.6	15 2	6.2
C3-Naphthalenes	3.7	35.1	26.7	32.5	15.2
C4-Naphthalenes	3.7	70.0	59 2	71.6	24.7
Biphenyl	2.0	2.1 J	1.4 J	2.8	1.5 J
Acenaphthylene	1.3	14.6	12.7	17.0	5.7
Acenaphthene	2.0	12.1	11 1	15.0	5.7
Fluorene	1.9	15.2	13 3	17.5	6.7
C1-Fluorenes	3.8	37.1	33.7	32.4	20.2
C2-Fluorenes	3.8	90.2	80.9	107.7	47.5
C3-Fluorenes	3.8	219.5	223.5	264.7	156.7
Phenanthrene	1.8	40.4	35 9	44 3	18.0
Anthracene	1.5	40.9	37.4	42 3	15.4
C1-Phenanthrenes/Anthracenes	1.6	73.3	70.0	76 9	32.7
C2-Phenanthrenes/Anthracenes	1.6	166.4	164.7	171.2	73.3
C3-Phenanthrenes/Anthracenes	1.6	178.0	195.3	198.7	85.9
C4-Phenanthrenes/Anthracenes	1.6	125.0	135.2	141.2	57.0

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE (CONTINUED)

		Inner Fore		Inner Fore		Inner Fore		Inner Fore	
Sample ID	Tissues Dry	1		2		3		4	
Dry Weight	2.2	2.00		1.99		1.87		1.73	
Wet Weight	2.2	15.25		15.09		15.13		15.26	
Sample Size Units	Grams	Grams		Grams		Grams		Grams	
Matrix	Tissue	Tissue		Tissue		Tissue		Tissue	
% solid	21.7	13.1		13.2		12.4		11.3	
% Lipid	1.4	7.5		5.9		8.0		10.6	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)	Dry	Dry		Dry		Dry		Dry	
Method	GCMS	GCMS		GCMS		GCMS		GCMS	
PAH Compounds	MDLs	**Conc**		**Conc**		**Conc**		**Conc**	
Dibenzothiophene	0.7	4.4		4.0		4.8		1.7	
C1-Dibenzothiophenes	1.3	16.2		13.3		17 5		5.9	
C2-Dibenzothiophenes	1.3	49.0		50.1		56.6		19.6	
C3-Dibenzothiophenes	1.3	76.5		71.9		76.6		28.5	
Fluoranthene	1.6	349.7		328 9		376.1		139.6	
Pyrene	1.7	316.2		310 1		338.7		127.3	
C1-Fluoranthenes/Pyrenes	3.4	244.0		251 3		277.9		96.7	
Benzo(a)anthracene	1.7	109.7		130.4		130.7		54.7	
Chrysene	1.3	197.9		220 1		238.0		81.2	
C1-Chrysenes	2.6	93.5		106 5		106.2		38.5	
C2-Chrysenes	2.6	40.8		49.2		47.8		15.9	
C3-Chrysenes	2.6	4.3		6.5		6.7		1.7	J
C4-Chrysenes	2.6	1.8	J	1.9	J	2.1	J	0.6	J
Benzo(b)fluoranthene	3.0	188.7		210.0		218.2		78.4	
Benzo(k)fluoranthene	2.1	47.3		57.9		63.0		21.8	
Benzo(e)pyrene	1.6	136.5		140.8		157.7		54.2	
Benzo(a)pyrene	3.3	50.8		55.7		61.7		21.2	
Perylene	0.8	36.4		36.0		40.7		13.9	
Indeno(1,2,3-c,d)pyrene	3.1	33.9		33.5		39 2		13.2	
Dibenzo(a,h)anthracene	1.6	6.0		6.6		7.1		1.9	J
Benzo(g,h,i)perylene	2.6	33.7		33.2		40.7		13.9	
2-Methylnaphthalene	1.9	7.8		5.4		6.6		3.9	
1-Methylnaphthalene	2.3	6.3		4.3		5.7		3.7	
2,6-Dimethylnaphthalene	1.2	3.7		3.1		3.7		1.8	
1,6,7-Trimethylnaphthalene	1.8	5.9		5.3		6.3		2.6	
1-Methylphenanthrene	0.8	20.9		19.5		22 1		7 2	

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified “J” and those analytes not detected are qualified “ND”. Concentrations that exceeded the calibration limits are qualified “EC”. The concentrations that are determined by analyses of a diluted aliquot are qualified “D”. If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified “I” to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified “B” to denote this possible contamination.

TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE (CONTINUED)

Sample ID	Tissues Dry	St Croix 1	St Croix 2	St Croix 3	St Croix 4
Dry Weight	2.2	2.44	2.07	1.87	2 28
Wet Weight	2.2	15.24	15.39	15.02	15.25
Sample Size Units	Grams	Grams	Grams	Grams	Grams
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue
% solid	21.7	16.0	13.4	12 5	14.9
% Lipid	1.4	7.7	9.5	7.9	9.0
Reporting Units	ng/g	ng/g	ng/g	ng/g	ng/g
Calculation Basis (dry/wet)	Dry	Dry	Dry	Dry	Dry
Method	GCMS	GCMS	GCMS	GCMS	GCMS
Surrogate Compounds	0.0	**%Recovery**	**%Recovery**	**%Recovery**	**%Recovery**
d8-Naphthalene	0.0	66.7	61.1	56 2	50.3
d10-Acenaphthene	0.0	88.2	83.4	80.7	73.2
d10-Phenanthrene	0.0	89.5	83.9	86 2	75.7
d12-Chrysene	0.0	77.8	76.2	79 2	65.6
d12-Perylene	0.0	75.1	74.0	76.4	66.4
Total PAHs	0.0	**Conc**	**Conc**	**Conc**	**Conc**
Total PAHs with Perylene	0.0	1214 9	1065.5	1153.2	992.7
Total PAHs without Perylene	0.0	1204.4	1060.7	1147.0	987.5
	0.0				
PAH Compounds	MDLs	**Conc**	**Conc**	**Conc**	**Conc**
Naphthalene	2.4	5.6	4.2	5.6	4.8
C1-Naphthalenes	4.2	6.4	3.8 J	6.0	3.9 J
C2-Naphthalenes	2.4	5.2	3.3	6.7	4.1
C3-Naphthalenes	3.7	11.6	7.2	8.7	7.5
C4-Naphthalenes	3.7	18.7	12.8	14 3	10.0
Biphenyl	2.0	1.4 J	2.7	3.1	2.8
Acenaphthylene	1.3	4.4	1.5	1.9	1.9
Acenaphthene	2.0	5.4	5.9	7.4	5.2
Fluorene	1.9	7.2	4.4	7.0	3.5
C1-Fluorenes	3.8	16.3	32.3	24.7	17.9
C2-Fluorenes	3.8	14.0	91.7	113.7	76.5
C3-Fluorenes	3.8	136.3	393 3	327.7	326.7
Phenanthrene	1.8	15.3	17.9	23.7	18.9
Anthracene	1.5	11.7	15.7	19.4	18.6
C1-Phenanthrenes/Anthracenes	1.6	24.9	27.7	17 1	13.0
C2-Phenanthrenes/Anthracenes	1.6	57.7	26.3	26 1	23.3
C3-Phenanthrenes/Anthracenes	1.6	76.6	81.6	80.8	97.8
C4-Phenanthrenes/Anthracenes	1.6	52.7	116 3	138.0	99.4

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE (CONTINUED)

Sample ID	Tissues Dry	St Croix 1		St Croix 2		St Croix 3		St Croix 4	
Dry Weight	2.2	2.44		2.07		1.87		2 28	
Wet Weight	2.2	15.24		15.39		15.02		15.25	
Sample Size Units	Grams	Grams		Grams		Grams		Grams	
Matrix	Tissue	Tissue		Tissue		Tissue		Tissue	
% solid	21.7	16.0		13.4		12 5		14.9	
% Lipid	1.4	7.7		9.5		7.9		9.0	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)	Dry	Dry		Dry		Dry		Dry	
Method	GCMS	GCMS		GCMS		GCMS		GCMS	
PAH Compounds	MDLs	**Conc**		**Conc**		**Conc**		**Conc**	
Dibenzothiophene	0.7	1.5		0.6	J	0.9		0.7	
C1-Dibenzothiophenes	1.3	4.2		2.5		3.0		3.0	
C2-Dibenzothiophenes	1.3	17.8		9.1		9.4		8.5	
C3-Dibenzothiophenes	1.3	25.0		13.7		19 9		17.0	
Fluoranthene	1.6	116.0		49.7		66.0		57.9	
Pyrene	1.7	103.7		52.6		68.6		58.2	
C1-Fluoranthenes/Pyrenes	3.4	81.1		24.3		56 2		38.5	
Benzo(a)anthracene	1.7	45.7		4.5		7.7		5.4	
Chrysene	1.3	72.1		10.8		14 9		12.6	
C1-Chrysenes	2.6	32.6		8.1		11.8		9.9	
C2-Chrysenes	2.6	14.0		4.6		7.0		5.3	
C3-Chrysenes	2.6	1.5	J	0.5	J	0.7	J	0.2	J
C4-Chrysenes	2.6	0.7	J	1.3	J	2.1	J	1.7	J
Benzo(b)fluoranthene	3.0	65.6		7.6		12 2		7.6	
Benzo(k)fluoranthene	2.1	19.8		2.5		3.9		1.8	J
Benzo(e)pyrene	1.6	47.5		10.1		14.0		12.1	
Benzo(a)pyrene	3.3	18.0		3.7		6.5		4.4	
Perylene	0.8	10.6		4.8		6.3		5.2	
Indeno(1,2,3-c,d)pyrene	3.1	11.1		2.0	J	3.4	J	1.8	J
Dibenzo(a,h)anthracene	1.6	1.6	J	0.2	J	0.6	J	0.4	J
Benzo(g,h,i)perylene	2.6	12.1		4.3		6.4		5.0	
2-Methylnaphthalene	1.9	3.3		2.3		3.5		2.3	
1-Methylnaphthalene	2.3	3.1		1.5	J	2.5	J	1.6	J
2,6-Dimethylnaphthalene	1.2	1.5		0.8	J	1.1	J	0 9	J
1,6,7-Trimethylnaphthalene	1.8	2.2		0.9	J	1.1	J	1 1	J
1-Methylphenanthrene	0.8	7.0		2.2		2.8		2.4	

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE (CONTINUED)

		Seal Cove	Seal Cove	Seal Cove	Seal Cove
Sample ID	Tissues Dry	1	2	3	4
Dry Weight	2.2	2.42	2.29	2.19	2 25
Wet Weight	2.2	15.28	15.08	15.24	15.31
Sample Size Units	Grams	Grams	Grams	Grams	Grams
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue
% solid	21.7	15.9	15.2	14.4	14.7
% Lipid	1.4	5.9	7.2	7.2	6.8
Reporting Units	ng/g	ng/g	ng/g	ng/g	ng/g
Calculation Basis (dry/wet)	Dry	Dry	Dry	Dry	Dry
Method	GCMS	GCMS	GCMS	GCMS	GCMS
Surrogate Compounds	0.0	**%Recovery**	**%Recovery**	**%Recovery**	**%Recovery**
d8-Naphthalene	0.0	43.2	49.3	60.6	46.4
d10-Acenaphthene	0.0	74.2	73.0	82.0	74.8
d10-Phenanthrene	0.0	85.9	80.0	90.6	84.4
d12-Chrysene	0.0	72.5	68.6	81.0	73.3
d12-Perylene	0.0	72.4	67.8	76.0	74.1
Total PAHs	0.0	**Conc**	**Conc**	**Conc**	**Conc**
Total PAHs with Perylene	0.0	274.0	347.7	363.2	340.8
Total PAHs without Perylene	0.0	273.0	346 3	362.0	339.9
	0.0				
PAH Compounds	MDLs	**Conc**	**Conc**	**Conc**	**Conc**
Naphthalene	2.4	5.6	5.5	5.0	6.8
C1-Naphthalenes	4.2	4.7	4.5	4.2	5.3
C2-Naphthalenes	2.4	3.5	3.2	3.3	4.4
C3-Naphthalenes	3.7	7.3	6.4	5.5	7.7
C4-Naphthalenes	3.7	6.2	6.9	5.9	7.7
Biphenyl	2.0	1.7 J	2.0	2.8	3 1
Acenaphthylene	1.3	0.9 J	0.9 J	0.7 J	1.4
Acenaphthene	2.0	9.5	9.1	8.7	10.0
Fluorene	1.9	3.5	3.9	4.5	4 5
C1-Fluorenes	3.8	8.9	10.9	11 2	10.5
C2-Fluorenes	3.8	38.4	53.6	59 5	48.1
C3-Fluorenes	3.8	82.9	116 1	131.1	109.2
Phenanthrene	1.8	4.6	5.0	4.5	5 3
Anthracene	1.5	1 5	1.8	1.4 J	1 9
C1-Phenanthrenes/Anthracenes	1.6	5.0	8.1	8.5	5.4
C2-Phenanthrenes/Anthracenes	1.6	6 9	8.8	9.9	8 3
C3-Phenanthrenes/Anthracenes	1.6	11.8	17.7	17.7	18.1
C4-Phenanthrenes/Anthracenes	1.6	9.8	12.1	11.6	12.9

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE (CONTINUED)

		Seal Cove		Seal Cove		Seal Cove		Seal Cove	
Sample ID	Tissues Dry	1		2		3		4	
Dry Weight	2.2	2.42		2.29		2.19		2 25	
Wet Weight	2.2	15.28		15.08		15.24		15.31	
Sample Size Units	Grams	Grams		Grams		Grams		Grams	
Matrix	Tissue	Tissue		Tissue		Tissue		Tissue	
% solid	21.7	15.9		15.2		14.4		14.7	
% Lipid	1.4	5.9		7.2		7.2		6.8	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)	Dry	Dry		Dry		Dry		Dry	
Method	GCMS	GCMS		GCMS		GCMS		GCMS	
PAH Compounds	MDLs	**Conc**		**Conc**		**Conc**		**Conc**	
Dibenzothiophene	0.7	0.4	J	0.5	J	0.5	J	0.6	J
C1-Dibenzothiophenes	1.3	2.0		2.5		2.7		2.1	
C2-Dibenzothiophenes	1.3	3.5		4.0		4.2		4.1	
C3-Dibenzothiophenes	1.3	4.6		6.3		7.0		5.2	
Fluoranthene	1.6	8.3		9.7		8.5		9.6	
Pyrene	1.7	6.2		6.8		6.1		7.0	
C1-Fluoranthenes/Pyrenes	3.4	5.7		6.9		6.3		6 5	
Benzo(a)anthracene	1.7	2.9		3.0		2.7		3.6	
Chrysene	1.3	4.0		4.1		4.0		4 3	
C1-Chrysenes	2.6	2.5		2.7		2.7		2.7	
C2-Chrysenes	2.6	3.4		4.1		3.0		3 9	
C3-Chrysenes	2.6	0.1	J	0.2	J	0.3	J	0 3	J
C4-Chrysenes	2.6	0.4	J	0.5	J	0.5	J	0 5	J
Benzo(b)fluoranthene	3.0	3.8		3.6		3.5		4 3	
Benzo(k)fluoranthene	2.1	1.3	J	1.1	J	1.3	J	1 2	J
Benzo(e)pyrene	1.6	3.2		4.1		3.7		3 9	
Benzo(a)pyrene	3.3	5.0		6.6		6.3		6 3	
Perylene	0.8	1.0		1.3		1.2		0 9	
Indeno(1,2,3-c,d)pyrene	3.1	1.5	J	1.5	J	1.1	J	1 5	J
Dibenzo(a,h)anthracene	1.6	0.4	J	0.3	J	0.2	J	0.4	J
Benzo(g,h,i)perylene	2.6	1.4	J	1.5	J	1.4	J	1.6	J
2-Methylnaphthalene	1.9	2.8		2.6		2.5		3 2	
1-Methylnaphthalene	2.3	1.9	J	1.9	J	1.7	J	2 2	J
2,6-Dimethylnaphthalene	1.2	0.7	J	0.7	J	0.8	J	0 9	J
1,6,7-Trimethylnaphthalene	1.8	0.7	J	0.7	J	0.8	J	0.7	J
1-Methylphenanthrene	0.8	1.1		1.1		1.0		1 2	

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified “J” and those analytes not detected are qualified “ND”. Concentrations that exceeded the calibration limits are qualified “EC”. The concentrations that are determined by analyses of a diluted aliquot are qualified “D”. If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified “I” to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified “B” to denote this possible contamination.

TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE (CONTINUED)

Sample ID	Tissues Dry	Mare Brook 1	Mare Brook 2	Mare Brook 3	Mare Brook 4
Dry Weight	2.2	1 94	1.85	1.89	1.75
Wet Weight	2.2	15.01	15.20	15.22	15.21
Sample Size Units	Grams	Grams	Grams	Grams	Grams
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue
% solid	21.7	12.9	12.2	12.4	11.5
% Lipid	1.4	7.1	8.3	7.0	6.5
Reporting Units	ng/g	ng/g	ng/g	ng/g	ng/g
Calculation Basis (dry/wet)	Dry	Dry	Dry	Dry	Dry
Method	GCMS	GCMS	GCMS	GCMS	GCMS
Surrogate Compounds	0.0	**%Recovery**	**%Recovery**	**%Recovery**	**%Recovery**
d8-Naphthalene	0.0	73.7	45.2	53 2	61.3
d10-Acenaphthene	0.0	87.6	67.4	71 3	79.3
d10-Phenanthrene	0.0	91.8	76.8	77.6	85.1
d12-Chrysene	0.0	83.0	68.8	72.0	77.1
d12-Perylene	0.0	80.4	64.2	67.0	77.6
Total PAHs	0.0	**Conc**	**Conc**	**Conc**	**Conc**
Total PAHs with Perylene	0.0	642.5	900.0	808.6	564.0
Total PAHs without Perylene	0.0	638.2	894.7	803.9	560.0
	0.0				
PAH Compounds	MDLs	**Conc**	**Conc**	**Conc**	**Conc**
Naphthalene	2.4	4.4	6.9	5.3	6.3
C1-Naphthalenes	4.2	4.0 J	6.6	5.2	5.8
C2-Naphthalenes	2.4	3.4	5.9	4.7	4.1
C3-Naphthalenes	3.7	6.6	11.9	9.5	8.0
C4-Naphthalenes	3.7	8.5	17.5	12 3	10.2
Biphenyl	2.0	1.9 J	2.9	2.2 J	1 9 J
Acenaphthylene	1.3	1.7	2.3	2.3	2.7
Acenaphthene	2.0	8.1	11.8	10 2	8 9
Fluorene	1.9	3.4	5.5	4.1	4 2
C1-Fluorenes	3.8	12.6	18.2	15.7	14.1
C2-Fluorenes	3.8	66.4	86.7	78.8	56.2
C3-Fluorenes	3.8	238.9	346.4	302.4	190.3
Phenanthrene	1.8	5.3	6.4	6.4	5 1
Anthracene	1.5	3.0	3.6	3.4	2.6
C1-Phenanthrenes/Anthracenes	1.6	7.9	12.3	9.7	8 2
C2-Phenanthrenes/Anthracenes	1.6	22.8	20.6	25.8	19.1
C3-Phenanthrenes/Anthracenes	1.6	70.8	97.5	92.6	55.7
C4-Phenanthrenes/Anthracenes	1.6	77.3	112 5	99.8	64.8

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE (CONTINUED)

Sample ID	Tissues Dry	Mare Brook 1		Mare Brook 2		Mare Brook 3		Mare Brook 4	
Dry Weight	2.2	1 94		1.85		1.89		1.75	
Wet Weight	2.2	15.01		15.20		15.22		15.21	
Sample Size Units	Grams	Grams		Grams		Grams		Grams	
Matrix	Tissue	Tissue		Tissue		Tissue		Tissue	
% solid	21.7	12.9		12.2		12.4		11.5	
% Lipid	1.4	7.1		8.3		7.0		6.5	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)	Dry	Dry		Dry		Dry		Dry	
Method	GCMS	GCMS		GCMS		GCMS		GCMS	
PAH Compounds	MDLs	**Conc**		**Conc**		**Conc**		**Conc**	
Dibenzothiophene	0.7	0.5	J	0.4	J	0.6	J	0.4	J
C1-Dibenzothiophenes	1.3	2.5		3.2		3.0		2.1	
C2-Dibenzothiophenes	1.3	5.8		9.7		9.8		8.9	
C3-Dibenzothiophenes	1.3	6.6		10.6		8.2		8.4	
Fluoranthene	1.6	14.4		18.5		18 1		13.5	
Pyrene	1.7	9.5		12.1		11.7		9 2	
C1-Fluoranthenes/Pyrenes	3.4	8.8		9.7		9.1		7.7	
Benzo(a)anthracene	1.7	3.0		4.2		4.0		3 1	
Chrysene	1.3	6.0		7.5		7.6		5.7	
C1-Chrysenes	2.6	3.8		4.3		4.0		3.6	
C2-Chrysenes	2.6	3.4		5.1		4.2		3.8	
C3-Chrysenes	2.6	0.3	J	0.4	J	0.4	J	0.3	J
C4-Chrysenes	2.6	0.6	J	0.5	J	0.4	J	0.4	J
Benzo(b)fluoranthene	3.0	6.5		8.3		8.3		6.6	
Benzo(k)fluoranthene	2.1	2.2	J	2.7		2.6		2 2	J
Benzo(e)pyrene	1.6	5.8		7.4		6.8		5 5	
Benzo(a)pyrene	3.3	6.4		8.1		7.9		5.6	
Perylene	0.8	4.3		5.4		4.7		4.0	
Indeno(1,2,3-c,d)pyrene	3.1	2.3	J	2.6	J	2.9	J	1 9	J
Dibenzo(a,h)anthracene	1.6	0.4	J	0.4	J	0.4	J	0 5	J
Benzo(g,h,i)perylene	2.6	2.8	J	3.6		3.7		2.6	J
2-Methylnaphthalene	1.9	2.4		3.9		3.2		3.4	
1-Methylnaphthalene	2.3	1.6	J	2.7	J	2.0	J	2.4	J
2,6-Dimethylnaphthalene	1.2	0.9	J	1.3	J	1.2	J	1 2	J
1,6,7-Trimethylnaphthalene	1.8	1.0	J	1.4	J	1.4	J	1 2	J
1-Methylphenanthrene	0.8	2.0		2.4		2.5		1 9	

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified “J” and those analytes not detected are qualified “ND”. Concentrations that exceeded the calibration limits are qualified “EC”. The concentrations that are determined by analyses of a diluted aliquot are qualified “D”. If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified “I” to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified “B” to denote this possible contamination.

TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE (CONTINUED)

		Harpswell	Harpswell	Harpswell	Harpswell
Sample ID	Tissues Dry	1	2	3	4
Dry Weight	2.2	1 96	1.62	1.71	1.85
Wet Weight	2.2	15.28	15.09	15.67	15.67
Sample Size Units	Grams	Grams	Grams	Grams	Grams
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue
% solid	21.7	12.8	10.8	10 9	11.8
% Lipid	1.4	7.4	10.0	9.2	10.0
Reporting Units	ng/g	ng/g	ng/g	ng/g	ng/g
Calculation Basis (dry/wet)	Dry	Dry	Dry	Dry	Dry
Method	GCMS	GCMS	GCMS	GCMS	GCMS
Surrogate Compounds	0.0	**%Recovery**	**%Recovery**	**%Recovery**	**%Recovery**
d8-Naphthalene	0.0	53.6	57.3	54.6	62.1
d10-Acenaphthene	0.0	66.5	71.6	69.8	76.4
d10-Phenanthrene	0.0	73.1	76.7	75 1	80.7
d12-Chrysene	0.0	64.1	68.9	67 5	69.6
d12-Perylene	0.0	73.5	75.5	74.6	78.3
Total PAHs	0.0	**Conc**	**Conc**	**Conc**	**Conc**
Total PAHs with Perylene	0.0	820.5	817 3	938.3	781.8
Total PAHs without Perylene	0.0	818.2	814 2	935.1	779.2
	0.0				
PAH Compounds	MDLs	**Conc**	**Conc**	**Conc**	**Conc**
Naphthalene	2.4	5.7	6.9	7.7	6.9
C1-Naphthalenes	4.2	7.9	10.1	9.1	7.5
C2-Naphthalenes	2.4	6.3	9.9	8.8	8.2
C3-Naphthalenes	3.7	8.7	14 2	10.4	9.2
C4-Naphthalenes	3.7	9.3	10.6	11.5	9.5
Biphenyl	2.0	1.5 J	2.9	1.9 J	1.6 J
Acenaphthylene	1.3	1.6	1.1 J	1 2 J	1.4 J
Acenaphthene	2.0	8.3	9.9	10.6	9.0
Fluorene	1.9	3.9	6.7	6.9	6.6
C1-Fluorenes	3.8	13.8	15.9	13.8	15.1
C2-Fluorenes	3.8	46.0	55.9	44 5	53.6
C3-Fluorenes	3.8	345.5	317.0	357.2	333.7
Phenanthrene	1.8	6.3	7.5	7.5	7.1
Anthracene	1.5	3.5	3.9	3.6	3.5
C1-Phenanthrenes/Anthracenes	1.6	23.2	43.0	25 1	26.5
C2-Phenanthrenes/Anthracenes	1.6	32.3	26.6	37 3	33.1
C3-Phenanthrenes/Anthracenes	1.6	125.7	108 9	162.4	136.9
C4-Phenanthrenes/Anthracenes	1.6	93.0	76.2	124.5	25.1

Laboratory Qualifiers

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TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE (CONTINUED)

		Harpswell		Harpswell		Harpswell		Harpswell	
Sample ID	Tissues Dry	1		2		3		4	
Dry Weight	2.2	1 96		1.62		1.71		1.85	
Wet Weight	2.2	15.28		15.09		15.67		15.67	
Sample Size Units	Grams	Grams		Grams		Grams		Grams	
Matrix	Tissue	Tissue		Tissue		Tissue		Tissue	
% solid	21.7	12.8		10.8		10 9		11.8	
% Lipid	1.4	7.4		10.0		9.2		10.0	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)	Dry	Dry		Dry		Dry		Dry	
Method	GCMS	GCMS		GCMS		GCMS		GCMS	
PAH Compounds	MDLs	**Conc**		**Conc**		**Conc**		**Conc**	
Dibenzothiophene	0.7	0.6	J	0.8	J	0.7	J	0.6	J
C1-Dibenzothiophenes	1.3	2.0		3.2		3.1		2.1	
C2-Dibenzothiophenes	1.3	7.7		9.5		8.1		7.6	
C3-Dibenzothiophenes	1.3	5.4		8.4		6.6		5.8	
Fluoranthene	1.6	13.0		13.0		14 5		13.9	
Pyrene	1.7	9.9		11.3		11 9		10.7	
C1-Fluoranthenes/Pyrenes	3.4	6.2		8.6		8.7		8 1	
Benzo(a)anthracene	1.7	2.7		2.9		3.2		3.0	
Chrysene	1.3	4.8		4.8		5.6		5.0	
C1-Chrysenes	2.6	2.0	J	2.1	J	2.9	J	2.8	J
C2-Chrysenes	2.6	4.6		5.4		5.4		6 1	
C3-Chrysenes	2.6	0.2	J	0.2	J	0.3	J	0 3	J
C4-Chrysenes	2.6	0.6	J	0.7	J	0.7	J	0.6	J
Benzo(b)fluoranthene	3.0	4.3		4.5		5.3		5.0	
Benzo(k)fluoranthene	2.1	1 2	J	1.4	J	1.9	J	1.4	J
Benzo(e)pyrene	1.6	4.0		3.9		4.3		4.4	
Benzo(a)pyrene	3.3	4.0		3.5	J	3.5	J	3 9	
Perylene	0.8	2.3		3.1		3.2		2.6	
Indeno(1,2,3-c,d)pyrene	3.1	1.0	J	1.1	J	1.7	J	1 5	J
Dibenzo(a,h)anthracene	1.6	0 3	J	0.3	J	0.4	J	0 3	J
Benzo(g,h,i)perylene	2.6	1 5	J	1.6	J	2.2	J	1.6	J
2-Methylnaphthalene	1.9	4.6		5.8		5.3		4.6	
1-Methylnaphthalene	2.3	3.3		4.3		3.8		2 9	
2,6-Dimethylnaphthalene	1.2	2.0		3.1		2.2		2.0	
1,6,7-Trimethylnaphthalene	1.8	1.4	J	2.7		1.7	J	1.6	J
1-Methylphenanthrene	0.8	1.8		2.2		2.2		2 2	

Laboratory Qualifiers

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TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE (CONTINUED)

		Maquoit	Maquoit	Maquoit	Maquoit
Sample ID	Tissues Dry	Bay 1	Bay 2	Bay 3	Bay 4
Dry Weight	2.2	2.46	2.21	2.54	1 97
Wet Weight	2.2	15.21	15.27	15.34	15.15
Sample Size Units	Grams	Grams	Grams	Grams	Grams
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue
% solid	21.7	16.2	14.5	16.6	13.0
% Lipid	1.4	8.2	10.8	10 2	10.8
Reporting Units	ng/g	ng/g	ng/g	ng/g	ng/g
Calculation Basis (dry/wet)	Dry	Dry	Dry	Dry	Dry
Method	GCMS	GCMS	GCMS	GCMS	GCMS
Surrogate Compounds	0.0	**%Recovery**	**%Recovery**	**%Recovery**	**%Recovery**
d8-Naphthalene	0.0	55.3	58.4	48.4	60.7
d10-Acenaphthene	0.0	69.8	76.0	67 5	66.5
d10-Phenanthrene	0.0	72.9	82.6	73.7	73.5
d12-Chrysene	0.0	67.9	78.3	67.4	69.5
d12-Perylene	0.0	67.1	76.5	72.7	78.1
Total PAHs	0.0	**Conc**	**Conc**	**Conc**	**Conc**
Total PAHs with Perylene	0.0	421.2	1161.3	1547.1	936.7
Total PAHs without Perylene	0.0	418.6	1156.4	1544.3	933.3
	0.0				
PAH Compounds	MDLs	**Conc**	**Conc**	**Conc**	**Conc**
Naphthalene	2.4	5.5	7.3	6.6	8.2
C1-Naphthalenes	4.2	7.1	9.0	7.6	7.5
C2-Naphthalenes	2.4	7.9	9.6	9.9	8.5
C3-Naphthalenes	3.7	8.1	11.9	12 3	12.0
C4-Naphthalenes	3.7	7.4	14.7	13.7	12.0
Biphenyl	2.0	1.5 J	1.9 J	1.6 J	2.1 J
Acenaphthylene	1.3	1.9	2.4	1.4	1.4
Acenaphthene	2.0	7.4	10.8	10 2	11.6
Fluorene	1.9	5.9	8.1	5.9	7.0
C1-Fluorenes	3.8	14.5	24.2	15 3	14.8
C2-Fluorenes	3.8	55.0	82.6	63 9	39.7
C3-Fluorenes	3.8	126.5	459 5	456.3	302.7
Phenanthrene	1.8	10.0	13.6	9.3	10.7
Anthracene	1.5	3.1	3.6	2.8	3.1
C1-Phenanthrenes/Anthracenes	1.6	27.0	32.4	36.0	24.7
C2-Phenanthrenes/Anthracenes	1.6	13.5	58.0	59.8	47.8
C3-Phenanthrenes/Anthracenes	1.6	22.2	218 5	323.0	251.3
C4-Phenanthrenes/Anthracenes	1.6	12.4	39.4	413.8	62.0

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

TABLE 1.2.6 LEVELS OF PAHs IN 2002 MUSSEL TISSUE (CONTINUED)

		Maquoit		Maquoit		Maquoit		Maquoit	
Sample ID	Tissues Dry	Bay 1		Bay 2		Bay 3		Bay 4	
Dry Weight	2.2	2.46		2.21		2.54		1 97	
Wet Weight	2.2	15.21		15.27		15.34		15.15	
Sample Size Units	Grams	Grams		Grams		Grams		Grams	
Matrix	Tissue	Tissue		Tissue		Tissue		Tissue	
% solid	21.7	16.2		14.5		16.6		13.0	
% Lipid	1.4	8.2		10.8		10 2		10.8	
Reporting Units	ng/g	ng/g		ng/g		ng/g		ng/g	
Calculation Basis (dry/wet)	Dry	Dry		Dry		Dry		Dry	
Method	GCMS	GCMS		GCMS		GCMS		GCMS	
PAH Compounds	MDLs	**Conc**		**Conc**		**Conc**		**Conc**	
Dibenzothiophene	0.7	0.7		1.1		0.9		0.9	
C1-Dibenzothiophenes	1.3	2.8		3.4		2.8		2.8	
C2-Dibenzothiophenes	1.3	3.9		10.6		10 2		7.3	
C3-Dibenzothiophenes	1.3	5.2		11.6		6.9		7.7	
Fluoranthene	1.6	15.0		19.4		13.8		17.0	
Pyrene	1.7	8.0		16.2		7.8		10.5	
C1-Fluoranthenes/Pyrenes	3.4	8.4		15.2		11 2		11.8	
Benzo(a)anthracene	1.7	2.7		7.2		3.1		4.0	
Chrysene	1.3	5.1		10.1		4.8		7 1	
C1-Chrysenes	2.6	2.4		7.5		5.6		5.5	
C2-Chrysenes	2.6	4.4		6.2		4.5		5.4	
C3-Chrysenes	2.6	0.2	J	0.4	J	0.4	J	0.5	J
C4-Chrysenes	2.6	0.5	J	0.5	J	0.6	J	0.5	J
Benzo(b)fluoranthene	3.0	5.5		10.8		5.7		8 2	
Benzo(k)fluoranthene	2.1	1.9		3.5		1.6	J	1.6	J
Benzo(e)pyrene	1.6	4.8		7.4		5.1		5 1	
Benzo(a)pyrene	3.3	5.9		9.2		6.1		4.4	
Perylene	0.8	2.6		4.9		2.8		3.4	
Indeno(1,2,3-c,d)pyrene	3.1	1.6	J	3.5		1.6	J	2.3	J
Dibenzo(a,h)anthracene	1.6	0.5	J	0.9	J	0.3	J	0.7	J
Benzo(g,h,i)perylene	2.6	2.3		4.2		2.2		3.0	
2-Methylnaphthalene	1.9	4.1		5.3		4.6		4.4	
1-Methylnaphthalene	2.3	2.9		3.7		3.0		3 1	
2,6-Dimethylnaphthalene	1.2	2.1		2.3		2.1		2.4	
1,6,7-Trimethylnaphthalene	1.8	1.8		2.1		1.9		2 3	
1-Methylphenanthrene	0.8	2 5		4.4		2.9		3.0	

Laboratory Qualifiers

All of the analytical data have been qualified based on the most recent method detection limits determined. Concentrations that were less than the MDL are adjusted for sample size and dilution and are qualified "J" and those analytes not detected are qualified "ND". Concentrations that exceeded the calibration limits are qualified "EC". The concentrations that are determined by analyses of a diluted aliquot are qualified "D". If the quantification of an analyte is interfered with by another analyte due to its high concentration the data will be left blank and qualified "I" to denote this interference. Analytes may be found above the three times the detection limits in the blank. These may cause possible contamination in samples that are less than ten times the observed level in the blank. These data are qualified "B" to denote this possible contamination.

2003 Shellfish Tissue Analysis

THE FOLLOWING SITES WERE SAMPLED IN 2003: CAPE NEDDICK, YORK; OUTER FORE RIVER, DOWNSTREAM OF THE RTE. 77 BRIDGE, CASCO BAY; GREAT DIAMOND ISLAND, LAMSON COVE (AT THE SOUTHWEST END OF THE ISLAND), CASCO BAY; LINEKIN BAY, BOOTHBAY; ROYAL RIVER, AT THE CONFLUENCE OF THE COUSINS RIVER, YARMOUTH; SACO RIVER, BIDDEFORD/SACO; MIDDLE FORE RIVER, DOWNSTREAM OF THE I-295 BRIDGE AND UPSTREAM OF THE RTE. 77 BRIDGE, CASCO BAY; UNION RIVER, ELLSWORTH; MACHIAS RIVER, MACHIASPORT/EAST MACHIAS; AND COBSCOOK BAY, GOVE POINT, LUBEC. ALL SAMPLES CONSISTED OF FOUR REPLICATE SAMPLES. SITES WERE SAMPLED ON THE FOLLOWING DATES:

Location	Date Sampled
Cape Neddick	11/04/03
Outer Fore River	11/17/03
Great Diamond Island	11/17/03
Linekin Bay	11/03/03
Royal River	11/05/03
Saco River	10/16/03
Middle Fore River	10/16/03
Union River	10/20/03
Machias River	10/22/03
Cobscook Bay	10/23/03

Cape Neddick, Outer Fore River, Great Diamond Island, and Linekin Bay were analyzed for: Mercury, heavy metals, pesticides, PCBs, PAHs, dioxin, furans, and coplanar PCBs as part of the SWAT program. Saco River, Middle Fore River, Union River, Machias River, and Cobscook Bay were all sampled as part of the Gulfwatch Program (part of the Gulf of Maine Project) for mercury, heavy metals, pesticides, PCBs, and PAHs, to be paid for by the Gulfwatch Program. These five Gulfwatch sites were also sampled under the SWAT program for dioxin, furans, and coplanar PCBs to obtain additional data on contaminants not tested for as part of Gulfwatch. Also, the Royal River was tested for dioxin, furans, and coplanar PCBs only, to provide additional data on contaminants not tested for in prior years. Gulfwatch data are provided by different laboratories, are not yet available, and will not be included in this report.

Wet weight based data were received from the lab and are reported below. Percent moisture data needed to convert to dry weight data have been received only recently. The wet weight data need to be converted to dry weights before the data can be analyzed. Once that task is completed, the dry weight data and conclusions will be substituted for the wet weight data in this report.

TABLE 1.2.1 MERCURY IN 2003 MUSSEL TISSUE

Wet weights only. Dry weight data is still pending from laboratory.

SAMPLE ID	DATE	Units	Mercury
Cape Neddick REP1	11/04/03	mg/Kg	**0.024**
Cape Neddick REP2	11/04/03	mg/Kg	**0.023**
Cape Neddick REP3	11/04/03	mg/Kg	**0.025**
Cape Neddick REP4	11/04/03	mg/Kg	**0.023**
Outer Fore R. REP1	11/17/03	mg/Kg	**0.034**
Outer Fore R. REP2	11/17/03	mg/Kg	**0.036**
Outer Fore R. REP3	11/17/03	mg/Kg	**0.034**
Outer Fore R. REP4	11/17/03	mg/Kg	**0.036**
G. Diamond Is.REP1	11/17/03	mg/Kg	**0.030**
G. Diamond Is.REP2	11/17/03	mg/Kg	**0.027**
G. Diamond Is.REP3	11/17/03	mg/Kg	**0.029**
G. Diamond Is.REP4	11/17/03	mg/Kg	**0.030**
Linekin Bay REP1	11/3/03	mg/Kg	**0.016**
Linekin Bay REP2	11/3/03	mg/Kg	**0.016**
Linekin Bay REP3	11/3/03	mg/Kg	**0.016**
Linekin Bay REP4	11/3/03	mg/Kg	**0.017**

Table 1.2.2 HEAVY METALS IN 2003 MUSSEL TISSUE
Wet weights only. Dry weight data is still pending from laboratory.

SAMPLE ID	DATE	Units	Aluminum	Cadmium	Chromium	Copper	Iron	Lead	Nickel	Selenium	Silver	Zinc
Cape Neddick REP1	11/04/03	mg/Kg	40	0.30	0.48	0.82	71	0.26	0.26	0.37	0.022	12
Cape Neddick REP2	11/04/03	mg/Kg	13	0.26	0.31	0.74	36	0.21	0.17	0.30	0.037	12
Cape Neddick REP3	11/04/03	mg/Kg	14	0.27	0.37	0.78	40	0.24	0.18	0.34	0.022	12
Cape Neddick REP4	11/04/03	mg/Kg	28	0.34	0.47	0.87	63	0.27	0.29	0.39	0.033	12
Outer Fore R. REP1	11/17/03	mg/Kg	24	0.24	0.36	1.2	60	0.92	0.19	0.28	0.0065	15
Outer Fore R. REP2	11/17/03	mg/Kg	23	0.27	0.38	1.2	61	0.95	0.20	0.28	0.0056	17
Outer Fore R. REP3	11/17/03	mg/Kg	23	0.23	0.33	1.2	57	0.86	0.19	0.26	0.0050	17
Outer Fore R. REP4	11/17/03	mg/Kg	22	0.23	0.33	1.1	63	0.84	0.19	0.27	0.0057	17
G. Diamond Is.REP1	11/17/03	mg/Kg	40	0.21	0.34	1.0	67	0.59	0.21	0.32	0.0086	12
G. Diamond Is.REP2	11/17/03	mg/Kg	36	0.20	0.34	0.96	63	0.52	0.19	0.30	0.0080	12
G. Diamond Is.REP3	11/17/03	mg/Kg	32	0.19	0.33	1.1	65	0.50	0.20	0.29	0.0074	14
G. Diamond Is.REP4	11/17/03	mg/Kg	32	0.16	0.29	0.85	66	0.44	0.19	0.29	0.0062	11
Linekin Bay REP1	11/3/03	mg/Kg	7.4	0.20	0.28	1.1	21	0.20	0.12	0.35	0.0047	14
Linekin Bay REP2	11/3/03	mg/Kg	10	0.22	0.27	1.3	28	0.21	0.14	0.36	0.0056	16
Linekin Bay REP3	11/3/03	mg/Kg	8.2	0.22	0.33	1.2	26	0.21	0.14	0.38	0.0059	16
Linekin Bay REP4	11/3/03	mg/Kg	9.9	0.22	0.32	1.4	25	0.23	0.15	0.38	0.0077	15

TABLE 1.2.3 PESTICIDES IN 2003 MUSSEL TISSUE
Wet weights only. Dry weight data is still pending from laboratory.

		Cape Neddick 1		Cape Neddick 2		Cape Neddick 3		Cape Neddick 4	
		11/04/03		11/04/03		11/04/03		11/04/03	
Analytes	Units		Qual		Qual		Qual		Qual
2,4'-DDD	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
2,4'-DDE	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
2,4'-DDT	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
4,4'-DDD	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
4,4'-DDE	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
4,4'-DDT	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
Aldrin	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
alpha-Chlordane	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
Dieldrin	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
Endosulfan I	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
Endosulfan II	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
gamma-BHC	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
gamma-Chlordane	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
Heptachlor	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
Heptachlor epoxide (B)	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
Hexachlorobenzene	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
Mirex	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
trans-Nonachlor	µg/Kg	0.42	U	0.44	U	0.44	U	0.44	U
Inorganics									
Percent Lipids	%	**0.75**		**0.80**		**0.82**		**0.74**	

Detection Limits are expressed under each replicate.
U - Indicates that the analyte was not detected at the sample specific level reported.

TABLE 1.2.3 PESTICIDES IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

		Outer Fore River 1		Outer Fore River 2		Outer Fore River 3		Outer Fore River 4	
		11/17/03		11/17/03		11/17/03		11/17/03	
Analytes	Units		Qual		Qual		Qual		Qual
2,4'-DDD	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
2,4'-DDE	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
2,4'-DDT	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
4,4'-DDD	µg/Kg	**0.84**		**0.78**		**1.1**		**0.99**	
4,4'-DDE	µg/Kg	**0.68**		**0.62**		**0.86**		**0.77**	
4,4'-DDT	µg/Kg	**0.88**		**0.81**		**1.5**		**0.87**	
Aldrin	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
alpha-Chlordane	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
Dieldrin	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
Endosulfan I	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
Endosulfan II	µg/Kg	0.43	U	0.44	U	**0.55**		0.43	U
gamma-BHC	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
gamma-Chlordane	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
Heptachlor	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
Heptachlor epoxide (B)	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
Hexachlorobenzene	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
Mirex	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
trans-Nonachlor	µg/Kg	0.43	U	0.44	U	0.42	U	0.43	U
Inorganics									
Percent Lipids	%	**0.59**		**0.62**		**0.75**		**0.61**	

Detection Limits are expressed under each replicate.
U - Indicates that the analyte was not detected at the sample specific level reported.

TABLE 1.2.3 PESTICIDES IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

		Great Diamond Island 1		Great Diamond Island 2		Great Diamond Island 3		Great Diamond Island 4	
		11/17/03		11/17/03		11/17/03		11/17/03	
Analytes	Units		Qual		Qual		Qual		Qual
2,4'-DDD	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
2,4'-DDE	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
2,4'-DDT	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
4,4'-DDD	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
4,4'-DDE	µg/Kg	**0.76**		**0.65**		**0.75**		**0.57**	
4,4'-DDT	µg/Kg	**0.48**		0.41	U	**0.85**		**0.49**	
Aldrin	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
alpha-Chlordane	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
Dieldrin	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
Endosulfan I	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
Endosulfan II	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
gamma-BHC	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
gamma-Chlordane	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
Heptachlor	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
Heptachlor epoxide (B)	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
Hexachlorobenzene	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
Mirex	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
trans-Nonachlor	µg/Kg	0.41	U	0.41	U	0.44	U	0.42	U
Inorganics									
Percent Lipids	%	**0.92**		**0.90**		**1.0**		**0.71**	

Detection Limits are expressed under each replicate.
U - Indicates that the analyte was not detected at the sample specific level reported.

TABLE 1.2.3 PESTICIDES IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

		Linekin Bay 1		Linekin Bay 2		Linekin Bay 3		Linekin Bay 4	
		11/03/03		11/03/03		11/03/03		11/03/03	
Analytes	Units		Qual		Qual		Qual		Qual
2,4'-DDD	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
2,4'-DDE	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
2,4'-DDT	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
4,4'-DDD	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
4,4'-DDE	µg/Kg	**0.47**		0.44	U	0.43	U	0.45	U
4,4'-DDT	µg/Kg	**0.78**		**0.63**		0.43	U	0.45	U
Aldrin	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
alpha-Chlordane	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
Dieldrin	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
Endosulfan I	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
Endosulfan II	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
gamma-BHC	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
gamma-Chlordane	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
Heptachlor	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
Heptachlor epoxide (B)	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
Hexachlorobenzene	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
Mirex	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
trans-Nonachlor	µg/Kg	0.43	U	0.44	U	0.43	U	0.45	U
Inorganics									
Percent Lipids	%	**1.6**		**1.5**		**1.4**		**1.4**	

Detection Limits are expressed under each replicate.
U - Indicates that the analyte was not detected at the sample specific level reported.

TABLE 1.2.4 PAHs IN 2003 MUSSEL TISSUE
Wet weights only. Dry weight data is still pending from laboratory.

		Cape Neddick 1		Cape Neddick 2		Cape Neddick 3		Cape Neddick 4	
		11/04/03		11/04/03		11/04/03		11/04/03	
Analytes	Units		Qual		Qual		Qual		Qual
Naphthalene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
2-Methylnaphthalene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
1-Methylnaphthalene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Biphenyl	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
2,6-Dimethylnaphthalene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Acenaphthylene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Acenaphthene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Fluorene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
2,3,5-Trimethylnaphthalene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Phenanthrene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Anthracene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
1-Methylphenanthrene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Fluoranthene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Pyrene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Benz[a]anthracene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Chrysene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Benzo[b]fluoranthene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Benzo[k]fluoranthene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Benzo[e]pyrene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Benzo[a]pyrene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Perylene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Indeno[1,2,3-cd]pyrene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Dibenz[a,h]anthracene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Benzo[g,h,]perylene	µg/Kg	4.2	U	4.4	U	4.4	U	4.4	U
Inorganics									
Percent Lipids	%	**0.75**		**0.80**		**0.82**		**0.74**	

Detection Limits are expressed under each replicate.
U - Indicates that the analyte was not detected at the sample specific level reported.

TABLE 1.2.4 PAHs IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

		Outer Fore River 1		Outer Fore River 2		Outer Fore River 3		Outer Fore River 4	
		11/17/03		11/17/03		11/17/03		11/17/03	
Analytes	Units		Qual		Qual		Qual		Qual
Naphthalene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
2-Methylnaphthalene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
1-Methylnaphthalene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
Biphenyl	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
2,6-Dimethylnaphthalene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
Acenaphthylene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
Acenaphthene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
Fluorene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
2,3,5-Trimethylnaphthalene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
Phenanthrene	µg/Kg	4.3	U	**4.4**		**4.4**		4.2	U
Anthracene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
1-Methylphenanthrene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
Fluoranthene	µg/Kg	**15**		**14**		**16**		**16**	
Pyrene	µg/Kg	**16**		**13**		**16**		**18**	
Benz[a]anthracene	µg/Kg	**7.7**		**7.2**		**7.6**		**9.0**	
Chrysene	µg/Kg	**13**		**11**		**14**		**14**	
Benzo[b]fluoranthene	µg/Kg	**11**		**10**		**12**		**12**	
Benzo[k]fluoranthene	µg/Kg	4.3	U	4.4	U	4.2	U	**4.3**	
Benzo[e]pyrene	µg/Kg	**6.8**		**6.2**		**8.3**		**7.7**	
Benzo[a]pyrene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
Perylene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
Indeno[1,2,3-cd]pyrene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
Dibenz[a,h]anthracene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
Benzo[g,h,]perylene	µg/Kg	4.3	U	4.4	U	4.2	U	4.2	U
Inorganics									
Percent Lipids	%	**0.59**		**0.62**		**0.75**		**0.61**	

Detection Limits are expressed under each replicate.
U - Indicates that the analyte was not detected at the sample specific level reported.

TABLE 1.2.4 PAHs IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

		Great Diamond Is. 1		Great Diamond Is. 2		Great Diamond Is. 3		Great Diamond Is. 4	
		11/17/03		11/17/03		11/17/03		11/17/03	
Analytes	Units		Qual		Qual		Qual		Qual
Naphthalene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
2-Methylnaphthalene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
1-Methylnaphthalene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Biphenyl	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
2,6-Dimethylnaphthalene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Acenaphthylene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Acenaphthene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Fluorene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
2,3,5-Trimethylnaphthalene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Phenanthrene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Anthracene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
1-Methylphenanthrene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Fluoranthene	µg/Kg	**5.1**		**5.4**		**5.5**		**5.5**	
Pyrene	µg/Kg	**4.4**		4.1	U	**4.5**		**4.3**	
Benz[a]anthracene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Chrysene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Benzo[b]fluoranthene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Benzo[k]fluoranthene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Benzo[e]pyrene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Benzo[a]pyrene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Perylene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Indeno[1,2,3-cd]pyrene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Dibenz[a,h]anthracene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Benzo[g,h,]perylene	µg/Kg	4.1	U	4.1	U	4.4	U	4.2	U
Inorganics									
Percent Lipids	%	**0.92**		**0.90**		**1.0**		**0.71**	

Detection Limits are expressed under each replicate.
U - Indicates that the analyte was not detected at the sample specific level reported.

TABLE 1.2.4 PAHs IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

		Linekin Bay 1		Linekin Bay 2		Linekin Bay 3		Linekin Bay 4	
		11/03/03		11/03/03		11/03/03		11/03/03	
Analytes	Units		Qual		Qual		Qual		Qual
Naphthalene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
2-Methylnaphthalene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
1-Methylnaphthalene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Biphenyl	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
2,6-Dimethylnaphthalene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Acenaphthylene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Acenaphthene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Fluorene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
2,3,5-Trimethylnaphthalene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Phenanthrene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Anthracene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
1-Methylphenanthrene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Fluoranthene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Pyrene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Benz[a]anthracene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Chrysene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Benzo[b]fluoranthene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Benzo[k]fluoranthene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Benzo[e]pyrene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Benzo[a]pyrene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Perylene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Indeno[1,2,3-cd]pyrene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Dibenz[a,h]anthracene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Benzo[g,h,]perylene	µg/Kg	4.3	U	4.4	U	4.3	U	4.5	U
Inorganics									
Percent Lipids	%	**1.6**		**1.5**		**1.4**		**1.4**	

Detection Limits are expressed under each replicate.
U - Indicates that the analyte was not detected at the sample specific level reported.

TABLE 1.2.5 COPLANAR PCBs IN 2003 MUSSEL TISSUE
Wet weights only. Dry weight data is still pending from laboratory.

IUPAC# Compound	DL (ng/Kg)	Royal River 1	Royal River 2	Royal River 3	Royal River 4
52	16.67	<DL	<DL	<DL	<DL
81	16.67	<DL	<DL	0.926	0.647
77	16.67	5.74	7.99	6.85	4.89
123	16.67	2.96	3.48	2.69	7.4
118	16.67	208	296	221	179
114	16.67	2.27	3.24	3.03	2.24
105	16.67	64.9	93.7	71.2	58.3
126	16.67	1.94	3.38	1.76	1.48
167	16.67	16.2	23.8	17.1	14.9
156	16.67	15.6	22.9	16.1	14.4
157	16.67	6.54	9.13	6.4	5.68
169	16.67	0.201	0.37	0.249	<DL
180	16.67	43.9	64.1	44.3	43.8
170	16.67	10	13.8	9.33	10.3
189	16.67	1.5	2.21	1.48	2.01
% Lipids		1.15	1.71	1.14	1.37
Sample weight (g)		30.2	30.1	30.6	31

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.5 COPLANAR PCBs IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

IUPAC# Compound	DL (ng/Kg)	Saco River 1	Saco River 2	Saco River 3	Saco River 4
52	16.67	<DL	<DL	<DL	<DL
81	16.67	0.575	0.991	0.734	<DL
77	16.67	6.59	8.61	6.39	8.28
123	16.67	<DL	11.1	5.94	8.46
118	16.67	307	476	302	403
114	16.67	5.42	7	4.38	6.78
105	16.67	104	164	105	141
126	16.67	<DL	3.15	2.36	2.63
167	16.67	21.9	34.1	21.4	27.7
156	16.67	32.8	58.9	34.5	44.2
157	16.67	10.3	16.8	9.89	13.3
169	16.67	0.174	0.406	0.166	0.3
180	16.67	82.1	122	72.5	95.4
170	16.67	17.7	31	16.2	19.2
189	16.67	2.53	3.56	2.35	3.03
% Lipids		1.03	2.04	1.24	1.32
Sample weight (g)		30.2	30.4	30.3	30.1

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.5 COPLANAR PCBs IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

Compound	DL (ng/Kg)	Middle Fore River 1	Middle Fore River 2	Middle Fore River 3	Middle Fore Rive
52	16.67	<DL	<DL	<DL	<DL
81	16.67	<DL	<DL	8.8	6.54
77	16.67	22	25.1	37.6	37
123	16.67	7.36	12.1	25	14.6
118	16.67	1070	1250	1940	1880
114	16.67	17	21.1	35.2	30.3
105	16.67	400	462	714	706
126	16.67	7.23	6.11	8.77	8.92
167	16.67	68	80.8	120	118
156	16.67	99.8	118	168	175
157	16.67	33.4	38.3	58.9	58.7
169	16.67	0.728	0.46	0.458	0.545
180	16.67	195	223	280	360
170	16.67	42.2	46	52.7	71
189	16.67	5.17	5.81	8.45	8.74
% Lipids		0.504	0.335	1.03	0.8
Sample weight (g)		31	30.1	30.4	30.4

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.5 COPLANAR PCBs IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

IUPAC# Compound	DL (ng/Kg)	Union River 1	Union River 2	Union River 3	Union River 4
52	16.67	<DL	<DL	<DL	<DL
81	16.67	<DL	0.416	0.278	0.428
77	16.67	4.84	4.01	4.03	5.99
123	16.67	1.93	1.47	1.19	8.85
118	16.67	114	96.9	97.2	120
114	16.67	2.31	1.56	2.21	2.26
105	16.67	42.1	35.5	35.7	41.9
126	16.67	<DL	0.945	0.827	1.51
167	16.67	7.88	6.12	7.06	7.98
156	16.67	10.1	8.04	3.24	10.7
157	16.67	3.39	2.76	0.946	4.05
169	16.67	<DL	0.121	<DL	<DL
180	16.67	24.5	16.6	20.8	27.2
170	16.67	5.31	3.8	5.81	6.59
189	16.67	<DL	0.61	0.706	<DL
% Lipids		1.66	1.63	2.5	1.66
Sample weight (g)		31.8	30.3	30.2	30.4

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.5 COPLANAR PCBs IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

IUPAC# Compound	DL (ng/Kg)	Machias River 1	Machias River 2	Machias River 3	Machias River
52	16.67	<DL	<DL	<DL	<DL
81	16.67	0.724	<DL	0.526	0.448
77	16.67	6.71	6.96	5.32	6.43
123	16.67	3.41	12.7	6.68	7.76
118	16.67	199	205	172	202
114	16.67	2.91	3.79	2.64	3.12
105	16.67	69.8	72.1	58.5	71.4
126	16.67	2.1	2.31	2.54	<DL
167	16.67	15.8	15.4	13.7	16.5
156	16.67	19.6	19.5	17.3	20
157	16.67	7.07	6.67	5.85	7.6
169	16.67	0.359	0.386	0.235	0.367
180	16.67	71.7	71.4	55	75
170	16.67	15.2	15.6	10.4	17.2
189	16.67	1.99	1.97	1.77	2.01
% Lipids		1.21	1.09	1.27	1.13
Sample weight (g)		30.2	30.1	30.4	30.3

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.5 COPLANAR PCBs IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

IUPAC# Compound	DL (ng/Kg)	Cobscook Bay 1	Cobscook Bay 2	Cobscook Bay 3	Cobscook Bay
52	16.67	<DL	<DL	<DL	<DL
81	16.67	0.465	0.27	0.47	0.277
77	16.67	4.44	2.27	2.72	2.15
123	16.67	3.91	1.42	1.35	1.95
118	16.67	130	63.2	68.8	48.2
114	16.67	1.83	0.825	1.16	0.729
105	16.67	44.4	21.6	24.4	17.8
126	16.67	1.25	0.538	0.606	0.485
167	16.67	10.7	4.31	5.16	3.29
156	16.67	10.5	5.03	5.29	4.21
157	16.67	4	2.01	1.98	1.3
169	16.67	0.336	<DL	<DL	<DL
180	16.67	38.8	22.1	21.9	19.3
170	16.67	8.87	4.19	4.42	4.49
189	16.67	0.851	0.569	0.633	0.366
% Lipids		1.66	1.36	1.75	1.73
Sample weight (g)		30.2	30.1	30.3	30.1

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.6 TOTAL PCBs IN 2003 MUSSEL TISSUE
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID	Cape Neddick 1	Cape Neddick 2	Cape Neddick 3	Cape Neddick 4
Totals				
Total Monochloro Biphenyls	<DL	<DL	<DL	<DL
Total Dichloro Biphenyls	80.6	76.5	102	71.1
Total Trichloro Biphenyls	184	144	229	150
Total Tetrachloro Biphenyls	382	354	382	340
Total Pentachloro Biphenyls	907	927	901	972
Total Hexachloro Biphenyls	1380	1380	1370	1370
Total Heptachloro Biphenyls	418	420	418	433
Total Octachloro Biphenyls	17.2	17.6	17.2	19.6
Total Nonachloro Biphenyls	<DL	<DL	<DL	<DL
Total Decachloro Biphenyls	<DL	<DL	<DL	<DL
TOTAL PCBs	3368.8	3319.1	3419.2	3355.7
% Lipids	0.46	0.4	0.58	0.39
Sample weight (g)	31.1	31.5	31.6	30.6

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.6 TOTAL PCBs IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID	Outer Fore River 1	Outer Fore River 2	Outer Fore River 3	Outer Fore River 4
Totals				
Total Monochloro Biphenyls	<DL	<DL	<DL	<DL
Total Dichloro Biphenyls	82.5	67.2	121	141
Total Trichloro Biphenyls	320	209	337	395
Total Tetrachloro Biphenyls	1680	971	1550	1700
Total Pentachloro Biphenyls	6380	3690	5660	6020
Total Hexachloro Biphenyls	6270	3720	5650	6470
Total Heptachloro Biphenyls	1960	1120	1740	2000
Total Octachloro Biphenyls	129	76.7	115	135
Total Nonachloro Biphenyls	<DL	<DL	<DL	<DL
Total Decachloro Biphenyls	<DL	<DL	<DL	<DL
TOTAL PCBs	16821.5	9853.9	15173	16861
% Lipids	0.11	0.69	0.26	0.3
Sample weight (g)	30	30.9	31.4	31.3

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.6 TOTAL PCBs IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID	Great Diamond Is. 1	Great Diamond Is. 2	Great Diamond Is. 3	Great Diamond Is. 4
Totals				
Total Monochloro Biphenyls	<DL	<DL	<DL	<DL
Total Dichloro Biphenyls	113	91.4	77.3	85.4
Total Trichloro Biphenyls	265	206	220	233
Total Tetrachloro Biphenyls	1010	677	694	801
Total Pentachloro Biphenyls	3830	2970	3060	3490
Total Hexachloro Biphenyls	4280	4310	4080	4590
Total Heptachloro Biphenyls	1370	1700	1620	1920
Total Octachloro Biphenyls	98	111	112	128
Total Nonachloro Biphenyls	<DL	<DL	<DL	<DL
Total Decachloro Biphenyls	<DL	<DL	<DL	<DL
TOTAL PCBs	10966	10065.4	9863.3	11247.4
% Lipids	0.16	0.24	0.29	0.39
Sample weight (g)	30.8	31.4	31.7	31.2

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.6 TOTAL PCBs IN 2003 MUSSEL TISSUE (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID	Linekin Bay 1	Linekin Bay 2	Linekin Bay 3	Linekin Bay 4
Totals				
Total Monochloro Biphenyls	<DL	<DL	<DL	<DL
Total Dichloro Biphenyls	82.4	74	90.1	91
Total Trichloro Biphenyls	260	229	243	253
Total Tetrachloro Biphenyls	761	536	794	602
Total Pentachloro Biphenyls	2000	1490	1880	1430
Total Hexachloro Biphenyls	2300	1600	2070	1870
Total Heptachloro Biphenyls	630	525	496	441
Total Octachloro Biphenyls	27.3	20.2	23.6	21.7
Total Nonachloro Biphenyls	<DL	<DL	<DL	<DL
Total Decachloro Biphenyls	<DL	<DL	<DL	<DL
TOTAL PCBs	6060.7	4474.2	5596.7	4708.7
% Lipids	0.68	0.41	0.63	1.19
Sample weight (g)	30	31.6	30.9	31

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.7 DIOXIN IN 2003 MUSSEL TISSUES
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID		Cape Neddick 1	Cape Neddick 2	Cape Neddick 3	Cape Neddick 4
Compound	DL (ng/Kg)				
2,3,7,8-TCDF	0.1	0.181	<DL	0.187	0.198
1,2,3,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
2,3,4,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
2,3,4,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDF	0.5	<DL	<DL	<DL	<DL
1,2,3,4,7,8,9-HpCDF	0.5	<DL	<DL	<DL	<DL
OCDF	1	<DL	<DL	<DL	<DL
2,3,7,8-TCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,7,8-PeCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDD	0.5	0.595	1.02	<DL	0.55
OCDD	1	2.96	8.11	2.03	2.75
Total TEQ (ND=0)		0.02434	0.01102	0.01886	0.02557
Total TEQ (ND=DL)		0.482	0.4574	0.4578	0.44
% Lipids		0.46	0.4	0.58	0.39
Sample weight (g)		30.8	30.6	30.4	31.9

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.7 DIOXIN IN 2003 MUSSEL TISSUES (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID		Outer Fore River 1	Outer Fore River 2	Outer Fore River 3	Outer Fore River 4
Compound	DL (ng/Kg)				
2,3,7,8-TCDF	0.1	0.27	0.52	0.407	0.374
1,2,3,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
2,3,4,7,8-PeCDF	0.1	0.119	<DL	0.177	0.276
1,2,3,4,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
2,3,4,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDF	0.5	<DL	<DL	0.668	<DL
1,2,3,4,7,8,9-HpCDF	0.5	<DL	<DL	<DL	<DL
OCDF	1	<DL	<DL	2.16	<DL
2,3,7,8-TCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,7,8-PeCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDD	0.5	0.778	1.8	2.06	1.45
OCDD	1	3.14	8.42	9.49	6.47
Total TEQ (ND=0)		0.09453	0.07081	0.1576	0.1904
Total TEQ (ND=DL)		0.476	0.4889	0.5329	0.5756
% Lipids		0.11	0.69	0.26	0.3
Sample weight (g)		30.7	31.6	30.8	30.4

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.7 DIOXIN IN 2003 MUSSEL TISSUES (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID		Great Diamond Is. 1	Great Diamond Is. 2	Great Diamond Is. 3	Great Diamond Is. 4
Compound	DL (ng/Kg)				
2,3,7,8-TCDF	0.1	0.178	<DL	<DL	0.288
1,2,3,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
2,3,4,7,8-PeCDF	0.1	<DL	<DL	0.101	0.194
1,2,3,4,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
2,3,4,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDF	0.5	<DL	<DL	<DL	<DL
1,2,3,4,7,8,9-HpCDF	0.5	<DL	<DL	<DL	<DL
OCDF	1	<DL	<DL	<DL	<DL
2,3,7,8-TCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,7,8-PeCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDD	0.5	<DL	0.945	0.849	1.1
OCDD	1	2.2	5.21	3.43	5.18
Total TEQ (ND=0)		0.01801	0.009975	0.05937	0.1374
Total TEQ (ND=DL)		0.457	0.464	0.4479	0.5058
% Lipids		0.16	0.24	0.29	0.39
Sample weight (g)		30.4	30.8	30.9	31.9

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.7 DIOXIN IN 2003 MUSSEL TISSUES (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID		Linekin Bay 1	Linekin Bay 2	Linekin Bay 3	Linekin Bay 4
Compound	DL (ng/Kg)				
2,3,7,8-TCDF	0.1	0.197	0.133	0.253	0.353
1,2,3,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
2,3,4,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
2,3,4,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDF	0.5	<DL	<DL	<DL	<DL
1,2,3,4,7,8,9-HpCDF	0.5	<DL	<DL	<DL	<DL
OCDF	1	<DL	<DL	<DL	<DL
2,3,7,8-TCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,7,8-PeCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDD	0.5	0.518	<DL	0.605	0.622
OCDD	1	2.77	1.42	3.05	3.02
Total TEQ (ND=0)		0.02515	0.01341	0.03165	0.04178
Total TEQ (ND=DL)		0.454	0.4477	0.456	0.4558
% Lipids		0.68	0.41	0.63	1.19
Sample weight (g)		30.8	30.8	31.1	31.9

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.7 DIOXIN IN 2003 MUSSEL TISSUES (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID		Royal River 1	Royal River 2	Royal River 3	Royal River 4
Compound	DL (ng/Kg)				
2,3,7,8-TCDF	0.1	0.328	<DL	0.328	0.277
1,2,3,7,8-PeCDF	0.1	0.106	<DL	<DL	<DL
2,3,4,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
2,3,4,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDF	0.5	<DL	<DL	<DL	<DL
1,2,3,4,7,8,9-HpCDF	0.5	<DL	<DL	<DL	<DL
OCDF	1	<DL	<DL	<DL	<DL
2,3,7,8-TCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,7,8-PeCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDD	0.5	0.825	0.858	0.804	0.689
OCDD	1	4.67	5.02	4.19	4.17
Total TEQ (ND=0)		0.04681	0.009078	0.04129	0.03498
Total TEQ (ND=DL)		0.4777	0.4574	0.4759	0.4645
% Lipids		1.15	1.71	1.14	1.37
Sample weight (g)		30.3	30.1	30.4	30.7

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.7 DIOXIN IN 2003 MUSSEL TISSUES (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID		Saco River 1	Saco River 2	Saco River 3	Saco River 4
Compound	DL (ng/Kg)				
2,3,7,8-TCDF	0.1	0.207	0.165	<DL	0.397
1,2,3,7,8-PeCDF	0.1	0.16	<DL	<DL	<DL
2,3,4,7,8-PeCDF	0.1	<DL	<DL	<DL	0.41
1,2,3,4,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
2,3,4,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDF	0.5	<DL	<DL	<DL	<DL
1,2,3,4,7,8,9-HpCDF	0.5	<DL	<DL	<DL	<DL
OCDF	1	<DL	<DL	<DL	<DL
2,3,7,8-TCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,7,8-PeCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDD	0.5	1.19	1.16	1.38	1.85
OCDD	1	5.67	5.47	6.95	7.94
Total TEQ (ND=0)		0.04115	0.02861	0.01445	0.2641
Total TEQ (ND=DL)		0.4957	0.4636	0.4564	0.6549
% Lipids		1.03	2.04	1.24	1.32
Sample weight (g)		30.2	30.4	30.6	30.1

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.7 DIOXIN IN 2003 MUSSEL TISSUES (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID		Middle Fore River 1	Middle Fore River 2	Middle Fore River 3	Middle Fore River 4
Compound	DL (ng/Kg)				
2,3,7,8-TCDF	0.1	0.964	0.941	0.753	0.492
1,2,3,7,8-PeCDF	0.1	<DL	0.613	0.394	<DL
2,3,4,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDF	0.25	0.293	<DL	<DL	<DL
2,3,4,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDF	0.5	0.758	0.539	<DL	<DL
1,2,3,4,7,8,9-HpCDF	0.5	<DL	<DL	<DL	<DL
OCDF	1	1.58	<DL	<DL	<DL
2,3,7,8-TCDD	0.1	0.102	<DL	<DL	<DL
1,2,3,7,8-PeCDD	0.1	<DL	0.127	<DL	<DL
1,2,3,4,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDD	0.25	<DL	0.26	<DL	<DL
1,2,3,7,8,9-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDD	0.5	3.95	2.79	2.16	1.7
OCDD	1	18.5	12.5	9.35	8.15
Total TEQ (ND=0)		0.2764	0.3127	0.1175	0.06704
Total TEQ (ND=DL)		0.5816	0.6541	0.5479	0.5006
% Lipids		0.504	0.335	1.03	0.8
Sample weight (g)		30.5	30.3	30.3	30.5

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.7 DIOXIN IN 2003 MUSSEL TISSUES (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID		Union River 1	Union River 2	Union River 3	Union River 4
Compound	DL (ng/Kg)				
2,3,7,8-TCDF	0.1	0.121	0.221	<DL	0.112
1,2,3,7,8-PeCDF	0.1	<DL	1.87	<DL	<DL
2,3,4,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
2,3,4,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDF	0.5	<DL	<DL	<DL	<DL
1,2,3,4,7,8,9-HpCDF	0.5	<DL	<DL	<DL	<DL
OCDF	1	<DL	<DL	<DL	<DL
2,3,7,8-TCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,7,8-PeCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDD	0.5	<DL	0.511	<DL	<DL
OCDD	1	<DL	3.63	<DL	1.75
Total TEQ (ND=0)		0.01211	0.1209	0	0.01136
Total TEQ (ND=DL)		0.4513	0.5513	0.4516	0.4488
% Lipids		1.66	1.63	2.5	1.66
Sample weight (g)		30.4	30.3	30.2	30.6

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.7 DIOXIN IN 2003 MUSSEL TISSUES (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID		Machias River 1	Machias River 2	Machias River 3	Machias River 4
Compound	DL (ng/Kg)				
2,3,7,8-TCDF	0.1	0.236	0.186	0.17	0.199
1,2,3,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
2,3,4,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
2,3,4,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDF	0.5	<DL	<DL	<DL	<DL
1,2,3,4,7,8,9-HpCDF	0.5	<DL	<DL	<DL	<DL
OCDF	1	<DL	<DL	<DL	<DL
2,3,7,8-TCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,7,8-PeCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDD	0.5	0.771	<DL	<DL	<DL
OCDD	1	5.1	1.43	1.53	1.78
Total TEQ (ND=0)		0.03177	0.01874	0.01718	0.02005
Total TEQ (ND=DL)		0.4668	0.4602	0.4499	0.4564
% Lipids		1.21	1.09	1.27	1.13
Sample weight (g)		30.4	30.2	30.9	30.6

<DL - Indicates that the analyte was not detected at the detection limit reported.

TABLE 1.2.7 DIOXIN IN 2003 MUSSEL TISSUES (CONTINUED)
Wet weights only. Dry weight data is still pending from laboratory.

DEP ID		Cobscook Bay 1	Cobscook Bay 2	Cobscook Bay 3	Cobscook Bay 4
Compound	DL (ng/Kg)				
2,3,7,8-TCDF	0.1	0.156	<DL	0.191	<DL
1,2,3,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
2,3,4,7,8-PeCDF	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
2,3,4,6,7,8-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDF	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDF	0.5	<DL	<DL	<DL	<DL
1,2,3,4,7,8,9-HpCDF	0.5	<DL	<DL	<DL	<DL
OCDF	1	<DL	<DL	<DL	<DL
2,3,7,8-TCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,7,8-PeCDD	0.1	<DL	<DL	<DL	<DL
1,2,3,4,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,6,7,8-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,7,8,9-HxCDD	0.25	<DL	<DL	<DL	<DL
1,2,3,4,6,7,8-HpCDD	0.5	0.498	<DL	0.548	<DL
OCDD	1	1.88	3.09	2.58	2.09
Total TEQ (ND=0)		0.02074	0.0003094	0.02486	0.0002087
Total TEQ (ND=DL)		0.4528	0.5556	0.4744	0.4504
% Lipids		1.66	1.36	1.75	1.73
Sample weight (g)		30.6	30.6	30.2	30.5

<DL - Indicates that the analyte was not detected at the detection limit reported.

1.2

MARINE SPORTFISH HEALTH ADVISORY-DEP/DMR

1.2 MARINE SPORTFISH HEALTH ADVISORY-DEP/DMR

The Maine Bureau of Health currently issues a common statewide advisory for striped bass and bluefish due primarily to the total PCB advisory. New data suggests this may not be appropriate. The new PCB data on bluefish (276 ppb) is the highest we have seen in any ocean fish. But we have very limited data on bluefish - two samples at around 50 ppb, and one new sample at 276 ppb.

Historically it is clear that striped bass in the Kennebec River, known to have a distinct population, had very low PCB concentrations. However, striped bass from the Saco River, the Scarborough River, the York River and the Penobscot all have significantly higher levels of total PCBs. The data on striped bass caught at Brunswick on the Androscoggin River (higher than the Striped Bass on the Kennebec River) are particularly confusing. More samples were needed to determine actual levels. In 2002 five striped bass and bluefish were captured from a number of Maine rivers. The striped bass were all within the slot limit (20-26 inches in length) and all averaged about the same except for the Penobscot fish which were smaller**.** The bluefish from the Saco River were larger than those from the Kennebec River. Results (Table 1.2) showed much higher levels than were measured in the past. These samples were analyzed by a different lab than those used in the past, which raised concerns about the labs and about the current advisories. Additional sampling will be needed.

Table 1.2.1 PCBs in marine fish from Maine estuaries, ppb average (95 ucl on the mean)

striped bass	Androscoggin	Kennebec	Penobscot	Sheepscot	Saco	Scarboro	York
Year							
1995		23 (30)					
1997		11 (14)					
1998	41 (43)	16 (17)			12.2	30.3	
1999		11 (12)					
2000	60 (72)			24 (28)	25 (32)		
2001			84				64
2002	288	93.2	279	149	135		103

bluefish	Androscoggin	Kennebec	Penobscot	Sheepscot	Saco	Scarboro	York
Year							
1995		48.8					
1997							
1998							
1999							
2000							
2001		276					
2002		232		63.4 alewife	320		

Table 1.2.2 PCBs in coastal marine fish 2002 (ug/kg ww)

WATER	SPECIES	FISH ID 1	2	3	4	5	mean
Androscoggin R- Brunswick	ST bass	278	235	373	230	322	288
Kennebec R- Sidney	ST bass	133	41.5	109	124	59.3	93.2
Penobscot R- Orrington	ST bass	722	203	222	153	96.6	279
Saco R	ST bass	74.5	216	60.4	112	212	135
Salmon Falls R	ST bass	104	203	215	466	365	271
Sheepscot R- Wiscasset	ST bass	140	200	100	224	80.5	149
York R	ST bass	67.8	150	175	30.4	90.5	103
Kennebec R- Phippsburg	bluefish	213	499	212	122	118	232
Saco R	bluefish	279	604	122	247	346	320
Sheepscot R- Wiscasset	alewife	52.6	74.2				63.4

1.3

MERCURY IN HARBOR SEALS
(finish from 2001)

MERCURY RESIDUES IN HARBOR SEALS AND THEIR PREY FISH IN THE GULF OF MAINE

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31 March 2004

1.85

INTRODUCTION

Elevated mercury residue levels in certain freshwater and marine fish in Maine have prompted fish consumption health advisories for sensitive human populations (DHS 2001). In 1995 mean mercury residues in both estuarine striped bass (*Morone saxatilis*) and bluefish (*Pomatomus saltatrix*) exceeded the State of Maine fish consumption level of concern of 0.20 ug Hg/g (Sowles et al. 1997). Mercury residues in juvenile pollock (*Pollachius virens*) and mackeral (*Scomber scombrus*) collected from 10 sites along the Maine coast showed significant regional variation related to estuarine input and coastal development (Bauer and Haines 2001).

Piscivorous harbor seals may be exposed to elevated mercury residues through their prey fish. Few studies report mercury levels in harbor seals sampled along the Northeast coast. Juvenile harbor seals sampled in Boothbay Harbor, Maine in 1971 were reported to have mean liver mercury residues of 3 ug Hg/g (wet wt.) (Gaskin et al. 1973). Lake et al. (1995) report mean mercury residues in harbor seal livers, 39-70 ug Hg/g (wet wt.), sampled along the Massachusetts and New York coasts in 1980 and 1991. Mercury residues in fur samples collected from seal pups stranded along the southern Maine coast in 1998 and 1999 ranged from 0.41 to 5.77 ug Hg/g (SWAT 2001) Using a hair:blood ratio of 250, 30% of the pups tested would have had blood Hg residues in excess of the observed effect level reported for humans (USDHHS 1994)

The findings reported below on mercury accumulation levels in harbor seals and their prey fish in the Gulf of Maine are part of a broader, on-going study of factors governing the trophic transfer of mercury from fish to seals.

METHODS

Tissue samples for mercury analysis were collected from beach-cast animals found at Mt. Desert Rock, a biological field station operated by College of the Atlantic. Mt. Desert Rock, a three-acre granite ledge at high tide, is located 20 miles due south of Mt. Desert Island and is nine miles from the nearest landfall, Great Duck Island to the northwest. The Rock is used year-round as a haul-out site for harbor and gray seals; during the summer, 700-900 harbor seals and approximately 100 gray seals use the site. The majority of harbor seals on the island are adult males.

Tissue samples for contaminant analyses were collected from stranded, dead seals followed standard necropsy procedures. (Dierauf 1994). Samples were collected using acid rinsed stainless steel instruments and immediately placed in Chem-clean jars or ziplock bags. Collected samples included dorsal and ventral blubber, from the skin to the muscle layer, dorsal and ventral fur, scapular muscle, liver, kidney, adrenal, stomach (for diet analysis), canine tooth, or entire lower jaw, claw from first digit of foreflipper and vibrissae. Samples were immediately frozen for later transport to the mainland for storage at -20^{o}C. Prior to analysis tissues were chopped and ground using a food processor before final homogenization with a Tissue Tearor.

Fish collections were primarily made during the DMR 2001 Fall Trawl Survey (Sherman et al. 2003). Trawls conducted on October 18 and 19, 2001 provided collections from three separate depth contours: shallow waters in upper Frenchman Bay, SSW of Sorrento (DMR tow sites 3A and 7); mid-depth trawls west of Schoodic Point, due south of the mouth of Frenchman Bay (DMR tow sites 54 and 94); and deep-water trawls three to six miles WSW of Mt. Desert Rock (DMR tow sites 483 and 501). Additional samples of Acadian redfish were made using hook and line in the immediate vicinity of Mt. Desert Rock.

During the trawl survey, at each depth contour up to 20 fish of each species, representing the range of size classes caught in the trawl, were collected, euthanized if necessary, then immediately bagged and chilled on layered crushed ice for transport to the lab for processing. At the lab, fish were weighed to 1.0 g, total and fork length were recorded to 1 cm and the fish were individually bagged in Ziploc plastic bags and frozen at -20^{o}C.

Subsequently, fish were partially thawed and dissected to remove otoliths and eye lenses for identification, size relationships and mercury analyses. The remaining whole fish was homogenized with a Tissue Tearor and or a food processor, depending on fish size, and re-frozen for later mercury analyses.

For mercury analyses, homogenized tissue samples were digested in a mixture of concentrated nitric acid and 30% hydrogen peroxide heated to 170^{o}C for 15 minutes. Each digestate was analyzed for total mercury using cold-vapor atomic fluorescence spectrometry. Standard calibration procedures were followed. Quality assurance methods for both seal and fish tissue included matrix spikes, standard reference material (DORM-2; National Research Council of Canada), duplicate digestions and method blanks. Digestate runs that did not meet quality assurance guidelines were re-digested and re-analyzed or deleted from the reported results.

For some fish species the mean length of fish collected varied between collection sites, preventing a direct comparison of mercury residue levels between sites. Since mercury residues increase with fish age, which can be inferred from fish length, mercury residues in longer fish are expected to be greater than in smaller fish, regardless of collection site location. For comparisons between collection sites, the mercury residue levels were statistically adjusted for differences in fish length using a least squares means method with fish length as the covariate.

RESULTS and DISCUSSION

Harbor Seals

During the 2001 and 2002 field seasons, eight beach-cast harbor seals were necropsied and sampled at Mt. Desert Rock. Seals were grouped into age classes using total length measurements, following the standards reported by Bigg (1969). Determinate growth in seals negates length as an indicator of actual age in years. Since

mercury body burdens increase with age, summary statistics for pups are separated from the older age class. The pups mean length was 92 cm and the four adults and one sub-adult had a mean length of 154 cm. All seals in the older age group were males.

The cause of death could not be confirmed for any animal. The three pups sampled were extremely emaciated, ribs were prominent and blubber layers were less than 3 mm, providing little insulation. External wounds were visible on two of the older seals sampled, one bled heavily from slashes along the snout prior to death and another had an injured eye and numerous bloody wounds around its head and neck.

As shown in Table 1, the highest mercury levels were found in the liver, which also had the most variable mercury residues, ranging from 0.9 to 157.4 *u*g/g. Unexpectedly low liver mercury residue levels were found in two of the older Gulf of Maine seals sampled. Whether this finding indicates low mercury exposure for those seals, and hepatic mercury excretion rather than storage as mercuric-selenide salts, or is an indication that the age of those seals is significantly less than the other seals sampled is uncertain at this time. (Exact age determination of the five older seals in the Gulf of Maine sample set from cementum age analysis is pending.) The liver is an accumulator organ, and mercury residues are known to increase with the age of the seal (Frank et al. 1992; Watanabe et al. 2002).

Kidney mercury levels were significantly lower and less variable, ranging from 1.5 to 5.5 *u*g/g in the older age class. Similarly, mercury residues in muscle ranged from 0.7 to 1.7 *u*g/g. The adrenal glands, collected in a subset of the older seals, had the lowest mercury level of the four tissues sampled. Figure 1 illustrates the range of mercury residues and relationship to tissue type found in each of the five older seals.

Regional comparisons of mercury residue levels for selected tissues are given in Table 2. The wide range of mercury concentrations found in Gulf of Maine seals bears investigation. The highest mercury residue found a Maine seal (160 ug Hg/g liver wet wt.) exceeded the highest liver concentration found in any seal sampled in San Francisco Bay. The mean mercury residue levels in the Gulf of Maine seals and those sampled in San Francisco Bay were essentially equivalent. San Francisco Bay has elevated mercury residues in the food web, prompting health warnings on human consumption of fish from San Francisco Bay. Those elevated mercury levels are attributed to historical placer mining within the Bay's watershed and ongoing municipal and industrial discharges (Kopec and Harvey 1995).

The Caspian and Baikal seals had notably lesser amounts of mercury in the three tissues sampled than found in Gulf of Maine seals. Both the Caspian Sea and Lake Baikal are reported to have low background mercury levels (Watanabe et al. 2002). This is especially true for Lake Baikal, where the Baikal seals primary prey is over 80% lipid, and has negligible mercury accumulations. (Watanabe et al. 1998).

Table 1. Mercury residue levels in selected tissues from harbor seals collected at Mt. Desert Rock, 2001 - 2002. Units are *u*g/g, wet wt.

	AGE CLASS			
TISSUE	Adult /Sub-adult		Pup	
	(n)	$X \pm$ S.D. (min-max)	(n)	$X \pm$ S.D. (min-max)
Muscle	5	1.22 ± 0.43 (0.65 - 1.71)	3	0.08 ± 0.01 (0.07 - 0.09)
Liver	5	54.90 ± 67.84 (0.91 - 157.40)	1	0.27
Kidney	5	3.07 ± 1.55 (1.53 - 5.59)	1	0.15
Adrenal	3	0.66 ± 0.24 (0.42 - 0.90)		

Grey seals sampled in the Baltic Sea and the North Atlantic at Sable Island had the highest liver and kidney mercury residues of the regions being compared. Nyman et al. (2002) speculate that that these elevated residues may be due to species differences or reflect seal foraging within the highly contaminated Gulf of Bothnia, adjacent to the Baltic Sea and St Lawrence River west of Sable Island.

Interestingly, mercury residues in muscle from grey seals sampled from both the Baltic Sea and Sable Island sites were equivalent to muscle mercury levels in the Caspian and Baikal seals. Organic mercury transported via the blood circulation is deposited in a bioavailable form in the muscle (Watanabe 1998). The highest muscle mercury levels for the regions reported were found in San Francisco Bay and Gulf of Maine seals.

Table 2. Regional comparison of mean mercury residues in adult/subadult seals. Units are *u*g/g wet wt. Species reported and source: [a] harbor seals (*Phoca vitulina c.*), this study; [b] harbor seals (*Phoca vitulina r.*), Kopec in prep; [c] Caspian seals (*Phoca caspica*), Watanabe et al. 2002; [d]Baikal seal (*Phoca sibirica*), Watanabe et al. 1998; [e]grey seals (*Halichoerus grypus*), Nyman et al. 2002;

	REGIONS SAMPLED					
	Gulf of Maine[a]	San Francisco Bay[b]	Caspian Sea[c]	Baikal Sea[d]	Baltic Sea[e]	Sable Island[e]
TISSUE	X ± S.D.	X ± S.D.	X ± S.D.	X ± S.D.	X ± S.D.	X ± S.D.
liver	54.9 ± 67.8	64.4 ± 35.4	15 ± 26	2.3 ± 2.6	78 ± 840	109 ± 72
kidney	3.1 ± 1.6	3.2 ± 1.7	1.6 ± 1.3	1.8 ± 0.8	4.7 ± 2.1	4.0 ± 2.3
muscle	1.2 ± 0.4	1.3 ± 0.5	0.55 ± 0.30	0.25 ± 0.15	0.7 ± 0.3	0.6 ± 0.4

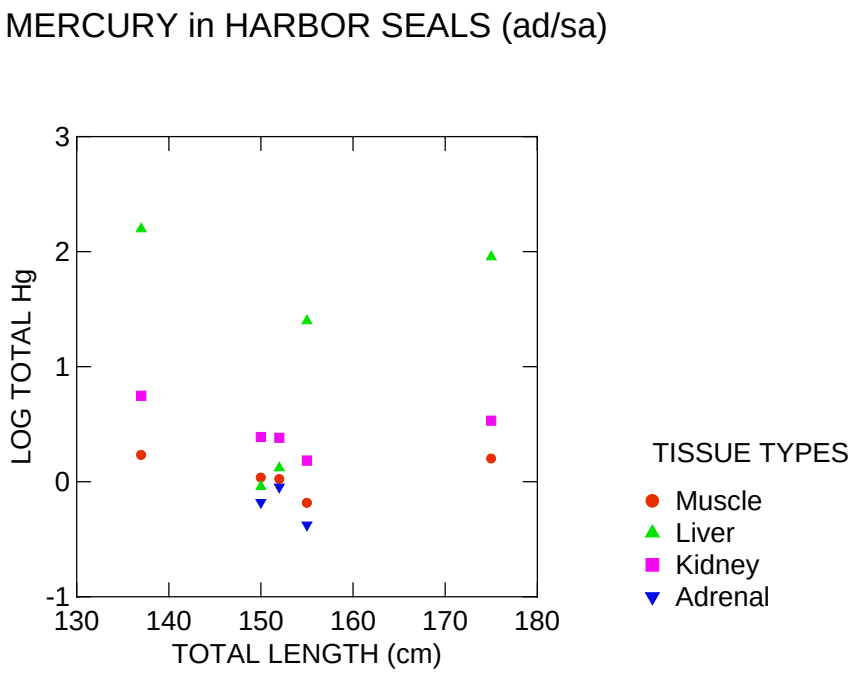


Figure 1. Log $_{10}$ mercury residues in selected tissues from adult and subadult harbor seals collected at Mt. Desert Rock, 2001 – 2002.

Whole fish mercury residues from samples collected in the central Gulf of Maine ranged between 5 and 85 ng Hg/g wet wt., below Maine's mercury fish action level for sensitive human populations of 200 ng Hg/g. (DHS 2001) While Acadian redfish and alewives were found to have the highest mercury residue levels in the species sampled, the age of the fish sampled varied greatly between species, and did not allow a formal comparison of mercury residue levels between species.

In order to determine whether mercury accumulation levels varied within a fish species between nearshore and offshore sites, fish collections were made at three progressively deeper depth contours - from the head of Frenchman Bay, to sites west of Schoodic Point, to the vicinity of Mt. Desert Rock. For each species analyzed, Table 2 lists the mean fish length and least squares means (length adjusted) of whole body mercury residues found at each sample site. Where noted in Table 2, small sample size or collections made at only one tow site prevented least squares means analyses, and the actual mean ± standard deviation is given. No significant differences ($P > 0.05$) in mercury residue levels within a species were found between nearshore and offshore collection sites. Sample sizes for certain species were limited, and some species were not present in trawl collections made at all three depth contours, reflecting distinct species habitat ranges or limitations of the collection method.

It is important to note that the size class of the fish species sampled in this study reflects the general size range in fish consumed by harbor seals. Depending on the growth rate of individual species, seal prey fish are often smaller, younger fish than those legally caught by sport fishermen (DMR, 2003). Species accounts given below include a discussion of the age – length relationship for each fish and the implications for interpreting the reported mercury residues.

In addition, the species accounts include a brief discussion of aspects of the species' population dynamics and natural history relevant to interpretation of the mercury residue levels reported. This background information was found exclusively in the latest edition of *Bigelow and Schroeder's Fishes of the Gulf of Maine* (Collette and Klein-MacPhee, 2002).

Table 3. Least squares mean (adjusted for length) mercury residue levels in marine fish sampled at three different depth contours in the central Gulf of Maine. Sample locations given in Methods. [a] indicates actual $X \pm$ S.D. of mercury residue.

Species	Tow	(n)	Fish Length (cm) $X \pm$ S.D.	Least Squares Mean ng Hg/g, wet wt.
Alewife	3/7	11	17.6 ± 4.1	24.1
	94/54	8	18.0 ± 3.9	25.6
	483/50			
	1	3	18.0 ± 1.0	20.5
Atlantic herring	3/7	7	14.3 ± 4.1	14.4
	94/54	8	20.8 ± 2.8	12.2
	482/50			
	1	8	22.8 ± 2.9	14.9
	482/50			
American plaice	1	5	22.6 ± 7.5	14.6 + 5.4[a]
	482/50			
Witch flounder	1	10	16.0 ± 5.2	13.6 + 2.0[a]
Winter flounder	3/7	15	16 ± 6.3	9.3
	94/54	14	20 ± 6.7	10
Atlantic cod	3/7	3	13.7 ± 1.5	15.5
	94/54	1	15	9.8
	482/50			
	1	4	13.5 ± 1.3	12.7
Haddock	3/7	2	15.5 ± 0.7	12.6
	94/54	3	14.0 ± 4.4	8.1
Pollock	3/7	2	18 ± 2.8	31.0 + 10.5[a]
	482/50			
	1	1	47	25.4[a]
Silver Hake	3/7	4	13 ± 4.6	15.5
	94/54	9	21 ± 4.9	14.2
	482/50			
	1	10	20 ± 8.3	18.1
Acadian redfish	94/54	1	5	28.8
	482/50	3	6 ± 4.5	27.7

	1 MDR	22	20 ± 3.0	25.4
Red hake	94/54	5	20 ± 7.0	14.2
	482/50 1	7	25 ± 3.0	12.9
White hake	3/7	12	20 ± 5.3	10.5
	94/54	11	19 ± 4.5	10.8
Longhorn sculpin	94/54	10	17 ± 3.6	12.7 + 3.5[a]

ALEWIFE (*Alosa pseudoharengus*)

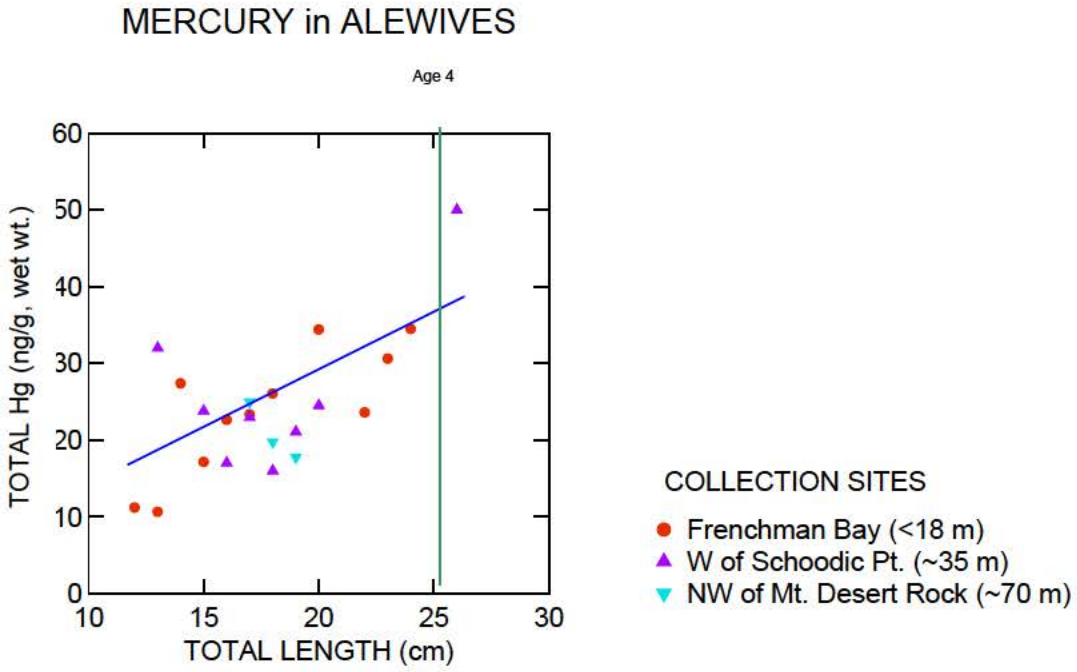
Alewives are anadromous fish that spawn in the spring in freshwater lakes and ponds. The rest of the year they travel the Maine coast in large schools, often in response to zooplankton abundance. They are generally found between depths of 55 to 110 meters. Alewives were collected from all three depth contours sampled.

At sea, alewives feed primarily on euphausiids, in addition to other zooplankton, selecting individual prey or filter feeding using gill rakers depending on prey type, prey density or water turbidity. Larger alewives can eat small fishes including Atlantic herring, eel, sandlance, or alewives. Larval and juvenile alewives in freshwater also eat zooplankton, primarily Cladocerans and copepods. Larger juveniles, longer than 12 cm, add benthic amphipods to their diet.

Alewives show a moderate growth rate, and can live eight years or more; individuals sampled in this study were generally less than four years of age. There is no minimum size limit established for alewives.

Mercury residues in alewives were among the highest found among all species sampled in this study, ranging between 10 – 50 ng Hg/g wet wt. (Figure 2). This could reflect early mercury exposure in freshwater food webs, foraging in the marine nearshore environment, or the age of fish sampled. Alewives had a moderate but significant correlation between fish length and mercury residue levels ($r^2 = 0.48$, $P = 0.001$.

Figure 2. Whole body mercury residue levels in alewives sampled at three sites within the Gulf of Maine in 2001. The vertical green line relates fish age to average length.



ATLANTIC HERRING (*Clupea harengus*)

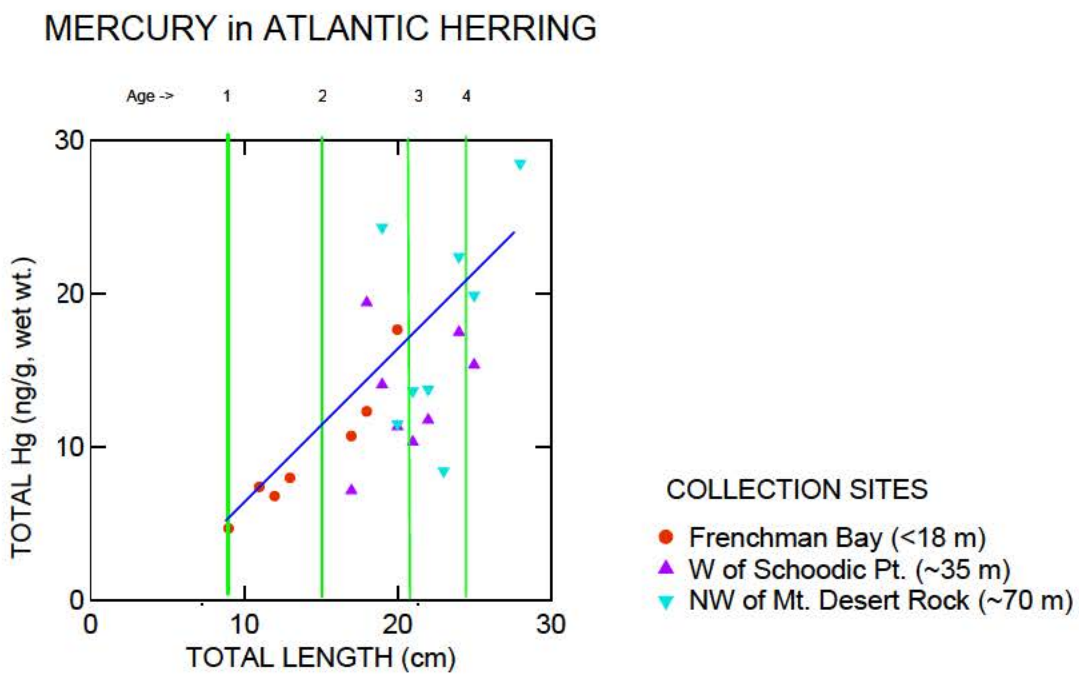
Atlantic herring are a marine coastal pelagic species that occur from shallow inshore areas to offshore depths of 200 meters. The species has strong schooling behavior, migrating in response to prey availability or to spawning areas. Adults mix extensively as they move throughout the Gulf of Maine. Atlantic herring were present in tows from all three depths.

Atlantic herring selectively forage or filter-feed on zooplankton, depending on prey density or light levels. Preferred prey varies seasonally with prey abundance and includes spawn, larvae or Cladocerans in the spring and copepods and euphausiids later in the summer.

Atlantic herring grow at a moderate rate, reaching average lengths less than 35 cm after eight years. Fish sampled in this study were generally less than 4 years of age. The largest Atlantic herring sampled was 28 cm in length. No minimum size limit has been established for this species.

Mercury residues ranged between 5 – 29 ng Hg/g , wet wt (Figure 3). A significant moderate correlation was found between fish length and mercury residue level ($r^2 = 0.52$, P= 0.009).

Figure 3. Whole body mercury residue levels in Atlantic herring sampled at three sites within the Gulf of Maine in 2001. The vertical green line relates fish age to average length.



AMERICAN PLAICE (*Hippoglossoides platessoides*)

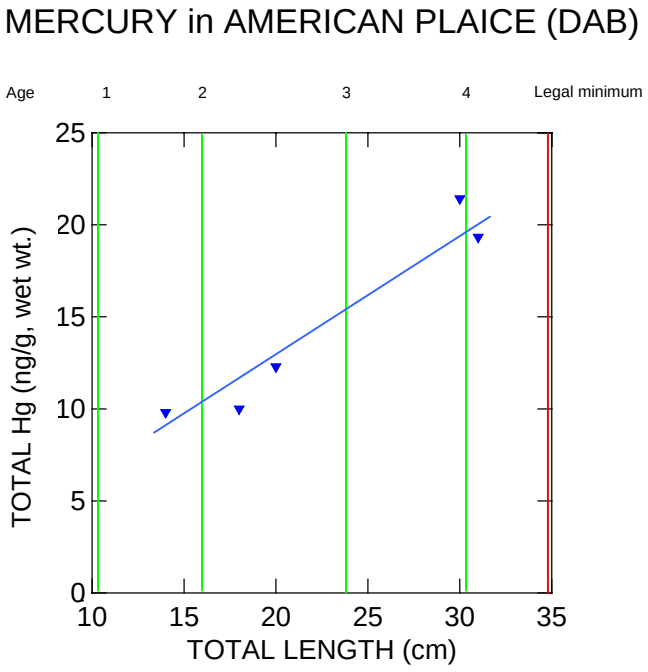
American plaice (dab) are bottom flatfish found between the tideline down to 700 m in depth. They show little population mixing, with some short movements to and from shallower water in the summer, but no significant migrations between coastal and offshore areas. Plaice were found only in deep water tows at approximately 70 meters.

They opportunistically feed on bottom-dwelling species small enough to eat, primarily echinoderms (brittle stars), polychaetes, sand dollars and shrimps. Juveniles feed on small shrimp, crustaceans and polychaete worms.

American plaice grow at a moderate to slow rate, reaching average lengths near 60 cm at 15 years of age. Plaice were collected only at the deeper depth contour of approximately 70 meters. Sampled fish ranged from one to four years of age. The minimum size of plaice legally taken by anglers is 36 cm (DMR 2003). No fish sampled exceeded this minimum length.

Mercury residues in plaice ranged between 10 – 21 ng Hg/g, wet wt.(Figure 4). A strong significant correlation was found between fish length and mercury residues (r^2 = 0.935, P = 0.007).

Figure 4. Whole body mercury residue levels in American plaice sampled at a depth of 70 meters, NW of Mt. Desert Rock in the Gulf of Maine in 2001. The vertical green line relates fish age to average length and the vertical red line indicates the minimum legal size.



WITCH FLOUNDER (*Glyptocephalus cynoglossus*)

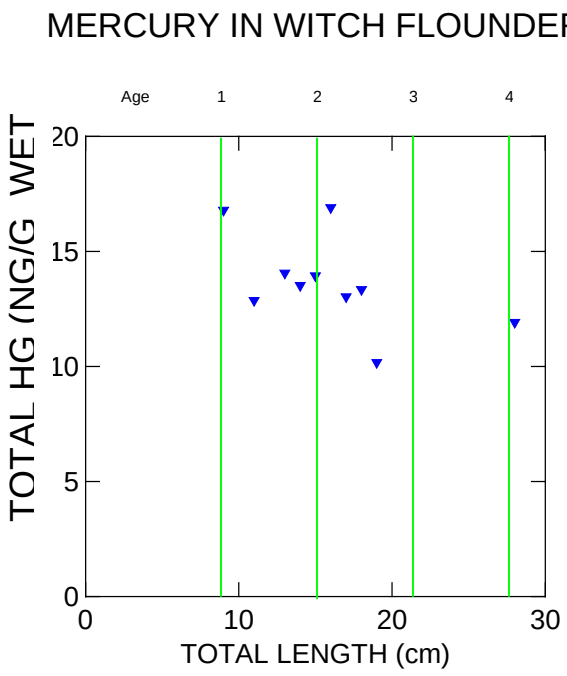
Witch flounder (gray sole) are found at depths ranging between 90 - 330 meters. They are relatively stationary, showing no seasonal inshore movements. This species was found only in deep-water tows in the vicinity of Mt. Desert Rock.

They feed primarily on polychaete worms, with limited foraging on echinoderms, amphipods, small shell mollusks and squid.

Witch are relatively slow growing, long-lived fish, reaching an average length of less than 22 cm at 15 years of age. All but one of the individuals sampled were less than 3 years of age. The minimum size limit for sport fishermen for this species is 36 cm (DMR 2003). No witch sampled exceeded this minimum length.

Mercury residues ranged between 10 – 17 ng Hg/g wet wt. (Figure 5). No correlation was found between fish length and whole fish mercury residues, possibly due to the limited size range in this sample.

Figure 5. Whole body mercury residue levels in witch flounder sampled at a depth of 70 meters, NW of Mt. Desert Rock in the Gulf of Maine in 2001. The vertical green line relates fish age to average length.



WINTER FLOUNDER (*Pleuronectes americanus*)

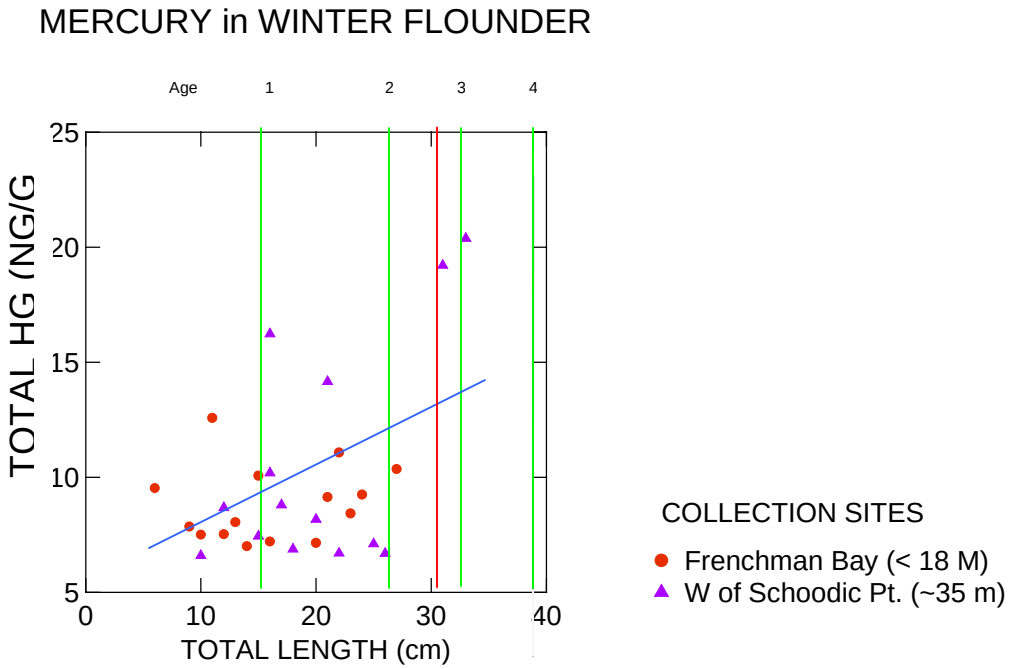
Winter flounder occupy relatively shallow water areas between 18 – 37 meters along the Maine coast, and on Georges Bank up to 82 meters in depth. They show limited seasonal movements; shifting offshore in the summer to avoid temperatures above 15^{o}C, then back inshore when the water cools. Their larvae sink, further reducing the chances for population mixing. Winter flounder were collected at all depths sampled; fish reported here are from the shallow and mid-depth tow sites.

Their small gape limits their foraging to small invertebrates, primarily polychaetes, anthazoans, and amphipods. On rare occasions they will eat small fish.

Winter flounder are fairly long-lived, growing to an average size of almost 60 cm at 15 years of age. In the samples reported here, all individuals were 3 years of age or less. The minimum length legally taken by anglers is 30 cm; two of the individuals reported here exceeded that minimum length.

Mercury residues ranged between 7 – 20 ng Hg/g wet wt (Figure 6). There was a very weak, but significant correlation between fish length and mercury residue level in the fish reported here (r^2 = 0.22, P = 0.026). This finding may result from the small size of the majority of fish sampled.

Figure 6. Whole body mercury residue levels in Atlantic herring sampled at two sites within the Gulf of Maine in 2001. The vertical green line relates fish age to average length and the vertical red line indicates the minimum legal size.



ATLANTIC COD (*Gadus morhua*)

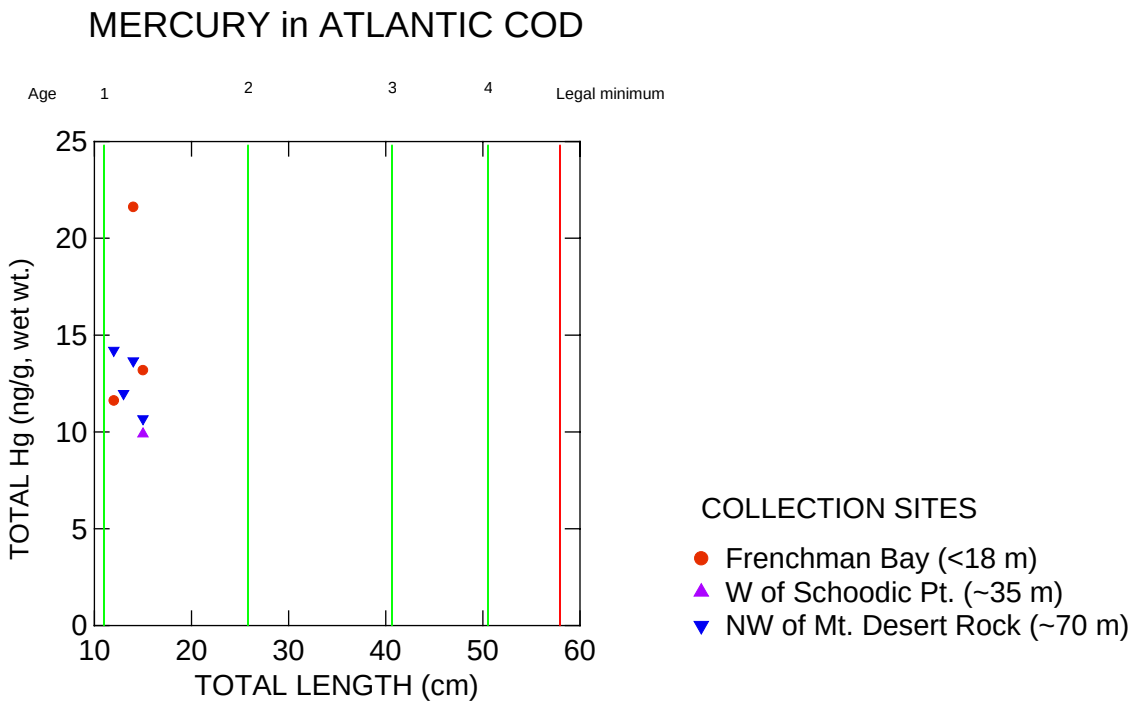
In the Gulf of Maine Atlantic cod are found between 10 – 135 meters in depth. In the spring juvenile cod generally keep to areas less than 100 meters in depth, and show little seasonal movement. Cod can travel long distances and exchange between Gulf of Maine fish with stocks east of Georges Bank has been noted. Cod were present in small numbers at all tow depths sampled.

Cod are typical groundfish, usually feeding within two meters of the bottom. While larval fish feed on pelagic invertebrates, by one year of age they switch to benthic prey including isopods, shrimps, decapods and polychaetes. The diet of adult cod is primarily fishes, including herring, silver hake, redfish, other gadoids, and sand lance. Cod also forage on decapod crustaceans, 21% by weight, and squid, 15% by weight.

Cod are fast growing, long-lived fish. They may live close to 30 years, with an average length of almost 50 cm at 15 years of age. The cod reported here are all less than 15 cm in length, under 1.5 years in age. The minimum length legally taken by anglers is 58 cm, just under 5 years of age.

Mercury residues in the cod sampled here ranged between 10 – 22 ng Hg/g wet wt (Figure 7). No correlation was found between fish length and mercury residue level, an expected outcome given the limited range in fish sizes sampled. Also, the size of fish sampled here would forage primarily on benthic invertebrates, rather than the higher trophic level fish and squid eaten by older, larger cod.

Figure 7. Whole body mercury residue levels in Atlantic cod sampled at three sites within the Gulf of Maine in 2001. The vertical green line relates fish age to average length and the vertical red line indicates the minimum legal size.



HADDOCK (*Melannogrammus aeglefinus*)

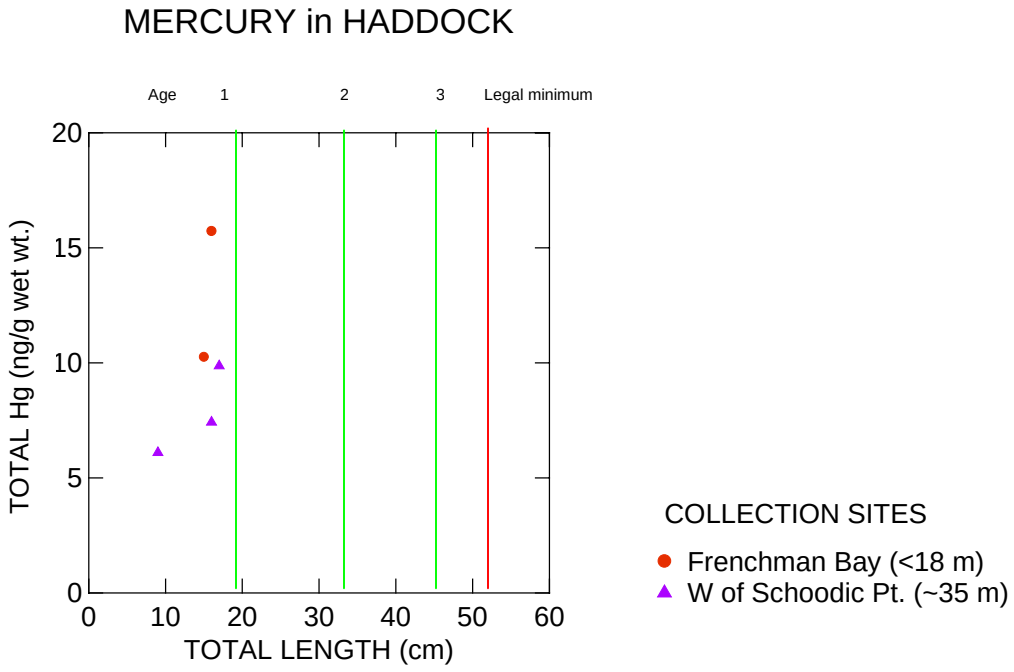
Haddock are generally found between 45 – 135 meters in depth. In the Gulf of Maine they make short seasonal movements to shallower water in the summer, returning to deeper areas in the winter. Small numbers of haddock were collected at the shallow and mid-depth tow sites.

Haddock feed more exclusively than cod on benthic prey. Juvenile haddock less than 8 cm in length live and feed in the epipelagic zone on small crustaceans, primarily amphipods. Larger fish switch to benthic prey. Adults forage on echinoderms, primarily brittle stars, consuming lesser amounts of fish, polychaetes and crustaceans.

Haddock are a fast growing fish, reaching an average of 19 cm in length in their first year. Haddock growth rate has increased as stocks have been reduced. All fish reported here were less than 20 cm in length, and less than one year old. The minimum length legally taken by anglers for this species is 53 cm (DMR 2003).

Mercury residues ranged from 6 – 16 ng Hg/g, wet wt. (Figure 8). No correlation was found between fish length and mercury residue level, a likely result given the small size range of this sample set.

Figure 8. Whole body mercury residue levels in haddock sampled at two sites in the Gulf of Maine in 2001. The vertical green line relates fish age to average length and the vertical red line indicates the minimum legal size.



POLLOCK (*Pollachius virens*)

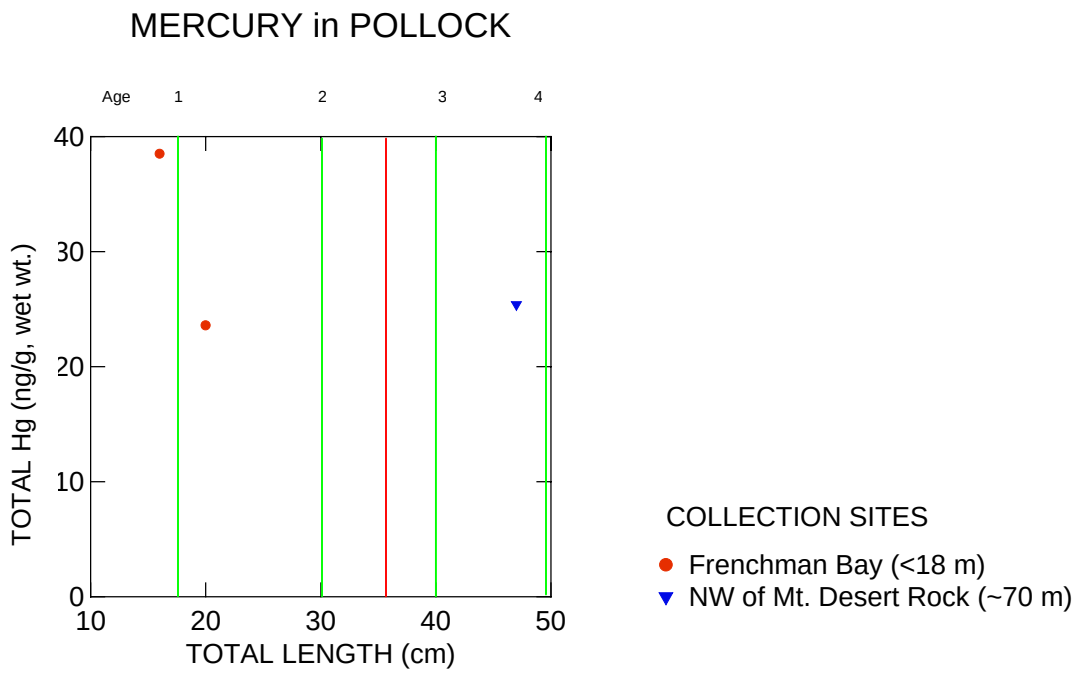
Pollock are an active fish ranging from the surface to a depth of 280 meters. In the Gulf of Maine they are found in nearshore areas and over offshore banks. Pollock move further offshore in the summer and to the south for winter spawning. A limited number of pollock were collected in the shallow and mid-depth tows, which, as designed, primarily collected groundfish.

Pollock foraging preferences change significantly with age. Younger fish less than 31 cm in length feed on chaetognaths, euphausiids and amphipods, between 31 and 60 cm, euphausiids are the principle prey, and above 61 cm in length pollock primarily eat other fishes, including herring, cod, haddock, redfish, and hake, and cephalopods.

Pollock are a fast-growing fish that are reported to live up to 19 years with an average length of 100 cm. Two of the fish sampled were one year of age or younger, and one sampled in the deep-water tow was 47 cm in length, approaching 4 years of age. The minimum length for pollock legally caught by anglers is 48 cm. No larger pollock that feed on mid-trophic level organisms were sampled.

Whole fish mercury residues in pollock ranged between 24 – 39 ng Hg/g wet wt (Figure 9) . Interpretation of these results is limited by the small size.

Figure 9. Whole body mercury residue levels in pollock sampled at two sites in the Gulf of Maine in 2001. The vertical green line relates fish age to average length and the vertical red line indicates the minimum legal size.



SILVER HAKE (*Merluccius bilinearis*)

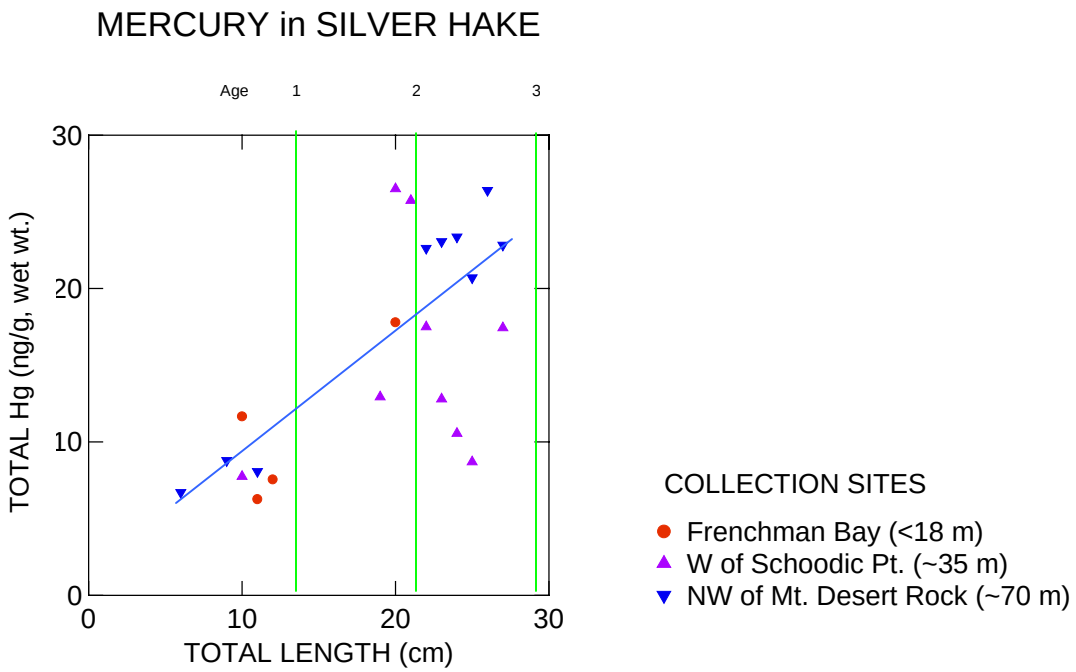
Silver hake are fast, wide ranging fish that may move from the surface to the bottom in pursuit of prey. During the day they have been observed motionless near the bottom. They have been caught in trawls at depths of 400 meters. They migrate seasonally to less than 90 meters in depth in the summer and autumn and move to deeper waters in the winter and spring. Silver hake were collected at all three tow depths.

Young silver hake, less than 20 - 25 cm in length, feed primarily on crustaceans. Above this size, older fish become increasingly piscivorous with a range of fish species and squids comprising 80 % of their diet, by weight.

Silver hake are a fairly fast growing fish, and growth rates are reported to accelerate after the hake become piscivorous. All individuals sampled were less than three years of age. There is no minimum take length assigned to this species.

Whole fish mercury residues ranged from 6 – 27 ng Hg/g wet wt. (Figure 10). A significant moderate correlation was found between fish length and mercury residue level ($r^2 = 0.58$, P = 0.000).

Figure 10. Whole body mercury residue levels in silver hake sampled at three sites in the Gulf of Maine in 2001. The vertical green lines relate fish age to average length



ACADIAN REDFISH (*Sebastes fasciatus*)

Acadian redfish are found on rocky hard bottoms at a depth range of 1 – 366 meters. In the summer and early autumn they occupy the deepwater portions of the Gulf, migrating to the southeastern region during the winter. During warmer months they are generally deeper than 30 meters.

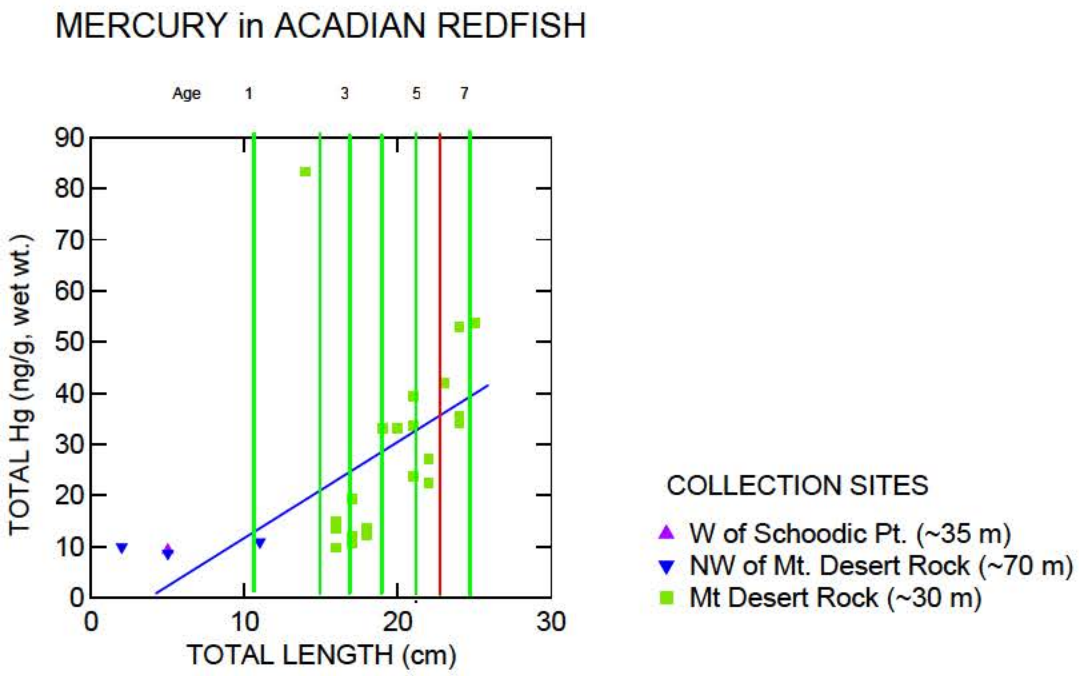
Few redfish were caught during the trawl survey, as they are more common on rocky bottoms not appropriate for a bottom trawl. Since this is the primary seal prey species at Mt. Desert Rock, additional collections were made using hook and line in the vicinity of the Rock.

Euphausiids and decapods make up 90% of the redfish diet by weight. The fish are reported to rise off the bottom to feed at night.

This species is an extremely slow growing and long-lived fish. By five years of age their average length remains less than 22 cm. After age six females are reported to grow slightly faster than males, reaching a size of 37 cm at 24 years of age, compared to males that average 23 cm in length at that age. The largest fish in the sample set reported below is 25 cm in length, approximately seven years old.

Whole fish mercury residue levels in redfish ranged between 9 – 54 ng Hg/g wet wt., with one possible outlier at 83 ug Hg/g (Figure 11). After the data set was adjusted for the outlier, there was a significant moderate correlation between fish length and mercury residue level ($r^2 = 0.54$, $P = 0.000$). This sample set contains the oldest fish included in this study and also fish with the highest mercury residues.

Figure 11. Whole body mercury residue levels in Acadian redfish sampled at three sites in the Gulf of Maine in 2001 and 2002. The vertical green line relates fish age to average length and the vertical red line indicates the minimum legal size.



RED HAKE (*Urophycis chuss*)

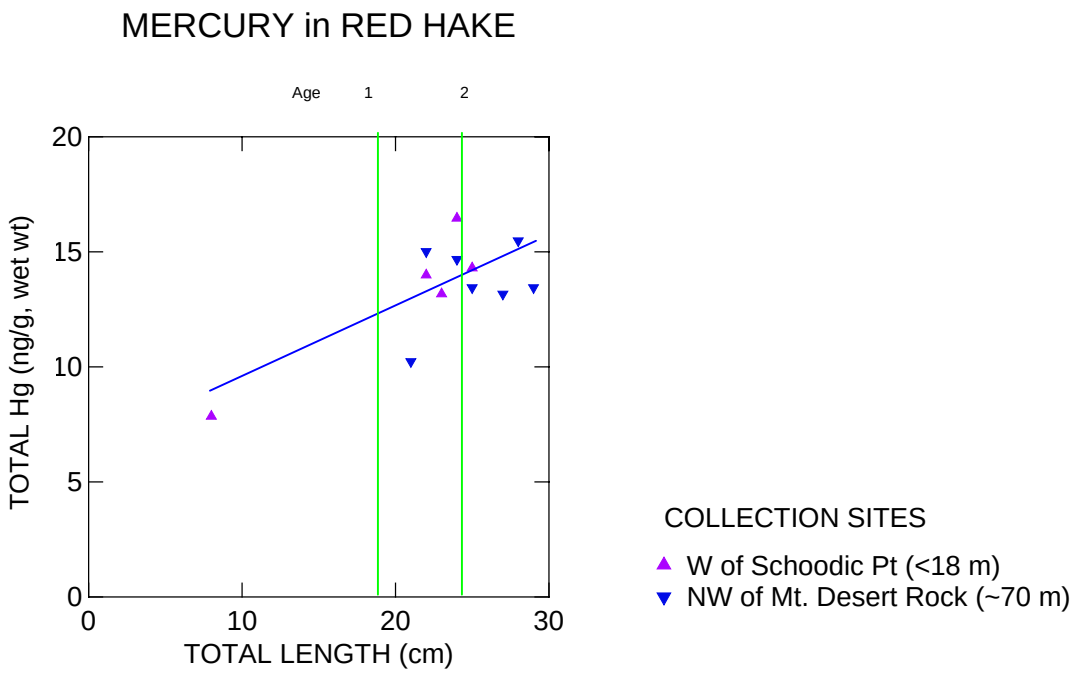
Red hake are found in relatively deep water year-round. Seasonal migrations shift them from a range of 110 – 130 meters depth in the summer to 180 – 460 meters in the winter months. Red hake are benthic feeders, using their pelvic fins and barbells to detect prey. In this study, red hake were present in mid-depth and deepwater tows.

Young fish less than 20 cm in length feed on small crustaceans including euphausiids, decapods, amphipods and polychaetes. Older fish continue to forage on crustaceans, primarily euphausiids and pandalid shrimps in addition to fishes, which comprise 20% of the diet by weight.

Red hake are a fairly fast growing fish reaching a maximum length of about 50 cm. The majority of fish in this sample set ranged from 20 – 30 cm in length.

Mercury residues ranged between 8 – 15 ng Hg/g wet wt. (Figure 12). Fish length was significantly moderately correlated with residue level ($r^2 = 0.63$, $P = 0.004$).

Figure 12. Whole body mercury residue levels in red hake sampled at two sites in the Gulf of Maine in 2001. The vertical green line relates fish age to average length.



WHITE HAKE (*Urophycis tenuis*)

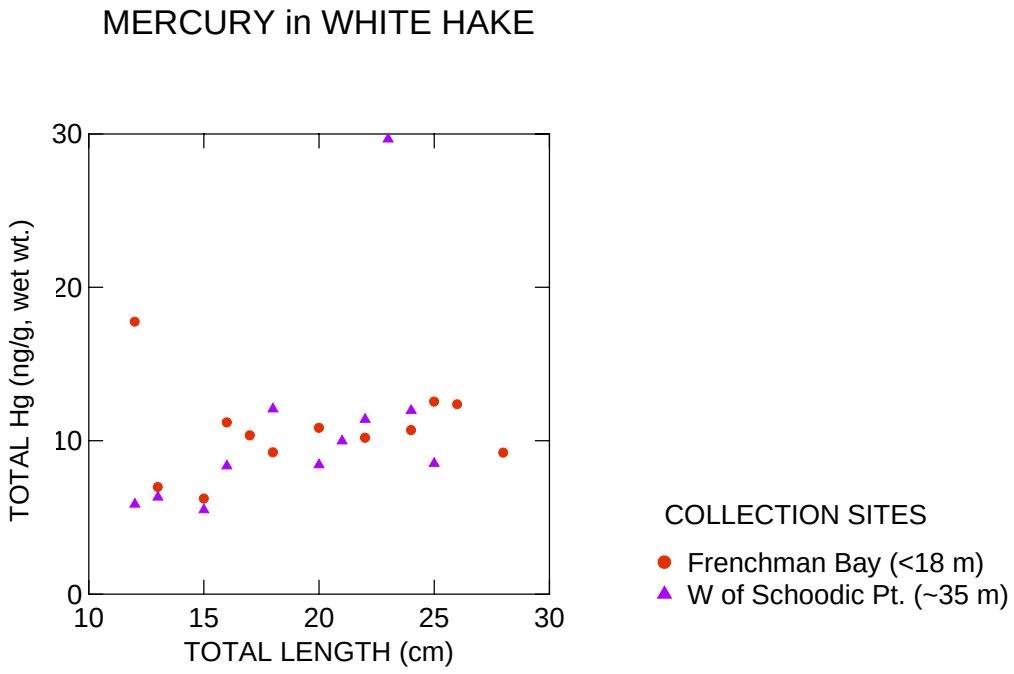
White hake are demersal fish generally found in the same habitat as red hake. They are reported common in trawls at depths greater than 110 meters, yet in this study white hake were collected at all three tow sites. Mercury analyses of fish from the shallow and mid-depth tows are given below.

Younger white hake, less than 40 cm in length, feed primarily on crustaceans. Fish greater than 40 cm in length forage exclusively for fishes and squids, eating a variety of fishes including herring, hakes, haddock, and winter flounder. All white hake in this data set were less than 30 cm in length and so fed primarily on crustaceans.

The largest reported white hake was 135 cm in length. Sexually mature females, approximately four years of age, were found to range from 40 – 54 cm. Three-year-old males ranged in size from 40 – 54 cm. Fish in this data set ranged in size from 12 – 28 cm in length.

Whole fish mercury residues ranged between 6 – 18 ng Hg/g wet wt., with a possible outlier at 30 ug Hg/g wet wt (Figure 13). No correlation was found between fish length and mercury residue level.

Figure 13. Whole body mercury residue levels in white hake sampled at two sites in the Gulf of Maine in 2001.



LONGHORN SCULPIN (*Myoxocephalus octodecemspinosus*)

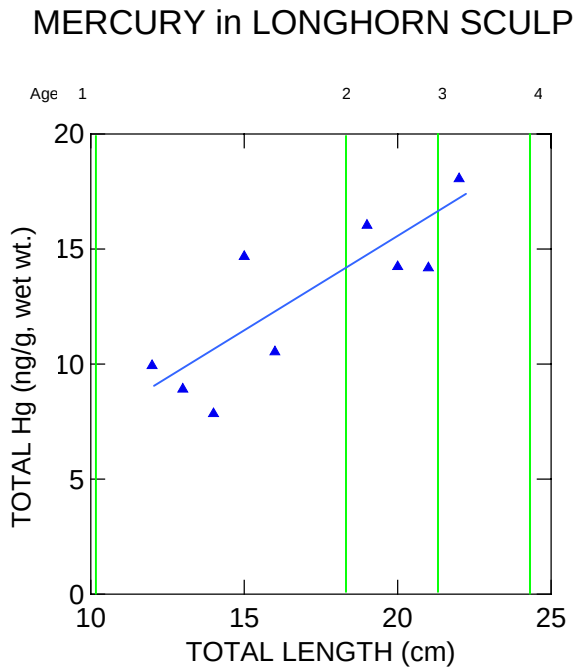
Longhorn sculpin are benthic fish found in coastal waters from shallow estuaries down to depths of 90 meters or more. They may shift out of the intertidal area when nearshore waters rise above 20^{o}C in the summer, then return when waters cool. Sculpin were present in tows from all depths, but sampled only from the mid-water tow.

Longhorn sculpin are benthic scavengers that shift prey preferences with age. Younger fish less than 15 cm in length forage primarily on amphipods, while older fish up to around 40 cm in length eat more decapods, primarily rock crabs, and fishes. In older sculpin, fishes were reported to be 10% of their diet by weight, and included skates, herring, eels, sculpins, and sand lance.

This species grows fairly slowly, reaching an average length of 25 cm at age four. All fish in this sample set were less than four years of age.

The range of whole fish mercury residues found was 8 – 18 ng Hg/g wet wt. (Figure 14). A significant moderate correlation was found between fish length and mercury residue levels (r^2 = 0.69, P=0.006)

Figure 14. Whole body mercury residue levels in longhorn sculpin sampled at a depth of ~35 meters west of Schoodic Pt. in the Gulf of Maine in 2001. The vertical green line relates fish age to average length.



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1.4

ANTIBIOTIC COMPOUNDS (from 2000)

ANTIBIOTIC COMPOUNDS IN THE MARINE ENVRIONMENT

Subsequent to being funded from the 2000 SWAT budget, a study was conducted to determine antibiotic concentrations in marine sediments at locations where antibiotic use is known or suspected. Sediment samples were collected from under Atlantic salmon aquaculture pens, from a lobster pound, and from two municipal sewer outfalls. Sediments collected under salmon pens were analyzed for oxytetracycline (a commonly used antibiotic) and PCBs (known to occur in cultured salmon fish foods). Lobster pound and municipal sewer outfall sediments were analyzed for oxytetracycline. All analyses returned from the laboratory indicated that, at all three locations, tetracycline was below detection limits for the laboratory. In addition, PCBs were also below detection limits in sediments beneath the salmon pens.

MODULE 2 LAKES

2.1

FISH CONSUMPTION ADVISORIES

FISH CONSUMPTION ADVISORIES

General Statewide Mercury Advisory -Lakes -DEP

We had hoped we could identify an indicator fish species and avoid the need to test multiple species. However, our review of the data from the 'Indicator Species Study' does not appear to support this approach. The mercury levels for the species sampled does not seem consistent enough to identify a reliable predictor fish species, though this conclusion is somewhat compromised by the small number of lakes sampled. Therefore, we are back to looking at obtaining data at the individual species level.

With regard to the statewide mercury advisory, it remains our goal to be able to characterize the statistical distribution of average lake mercury levels for the various fish species that are commonly consumed. This is necessary in order to reliably estimate an upper percentile lake average (90^{th} or 95^{th} percentile), which currently serves as the basis for the advisory. Such data would also increase our confidence in estimates of the statewide mean. To meet this goal, our objective was to obtain a total of 50 lakes per species to adequately characterize the distribution of lake averages of fish mercury by species. As usual we wanted 5 or more individual fish per lake. Our top priorities for obtaining additional samples were the following species:

1. Brown Trout -BNT– currently have 12 lakes
2. Chain Pickerel-CHP-currently have 13 lakes
3. Splake-SPK– currently have 5 lakes
4. Lake Trout -LKT– currently have 25 lakes
5. Landlocked Salmon-LLS – currently have 25 lakes
6. Brook Trout – BKT-currently have 25 lakes
7 Smallmouth Bass-SMB-

There are two new fish species we wanted data on. Drs. Haines and Evers have provided us some limited data that suggests lake run rainbow smelt have significantly higher mercury concentrations than ocean run Rainbow Smelt. Hence we wanted several lakes sampled for rainbow smelt. It is our understanding that IFW can identify lakes where there is focused activity for catching this species. The second species is rainbow trout. We have also had some questions about Rainbow Trout from Little Androscoggin River. Apparently these are stocked fish (put and take).

In 2002 we asked the Department of Inland Fisheries and Wildlife to collect 5 fish of any of these species they catch in performance of their normal duties. DIFW biologists were able to provide the following samples (see Appendix 2.1 for lengths and weights) :

Brook trout	6 lakes	Brown trout	3 lakes	Chain pickerel	2 lakes
Lake trout	3 lakes	Landlocked salmon	3 lakes		

In addition smallmouth bass from Pocasset Lake in Wayne were sampled by DEP staff. Concentrations ranged from 0.027-0.882 ppm mercury (Table 2.1). Brook trout had lower levels

of mercury than lake trout or landlocked salmon probably due to being younger and smaller. Mercury levels in chain pickerel were lower than previously found in other lakes. From previous studies, it is know that species, size and age, and lake characteristics all affect mercury levels.

Table 2.1.1. MERCURY CONCENTRATIONS IN FISH FROM MAINE LAKES 2002

Summary

DEP Sample ID	Species	Hg conc. (mg/Kg)
Allen P. LK3788	BNT	0.641
Baker P LK0242	BKT	0.326
	LLS	0.618
Carr P LK-1598	LKT	0.537
Daigle P LK-1665	BKT	0.027
Hancock P LK0082	LKT	0.820
Hale Pond LK3652	BKT	0.206
Island P LK-1586	BKT	0.093
Kennebago L LK 2374	BKT	0.322
Kezar L LK0097	CHP	0.197
Kennebunk P. LK3998	BNT	0.090
Mooselookmeguntic L.	LLS	0.406
Maranacook L LK5312	BNT	0.106
Mousam Lk3838	CHP	0.315
Pocasset L.	SMB	0.595
2ND Musquacook L.	LKT	0.882
Spicer P. LK3906	BKT	0.171
Third Sly Brook L LK-1646	LLS	0.446

Raw Data

DEP Sample ID	Hg conc. (mg/Kg)
Allen P. LK3788	
LK-3788-BNT-1	0.363
LK-3788-BNT-2	0.271
LK-3788-BNT-3	1.29
Baker P	
BakerP-BKT-1	0.344
BakerP-BKT-2	0.396
BakerP-BKT-3	0.171
BakerP-BKT-4	0.246
BakerP-BKT-5	0.472
BakerP-LLS-1	0.411
BakerP-LLS-2	0.621
BakerP-LLS-3	0.595
BakerP-LLS-4	0.844
BakerP-LLS-5	0.618
Carr P LK-1598	
LK-1598-LKT-1	0.538
LK-1598-LKT-2	0.467
LK-1598-LKT-3	0.648
LK-1598-LKT-4	0.493
LK-1598-LKT-5	0.537
Daigle P LK-1665	
LK-1665-BKT-1	0.017
LK-1665-BKT-2	0.021
LK-1665-BKT-3	0.046
LK-1665-BKT-4	0.026
LK-1665-BKT-5	0.026
Hancock P LK0082	
HancockP-LKT-1	0.759
HancockP-LKT-2	0.722
HancockP-LKT-3	0.634
HancockP-LKT-4	1.23
HancockP-LKT-5	0.754
Hale Pond LK3652	
Hale P.-BKT-1	0.317
Hale P.-BKT-2	0.197
Hale P.-BKT-3	0.186
Hale P.-BKT-4	0.221
Hale P.-BKT-5	0.108

DEP Sample ID	Hg conc. (mg/Kg)
Island P LK-1586	
LK-1586-BKT-1	0.102
LK-1586-BKT-2	0.096
LK-1586-BKT-3	0.078
LK-1586-BKT-4	0.133
LK-1586-BKT-5	0.056
Kennebago L LK 2374	
Kenneb L.-BKT-1	0.256
Kenneb L.-BKT-2	0.425
Kenneb L.-BKT-3	0.225
Kenneb L.-BKT-4	0.177
Kenneb L.-BKT-5	0.527
Kezar LK0097	
LK-0097-PKL-1	0.17
LK-0097-PKL-2	0.222
LK-0097-PKL-3	0.176
LK-0097-PKL-4	0.207
LK-0097-PKL-5	0.212
Kennebunk P. LK3998	
LK-3998-BNT-1	0.087
LK-3998-BNT-2	0.11
LK-3998-BNT-3	0.074
LK-3998-BNT-4	0.099
LK-3998-BNT-5	0.08
Mooselookmeguntic L.	
LK-3302-LLS-1	0.833
LK-3302-LLS-2	0.299
LK-3302-LLS-3	0.325
LK-3302-LLS-4	0.314
LK-3302-LLS-5	0.257
Maranacook L LK5312	
LK-5312-BNT-1	0.064
LK-5312-BNT-2	0.123
LK-5312-BNT-3	0.123
LK-5312-BNT-4	0.123
LK-5312-BNT-5	0.097
Mousam Lk3838	
LK-3838-PKL-1	0.165
LK-3838-PKL-2	0.23
LK-3838-PKL-3	0.187
LK-3838-PKL-4	0.677

DEP Sample ID	Hg conc. (mg/Kg)
Pocasset L	
Pocasset-SMB-1C5	0.595
Second Musquacook L.	
LK-1916-LKT-1	0.64
LK-1916-LKT-2	0.967
LK-1916-LKT-3	1.51
LK-1916-LKT-4	0.725
LK-1916-LKT-5	0.57
Spicer P. LK3906	
LK-3906-BKT-1	0.183
LK-3906-BKT-2	0.097
LK-3906-BKT-3	0.241
LK-3906-BKT-4	0.133
LK-3906-BKT-5	0.2
Third Sly Brook L.M-1646	
LK-1646-LLS-1	0.632
LK-1646-LLS-2	0.546
LK-1646-LLS-3	0.309
LK-1646-LLS-4	0.254
LK-1646-LLS-5	0.491

Androscoggin Lake PCB – DEP

In 2001, a pilot scale study of PCB and other contaminants in fish and shellfish in Androscoggin Lake, on behalf of the Androscoggin Lake Improvement Association, BioDiversity Research Institute (BRI) found levels of PCB in white suckers and white perch much higher than those found by DEP in similar samples of white perch from the same year.

Sampling was repeated by DEP in 2002, using a nationally respected lab, to attempt to determine true concentrations in white perch. A total of 10 white perch were collected and combined into 2 composites of 5 fish each for total PCB analysis. The results were higher than found previously (Table 2.1.2), but still much lower than found by BRI in 2001. Repeat sampling of white suckers in 2002 and 2003 by BRI, however, found much lower levels than in 2001, bringing into question their 2001 data. Concentrations in the DEP white perch exceeded the Maine Bureau of Health's Fish Tissue Action Level (FTAL=11ug/kg) in all samples during 2001 and 2002. A sample of smallmouth bass from Pocasset Lake had lower concentrations than found in bass from Androscoggin Lake in 2001.

Table 2.1.2. Total PCB in fish from Androscoggin Lake and Pocasset Lake, ug/kg

Sample ID	1998	2001	2002	2002 Pocasset L
smallmouth bass C1	3.61	11.1		2.67
smallmouth bass C2	2.59	19.8		
white perch C1	5.09	12.9	29.1	
white perch C2	4.10	31.2	52.3	
white sucker C1	5.22			
white sucker C2	4.81			

2.2

WILDLIFE CRITERION VALUE -LOONS

2002 & 2003

Assessing the impacts of methylmercury on piscivorous wildlife using a wildlife criterion value based on the Common Loon, 1998-2002

(Report BRI2003-07)

2002 Report

Submitted to:

Maine Department of Environmental Protection
Surface Water Ambient Toxic Monitoring Program
State House Station 17
Augusta, Maine 04333

Submitted by:

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12 June 2003

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Executive Summary:

Anthropogenic inputs of mercury (Hg) into the environment have significantly increased in the past century. 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, habitat, 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 and probability-based sampling efforts from 1994-2002 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, at least 22% of the breeding loon population in Maine is estimated to be at risk.

Because results from national sampling indicated loons were at most risk from Hg in New England, we identified several individual- and population-level parameters to better understand the extent of mercury toxicity across Maine. From 1994-02 we collected 248 abandoned eggs (49 in 2002) as well as blood and feather samples from 370 adult (67 in 2002) and 120 juvenile (17 in 2002) loons in Maine. The Hg concentrations in these samples were used to relate sublethal impacts on behavior, developmental stability, individual survival, egg development, and overall reproductive success. In the Rangeley Lakes Study Area, a total of 176 loon territories were monitored on 44 lakes during 1998-02. Current monitoring efforts and historical data comprise 845 territory-years measured. Behavioral observations were conducted for over 1,500 hours on 16 lakes with 38 loon territories from 1998 to 2000.

Several reproductive measures significantly declined for loon pairs at high risk to prey MeHg availability, thereby corroborating studies in high-risk sites in Nova Scotia and Wisconsin that show Hg impacts reproductive success. Based on 212 loon territories representing 1,153 territory-years surveyed we found that pairs above the lowest observed adverse effect level (LOAEL) (i.e., >3.0 ppm in the blood) fledged 40% fewer young than pairs below our no observed adverse effect level (i.e., <1.0 ppm in the blood). We also found similar significant patterns of lower productivity for other reproductive measures. We view the implication of long-term declines in these reproductive measures as serious and contend they would not be detected by traditional survey techniques.

Insight into why loons are facing Hg-based population declines can be viewed through our hazard assessment process that is based on a weight-of-evidence approach. Physiological impacts of Hg are measured through two key biomarkers: corticosterone stress hormone levels and flight feather asymmetry. Circulating corticosterone hormone levels are strongly linked with increasing blood Hg levels and are not related to capture and handling stress. Corticosterone hormone levels increase on an average of 14.6% for every one ppm of increase in blood Hg levels (n=239). This indicates that loons with high blood Hg levels have higher rates of chronic stress and may therefore have compromised immune systems. Asymmetry measurements provide insights into developmental stability and potentially reproductive fitness. Three years of flight feather measurements have shown agreement among years that loon breeding populations with greater exposure to Hg have significantly greater asymmetry than populations at low risk (n=227). Greater asymmetry may indicate disruptions from stressors on embryonic development, current physiological status and decline in reproductive fitness.

Many behavioral impacts that appear to be related to the neurotoxic effects of MeHg can rarely be observed in the field. We found adult loons in high risk situations left eggs unattended 14% of the time, compared to 1% in controls. Several cases of direct field observations indicate that adult loons with high MeHg body burdens avoid incubating their eggs and display atypical behaviors such as patrolling in front of, or sitting next to the nest. We documented a significant negative relationship between adult blood Hg and foraging behavior, and a significant positive relationship between adult blood Hg and brooding behavior. Analyzing our data according to energy demands revealed a significant inverse relationship between blood Hg and time spent in high energy behaviors. Our findings are consistent with other studies linking Hg and lethargy, reduced motivation to hunt prey, and compromised foraging abilities.

Current levels of Hg in Maine's lacustrine ecosystems also appear to be impacting individual survival of adult and juvenile loons. Recaptured adult loons exhibit a significant annual increase of Hg (9% in males, 5.6% in females) that we predict will significantly reduce lifetime individual performance. A model of this impact indicates a decline of 13 to 8 young produced over a loon's lifetime. Further, juveniles from high-risk territories have increasing blood Hg levels of 3% per day during the summer, potentially reaching dangerous levels after the final feather molt at 11 weeks of age.

Characterization of the risk imposed by MeHg bioavailability in aquatic systems to high trophic level obligate piscivores such as the Common Loon indicates negative population level impacts in Maine. Although the impacts of Hg on loons are varied, complex, and not yet fully understood, the combination of high exposure to a significant part of the breeding population and the "bottom-line" impact of reducing overall reproductive success to 40%, is is not sustainable for the Common Loon in Maine.

Current models indicate a negative population growth rate. Because of the loon's life history strategy (i.e., long lived, slow maturing, and low fecundity) the annual and continual impacts of this type of stressor causes an erosion of the non-breeding or buffer population that serves as a natural cushion to catastrophic events. Once this buffer population is exhausted, the occupancy of established territories will shrink and it will be more obvious that loon populations are declining. However, the realization of shrinking loon populations at that stage will require drastic and potentially expensive efforts to reverse the decline. Models based on a 25-year, statewide comprehensive monitoring effort in New Hampshire show approximately half of Maine's buffer population has been exhausted. Certain areas in Maine, such as the Allagash area that may be particularly impacted from Hg, may already exhibit exhaustion of the buffer population and a shrinking number of territorial pairs. Continued refinement of model parameters and either a probability-based sampling scheme or new sampling efforts in northern Maine will provide higher confidence in our estimates that will therefore assist in state-based policy efforts as well as national regulations that reflect the ecological injury Hg is currently having on the freshwater landscape.

Our approach to a high resolution risk characterization for the Common Loon provides the necessary information for developing a Maine-based wildlife criterion value (WCV). Recent efforts by the USEPA have established a generic WCV with several major limitations that we are improving with this study. A WCV estimates wildlife population viability through measurement of contaminant stressors such as surface water Hg concentrations.

Two-year measurements of exposure parameters indicate a bioconcentration factor (BCF) of 72,000 for trophic level 3 and 142,000 for trophic level 4 based on the relationship of total Hg in unfiltered water with total Hg in yellow perch (or perch equivalents). Based on the mean Hg

levels of four fish size classes and their relationship with the loon blood Hg levels of known impact (i.e., >3.0 ug/g, ww) we chose a prey effect level of 0.15 ug/g (ww, whole body, total Hg). The threshold or test dose of Hg that causes chronic LOAEL for adult loons is 179ug Hg/kg bw/d for males and 142 ug Hg/kg bw/d for females. Based on the use of the Great Lakes Water Quality Initiative uncertainty factors totaling 6, a reference dose of 30 ug Hg/kg bw/d is determined for adult male loons and 24 ug Hg/kg bw/d for adult females (similar to the USEPA generic avian model of 26ug Hg/kg bw/d). The WCV model currently indicates that an unfiltered total Hg water level less than 1.41 ng Hg/L is protective of loons and wildlife at the population level.

The full report is available as a separate file with the SWAT report at http://www.maine.gov/dep/blwq/docmonitoring/swat/index.htm

Development of a Maine-based wildlife criterion value with special emphasis on the Common Loon, 1998-2003

(Report BRI2004-05)

2003 Report

Submitted to:

Maine Department of Environmental Protection
Surface Water Ambient Toxic Monitoring Program
State House Station 17
Augusta, Maine 04333

Submitted by:

David C. Evers, Oksana P. Lane, Lucas Savoy and Wing Goodale
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15 June 2004

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Executive Summary:

Anthropogenic inputs of mercury (Hg) into the environment have significantly increased in the past century. 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, habitat, 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 and probability-based sampling efforts from 1994-2003 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, at least 22% of the breeding loon population in Maine is estimated to be at risk.

Because results from national sampling indicated loons were at most risk from Hg in New England, we identified several individual- and population-level parameters to better understand the extent of mercury toxicity across Maine. From 1994-03 we collected 324 abandoned eggs (769 in 2003) as well as blood and feather samples from 408 adult (38 in 2002) and 142 juvenile (22 in 2003) loons in Maine. The Hg concentrations in these samples were used to relate sublethal impacts on behavior, developmental stability, individual survival, egg development, and overall reproductive success. In the Rangeley Lakes Study Area, a total of 176 loon territories were monitored on 44 lakes during 1998-2003. Current monitoring efforts and historical data comprise 845 territory-years measured. Behavioral observations were conducted for over 1,500 hours on 16 lakes with 38 loon territories from 1998 to 2000.

Several reproductive measures significantly declined for loon pairs at high risk to prey MeHg availability, thereby corroborating studies in high-risk sites in Nova Scotia and Wisconsin that show Hg impacts reproductive success. Based on 212 loon territories representing 1,153 territory-years surveyed we found that pairs above the lowest observed adverse effect level (LOAEL) (i.e., >3.0 ppm in the blood) fledged 40% fewer young than pairs below our no observed adverse effect level (i.e., <1.0 ppm in the blood). We also found similar significant

patterns of lower productivity for other reproductive measures. We view the implication of long-term declines in these reproductive measures as serious and contend they would not be detected by traditional survey techniques.

Insight into why loons are facing Hg-based population declines can be viewed through our hazard assessment process that is based on a weight-of-evidence approach. Physiological impacts of Hg are measured through two key biomarkers: corticosterone stress hormone levels and flight feather asymmetry. Circulating corticosterone hormone levels are strongly linked with increasing blood Hg levels and are not related to capture and handling stress. Corticosterone hormone levels increase on an average of 14.6% for every one ppm of increase in blood Hg levels (n=239). This indicates that loons with high blood Hg levels have higher rates of chronic stress and may therefore have compromised immune systems. Asymmetry measurements provide insights into developmental stability and potentially reproductive fitness. Three years of flight feather measurements have shown agreement among years that loon breeding populations with greater exposure to Hg have significantly greater asymmetry than populations at low risk (n=227). Greater asymmetry may indicate disruptions from stressors on embryonic development, current physiological status and decline in reproductive fitness.

Many behavioral impacts that appear to be related to the neurotoxic effects of MeHg can rarely be observed in the field. We found adult loons in high-risk situations left eggs unattended 14% of the time, compared to 1% in controls. Several cases of direct field observations indicate that adult loons with high MeHg body burdens avoid incubating their eggs and display atypical behaviors such as patrolling in front of, or sitting next to the nest. We documented a significant negative relationship between adult blood Hg and foraging behavior, and a significant positive relationship between adult blood Hg and brooding behavior. Analyzing our data according to energy demands revealed a significant inverse relationship between blood Hg and time spent in high-energy behaviors. Our findings are consistent with other studies linking Hg and lethargy, reduced motivation to hunt prey, and compromised foraging abilities.

Current levels of Hg in Maine's lacustrine ecosystems also appear to be impacting individual survival of adult and juvenile loons. Recaptured adult loons exhibit a significant annual increase of Hg (9% in males, 5.6% in females) that we predict will significantly reduce lifetime individual performance. A model of this impact indicates a decline of 13 to 8 young produced over a loon's lifetime. Further, juveniles from high-risk territories have increasing blood Hg levels of 3% per day during the summer, potentially reaching dangerous levels after the final feather molt at 11 weeks of age.

Characterization of the risk imposed by MeHg bioavailability in aquatic systems to high trophic level obligate piscivores such as the Common Loon indicates negative population level impacts in Maine. Although the impacts of Hg on loons are varied, complex, and not yet fully understood, the combination of high exposure to a significant part of the breeding population and the "bottom-line" impact of reducing overall reproductive success to 40%, is not sustainable for the Common Loon in Maine.

Current models indicate a negative population growth rate. Because of the loon's life history strategy (i.e., long lived, slow maturing, and low fecundity) the annual and continual impacts of this type of stressor causes an erosion of the non-breeding or buffer population that serves as a natural cushion to catastrophic events. Once this buffer population is exhausted, the occupancy of established territories will shrink and it will be more obvious that loon populations are declining. However, the realization of shrinking loon populations at that stage will require drastic and potentially expensive efforts to reverse the decline. Models based on a 25-year,

statewide comprehensive monitoring effort in New Hampshire show approximately half of Maine's buffer population has been exhausted. Certain areas at high risk to Hg in Maine, such as the upper Androscoggin, Kennebec and western Penobscot River Watersheds may have particularly high impacts on high risk species such as the Common Loon, Bald Eagle, mink and river otter.

Our approach to a high resolution risk characterization for the Common Loon provides the necessary information for developing a Maine-based wildlife criterion value (WCV). Efforts for the past four years have emphasized both birds (i.e., Common Loon) and mammals (i.e., mink and river otter). Recent efforts by the USEPA have established generic WCVs for birds and mammals with several major limitations that we are improving with this study. A WCV estimates wildlife population viability through measurement of contaminant stressors such as surface water Hg concentrations.

Two-year measurements of exposure parameters indicate a bioconcentration factor (BCF) of 72,000 for trophic level 3 and 142,000 for trophic level 4 based on the relationship of total Hg in unfiltered water with total Hg in yellow perch (or perch equivalents). Based on the mean Hg levels of four fish size classes and their relationship with the loon blood Hg levels of known impact (i.e., >3.0 ug/g, ww) we chose a prey effect level of 0.15 ug/g (ww, whole body, total Hg). The threshold or test dose of Hg that causes chronic LOAEL for adult loons is 17.9ug Hg/kg bw/d for males and 14.2 ug Hg/kg bw/d for females. Based on the use of the Great Lakes Water Quality Initiative uncertainty factors totaling 6, a reference dose of 30 ug Hg/kg bw/d is determined for adult male loons and 24 ug Hg/kg bw/d for adult females (similar to the USEPA generic avian model of 26ug Hg/kg bw/d). The WCV model currently indicates that an unfiltered total Hg water level less than 1.41 ng Hg/L is protective of loons at the population level and for mammals it is 1.14ng Hg/L in mink and 1.29 ng Hg/L in the river otter.

The full report is available as a separate file with the SWAT report at http://www.maine.gov/dep/blwq/docmonitoring/swat/index.htm

2.2

WILDLIFE CRITERION VALUE -MAMMALS

2002 & 2003

Developing a mercury exposure profile for mink and river otter in Maine

2002

Submitted to:

Barry Mower, Maine Department of Environmental Protection
&
Wally Jakubas, Maine Inland Fisheries and Wildlife

Submitted by:

David C. Evers, Dave Yates, and Lucas Savoy

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411 North U.S. Rt. 1, Suite 1
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10 December, 2003

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ABSTRACT

Anthropogenic releases of mercury into the environment for the past several decades have collected in aquatic ecosystems. The impact of this mercury build-up is of concern to regulators and policy makers. Maine and much of New England are especially at high risk because of local and regional emission sources, prevailing wind patterns, and certain hydrological and biogeochemical features. This study establishes an exposure profile for mercury in Maine's mink and river otter populations. A total of 36 otter and 73 mink carcasses have been collected. Mercury levels tend to be greater in mink vs. otter, interior vs. coastal populations, and females vs. males. Respectively mean mercury levels in otter and mink fur, were 20.08 and 20.69 ppm. Based on other studies, fur mercury levels greater than 20 ppm indicate adverse effects. The proportion of sampled individuals exceeding 20 ppm in the fur was 29% for mink and 61% for otter. Mink and otter fur Hg levels ranged up to 68.5 ppm and 234 ppm, respectively. Brain and liver Hg levels were below published lethal levels. The strong and significant relationships among brain, liver, and fur Hg levels provide great flexibility in using one compartment for determining mercury exposure. Successful efforts with live-trapping are providing an ability to relate fur and blood Hg levels and also provide an effective way to target sampling areas. Ageing based on teeth indicate a significant positive relationship between otter brain Hg levels and age (n=26; mean age = 1.8 years) and no correlation among the three matrices and mink age (n=48; mean age = 0.6 years). A significant negative correlation between otter brain Hg levels and corpus luteum counts was found (n=11; mean age = 1.7 years). No relationship was found with mink and is likely explained by the majority of mink (94%) under breeding age. This investigation will soon provide (1) a geographically-relevant mercury exposure profile, (2) data that can be linked to potential mercury impacts, and (3) contributions toward a wildlife criterion value model that is protective of Maine's mink and river otter population.

The full report is available as a separate file with the SWAT report at
http://www.maine.gov/dep/blwq/docmonitoring/swat/index.htm

Developing a mercury exposure profile for mink and river otter in Maine

(BRI 2003-05)

Submitted to:

Barry Mower, Maine Department of Environmental Protection
&
Wally Jakubas, Maine Inland Fisheries and Wildlife

Submitted by:

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June 15, 2004

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ABSTRACT

Anthropogenic releases of mercury into the environment for the past several decades have collected in aquatic ecosystems. The impact of this mercury build-up is of concern to regulators and policy makers. Maine and much of New England are especially at high risk because of local and regional emission sources, prevailing wind patterns, and certain hydrological and biogeochemical features. This study establishes an exposure profile for mercury in Maine's mink and river otter populations. A total of 69 otter and 92 mink carcasses have been collected. Mercury levels tend to be greater in otter vs. mink, interior vs. coastal populations, and females vs. males. Respective mean mercury levels in otter and mink fur are 25.88 and 20.69 ppm; based on other studies, fur mercury levels greater than 20 ppm indicate adverse effects. The proportion of sampled individuals exceeding 20 ppm in the fur was 59% for otter and 45% for mink. Otter and mink fur Hg levels ranged up to 234 ppm and 68.5 ppm, respectively. Brain and liver Hg levels were below published lethal levels. The strong and significant relationships among brain, liver, and fur Hg levels provide great flexibility in using one compartment for determining mercury exposure. Successful efforts with live-trapping are providing an ability to relate fur and blood Hg levels and also provide an effective way to target sampling areas. A total of 60 otter jaws were sent to Matson's Lab to determine age. Average age of trapped otters was 1.87 years old (the oldest was 9 years old). Age and fur mercury have a significant correlation ($p=0.0089$), while brain and liver did not. A total of 64 mink jaws were sent to Matson's Lab to determine age. Average age of trapped mink was 0.58 years old (the oldest was 5 years old). The brain, liver, and fur mercury and age did not correlate significantly in mink. No relationship was found with otter and mink corpora lutea and is likely explained by the majority of animals were under breeding age. Because of a small sample size in older individuals and the preponderance of individuals < 2 years of age, reproductive success and mercury levels cannot be significantly correlated.

The full report is available as a separate file with the SWAT report at http://www.maine.gov/dep/blwq/docmonitoring/swat/index.htm

2.3

ANDROSCOGGIN LAKE SEDIMENTS

2.3 ANDROSCOGGIN LAKE SEDIMENTS - DEP

Monitoring of fish from Androscoggin Lake for dioxin as part of Maine's Dioxin Monitoring Program in 1996 documented concentrations of dioxins similar to those found in fish from the Androscoggin River nearby and higher than found in any other lake monitored in Maine (9 lakes). Since the Androscoggin River floods the lake one or more times each year, the river is the suspected source of dioxins to the fish in the lake. Additional fish samples collected SINCE 1998 have documented a continuing decline in dioxin concentrations to levels near background (Dioxin Monitoring Program Report, 2000 at http://www.state.me.us/dep/blwq/monitoring.htm).

In order to document the pathway, in 1999, surficial sediment samples were collected from 4 areas in the lake and analyzed for dioxins. Results were all below the detection limit. To further explore the potential pathway, in 2000 sediment samples were collected at the lake outlet, as in 1999, at a station just upstream of the Dead River Dam and a station approximately half way between. Both surficial and subsurface samples were collected in order to determine historical and recent contamination. Results show that the lake outlet sample had significantly more dioxin than measured in 1999 and that both river stations also had measurable amounts. The difference between the 1999 and 2000 lake outlet concentrations may be due to the patchniness of sediments. It is interesting that in 1999 the fish had more but the sediments had less than in 2000. The 2000 study was repeated in 2002 to provide more documentation of sediment concentrations in the lake and river.

Similar to those of 1999, the results showed very little dioxin in sediments,. One exception was the deep hole that had significantly more than the other stations but which seems questionable given the results at all the other stations. There was no more dioxin in subsurface samples than in surface samples at the only site where multiple samples were analyzed, R1 in the Dead River. These results are curious given the significant amounts found in fish.

Table 2.3. Dioxin Toxic Equivalents (DTE*) in Androscoggin & Pocasset lakes' sediment samples (ppt)

station	depth	1999 DTE*	2000 DTE*	2002 DTE*	location
L1	0-1"	0.1-0.7	7.6-8.1		lake outlet mouth 10'
	3-4"		8.0-8.2		
L2	0-1"	0.03-0.7		0.6-1.0	lake outlet lake 4'
L3	0-1"	0.01-0.7		6.4-9.6	lake deep hole 38'
	4-5"			na	
L4	0-1"	0.06-0.7		0.4-0.6	lake SW cove behind Lothrop Is
R1	0-1"		13.1-13.2	0.9-1.6	river at Riverbend campground
	2-3"		14.2-14.3	0.6-0.9	
R2	0-1"		7.9-8.3	0.3-0.8	river at Rt 219 Bridge 15'
	1.5-2.5"		11.5-12.0		
PLW	0-1			1.6-5.5	Pocasset L 20'
	3-4"			na	

* = range with non-detects at 0 and the detection limit

Table 2.3. Dioxin levels in Androscoggin Lake and Dead River Sediments

DEP Sample Site	Deep Hole	Lothrop Is	Outlet	Dead R mid	Dead R mid
	L3	L4	L2	DR1 (0-1")	DR1 (2-3")
% Solids	10.54	37.07	52.38	24.47	31.69
Analyte (ng/kg) dry weight					
2378 TCDF	**2.6**	**0.1**	**0.32**	**0.31**	**0.14**
12378 PeCDF	2.2	0.26 E	0.26	0.57 E	0.43
23478 PeCDF	2.0	0.15	0.20	0.5	0.46
123478 HxCDF	3.1	0.23	0.13	0.36	0.12
123678 HxCDF	2.7	0.22	0.12	0.41	0.16
234678 HxCDF	3.2	0.21	0.12 J	0.24	0.17
123789 HxCDF	2.2	0.25	0.15	0.38	0.14
1234678 HpCDF	1.2	0.28	0.18	0.47	0.12
1234789 HpCDF	1.7	0.21	0.21 J	0.67 J	0.17
OCDF	3.9	0.33	0.26	0.74	0.13
2378 TCDD	**3.6**	**0.14**	**0.37**	**0.39**	**0.25**
12378 PeCDD	2.8 J	0.19 J	0.34 I	0.61 I	0.25 J
123478 HxCDD	2.2 J	0.28 J	0.26 J	0.27 I	0.20 J
123678 HxCDD	2.2	0.35	0.29	0.41	0.21
123789 HxCDD	1.7 J	0.29 J	0.22 J	0.29 J	0.17
1234678 HpCDD	4.0	0.13	0.43	0.64	0.22
OCDD	4.6	0.25	0.59	0.72	0.23
DTEo	**6.4**	**0.4**	**0.6**	**0.9**	**0.6**
DTEd	**9.6**	**0.6**	**1.0**	**1.6**	**0.9**

J= Concentration detected is below the calibration range
I = Interference
B = Less than 10 times higher than method blank level
E = PCDE Interference

Table 2.3. Dioxin levels in Androscoggin Lake and Dead River Sediments

DEP Sample Site	Dead R Bridge DR2 0-1"	Pocasset L PLW 0-1"	Blank	LCS Blank Spike
% Solids	**53.05**	**12.91**		**% Recovery**
Analyte (ng/kg) dry weight				
2378 TCDF	**0.10**	**0.73**	**0.14 I**	**98**
12378 PeCDF	0.22E	1.40 E	0.17 J	97
23478 PeCDF	0.42	1.50 J	0.21	100
123478 HxCDF	0.17	1.30 J	0.13 J	96
123678 HxCDF	0.16	1.10 J	0.13 I	97
234678 HxCDF	0.10 J	0.88 J	0.14	103
123789 HxCDF	0.13 J	1.20 J	0.19	95
1234678 HpCDF	0.22	1.20	0.12 J	101
1234789 HpCDF	0.24 J	1.30 I	0.20	92
OCDF	0.14 B	1.70	0.25 J	92
2378 TCDD	**0.24 J**	**1.50**	**0.29**	**102**
12378 PeCDD	0.21 I	2.00 J	0.31	101
123478 HxCDD	0.17 J	1.90 I	0.20	102
123678 HxCDD	0.33 J	2.10 J	0.19	103
123789 HxCDD	0.23 J	1.80 J	0.25	99
1234678 HpCDD	0.41	2.90	0.16 J	94
OCDD	0.31	2.30	0.30J	99
DTEo	**0.3**	**1.6**	**0.8**	
DTEd	**0.8**	**5.5**	**0.9**	

J= Concentration detected is below the calibration range
I = Interference
B = Less than 10 times higher than method blank level
E = PCDE Interference

MODULE 3 RIVERS AND STREAMS

3.1

FISH CONSUMPTION ADVISORIES

COPLANAR PCB

In 2002 the SWAT program was again integrated with the Dioxin Monitoring Program (DMP) that has been in effect since 1988. Fish samples collected at 20 DMP stations for dioxin analyses were also analyzed for coplanar PCBs in the SWAT program. All non-detects were calculated at half the detection limit. Dioxin toxic equivalents (DTEh) and coplanar PCB toxic equivalents (CTEh) were calculated using World Health Organization (1998) toxicity equivalency factors (TEFs). For comparison with the Bureau of Health (BOH) Fish Tissue Action Levels (FTAL) for protection of human consumers, the 95th upper confidence limits (95% UCL) were used. The 95%UCL DTEh are compared to the cancer action level, FTALc=1.5 ppt, and the 95%UCL TTEh (sum of both CTEh and DTEh) are compared to the reproductive and developmental action level, FTALr=1.8 ppt.

SPECIES CODES
BNT brown trout
EEL eel
LMB largemouth bass
RBT rainbow trout
SMB smallmouth bass
WHP white perch
WHS white sucker

STATION CODES
AGL Androscoggin R at Gilead
ARP Androscoggin R at Rumford Point
ARF Androscoggin R at Rumford
ARY Androscoggin R at Riley
AGI Androscoggin R at GIP, Auburn
ALV Androscoggin R at Livermore Falls
ALS Androscoggin R at Lisbon Falls
ALW Androscoggin Lake at Wayne
KRM Kennebec R at Madison
KNW Kennebec R at Norridgewock
KFF Kennebec R at Shawmut, Fairfield
KRS Kennebec R at Sidney
PBW Penobscot R at Woodville
PBM Penobscot R at Winn
PBL Penobscot R at S Lincoln
PBV Penobscot R at Veazie
PBO Penobscot R at Orrington
PWD Presumpscot R at Windham
PWB Presumpscot R at Westbrook
SFS Salmon Falls R at S. Berwick
SEN E Br Sebasticook at Newport
SED E Br Sebasticook at Detroit
SWP W Br Sebasticook at Palmyra

The results show that dioxin toxic equivalents (DTEh95ucl, upper 95% confidence limit with non-detects at ½ the detection level) in bass from Rumford Point exceeded the FTALc (Figure 3.1.1). The total toxic equivalents (sum of Coplanar PCB toxic ewuivalents, CTEh95ucl, and DTEh95ucl) exceeded the FTALr in bass from Rumford Point and Livermore Falls and Androscoggin Lake on the Androscoggin River, South Lincoln on the Penobscot River, S. Berwick on the Salmon Falls River, and Hartland on the West Branch of the Sebasticook River. Mean CTEh95ucl varied in magnitude in relation to mean DTEh95ucl as a percentage of total toxic equivalents TTEh95ucl and alone exceeded the FTALc at Livermore Falls (Table 3.1.1). DTEh95ucl were higher Woodville on the Penobscot River than in previous years. CTEh were generally similar among stations, with a couple of exceptions, and lower than in previous years at many stations. Due to budget restrictions, sucker were not analyzed for coplanar PCBs, but DTEh95ucl exceeded the FTALc at many stations (Table 3.1.1).

Figure 3.1.1 COPLANAR PCB (CTE95ucl) & DIOXIN (DTE95ucl) TOXIC EQUIVALENTS IN 2002 SMALLMOUTH BASS SAMPLES FROM MAINE RIVERS

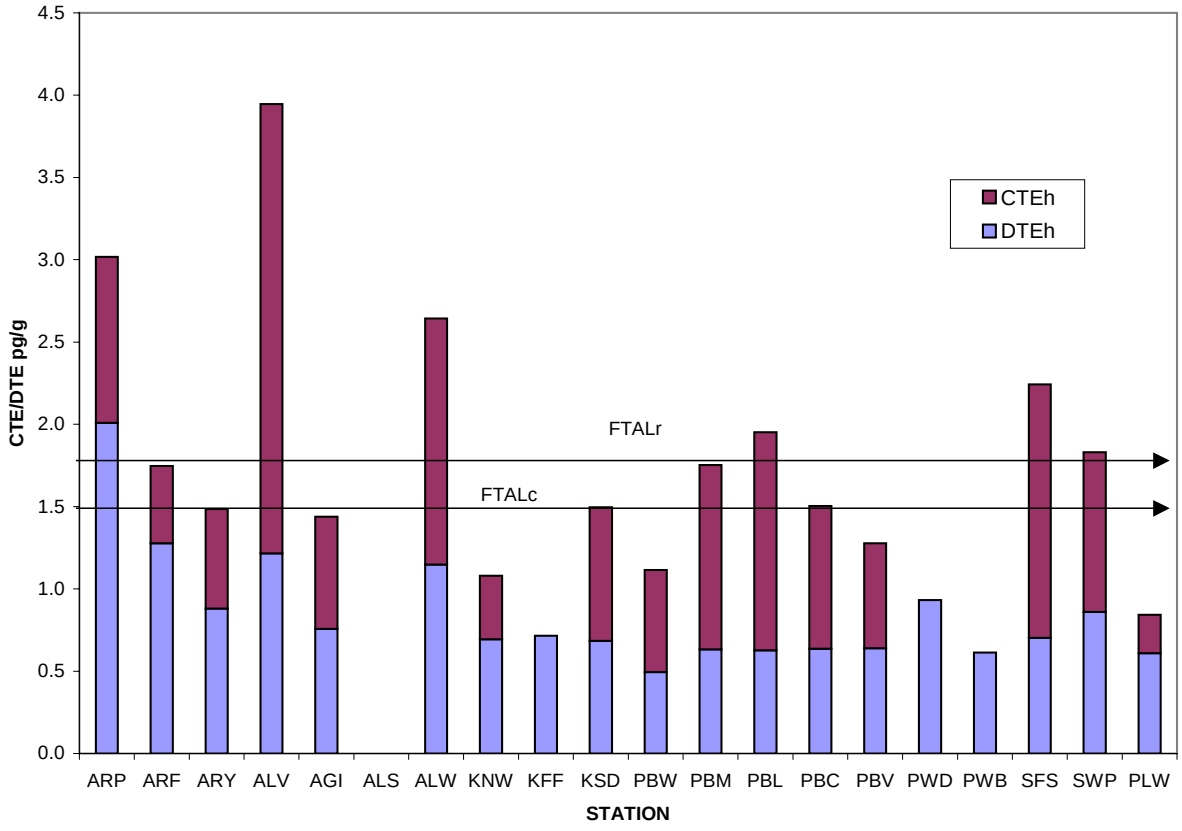


Table 3.1.1 RAW DATA

	DEP ID	BLANK	Blank	3206-MB	Blank
	SWAT ID	02-BLK	02-Blk	BLANK	02-BLK
	ECL ID	2906-MB	2932-MB	02-BLK	2966-MB
	GCMS File	030929-4	030929-12	031006-7	030930-14
	Ext_wt (g)	25.0	25.1	25	25
Analyte	% Lipid	0.00	0.00	0	0
PCB-81		< 0.8	< 0.8	< 0.8	< 0.8
PCB-77		0.86	0.91	< 0.8	1.466
PCB-123		< 0.8	< 0.8	< 0.8	< 0.8
PCB-118		6.22	5.33	2.367	10.863
PCB-114		< 0.8	< 0.8	< 0.8	< 0.8
PCB-105		1.51	1.23	< 0.8	2.424
PCB-126		< 0.8	< 0.8	< 0.8	0.873
PCB-167		< 0.8	< 0.8	< 0.8	1.349
PCB-156		1.06	1.41	< 0.8	2.915
PCB-157		< 0.8	< 0.8	< 0.8	< 0.8
PCB-169		< 0.8	< 0.8	< 0.8	< 0.8
PCB-189		< 0.8	< 0.8	< 0.8	< 0.8
I-TEQ (ND=0)		0.001	0.001	0.000	0.0900
I-TEQ (ND=ML)		0.090	0.090	0.090	0.0990

	ARP-SMB-01 AV	ARP-SMB-02	ARP-SMB-03	ARP-SMB-04	ARP-SMB-05
		02-287	02-288	02-289	02-290
		2928	2929	2930	2931
		030929-7	030929-8	030929-9	030929-10
	25.1	25.1	25.1	25.0	25.0
Analyte	1.8	1.54	1.37	2.58	1.42
PCB-81	1.1	0.85	< 0.8	1.06	< 0.8
PCB-77	22.4	17.98	13.15	24.77	17.83
PCB-123	19.7	32.51	11.61	28.60	28.17
PCB-118	1382.6	1777.37	1034.80	1801.35	1979.39
PCB-114	37.1	35.33	27.71	41.84	35.94
PCB-105	425.4	525.33	314.48	609.22	572.16
PCB-126	3.6	4.31	3.15	4.62	4.44
PCB-167	201.9	279.74	144.46	267.66	324.14
PCB-156	414.7	629.01	298.34	556.69	740.65
PCB-157	48.0	61.95	35.12	66.54	69.68
PCB-169	0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	100.3	142.77	70.10	127.66	156.24
I-TEQ (ND=0)	0.806	1.046	0.641	1.057	1.146
I-TEQ (ND=ML)	0.814	1.054	0.650	1.065	1.154

	ARP-SMB-06	ARP-SMB-07 Red	ARP-SMB-08	ARP-SMB-09	ARP-SMB-10
	02-291	02-292 Redo	02-293	02-294	02-295
	2934	3242	2936	2937	2938
	030929-15	031006-16	030929-16	030929-17	030929-18
	25.0	25	25.1	25.0	25.0
Analyte	2.01	2.008	2.19	1.71	1.25
PCB-81	1.24	< 0.8	1.36	1.04	< 0.8
PCB-77	25.08	16.335	23.48	20.63	16.72
PCB-123	25.26	23.84	18.65	24.14	10.92
PCB-118	1367.09	1582.348	1590.20	1853.66	1275.20
PCB-114	39.88	39.204	33.52	51.19	32.86
PCB-105	432.77	509.56	490.73	590.54	397.37
PCB-126	3.92	2.955	4.90	4.37	4.30
PCB-167	197.87	237.184	237.79	250.31	179.70
PCB-156	410.72	464.155	459.47	524.79	379.77
PCB-157	47.16	51.688	52.66	62.13	43.55
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	100.36	103.03	103.20	115.99	83.96
I-TEQ (ND=0)	0.838	0.799	0.988	1.019	0.839
I-TEQ (ND=ML)	0.846	0.807	0.996	1.027	0.847

	ARY-SMB-03	ARY-SMB-04	**ARY-SMB-05 AV**	ARY-SMB-06	ARY-SMB-07
	02-306	02-307		02-309	02-310
	2952	2953		2955	2958
	030929-20	030929-21		030929-23	030930-5
	25.0	25.0	#REF!	25.1	25
Analyte	1.00	1.28	#REF!	1.65	0.8004
PCB-81	<0.8	<0.8	<0.8	<0.8	<0.8
PCB-77	19.78	10.28	#REF!	11.35	7.96
PCB-123	10.18	6.60	#REF!	6.43	8.569
PCB-118	1171.25	625.81	#REF!	347.58	448.634
PCB-114	35.82	16.19	#REF!	9.50	9.605
PCB-105	406.82	187.63	#REF!	108.78	131.332
PCB-126	3.88	2.42	#REF!	5.03	2.367
PCB-167	110.00	78.93	#REF!	50.02	55.866
PCB-156	246.18	162.21	#REF!	104.08	111.093
PCB-157	35.72	20.04	#REF!	11.90	14.093
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	38.63	32.93	#REF!	25.19	22.952
I-TEQ (ND=0)	0.713	0.429	#REF!	0.616	0.367
I-TEQ (ND=ML)	0.721	0.437	#REF!	0.624	0.375

	ARY-SMB-08	ARY-SMB-09	ARY-SMB-10	ARY-SMB-11	ARY-SMB-12
	02-311	02-312	02-313	02-314	02-315
	2959	2960	2961	2962	2963
	030930-6	030930-7	030930-8	030930-9	030930-10
	25.2	25	25	25.1	25
Analyte	0.982539683	0.9424	0.72	0.856573705	1.1544
PCB-81	<0.8	<0.8	<0.8	<0.8	1.087
PCB-77	6.388	7.567	5.35	8.643	11.627
PCB-123	6.508	11.909	8.119	8.148	11.865
PCB-118	405.696	602.69	635.092	645.857	922.407
PCB-114	10.967	17.596	17.645	16.357	24.605
PCB-105	122.501	185.144	194.935	195.647	276.342
PCB-126	1.627	2.361	5.515	3.235	3.234
PCB-167	47.716	67.9	98.007	73.848	108.549
PCB-156	103.584	141.124	195.042	152.246	217.619
PCB-157	12.924	18.949	24.332	19.209	28.035
PCB-169	< 0.8	< 0.8	< 0.8	<.8	< 0.8
PCB-189	20.371	25.435	38.508	28.822	43.833
I-TEQ (ND=0)	0.283	0.409	0.759	0.507	0.586
I-TEQ (ND=ML)	0.291	0.417	0.767	0.515	0.594

	ALV-SMB-01	ALV-SMB-02	LV-SMB-03 AVG	ALV-SMB-04	ALV-SMB-05
	02-326	02-327 Redo		02-329	02-330
	2982	3144		2985	2986
	030930-15	031005-7		030930-16	030930-17
	25.1	25	25.1	25.1	25.1
Analyte	0.724302789	0.464	0.847410359	0.582071713	0.840239044
PCB-81	1.814	< 0.8	< 0.8	< 0.8	7.682
PCB-77	78.335	1.587	11.056	2.506	5.366
PCB-123	30.025	4.998	13.566	1.307	545.662
PCB-118	2373.198	156.185	851.077	129.395	15.319
PCB-114	65.796	4.506	27.5655	3.541	171.25
PCB-105	805.24	47.26	305.9425	38.918	2.532
PCB-126	39.391	< 0.8	3.378	0.87	60.803
PCB-167	238.708	23.055	71.92	16.734	129.098
PCB-156	478.376	50.166	163.4675	35.234	16.297
PCB-157	67.703	5.902	26.3235	3.751	< 0.8
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	24.415
PCB-189	96.59	9.315	25.159	7.8	< 0.8
I-TEQ (ND=0)	4.586	0.052	0.568	0.126	6.477
I-TEQ (ND=ML)	4.594	0.141	0.576	0.135	6.478

	ALV-SMB-06	ALV-SMB-07 Redo	ALV-SMB-08 Redo	ALV-SMB-09 Redo	ALV-SMB-10 Redo
	02-331	02-332 Redo	02-333 Redo	02-334 Redo	02-335 Redo
	2987	3133	3134	3135	3136
	030930-18	031004-9	031004-10	031004-11	031004-12
	25.1	25	25	25	25
Analyte	0.537051793	0	0	0	0
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	4.589	3.991	2.171	2.435	9.581
PCB-123	3.847	4.883	3.668	3.143	16.360
PCB-118	386.239	335.604	274	223.205	795.828
PCB-114	10.405	8.879	7.324	6.166	22.452
PCB-105	112.469	106.77	81.115	68.044	250.577
PCB-126	2.297	1.156	0.968	< 0.8	2.308
PCB-167	62.258	39.522	52.858	38.785	87.710
PCB-156	127.046	87.345	108.108	79.143	186.442
PCB-157	14.546	10.751	13.885	9.835	23.681
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	28.285	19.158	23.922	17.6	37.273
I-TEQ (ND=0)	0.36	0.217	0.2	0.079	0.459
I-TEQ (ND=ML)	0.368	0.225	0.209	0.167	0.467

	ARF-SMB-01Redo	ARF-SMB-02 Redo	ARF-SMB-03 Redo	ARF-SMB-04 Redo	ARF-SMB-05
	02-206 Redo	02-207 Redo	02-208 Redo	02-209 Redo	02-210
	3237	3238	3240	3241	2896
	031006-10	031006-11	031006-12	031006-15	030927-16
	25	25.1	25	25.1	25
Analyte	1.1124	0.715139442	1.5288	1.421513944	0.8016
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	7.44	3.128	12.305	10.15	9.226
PCB-123	8.097	10.988	9.902	9.456	3.514
PCB-118	569.934	692.22	724.546	593.292	443.559
PCB-114	13.992	16.725	17.855	15.615	12.342
PCB-105	173.826	202.945	246.548	201.908	141.667
PCB-126	1.574	1.625	1.881	1.735	2.29
PCB-167	67.941	133.023	85.386	79.935	51.33
PCB-156	135.188	255.36	176.519	167.618	107.733
PCB-157	19.019	30.43	22.159	19.204	13.84
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	21.429	52.621	31.112	31.943	19.712
I-TEQ (ND=0)	0.32	0.411	0.4	0.36	0.358
I-TEQ (ND=ML)	0.328	0.419	0.408	0.368	0.366

o	ARF-SMB-06	ARF-SMB-07	ARF-SMB-08	ARF-SMB-09	ARF-SMB-10
	02-211	02-212	02-213	02-214	02-215
	2897	2898	2899	2900	2901
	030927-17	030927-18	030927-19	030927-20	030927-21
	25	25.1	25	25.1	25.1
Analyte	1.548	1.196414343	0.7192	0.94063745	1.295219124
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	12.027	12.552	8.175	8.453	11.418
PCB-123	7.117	16.198	7.9	8.533	10.75
PCB-118	673.255	1019.108	622.269	536.644	759.322
PCB-114	18.295	21.984	16.764	14.903	20.841
PCB-105	210.118	308.684	200.306	171.587	238.26
PCB-126	2.898	3.04	2.293	1.54	2.421
PCB-167	80.87	122.18	68.297	63.13	86.627
PCB-156	171.519	257.903	146.023	139.438	174.357
PCB-157	20.373	32.055	18.519	16.676	23.295
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	33.94	50.376	24.788	25.649	33.212
I-TEQ (ND=0)	0.489	0.602	0.407	0.315	0.458
I-TEQ (ND=ML)	0.497	0.61	0.415	0.323	0.466

	AGI-SMB-01 Redo	AGI-SMB-02 Redo	AGI-SMB-03 Redo	**GI-SMB-04 AVG**	AGI-SMB-05 Redo
	02-449 Redo	02-450 Redo	02-451 Redo		02-453 Redo
	3137	3138	3139		3143
	031004-15	031004-16	031004-17		031005-6
	25	25.1	25.1	25	25.1
Analyte	0	0	0	0.6048	0.608366534
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	5.41	17.903	3.761	6.2285	6.187
PCB-123	13.293	22.707	4.165	13.2615	21.925
PCB-118	836.504	1385.284	250.079	519.9675	627.532
PCB-114	17.625	47.216	6.927	13.2485	15.552
PCB-105	197.004	518.273	65.58	129.7345	161.624
PCB-126	2.284	5.277	1.288	1.8585	1.644
PCB-167	103.154	101.049	35.543	77.9015	86.265
PCB-156	182.897	239.981	67.593	142.7975	159.059
PCB-157	24.605	42.469	8.775	16.894	19.634
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	32.295	31.278	17.419	37.973	31.12
I-TEQ (ND=0)	0.45	0.891	0.205	0.344	0.347
I-TEQ (ND=ML)	0.459	0.899	0.213	0.352	0.355

	ARF-sSMB 02-197 2713 031009-3	ARF-sSMB 02-201 2714 031009-4	ARF-sSMB 02-196 2725 031009-5	ARF-sSMB 02-198 2726 031009-6	ARF-sSMB 02-199 2727 031009-7
	21.5	24.9	52.6	30.3	30.2
Analyte	3.057674419	1.925702811	2.294296578	2.730363036	3.546357616
PCB-81	< 0.8	1.418	2.034	2.083	2.026
PCB-77	32.908	37.632	41.66	54.485	51.382
PCB-123	30.42	45.323	51.142	39.118	48.652
PCB-118	1199.294	2342.675	2882.637	2627.328	2449.401
PCB-114	30.662	61.109	71.981	69.886	67.192
PCB-105	372.285	746.935	862.528	842.389	769.257
PCB-126	12.007	11.9	11.087	10.387	10.257
PCB-167	175.327	318.059	360.172	325.619	285.864
PCB-156	329.677	609.895	684.162	606.557	553.8
PCB-157	42.871	79.856	85.721	76.562	775.635
PCB-169	< 0.8	< 0.8	0.718	< 0.8	0.775
PCB-189	73.472	121.178	125.766	109.983	104.313
I-TEQ (ND=0)	1.575	1.898	1.937	1.786	2.077
I-TEQ (ND=ML)	1.583	1.906	1.937	1.794	2.077

	ARF-sSMB 02-200 2728 031009-8	ARF-sSMB 02-202 2729 031009-9	ARF-sSMB 02-204 2748 031009-10	ARF-sSMB 02-205 2749 031009-11
	34.2	31.3	60.1	67.4
Analyte	2.320760234	2.058146965	2.637104825	2.209643917
PCB-81	2.176	1.74	2.857	2.811
PCB-77	38.224	72.887	67.425	53.141
PCB-123	< 0.8	48.966	81.388	52.953
PCB-118	1662.74	2668.015	4084.279	2538.895
PCB-114	50.574	70.752	101.931	54.107
PCB-105	621.98	843.889	1269.13	864.786
PCB-126	7.407	28.293	15.601	12.52
PCB-167	< 0.8	< 0.8	515.693	411.414
PCB-156	433.582	663.888	996.881	675.542
PCB-157	65.355	83.43	128.927	85.209
PCB-169	0.574	< 0.8	0.828	1.091
PCB-189	81.078	128.035	196.059	122.51
I-TEQ (ND=0)	1.262	3.615	2.758	2.038
I-TEQ (ND=ML)	1.262	3.623	2.758	2.038

	ARP-sSMB 02-276 2916 031009-12	ARP-sSMB 02-277 2917 031009-15	ARP-sSMB 02-278 2918 031009-16	ARP-sSMB 02-279 2919 031009-17	ARP-sSMB 02-280 2920 031009-18
Analyte	25.1 6.325099602	25 5.4564	25 4.9208	25.2 4.780555556	25.1 4.159760956
PCB-81	76.885	1.812	1.189	2.036	1.397
PCB-77	1160.016	39.374	29.195	48.723	36.995
PCB-123	153.126	39.416	35.264	42.86	55.467
PCB-118	3059.832	2321.427	2016.731	1802.893	3011.896
PCB-114	191.533	64.845	49.186	45.156	71.526
PCB-105	1792.258	698.804	563.531	534.078	828.053
PCB-126	12.118	4.801	4.258	4.9	8.528
PCB-167	241.108	296.948	270.619	235.781	446.963
PCB-156	479.85	558.862	460.908	453.963	803.96
PCB-157	57.658	63.341	52.361	51.039	87.732
PCB-169	< 0.8	< 0.8	0.426	< 0.8	0.338
PCB-189	90.002	112.042	86.404	91.41	158.916
I-TEQ (ND=0)	2.212	1.148	0.987	1.020	1.752
I-TEQ (ND=ML)	2.220	1.156	0.987	1.028	1.752

	ARP-sSMB 02-281 2921 031009-19	ARP-sSMB 02-282 2922 031009-20	ARP-sSMB 02-283 2923 031009-21	ARP-sSMB 02-284 2924 031009-22	ARP-sSMB 02-285 2925 031009-23
Analyte	25 4.5576	25.1 4.592031873	25 2.448	21.2 4.848584906	25 4.7632
PCB-81	1.074	2.271	0.947	1.043	1.14
PCB-77	24.471	46.52	27.089	24.3	29.859
PCB-123	39.803	52.316	49.481	29.236	36.684
PCB-118	2240.073	3219.47	3004.092	1908.872	2394.791
PCB-114	49.731	86.703	71.739	46.284	62.197
PCB-105	591.39	954.63	860.355	552.615	706.4
PCB-126	4.638	8.047	7.78	4.275	5.69
PCB-167	331.176	490.081	477.617	281.367	353.709
PCB-156	554.802	961.332	910.498	515.953	697.653
PCB-157	62.28	104.858	101.801	58.171	76.638
PCB-169	< 0.8	0.707	0.856	0.365	0.418
PCB-189	108.066	225.982	201.071	111.59	151.649
I-TEQ (ND=0)	1.101	1.843	1.748	1.007	1.327
I-TEQ (ND=ML)	1.109	1.843	1.748	1.007	1.327

	ALW-SMB-C1 02-479-C1 3008 031001-7	ALW-SMB-C2 Red 02-480-C2 Redo 3148 031005-8	ALW-WHP-C1 02-464-C1 3006 031001-6	W-WHP-C2 Redo 02-465-C2 Redo #2 3179 031008-18
	25.1	25.1	25.2	25
Analyte	1.316733068	0.975298805	1.66468254	1.0948
PCB-81	1.037	< 0.8	< 0.8	< 0.8
PCB-77	17.077	8.58	9.027	8.059
PCB-123	32.906	24.859	15.198	24.039
PCB-118	1348.469	684.843	630.944	881.505
PCB-114	41.591	22.32	13.931	25.671
PCB-105	459.622	229.696	185.4	258.797
PCB-126	7.451	3.923	3.185	3.274
PCB-167	217.674	121.465	97.583	141.313
PCB-156	408.752	219.603	186.339	282.362
PCB-157	63.545	33.901	26.32	40.492
PCB-169	1.574	< 0.8	0.856	< 0.8
PCB-189	102.153	59.397	59.882	87.497
I-TEQ (ND=0)	1.216	0.632	0.531	0.629
I-TEQ (ND=ML)	1.216	0.64	0.531	0.637

	KFF-BNT-01	KFF-BNT-02	KFF-BNT-03 Redo	**KFF-BNT-04**	KFF-BNT-05
	02-474	02-475	02-476 Redo		02-478
	3053	3054	3246		3060
	031001-12	031001-15	031006-20		031001-19
	25.1	25.1	25		25.1
Analyte	6.022310757	5.773705179	4.1088	**AVERAGE**	4.224302789
PCB-81	< 0.8	< 0.8	< 0.8	0.8	< 0.8
PCB-77	9.248	10.048	8.298	8.518	6.818
PCB-123	9.939	10.983	6.374	7.901	7.895
PCB-118	434.377	519.854	438.264	354.643	381.859
PCB-114	10.811	13.298	10.576	9.019	9.418
PCB-105	161.419	191.592	166.195	136.548	153.463
PCB-126	1.514	1.73	1.186	1.3205	1.597
PCB-167	27.571	34.089	26.921	22.627	21.486
PCB-156	54.487	68.203	52.151	45.1975	44.098
PCB-157	11.59	14.226	11.452	9.6335	9.767
PCB-169	< 0.8	< 0.8	< 0.8	0.8	< 0.8
PCB-189	7.411	9.594	6.732	6.1795	4.916
I-TEQ (ND=0)	0.252	0.295	0.219	0.2155	0.247
I-TEQ (ND=ML)	0.26	0.303	0.227	0.2235	0.255

	KFF-SMB-01 Redo	KFF-SMB-03 redo	KFF-SMB-04 redo	KFF-SMB-05 Redo	KFF-SMB-06 Redo
	02-66 redo	02-68 Redo	02-69 redo	02-70 redo	02-71 Redo
	3167	3168	3169	3170	3173
	031008-6	031008-7	031008-8	031008-9	031008-10
	25.1	25.1	25	25	25
Analyte	0.794820717	0.439043825	0.4556	0.56	0.468
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	1.858	1.533	2.448	2.166	1.638
PCB-123	1.791	2.683	3.064	1.866	5.51
PCB-118	73.389	115.911	138.629	78.473	58.721
PCB-114	2.1	2.717	3.852	2.3	1.7
PCB-105	24.801	39.956	47.955	27.06	19.965
PCB-126	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-167	5.648	8.58	10.977	6.835	4.65
PCB-156	11.243	20.964	20.396	12.859	9.39
PCB-157	2.239	4.254	4.076	2.474	1.837
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	1.891	2	3.06	2.382	1.595
I-TEQ (ND=0)	0.018	0.03	0.034	0.02	0.015
I-TEQ (ND=ML)	0.106	0.118	0.122	0.108	0.103

	KFF-SMB-07 Redo	KFF-SMB-08 Redo	KFF-SMB-09 Redo	KFF-SMB-10 Redo
	02-72 Redo	02-73 Redo	02-74 Redo	02-75 Redo
	3174	3175	3176	3177
	031008-11	031008-12	031008-15	031008-16
	25.1	25.1	25.1	25
Analyte	0.390039841	0.384462151	0.43187251	0.5808
PCB-81	< 0.8	< 1.1	< 0.8	< 0.8
PCB-77	0.891	2.882	2.059	17.903
PCB-123	0.87	4.117	2.19	22.707
PCB-118	38.568	198.012	101.864	1385.284
PCB-114	1.014	5.184	2.456	47.216
PCB-105	12.434	69.288	32.706	518.273
PCB-126	< 0.8	< 1.1	< 0.8	5.277
PCB-167	3.383	16.458	9.515	101.049
PCB-156	6.93	32.477	18.185	239.981
PCB-157	1.253	6.248	3.425	42.469
PCB-169	< 0.8	< 1.1	< 0.8	< 0.8
PCB-189	1.196	4.466	3.923	31.278
I-TEQ (ND=0)	0.01	0.05	0.026	0.891
I-TEQ (ND=ML)	0.098	0.171	0.114	0.899

	KNW-BNT-01 Red	KNW-BNT-02	KNW-BNT-03	KNW-BNT-04	KNW-BNT-05
	02-271 Redo	02-272	02-273	02-274	02-275
	3245	3049	3050	3051	3052
	031006-19	031010-6	031010-7	031010-8	031001-11
	25.1	25.1	25.1	25	25.1
Analyte	5.444223108	5.006374502	4.27689243	4.1912	2.353306773
PCB-81	<0.8	0.477	0.282	0.297	< 0.8
PCB-77	9.316	10.121	7.766	8.791	7.562
PCB-123	12.199	11.954	8.091	11.718	8.361
PCB-118	919.079	729.836	463.121	609.097	447.873
PCB-114	22.805	17.586	10.539	14.764	10.85
PCB-105	327.971	268.715	171.076	227.409	166.855
PCB-126	2.049	2.382	1.913	1.99	0.913
PCB-167	57.316	41.457	28.071	35.07	28.22
PCB-156	133.623	86.389	53.209	74.162	56.527
PCB-157	25.776	18.942	11.945	16.459	12.558
PCB-169	<0.8	0.444	< 0.8	< 0.8	< 0.8
PCB-189	13.175	8.439	6.293	8.106	6.801
I-TEQ (ND=0)	0.425	0.407	0.295	0.339	0.195
I-TEQ (ND=ML)	0.433	0.407	0.303	0.347	0.203

	KNW-SMB-01 Red	KNW-SMB-02 Red	KNW-SMB-03 Red	KNW-SMB-04 Red	KNW-SMB-05 Red
	02-36 Redo	02-37 Redo	02-38 Redo	02-39 Redo	02-40 Redo
	3149	3150	3151	3152	3154
	031005-9	031005-10	031005-11	031005-12	14
	25.1	25.1	25	25.1	25
Analyte	0.433864542	0.666135458	0.4976	0.603585657	0.5784
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	3.685	5.845	2.853	1.982	17.903
PCB-123	9.146	4.007	6.943	2.796	22.707
PCB-118	366.199	231.062	279.271	121.988	1385.284
PCB-114	9.685	6.353	7.638	3.028	47.216
PCB-105	122.056	77.446	92.709	43.795	518.273
PCB-126					
PCB-167	46.98	26.743	36.083	12.054	101.049
PCB-156	80.984	48.513	66.072	24.115	239.981
PCB-157	16.581	9.587	12.504	4.742	42.469
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	14.523	8.97	12.555	4.793	31.278
I-TEQ (ND=0)	0.215	0.171	0.215	0.034	0.891
I-TEQ (ND=ML)	0.223	0.179	0.223	0.122	0.899

	KNW-SMB-06 Red	KNW-SMB-07 Red	KNW-SMB-08 Red	KNW-SMB-09 Red	NW-SMB-10 Redo
	02-41 Redo	02-42 Redo	02-43 Redo	02-44 Redo	02-45 Redo #2
	3155	3156	3157	3158	3178
	15	16	17	18	031008-17
	25.1	25.1	25	25	25.1
Analyte	0.626693227	0.645816733	0.4772	0.6544	0.558964143
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 1.2
PCB-77	2.312	3.652	2.848	2.464	3.447
PCB-123	4.509	8.282	10.823	3.271	6.065
PCB-118	249.97	327.478	419.757	138.648	262.889
PCB-114	6.286	8.643	10.882	3.766	6.653
PCB-105	87.403	113.039	141.798	48.63	87.607
PCB-126					
PCB-167	27.882	33.843	50.558	13.707	26.233
PCB-156	50.387	65.585	95.393	27.249	49.287
PCB-157	10.174	12.919	18.288	4.869	9.27
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 1.2
PCB-189	8.047	8.925	15.015	4.497	8.233
I-TEQ (ND=0)	0.069	0.207	0.257	0.038	0.07
I-TEQ (ND=ML)	0.157	0.215	0.265	0.126	0.202

o	KSD-SMB-01 Redo	KSD-SMB-02 Redo	KSD-SMB-04 Dup	KSD-SMB-05 Redo	KSD-SMB-06 Redo
	02-46 Redo	02-47 Redo	02-48 Dup	02-49 Redo	02-50 redo
	3160	3161	3162	3163	3166
	19	20	21	22	031008-5
	25.1	25	25.1	25	25.1
Analyte	0.552191235	0.4212	1.085258964	0.5884	0.484860558
PCB-81	< 0.8	< 0.9	< 0.8	< 0.8	< 0.8
PCB-77	11.501	4.475	26.607	13.302	4.978
PCB-123	22.621	14.98	32.824	22.183	11.166
PCB-118	1613.901	937.451	2155.153	1263.83	506.664
PCB-114	35.755	22.176	45.763	27.87	11.727
PCB-105	439.481	292.808	550.941	329.708	132.454
PCB-126	3.061	1.631	4.814	3.117	1.43
PCB-167	104.247	101.644	119.349	85.163	34.523
PCB-156	224.357	221.83	274.731	184.335	76.805
PCB-157	45.63	40.171	53.919	36.287	14.921
PCB-169	< 0.8	< 0.9	< 0.8	< 0.8	< 0.8
PCB-189	16.331	32.138	16.266	15.011	7.832
I-TEQ (ND=0)	0.67	0.434	0.948	0.601	0.261
I-TEQ (ND=ML)	0.678	0.443	0.956	0.609	0.269

#2
Analyte
PCB-81
PCB-77
PCB-123
PCB-118
PCB-114
PCB-105
PCB-126
PCB-167
PCB-156
PCB-157
PCB-169
PCB-189
I-TEQ (ND=0)
I-TEQ (ND=ML)

	DEP ID	BLANK	BLANK SPIKE	BLANK	BLANK
	SWAT ID	BLK	BLK SPK	02-BLK	02-BLK
	ECL ID	2811-MB	2812-LCS	2883-MB	3211-MB
	GCMS File	030925-4	030925-3	030927-15	031004-19
	Ext_wt (g)	25.0	25.0	25	25
Analyte	% Lipid	N/A	N/A	0	0
PCB-81		< 0.8	63.14	< 0.8	< 0.8
PCB-77		**9.54**	**70.75**	1.064	< 0.8
PCB-123		< 0.8	62.11	< 0.8	< 0.8
PCB-118		**11.62**	**71.74**	5.95	7.997
PCB-114		< 0.8	63.07	< 0.8	< 0.8
PCB-105		**6.60**	**69.39**	1.622	2.427
PCB-126		**6.53**	**68.59**	< 0.8	< 0.8
PCB-167		< 0.8	64.13	< 0.8	< 0.8
PCB-156		< 0.8	65.97	1.305	1.148
PCB-157		< 0.8	66.62	< 0.8	< 0.8
PCB-169		< 0.8	63.22	< 0.8	< 0.8
PCB-189		< 0.8	64.08	< 0.8	< 0.8
I-TEQ (ND=0)		0.655	7.629	0.002	0.002
I-TEQ (ND=ML)		0.665	7.629	0.091	0.091

	PBO-EEL-C2 Red	PBO-EEL-C4 Red sm	PBO-EEL-C1 Redo
	02-223-C2 Redo	02-227-C4 Redo	02-234-C1 Redo
	3203	3204	3205
	031010-9	031010-10	031010-11
	25	25.1	25.1
Analyte	13.28924303	14.9572	8.441434263
PCB-81	0	0	0
PCB-77	3.469	3.694	1.824
PCB-123	319.547	68.178	42.968
PCB-118	6223.852	3908.144	2800.634
PCB-114	331.083	87.098	50.682
PCB-105	4091.7	1494.899	999.704
PCB-126	22.284	10.633	6.185
PCB-167	985.885	258.281	190.959
PCB-156	1880.784	572.804	385.494
PCB-157	398.866	120.299	85.048
PCB-169	4.229	2.098	1.263
PCB-189	215.423	63.902	47.456
I-TEQ (ND=0)			
I-TEQ (ND=ML)			

	PBW-SMB-01	PBW-SMB-03	PBW-SMB-05	PBW-SMB-06	PBW-SMB-07
	02-346	02-347	02-349	02-350	02-351
	2862	2863	2864	2865	2866
	030927-5	030927-6	030927-7	030927-8	030927-9
	25	25.1	25	25	25.1
Analyte	0.5508	0.756972112	0.7188	0.7456	0.492430279
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	19.748	13.66	12.894	16.679	8.432
PCB-123	12.753	5.074	2.948	11.586	10.146
PCB-118	1306.149	468.343	540.324	1164.996	826.179
PCB-114	35.533	13.416	15.33	33.08	22.962
PCB-105	413.844	143.13	165.07	365.614	260.96
PCB-126	3.326	5.654	4.066	4.142	2.134
PCB-167	141.909	59.21	60.44	137.376	90.993
PCB-156	324.091	128.124	138.382	309.095	212.391
PCB-157	36.771	14.812	15.223	34.833	23.922
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	65.081	31.094	30.441	64.543	39.145
I-TEQ (ND=0)	0.714	0.71	0.567	0.766	0.458
I-TEQ (ND=ML)	0.722	0.718	0.575	0.774	0.467

	PBW-SMB-08	PBW-SMB-09 Re	PBW-SMB-11	PBW-SMB-14 Redo
	02-352	02-353 Redo #2	02-121	02-355 Redo
	2867	3232	3092	3233
	030927-10	031004-22	031003-3	031004-23
	25.1	25.1	25.1	25
Analyte	0.766135458	0	0.732669323	0
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	7.909	7.77	7.34	9.588
PCB-123	6.273	5.052	12.006	10.561
PCB-118	464.886	470.959	550.051	774.188
PCB-114	13.972	13.461	14.515	20.779
PCB-105	145.851	147.377	173.083	225.881
PCB-126	0.892	1.461	0.929	1.726
PCB-167	58.261	55.711	37.411	94.128
PCB-156	128.176	125.201	80.124	202.065
PCB-157	14.122	14.155	15.837	22.785
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	33.222	26.116	6.263	37.243
I-TEQ (ND=0)	0.234	0.289	0.223	0.402
I-TEQ (ND=ML)	0.242	0.297	0.231	0.41

	PBM-SMB-06	PBM-SMB-07	PBM-SMB-08	PBM-SMB-09	PBM-SMB-10
	AVERAGE	AVERAGE	AVERAGE	AVERAGE	AVERAGE
	25.1	25.1	25.05	25.05	25.05
Analyte	1.435458167	1.258964143	1.253875697	0.524701195	0.847332271
PCB-81	2.1005	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	39.1215	20.3625	16.88	9.4095	5.5365
PCB-123	10.275	36.0455	15.428	8.4395	4.6695
PCB-118	482.9735	1814.765	879.5865	410.2975	237.3255
PCB-114	21.793	50.195	24.7825	12.834	6.878
PCB-105	207.6605	763.117	295.7565	142.9895	77.858
PCB-126	4.2455	5.9865	3.526	1.4935	1.6995
PCB-167	35.793	112.055	63.6455	35.6705	15.787
PCB-156	86.729	304.4285	139.909	77.5855	33.4625
PCB-157	12.974	62.79	23.7895	10.7995	6.377
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	15.089	19.08	19.1605	12.578	3.39
I-TEQ (ND=0)	0.5615	1.0735	0.57	0.263	0.1865
I-TEQ (ND=ML)	0.5695	1.0815	0.578	0.271	0.2345

	PBM-SMB-11	PBM-SMB-12	PBM-SMB-13	PBM-SMB-14	PBM-SMB-15 Rec
		02-354	02-413	02-414	02-415 Redo #2
		2870	2845	2848	3250
	AVERAGE	030927-11	030926-11	030926-12	031006-21
	25.05	25	25	25.1	25
Analyte	1.077366534	1.0516	1.2836	0.930677291	1.604
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	23.4275	11.88	20.866	15.417	15.223
PCB-123	15.09	11.616	9.568	12.82	6.086
PCB-118	841.9645	607.581	835.33	813.174	888.99
PCB-114	23.623	17.623	25.079	25.334	25.622
PCB-105	296.577	184.428	301.97	281.562	317.435
PCB-126	22.1495	2.599	4.234	2.764	2.393
PCB-167	61.953	73.853	70.578	81.01	69.689
PCB-156	134.8245	178.369	160.342	184.003	157.962
PCB-157	24.49	17.428	22.289	24.424	22.262
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	15.2515	45.981	24.966	31.345	22.984
I-TEQ (ND=0)	2.426	0.453	0.647	0.51	0.468
I-TEQ (ND=ML)	2.434	0.462	0.655	0.518	0.476

	02-366 2850 030926-15	02-367 2851 030926-16	02-368 2852 030926-17	02-369 2853 030926-18	02-370 2854 030926-19
Analyte	25 0.792	25 0.9188	25 1.2768	25 1.6116	25 0.8668
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	17.903	11.149	15.976	38.583	11.807
PCB-123	22.707	7.215	12.298	11.398	7.084
PCB-118	1385.284	322.329	612.984	479.402	257.379
PCB-114	47.216	9.791	21.159	17.085	9.169
PCB-105	518.273	114.575	232.7	190.893	91.215
PCB-126	5.277	4.056	3.8	26.322	5.606
PCB-167	101.049	27.537	49.286	36.083	17.453
PCB-156	239.981	66.381	138.461	101.712	46.776
PCB-157	42.469	9.635	18.249	13.579	6.999
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	31.278	12.433	24.785	16.776	7.292
I-TEQ (ND=0)	0.891	0.496	0.559	2.772	0.63
I-TEQ (ND=ML)	0.899	0.504	0.567	2.781	0.638

do #2	PBL-SMB-15 02-371 2855 030926-20	PBL-SMB-19 02-372 2856 030926-21	PBL-SMB-20 02-373 2857 030926-22	PBL-SMB-22 02-374 2858 030926-23	PBL-SMB-23 02-375 2859 030926-24
Analyte	25.1 1.444223108	25.1 1.237450199	25.1 0.929880478	25.1 0.752191235	25 0.8456
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	21.974	12.556	13.027	8.476	8.804
PCB-123	8.893	10.647	12.871	8.167	6.528
PCB-118	529.445	387.1	532.981	512.507	358.409
PCB-114	18.051	14.969	16.862	17.28	11.516
PCB-105	197.823	147.446	188.526	183.127	118.687
PCB-126	11.773	4.798	4.52	3.552	3.231
PCB-167	39.935	25.887	42.351	36.55	41.152
PCB-156	102.522	76.576	99.983	90.042	92.442
PCB-157	13.935	11.181	14.301	14.705	12.017
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	18.307	12.107	17.06	12.73	19.472
I-TEQ (ND=0)	1.323	0.588	0.594	0.489	0.433
I-TEQ (ND=ML)	1.331	0.596	0.603	0.497	0.441

	PBC-SMB-08	PBC-SMB-09	PBC-SMB-10	PBC-SMB-11	PBC-SMB-12
		392	393	394	395
		2820	2821	2823	2824
	AVERAGE	030925-9	030925-10	030925-11	030925-12
	25.05	25.1	25.1	25.1	25.1
Analyte	0.359	1.09	0.689	0.868	1.08
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	6.8445	**10.39**	**7.00**	**7.31**	**5.94**
PCB-123	7.919	5.62	7.35	3.41	3.48
PCB-118	364.358	**271.64**	**303.77**	**149.32**	**150.82**
PCB-114	10.98	8.37	9.89	4.50	4.81
PCB-105	125.433	**95.26**	**109.53**	**51.02**	**54.28**
PCB-126	1.284	**4.42**	**3.52**	**3.59**	**2.70**
PCB-167	32.2145	25.79	25.24	14.11	15.05
PCB-156	68.266	52.55	56.81	33.84	30.98
PCB-157	11.603	8.65	9.16	4.90	4.98
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	11.1605	7.38	7.35	5.26	4.86
I-TEQ (ND=0)	0.226	0.516	0.433	0.402	0.313
I-TEQ (ND=ML)	0.234	0.524	0.442	0.410	0.321

	PBC-SMB-03	PBC-SMB-04	PBC-SMB-05	PBC-SMB-06 Red	PBC-SMB-07 Red
	2813	2814	2815	02-389 Redo	02-390 Redo
	386	387	388	3202	3231
	030925-6	030925-7	030925-8	031006-5	031010-12
	25.0	25.0	25.1	25.1	25.1
Analyte	1.14	1.14	0.727	0.665338645	0.578
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	0.112
PCB-77	**8.94**	**17.29**	**8.68**	2.833	2.245
PCB-123	5.56	15.62	6.03	3.395	2.047
PCB-118	**217.21**	**691.04**	**297.39**	187.555	111.631
PCB-114	6.01	21.63	9.23	5.697	3.512
PCB-105	**76.49**	**245.47**	**103.15**	64.641	38.5
PCB-126	**4.22**	**6.16**	**3.33**	< 0.8	0.475
PCB-167	19.87	61.03	29.42	17.24	10.774
PCB-156	40.67	128.66	61.43	36.305	22.253
PCB-157	6.92	22.24	10.04	5.731	4.017
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	0
PCB-189	4.95	16.92	9.39	4.628	3.557
I-TEQ (ND=0)	0.480	0.802	0.416	0.05	1.866
I-TEQ (ND=ML)	0.488	0.810	0.424	0.138	1.883

	PBV-SMB-01	PBV-SMB-03	PBV-SMB-06 Rec	PBV-SMB-07 Redo #2
	396	397	02-398 Redo #2	02-399 Redo #2
	2825	2826	3234	3153
	030925-15	030925-16	031004-24	031005-15
	25.0	25.1	25	25.1
Analyte	0.6	0.964	0	0.583266932
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	**9.99**	**14.53**	28.654	4.387
PCB-123	5.54	13.09	10.392	9.996
PCB-118	**343.25**	**670.50**	618.323	426.42
PCB-114	10.52	18.85	20.366	11.754
PCB-105	**113.85**	**232.60**	229.251	148.177
PCB-126	**4.99**	**5.55**	2.16	1.496
PCB-167	34.02	60.03	49.702	37.79
PCB-156	69.86	129.34	95.899	87.323
PCB-157	12.26	23.43	18.711	14.041
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	9.91	15.85	16.887	10.992
I-TEQ (ND=0)	0.594	0.736	0.374	0.267
I-TEQ (ND=ML)	0.602	0.744	0.382	0.275

lo	PBV-SMB-09	PBV-SMB-10	PBV-SMB-11 Rec	PBV-SMB-12	PBV-SMB-13
	401	402	02-403 Redo #2	404	405
	2830	2831	3132	2833	2834
	030925-17	030925-18	031004-8	030925-19	030925-20
	25.1	25.1	25.1	25.0	25.0
Analyte	0.634	1.84	0	0.684	0.684
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	**10.41**	**7.35**	7.004	**11.94**	**14.25**
PCB-123	5.67	7.22	11.454	13.58	16.86
PCB-118	**549.84**	**304.70**	631.147	**636.65**	**798.68**
PCB-114	15.08	8.47	18.125	18.69	21.73
PCB-105	**203.21**	**100.08**	219.077	**234.74**	**268.67**
PCB-126	**4.24**	**3.49**	1.884	**4.18**	**6.64**
PCB-167	44.44	24.40	48.839	49.42	82.19
PCB-156	95.51	55.46	106.353	111.16	167.12
PCB-157	17.80	9.68	20.023	20.29	30.11
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	11.21	7.21	12.639	13.13	22.95
I-TEQ (ND=0)	0.567	0.429	0.349	0.585	0.886
I-TEQ (ND=ML)	0.575	0.437	0.357	0.593	0.894

	DEP ID	BLANK	BLANK	3185
	SWAT ID	02-BLK	02-BLK	RM (to finish season)
	ECL ID	2996-MB	3067-MB	02-SRM (last)
	GCMS File	031001-4	031002-7	031008-24
	Ext_wt (g)	25.0	25	10
Analyte	% Lipid	0.00	0	0
PCB-81		< 0.8	< 0.8	< 2
PCB-77		1.13	< 0.8	2024.237
PCB-123		< 0.8	< 0.8	3350.51
PCB-118		5.34	5.012	18777.925
PCB-114		< 0.8	< 0.8	4424.75
PCB-105		1.53	1.004	18299.71
PCB-126		< 0.8	< 0.8	668.838
PCB-167		< 0.8	< 0.8	7317.99
PCB-156		1.08	1.365	12538.633
PCB-157		< 0.8	< 0.8	3460.407
PCB-169		< 0.8	< 0.8	49.083
PCB-189		< 0.8	< 0.8	1660.939
I-TEQ (ND=0)		0.001	0.001	82.071
I-TEQ (ND=ML)		0.090	0.09	82.071

	SWP-SMB-01	SWP-SMB-02	SWP-SMB-03	SWP-SMB-04	SWP-SMB-05
	02-61	02-62	02-63	02-64	02-65
	3061	3062	3063	3064	3065
	031001-20	031001-21	031001-22	031001-23	031001-24
	25.1	25	25.1	25.1	25.1
Analyte	0.906374502	0.7016	0.872111554	0.450199203	0.667330677
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	5.834	5.533	6.131	9.321	8.18
PCB-123	11.405	11.39	7.915	43.079	57.689
PCB-118	805.31	887.292	693.479	2963.077	4010.497
PCB-114	12.302	12.998	8.106	62.87	93.771
PCB-105	161.025	166.604	106.21	820.937	1306.164
PCB-126	1.715	1.765	1.313	2.004	1.907
PCB-167	52.169	53.654	39.624	194.208	231.79
PCB-156	104.521	112.066	79.508	519.104	642.447
PCB-157	21.036	22.189	15.017	95.992	121.28
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	12.414	12.061	9.677	22.16	23.335
I-TEQ (ND=0)	0.341	0.359	0.265	0.927	1.162
I-TEQ (ND=ML)	0.349	0.367	0.273	0.935	1.17

E (underlined) = elevated detection limit due to presence of interfering compound.
J (shaded) = Response of related 13C-labeled compound outside of objective of 25-150 percent.
B (bold) = Compound found in method blank.
International Toxic Equivalency Quotient (I-TEQ) using zero and ML value for non-detects.

	SFS-SMB-01 02-96 3069 031002-8	SFS-SMB-02 AVERAGE	SFS-SMB-03 02-98 3072 031002-11	SFS-SMB-04 02-99 3073 031002-12	SFS-SMB-05 02-100 3074 031002-15
	25.1	25.05	25	25.1	25.1
Analyte	0.55498008	0.812486056	1.0832	0.609960159	0.727091633
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	13.414	10.5965	18.67	19.638	21.13
PCB-123	42.591	37.7905	55.55	61.149	109.324
PCB-118	2466.696	2476.3625	2875.695	3397.915	5452.881
PCB-114	45.214	45.203	61.055	74.318	131.248
PCB-105	618.915	586.6425	731.7	899.199	1691.082
PCB-126	2.781	2.6195	3.707	4.316	4.868
PCB-167	199.732	212.808	271.621	269.101	445.123
PCB-156	374.376	413.4335	526.474	536.372	954.349
PCB-157	67.574	68.253	88.409	95.163	167.031
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	46.604	57.27	74.278	57.576	101.994
I-TEQ (ND=0)	0.843	0.844	1.087	1.231	1.855
I-TEQ (ND=ML)	0.851	0.8525	1.095	1.239	1.863

	PWD-SMB-01 02-106 3075 031002-16	PWD-SMB-02 02-107 3076 031002-17	PWD-SMB-03 02-108 3077 031002-18	'WD-SMB-04 Red 02-109 Redo 3180 031008-19	PWD-SMB-05 02-110 3079 031002-19
	25.1	25	25	25	25
Analyte	0.772111554	0.8704	1.0832	0.5068	0.5036
PCB-81	< 0.8	< 0.8	0.906	< 1.4	1.112
PCB-77	4.897	3.957	14.827	7.579	19.002
PCB-123	4.824	3.068	13.56	5.057	< 0.8
PCB-118	171.73	111.498	402.038	232.257	451.825
PCB-114	5.358	3.483	17.601	8.075	20.65
PCB-105	63.511	43.574	178.717	84.803	211.995
PCB-126	1.034	0.99	2.477	1.566	2.059
PCB-167	13.547	8.21	28.322	18.74	29.069
PCB-156	26.386	15.644	55.663	38.135	56.452
PCB-157	5.653	3.295	12.411	7.321	13.443
PCB-169	< 0.8	< 0.8	< 0.8	< 1.4	< 0.8
PCB-189	3.304	1.988	6.769	4.194	6.197
I-TEQ (ND=0)	0.147	0.127	0.353	0.217	0.32
I-TEQ (ND=ML)	0.155	0.135	0.361	0.231	0.329

	PWD-SMB-06	PWD-SMB-07	'WD-SMB-09 Red	'WD-SMB-10 Redo
	02-111	02-112	02-114 Redo	02-115 Redo
	3080	3081	3181	3182
	031002-20	031002-21	031008-20	031008-21
	25.1	25	25	25
Analyte	1.810358566	1.174	0.8888	0.7508
PCB-81	< 0.8	< 0.8	< 1.9	< 0.8
PCB-77	8.993	5.429	6.908	4.457
PCB-123	12.344	6.768	6.384	4.351
PCB-118	469.903	182.61	235.202	180.598
PCB-114	13.266	5.696	7.515	5.578
PCB-105	180.934	68.934	88.364	69.786
PCB-126	2.732	1.261	< 1.9	1.196
PCB-167	39.284	14.788	17.998	15.216
PCB-156	71.66	26.466	34.391	28.202
PCB-157	16.316	5.946	7.596	6.227
PCB-169	< 0.8	< 0.8	< 1.9	< 0.8
PCB-189	9.165	< 0.8	3.982	3.248
I-TEQ (ND=0)	0.392	0.172	0.059	0.166
I-TEQ (ND=ML)	0.4	0.18	0.268	0.174

	PWB-SMB-01	PWB-SMB-03	PWB-SMB-04	'WB-SMB-05 Red	'WB-SMB-11 Red
	02-116	02-117	02-118	02-119 Redo	02-120 Redo
	3085	3086	3087	3183	3184
	031002-22	031002-23	031002-24	031008-22	031008-23
	25	25.1	25.1	25.1	25
Analyte	1.1388	0.47250996	0.82749004	0.989243028	0.8568
PCB-81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-77	11.059	6.893	5.601	7.14	8.232
PCB-123	35.928	18.498	9.602	13.943	10.174
PCB-118	1871.087	934.715	503.806	787.619	523.062
PCB-114	58.618	25.323	15.103	22.065	15.754
PCB-105	673.081	298.452	164.122	267.692	175.148
PCB-126	2.758	1.594	1.037	1.409	1.162
PCB-167	114.345	62.981	34.449	53.69	33.321
PCB-156	281.475	136.845	76.975	120.76	73.022
PCB-157	55.697	28.546	15.196	24.076	13.399
PCB-169	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
PCB-189	< 0.8	10.745	6.414	8.841	5.324
I-TEQ (ND=0)	0.734	0.382	0.227	0.333	0.24
I-TEQ (ND=ML)	0.742	0.39	0.235	0.341	0.248

	PLW-SMB-C 02-489-C 3125 031004-4	PLW-SMB-C (Dup 02-489-C (Dup) 3126 (Dup) 031004-5	**PLW-SMB** **MEAN**
	25	25.1	**25.05**
Analyte	0.977	1.844	**1.4105**
PCB-81	< 0.8	< 0.8	**< 0.8**
PCB-77	3.172	3.885	**3.5285**
PCB-123	4.176	4.59	**4.383**
PCB-118	178.056	203.09	**190.573**
PCB-114	4.887	5.556	**5.2215**
PCB-105	58.068	66	**62.034**
PCB-126	1.498	1.589	**1.5435**
PCB-167	23.575	26.718	**25.1465**
PCB-156	44.876	51.041	**47.9585**
PCB-157	8.56	9.604	**9.082**
PCB-169	< 0.8	< 0.8	**< 0.8**
PCB-189	9.377	10.996	**10.1865**
I-TEQ (ND=0)	0.204	0.221	**0.213**
I-TEQ (ND=ML)	0.213	0.229	**0.221**

MERCURY AND TOTAL PCBS

Previous studies have found high or conflicting concentrations of mercury and PCBs in fish from some rivers. More data were needed to make accurate determinations of actual concentrations.

Androscoggin River

Mercury and PCB

The Androscoggin River looks like it is due for a major reanalysis of the advisories. The current advisory is driven by total PCBs, which unexplainably appear to have dropped several fold from 1995 to the present at least for some stations. For some stations (e.g., Riley, GIP), there is evidence of substantial decrease in fish PCB levels. For other stations (e.g., Lisbon, Livermore), year-to-year variability obscure any clear trends. New data are needed to confirm these lower levels. Mercury sampling is also needed because sampling years ago indicated the Androscoggin River had some of the highest mercury levels for river bass populations, and mercury could become the limiting chemical for these waters.

In 2002 we collected 5 smallmouth bass from each of 6 stations from Gilead to Lisbon to be analyzed for mercury and total PCB. Three of the fish from Lisbon were lost in the lab. In 2003 we collected 10 smallmouth bass and 10 white suckers from stations at Livermore Falls and Livermore to be analyzed for dioxins and PCBs as part of a study of the effects of a hydropower dam.

Mercury in smallmouth bass generally increases downriver below the pulp and paper mills and municipal discharges (Table 3.1.2). Smallmouth bass at Gulf Island Pond in Turner were significantly higher in mercury than those at Livermore Falls even though there are no point source discharges between the stations. It is well known that there are many factors that influence mercury levels in fish. This increasing amount below discharges was not evident in similar studies in 1994, although concentrations were elevated above those in other rivers then also. The pattern was somewhat similar in studies conducted in 1998, however. All results exceed the Bureau of Health's Fish Tissue Action Level (FTAL= 0.2 mg/kg, ppm) for mercury, as do most all warmwater fish and most cold water fish of a size desired by anglers, prompting the statewide fish consumption advisory.

PCBs in smallmouth bass did not follow the same pattern as of increasing concentrations downstream as was the case in previous years (Table 3.1.3). Concentrations were slightly lower than those measured in 1995, but higher than those measured in more recent years at most stations. Concentrations exceeded the Maine Bureau of Health's Fish Tissue Action Level (FTAL= 11 ppb) at all locations. The wide variation from year to year is curious. The high concentrations at Rumford Point in 2002 were unprecedented and warrant additional sampling.

Table 3.1.2 MERCURY CONCENTRATIONS IN 2002 FISH SAMPLES FROM MAINE RIVERS

DEP Sample ID (station-species-no.)	Length (mm)	Hg conc. (mg/Kg)
ANDROSCOGGIN R RUMFORD POINT	**359**	**0.387**
ARP-SMB-2	360	0.478
ARP-SMB-4	352	0.339
ARP-SMB-7	360	0.399
ARP-SMB-9	367	0.37
ARP-SMB-10	358	0.347
ANDROSCOGGIN R RUMFORD	**358**	**0.361**
ARF-SMB-1	357	0.371
ARF-SMB-2	384	0.612
ARF-SMB-6	335	0.201
ARF-SMB-8	360	0.306
ARF-SMB-10	355	0.313
ANDROSCOGGIN R RILEY	**391**	**0.718**
ARY-SMB-6	406	0.717
ARY-SMB-7	380	0.508
ARY-SMB-9	379	0.678
ARY-SMB-10	404	1.09
ARY-SMB-11	384	0.596
ANDROSCOGGIN R LIVERMORE FALLS	**386**	**0.798**
ALV-SMB-4	375	0.939
ALV-SMB-5	394	0.635
ALV-SMB-7	402	0.949
ALV-SMB-9	382	0.952
ALV-SMB-10	375	0.517
ANDROSCOGGIN R TURNER	**391**	**1.086**
AGI-SMB-1	390	1.11
AGI-SMB-2	365	0.863
AGI-SMB-3	380	0.849
AGI-SMB-4	422	1.34
AGI-SMB-5	396	1.27
ANDROSCOGGIN R LISBON	**345**	**0.612**
ALS-SMB-4	350	0.641
ALS-SMB-5	340	0.583

bold value = mean

DEP Sample ID	Length (mm)	Hg conc. (mg/Kg)
SALMON FALLS R/ Northeast P.	**288**	**0.589**
NEP-WHP-1	282	0.483
NEP-WHP-2	236	0.222
NEP-WHP-3	324	0.882
NEP-WHP-4	319	0.833
NEP-WHP-5	278	0.523
SALMON FALLS / BERWICK	**316**	**0.605**
SFB-SMB-1	376	0.97
SFB-SMB-2	310	0.591
SFB-SMB-3	310	0.492
SFB-SMB-4	306	0.509
SFB-SMB-5	280	0.464
KENNEBEC R BOWDOINHAM	**909**	**0.721**
KRB-EEL-C1	837	0.058
KRB-EEL-C2	842	0.919
KRB-EEL-C3	904	0.917
KRB-EEL-C4	1052	0.991
PENOBSCOT R ORRINGTON	**496**	**0.477**
PBO-EEL-C1	492	0.444
PBO-EEL-C2	456	0.542
PBO-EEL-C3	507	0.414
PBO-EEL-C4	530	0.508
sm PBO-EEL	**293**	**0.246**
sm PBO-EEL-C1	306	0.273
sm PBO-EEL-C2	280	0.218

Table 3.1.3 PCBs in smallmouth bass from the Androscoggin River, ppb average (95 ucl on the mean)

Year	Rumford Pt	Rumford	Riley	Jay	Livermore Fls	Livermore	Turner GIP	Lisbon
1995			97	42	49		114	98
1998	4 (4)	9 (12)	7 (8)		15 (19)		20(26)	27(30)
2000	10 (11)	21 (27)	15 (17)		38 (42)	27 (32)	29(36)	52(60)
2002	411	93	73		18		88	71
2003					22	19		

Kennebec River

We have two concerns about the Kennebec River between Gardiner and Fairfield. One is how the removal of the Edwards Dam is impacting the movement of PCB contaminated smallmouth bass from Augusta upstream. Second is the disconnect between the smallmouth bass PCB levels in Fairfield compared to the Brown Trout PCB levels in Fairfield. PCB levels in Brown Trout from Fairfield have been quite variable (3-fold). Additionally, it is unclear why brown trout in Fairfield have such higher PCB levels than the smallmouth bass, when levels are similar in Sidney, and bass were actually much higher that brown trout in Augusta prior to the dam removal. The apparent increased PCB levels in smallmouth bass from Sidney are consistent with fish migrating up from the Augusta area, but additional data are needed for confirmation. Since there is so much uncertainty as to how to evaluate this data we attempted to collect 5 individual brown trout and 5 smallmouth bass from Norridgewock, Fairfield, Winslow/Sidney. We were successful in collecting all but the brown trout from Winslow/Sidney, and we did also get smallmouth bass from Augusta and Gardiner.

In 2002, PCB concentrations in smallmouth bass were significantly higher at Augusta and Gardiner than upstream, similar to those of previous years (Table 3.1.4). Concentrations at Sidney were similar to those of two of three previous years and much lower than at Augusta, although elevated from stations further upstream. These data do not indicate that bass are migrating upstream from Augusta in any appreciable numbers. Concentrations in brown trout at Fairfield did were not high as in previous years. Additional sampling is needed to elucidate any pattern.

Table 3.1.4 PCBs in smallmouth bass and brown trout from the Kennebec River
ppb average (95 ucl on the mean or max if n=2

Smallmouth Bass

Year	Norridgewock	Skowhegan	Fairfield	Sidney	Augusta	Gardiner
1994			4.5	8.6	604	
1997		3.7 (4.5)	4.0 (4.9)	6.1 (7.2)	342 (357)	
1999					263 (323)	179 (227)
2000				32 (42)		
2002	1.6		1.7	9.7	111	47.5

Brown Trout

Year	Norridgewock	Skowhegan	Fairfield	Sidney	Augusta	Gardiner
1994			300			
1997			93 (107)		54.6 (70.9)	
1999					55 (71)	
2000				34 (45)		
2002	7.9		10.2			

Salmon Falls River

Sampling from 2000 confirmed high levels of total PCBs in smallmouth bass at South Berwick below the discharge from the town of Berwick and Prime Tanning Co.. Additionally, that site has had elevated levels of dioxin and some of the higher levels of coplanar PCBs in the state. Concentrations in fish upstream at Acton are much lower. The confirmatory PCB data for South Berwick indicate a need for a reanalysis of the advisory for the Salmon Falls River (perhaps leading to a "no consumption" advisory). In order to know the upper boundary, we collected fish from a location upstream of the Berwick discharge for both mercury and PCB analysis. We also needed to collect data for other species. We collected white perch from Northeast Pond, an impoundment in the Salmon Falls River and smallmouth bass from the river in Berwick upstream of all major discharges.

Mercury concentrations were elevated similarly for both species (Table 3.1.2). Concentrations were within the range for these species in other rivers in Maine.

PCB concentrations in bass at Berwick were higher than those at South Berwick from previous years, but lower than those in white perch at Northeast Pond (Table 3.1.5). As there are no known point sources of PCBs between these stations, additional sampling is needed to identify the source and any differences in species PCB levels.

Table 3.1.5. PCBs in smallmouth Bass (SMB), chain pickerel (CHP), and white perch (WHP) from the Salmon Falls River, ppb average (95 ucl on the mean)

Year	Acton		Northeast P		Berwick		S. Berwick	
1997	5 (6)	SMB					75	SMB
							47 (53)	CHP
2000							83 (100)	SMB
2002			23.4	WHP	110	SMB		

EELS

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 US and international markets, although some are consumed in Maine. People fishing eels need permits from either DMR or DIFW. DMR also funds several eel research projects at the University of Maine. Limited data from previous years show that eels from rivers are often among the species most highly contaminated with a number of contaminants. In 1998 eels were captured from 3 lakes. Since then we have tried to get eels from 3 rivers as well, but were successful only in collecting eels from the Penobscot River and which contained high levels of PCB. Therefore, in 2002, we attempted to collect 20 eels from each of three rivers and analyzed

as four composites of five fish each for mercury and PCBs. We were successful in capturing large eels from the Kennebec River and both large and small eels from the Penobscot River.

Mercury concentrations were elevated and proportional to size (Table 3.1.2). Similar to concentrations in 1996, those in 2000 were higher in eels from the Penobscot River than in eels from lakes and many other rivers (Table 3.1.6). Concentrations in small eels from the Penobscot were lower but elevated. Mercury concentrations in eels from the Kennebec River at Bowdoinham were the highest of all. Concentrations in all rivers exceeded the Maine Bureau of Health's Fish Tissue Action Level (0.2 mg/kg).

PCB concentrations in eels from the Penobscot River were intermediate of those from previous years (Table 3.1.6). PCB levels were higher in large eels than in smaller eels. Concentrations were highest in eels from the Kennebec River at Bowdoinham, which is consistent with highly elevated PCBs in all species of fish tested from the river downstream of Augusta previously. Consequently, the Maine Bureau of Health issued a no consumption advisory for this reach in 2000.

Table 3.1.6 Mercury and PCB concentrations in eels from Maine rivers (mg/kg).

WATER	1994	1995	1996	1997	1998	1999	2000	2001	2002
MERCURY									
W Br Piscataquis R at Falmouth	0.48								
Goosefare Brook at Saco		0.14							
Great Works River at N Berwick		0.32							
Kennebunk R at Kennbunk		0.62							
Kenduskeag R at Bangor			0.31						
Kenduskeag R at Kenduskeag			0.30						
Mill St at Orrington			0.46						
Penobscot R at Orrington			0.53						0.48
small eels									0.25
W Br Piscataquis R at Falmouth			0.43						
Cobbosseecontee Lake					0.32				
Auburn Lake					0.11				
China Lake					0.34				
Kennebec R at Bowdoinham									0.72
PCBS									
Penobscot R at Orrington			0.037				0.253		0.098
small eels									0.055
Kennebec R at Bowdoinham									0.377

Table 3.1.7 PCBs in fish from Maine rivers 2002, raw data (ug/kg ww)

WATER	SPECIES	FISH ID 1	2	3	4	5	mean
Androscoggin R							
Rumford Point	SM bass	126	100	77.9	128	74	**101**
Rumford	SM bass	11.7	37.3	25.6	14.1	21.2	**22.0**
Riley	SM bass	12.9	12.9	19.4	24.2	22.7	**18.4**
Livermore Falls	SM bass	8.22	21.6	14.2	16.4	31.4	**18.4**
Gulf Island P	SM bass	35.9	10.3	9.0	25.4	28.1	**21.7**
Lisbon	SM bass	15.2	25.0	9.8			**16.7**
Androscoggin L	white perch	29.1	52.3				**40.7**
Pocasset L	SM bass	2.67					**2.67**
Kennebec R							
Norridgewock	SM bass	4.21	0.69	0.10	2.40	0.77	**1.63**
	brown trout	8.88	8.91	7.25	7.98	6.28	**7.86**
Fairfield	SM bass	0.41	2.25	1.75	2.89	1.24	**1.71**
	brown trout	13.5	11.5	9.91	8.19	7.68	**10.2**
Sidney	SM bass	7.7	31.2	0.0	0.0		**9.73**
Augusta	SM bass	158	101	126	108	60.8	**111**
Gardiner	SM bass	42.1	35.2	78.2	45.5	36.4	**47.5**
Bowdoinham	eel	264	726	232	286		**377**
Penobscot R- Orrington	eel (lg)	12.4	45.0	272	63.5		**98.3**
	eel (sm)	68.5	41.4				**54.9**

3.2 AMBIENT BIOLOGICAL MONITORING

IN A SEPARATE SECTION

3.3

CUMMULATIVE EFFECTS ASSESSMENT FISH STUDY

CUMMULATIVE EFFECTS ASSESSMENT OF FISH STUDY

To date, most SWAT studies of fish have focused on the effects of persistent, toxic, and bioaccumulative (PBT) contaminants on human consumers, with some consideration of impacts to wildlife consumers as well. Direct effects on fish populations have been measured or estimated by other DEP programs able to detect only relatively severe impacts on survival, growth, and reproduction. Recent studies (Adams et al, 1992; Kavlock et al, 1996; Munkittrick et al, 1998; Rolland et al, 1997) have measured other more subtle effects on development, immune system function, and reproduction not normally seen in testing regimes historically used by DEP. These effects may be a result of long term exposure to relatively low levels of contaminants or cumulative effects of exposure to many low-level 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, such as cumulative effects-driven assessments of fish populations have been developed to measure some of these effects.

With the assistance of Environment Canada (EC), DEP has conducted cumulative effects-driven assessments of fish populations on the St John River in 1999-2001 that have documented impacts to fish populations and identified a previously unknown source. In 2000 EC assisted DEP in similar studies of the North Branch of Presque Isle Stream and Prestile Stream, where high concentrations of DDT, a known endocrine disruptor, have been previously found. Results showed a significant reduction in gonad size in both streams compared to two reference streams with much lower DDT levels in fish. Impacts on the population could not be determined due to lack of reference streams of similar productivity in the area that had not been subjected to DDT.

In Maine, a 1994 partial cumulative effects-driven assessment of a fish population from the Androscoggin River (Gulf Island Pond) downstream of 3 bleached kraft pulp and paper mills with secondary treatment, documented some of the effects found in studies elsewhere (McMaster et al, 1996). Female white suckers showed increased mixed function oxidase enzymes (MFO), reduced levels of circulating estradiol (E2), reduced gonad size (gonadosomatic index, GSI), and increased levels of circulating testosterone (T) when compared to a reference population in Androscoggin Lake. In-vitro steroid production by ovarian follicles showed no differences in basal and human chorionic gonadotropin (hCG) stimulated E2 between experimental and reference stations, but in-vitro basal levels of T were reduced in the exposed fish in contrast to circulating levels. No other lesions in the pathway were measured, unlike previous studies elsewhere. Exposed brown bullhead showed induction of MFO for both sexes. There were no other differences in any measure in females between the populations. Condition factor was lower in exposed males than in unexposed males. There were decreased circulating levels of T and 11 ketotestosterone (11-KT) in exposed males but in vitro levels of both were similar at both sites.

Since 1994, the 3 bleached kraft mills on the Androscoggin River have made significant modifications to their process, primarily to decrease their discharge of dioxin. Modifications include changes in brownstock washing, reduced use of precursors, and increased recovery of chemicals. These changes have improved the overall quality of the effluent. Most important of all is a switch to elemental chlorine free (ECF) bleaching, using oxygen and chlorine dioxide

(CLO2) instead of elemental chlorine, by the end of 1999. The primary objective of this study was to determine if ECF and other changes in effluent quality since 1994 have eliminated impacts on reproductive performance of fish from the Androscoggin River. A second objective was to determine, if impacts have not been eliminated, whether or not impacts could be measured at a population level. The conceptual model is that endocrine disrupting substances in the discharges from the bleached kraft pulp and paper mills and/or municipal treatment plants result in differences in circulating levels of E2, 11-KT, and T between experimental and reference stations, which lead to adverse effects on populations as indicated by GSIs, population estimates and other population characteristics. Another objective was to determine if other biomarkers, such as plasma cortisol (F) levels, liver somatic index (LSI) and MFO activity, are correlated with circulating levels of sex steroids and linked to population level effects.

In 2001 and 2002 we repeated and expanded the study conducted in 1994 on white suckers. We sampled white suckers from the Androscoggin River from Lake Umbagog to Gulf Island Pond and Androscoggin Lake. These were stations above and below the 3 major bleached kraft pulp and paper mill discharges and the latter two stations that were sampled in 1994. We measured population indices (GSI, age structure, growth rate (length at age), and condition factor). We also measured biomarkers of fish performance (E2, T, 11-KT, LSI, and MFOs). In 2002 we added a second reference at Pocasset Lake, immediately upstream from Androscoggin Lake but not subject to flooding by the Androscoggin River. In 2003 we resampled fish from Gulf Island Pond, Androscoggin Lake and Pocasset Lake. The pulp mill and paper mill in Berlin NH had been down since August and September 2001 respectively, with the paper mill resuming operation in June 2002 and the pulp mill resuming only in April 2003. Therefore, in late summer of 2003, the studies were repeated above and below that mill.

Results show that the mean age of suckers varied from year to year at each station, but there was no consistent difference with any of the stations over the 3 year study (Figures 3.3.1 and 3.3.2).

Mean length at Gulf Island Pond (AGI) was significantly lower than the next upstream station (Livermore Falls ALV) for the only two years both were measured and lower than the Rumford Point station (ARP) for the third year (Figures 3.3.3 and 3.3.4). The lower mean length at AGI did not correlate to the discharges from the mills as evidenced by specific conductance, a marker for pulp and paper mill discharges. Since there are no major point sources between ALV and AGI, these differences cannot be ascribed to any known source. Mean length was greater in suckers from Androscoggin Lake for females in 2 of 3 years and for males in all three years and greater still in suckers from Pocasset Lake for both years measured. The reason for lower mean length at AGI may be the result of reduced growth. Given that age at AGI is not significantly different, then growth rates must be lower resulting in lower mean length. AGI in an impoundment with poor dissolved oxygen on the bottom, and low dissolved oxygen is known to reduce growth in fish. Another possible cause of lower mean length in AGI is that there is a commercial fishery in the tributaries to AGI during the spring spawning run. This doesn't seem likely as estimates of the number taken (3000, 1400, >100) are small percentages of the total population estimated by mark-recapture (73,000, 98,000, >112,000) for 2001, 2002 and 2003 respectively.

Figure 3.3.1 AGE OF FEMALE SUCKERS FROM THE ANDROSCOGGIN RIVER 2001-2003

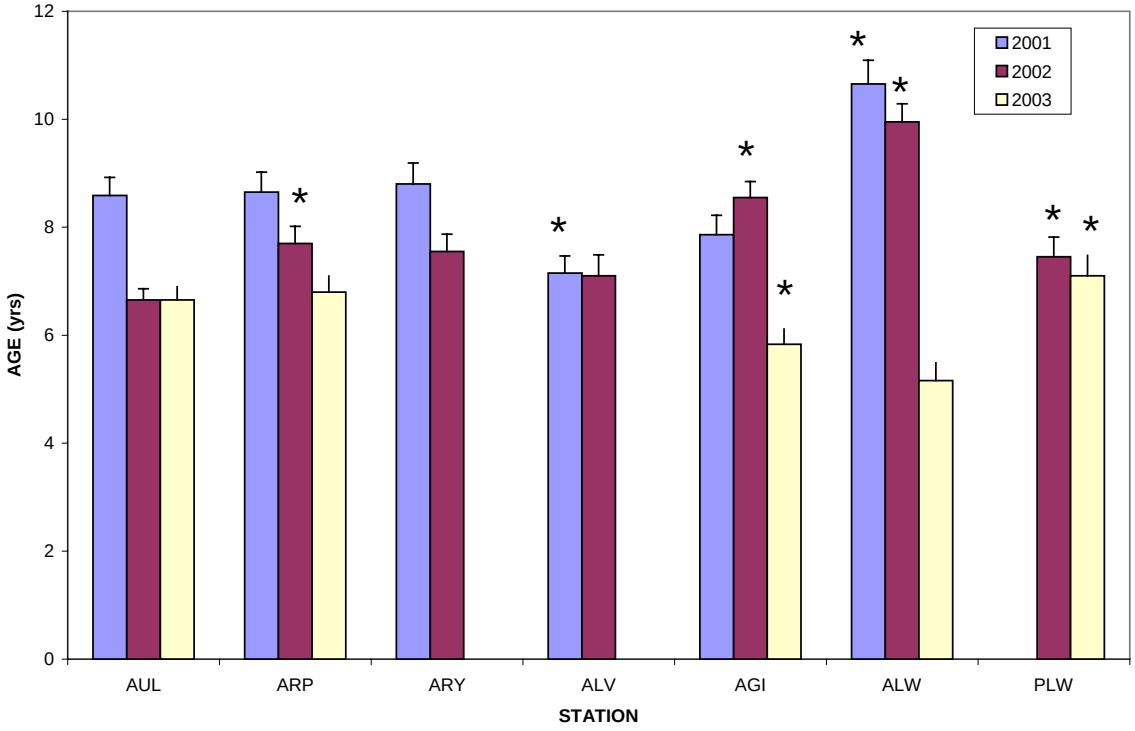


Figure 3.3.2 AGE OF MALE SUCKERS FROM THE ANDROSCOGGIN RIVER 2001-2003

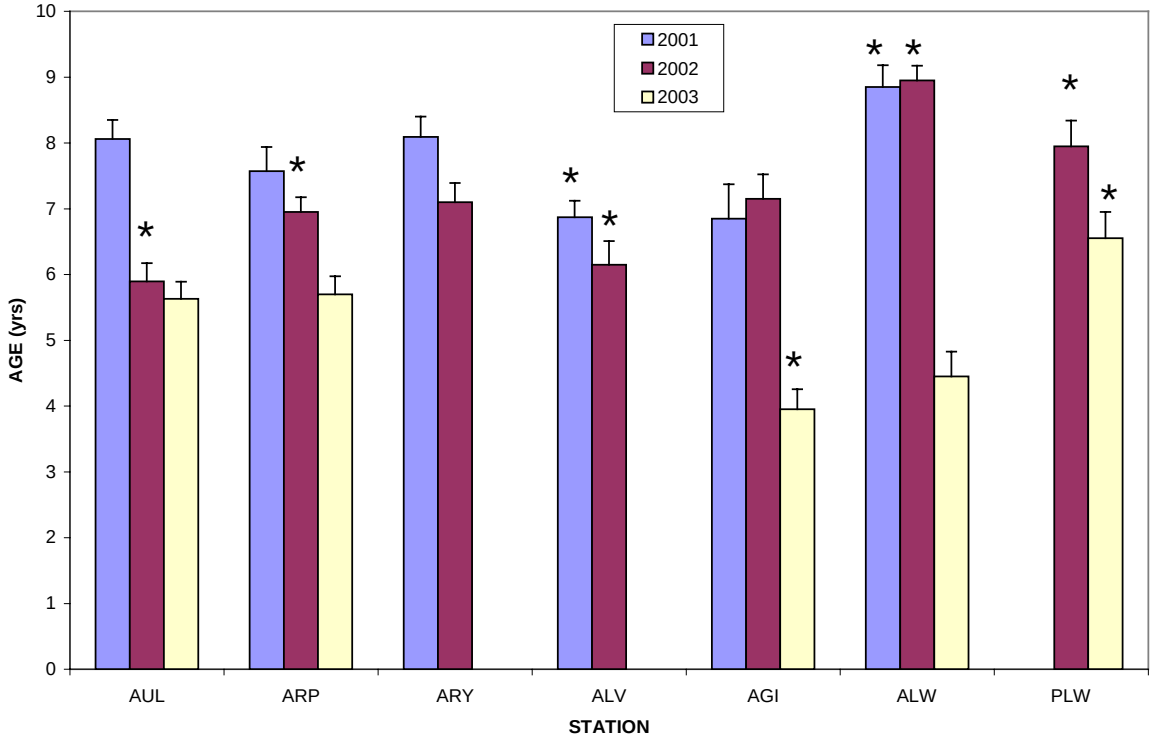


Figure 3.3.3 LENGTH OF FEMALE SUCKERS FROM 2001-2003 AND SPECIFIC CONDUCTANCE (SC) FROM THE ANDROSCOGGIN RIVER

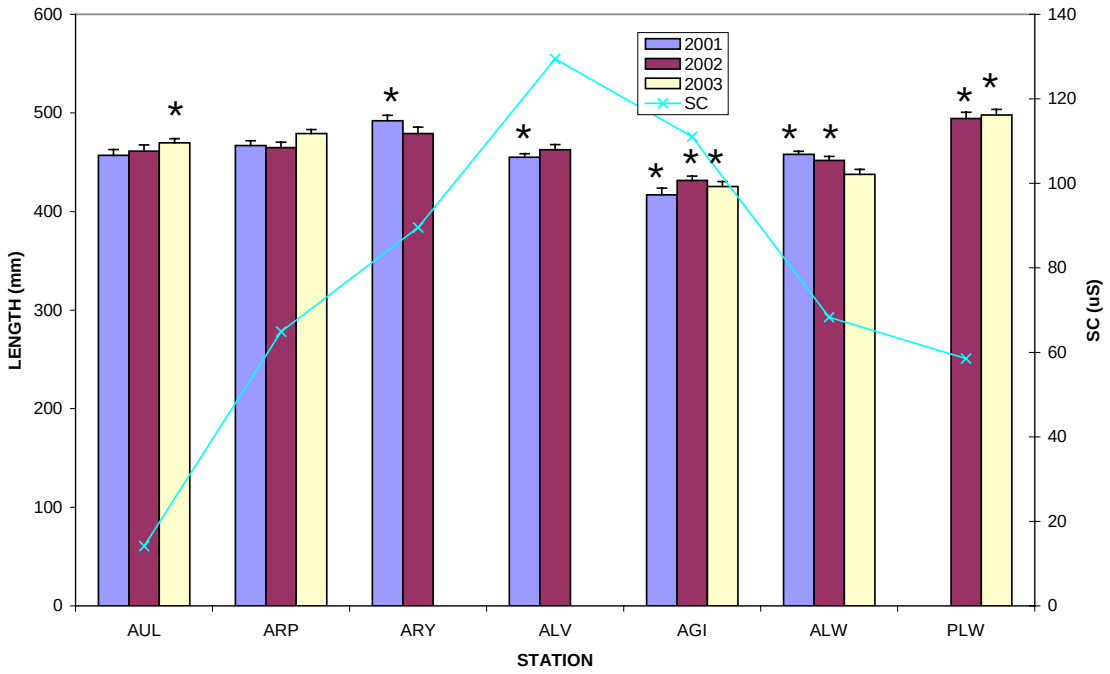
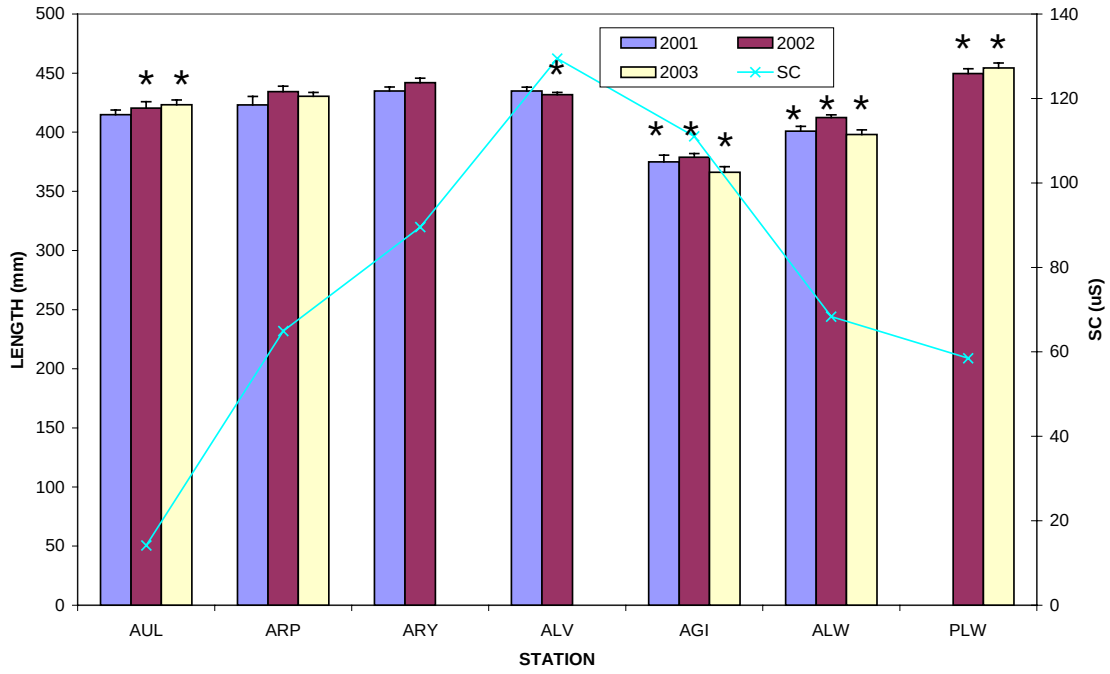


Figure 3.3.4 LENGTH OF MALE SUCKERS 2001-2003 AND SPECIFIC CONDUCTANCE (SC) IN THE ANDROSCOGGIN RIVER



Condition factor (K=length/weight^{3}x100) of fish is a measure of overall fitness. K was greater in female suckers below the Berlin NH mill, ARP, than above at Umbagog Lake, AUL, for all 3 years (Figure 3.3.5). Apparently resumption of the mill's discharge in 2003 had no significant effect on K of suckers downstream at ARP. This is interesting since DEP had received a number of complaints about poorer water quality downstream in Maine since the mill came back on line. There were no other stations where there was a significant difference for all years. But there was an overall increase in K from AUL downriver to below the International Paper Co mill in Jay (ALV) and then a decline for both sexes for all three years (Figures 3.3.5 and 3.3.6). This seemed to follow the specific conductance, a marker for the discharges from the mills. Specific conductance also mirrored the pattern for total phosphorus, a significant nutrient. The overall increase in fitness, then, may be a result of increased food brought on by the increased organic matter and nutrients from the discharges from the mills and towns. The town discharges are approximately 1-12% of the organic and nutrient load respectively of the mills load to the river. An exception to the pattern in K, is Pocasset Lake (PLW) where K is higher than AGI and ALW for both sexes while SC and TP are relatively lower than AGI and ALW.

Gonad size (GSI) was significantly greater in both sexes at ARP compared to AUL for all years (Figures 3.3.7 and 3.3.8) as was the case for K in females. Also like K, there was a general overall increase in GSI from AUL to ALV and then a decline to AGI and ALW and increase at PLW. There was more variability from year to year at many stations, however, so the pattern was not as consistent as it was for K, especially for 2002. This was opposite of the expected decline in GSI below the mills and towns if there had been a negative effect of endocrine disrupting substances from the discharges. The pattern generally followed that of specific conductance and it appears that organic and nutrient enrichment is the predominant impact of the discharges.

Liver size (LSI) is a measure of enzymatic activity of processing xenobiotics. Abnormally large livers may also be a result of storage of energy, which may be diverted from other physiological processes due to some lesion in the metabolic pathway. Like K and GSI, LSI was increased at ARP compared to AUL, but for all 3 years in males and 2 years in females. There was the same overall pattern of increase from AUL to ALV, decline to AGI and ALW, but there was no significant increase at PLW. There was less variablity from year to year than there was for GSI. This was the expected pattern and may simply be a function of organic and nutrient enrichment from the discharges as indicated by specific conductance. Examination of MFOs for 2001 showed an increase at ARP only and therefore do not indicate any metabolic disruption for downstream stations that could explain increased LSI. The data from 2002 and 2003 are expected from the lab soon.

None of the indices of fitness or population (mean age, mean length, K, GSI) indicated any negative toxic effect of discharge from the mills or towns. The overall response was one consistent with nutrient enrichment. There is a natural increase from the headwaters to the lowlands in most rivers due to accumulation of nutrients with increased activities in the watershed. But here the increase is followed by a decrease that is consistent with the increased discharges of organics and nutrients from the mills as indicated by specific conductance.

Figure 3.3.5 K OF FEMALE SUCKERS AND SPECIFIC CONCUCTIVITY (SC) FROM THE ANDROSCOGGIN RIVER 2001-2003

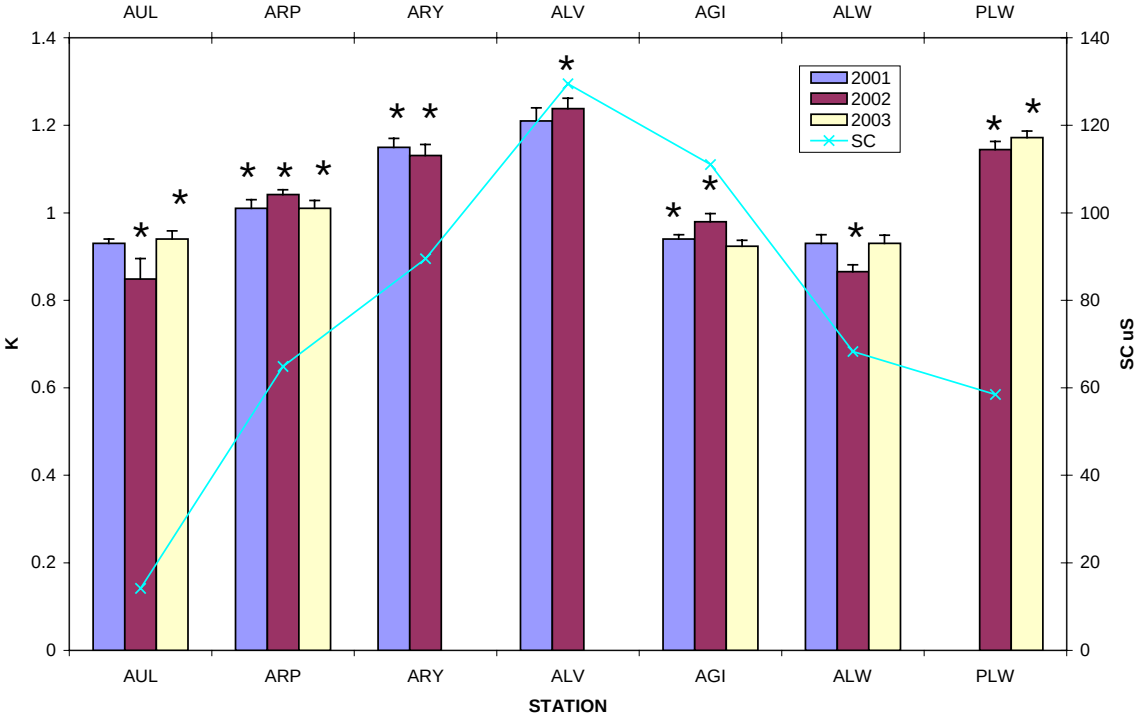


Figure 3.3.6 K OF MALE SUCKERS 2001-2003 AND SPECIFIC CONDUCTIVITY (SC) FROM THE ANDROSCOGGIN RIVER

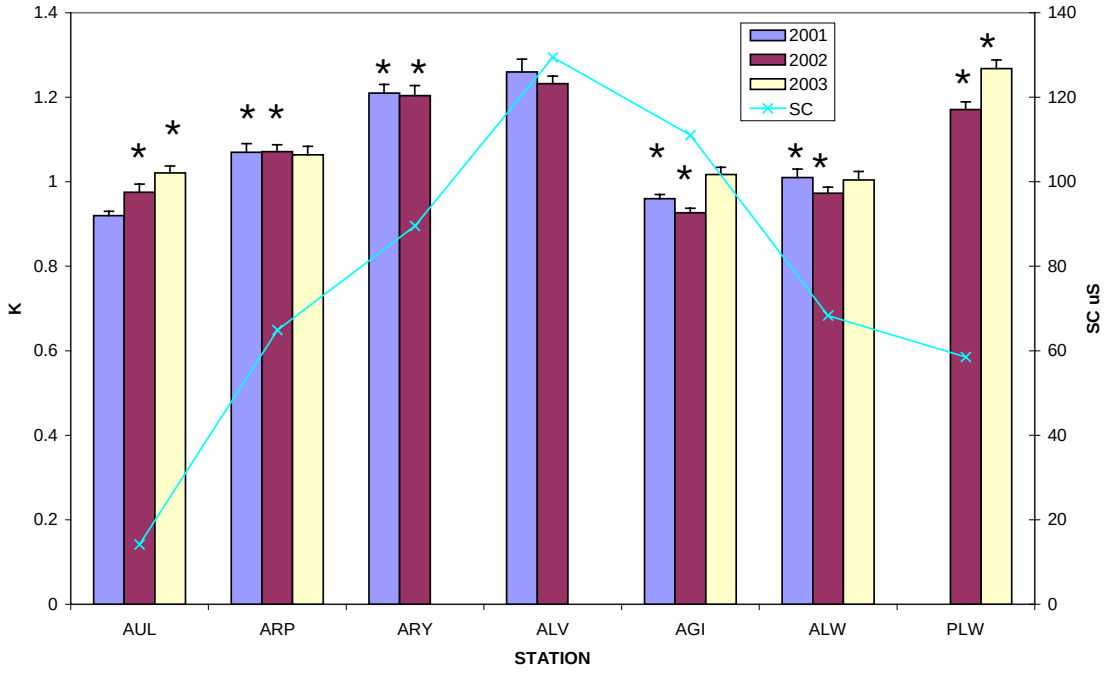


Figure 3.3.7 GSI IN FEMALE WHITE SUCKERS 2001-2203 AND SPECIFIC CONDUCTIVITY (SC) FROM THE ANDROSCOGGIN RIVER

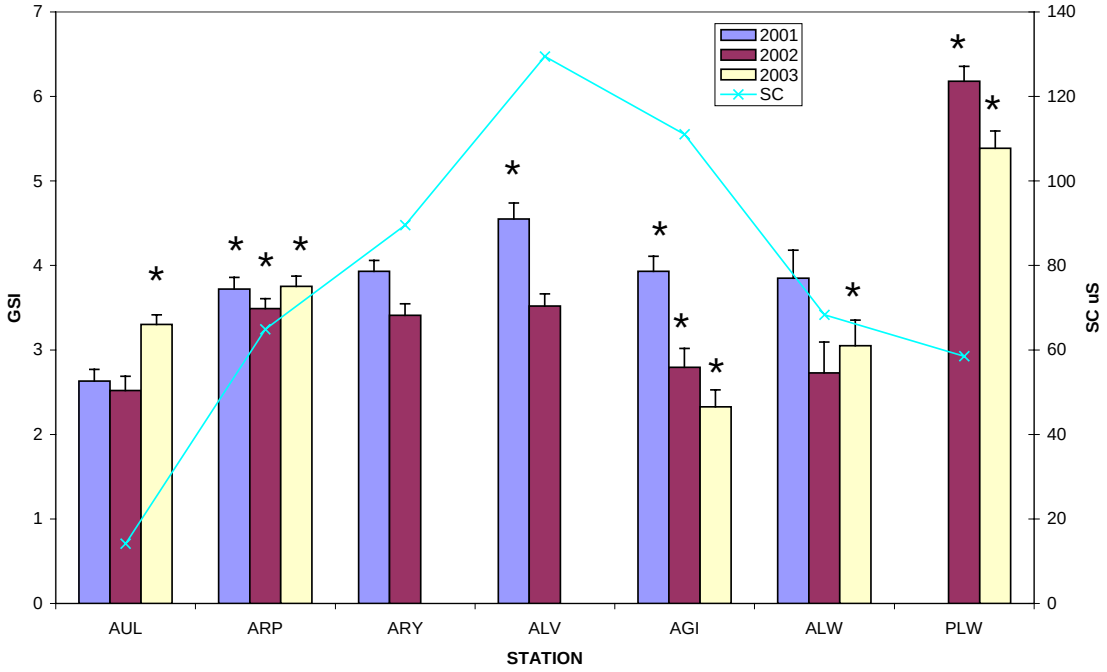


Figure 3.3.8 GSI IN MALE SUCKERS 2001-2003 AND SPECIFIC CONDUCTIVITY (SC) FROM THE ANDROSCOGGIN RIVER

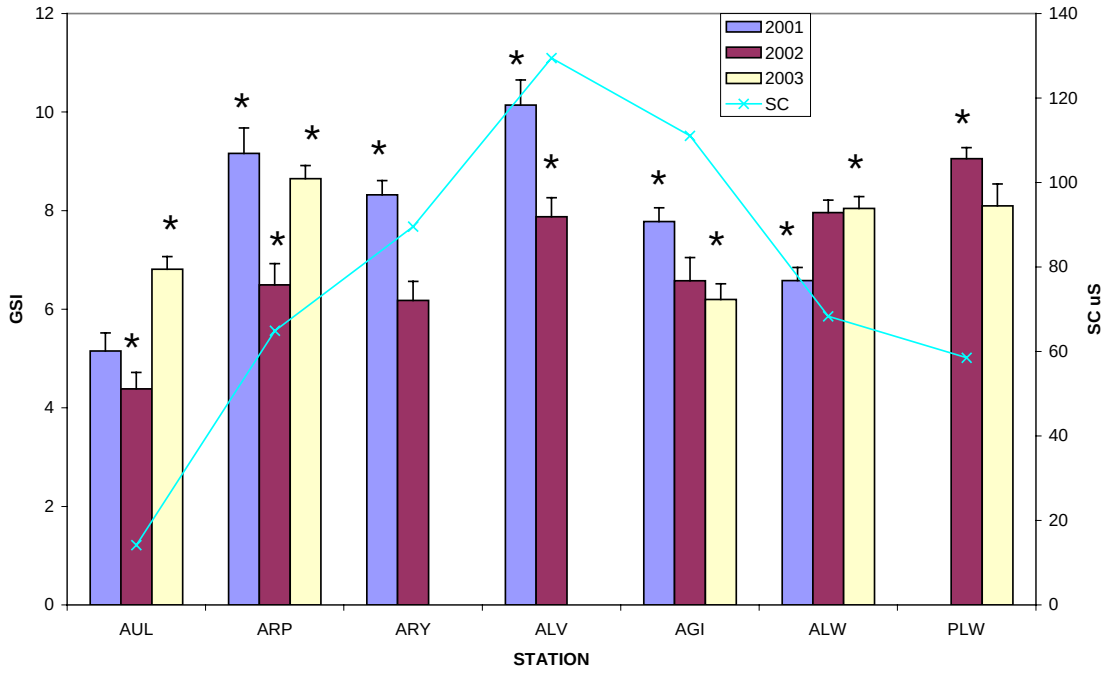


Figure 3.3.9 LSI IN FEMALE WHITE SUCKERS 2001-2003 AND SPECIFIC CONDUCTIVITY FROM THE ANDROSCOGGIN RIVER

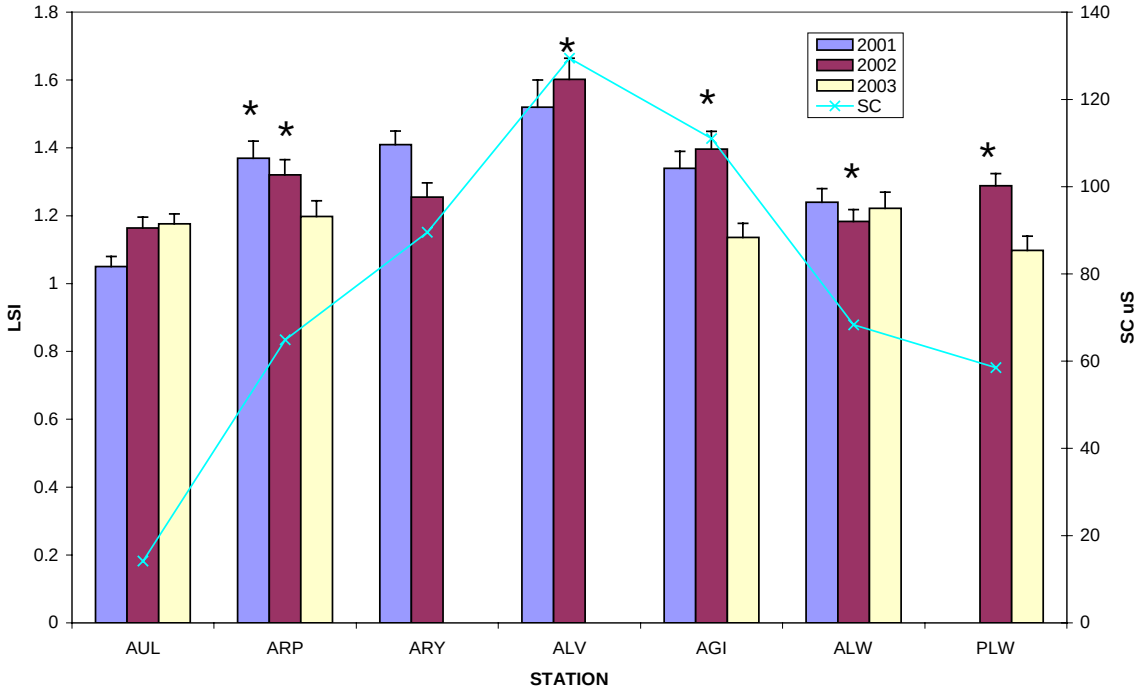
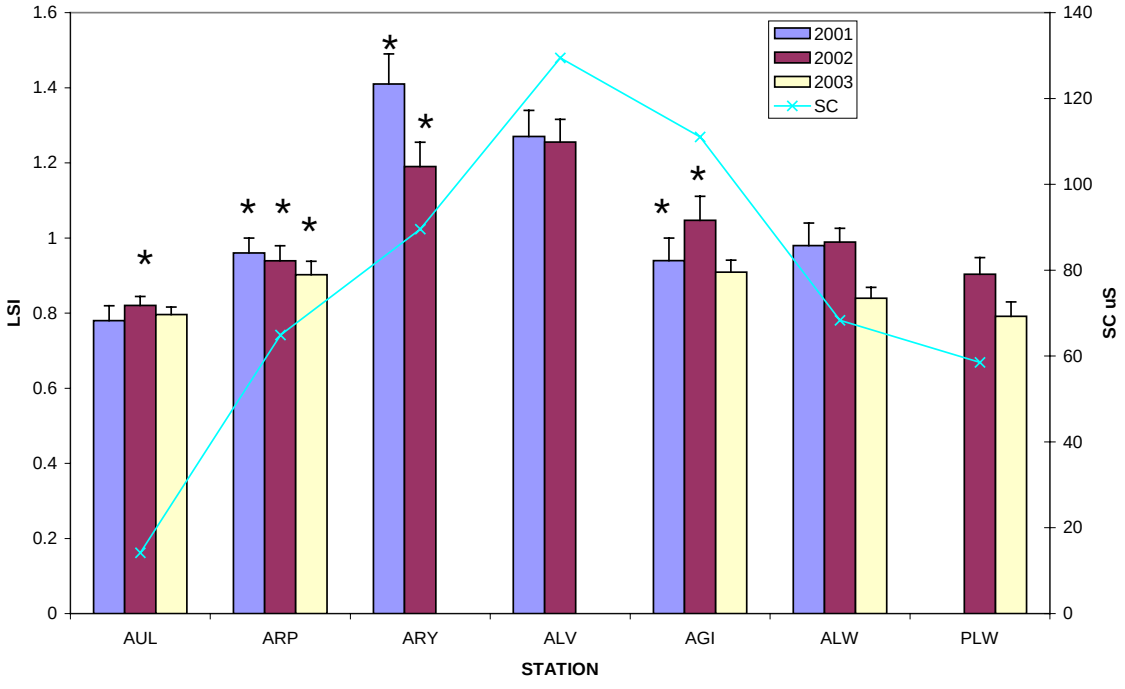


Figure 3.3.10 LSI IN MALE WHITE SUCKERS 2001-2003 AND SPECIFIC CONDUCTIVITY FROM THE ANDROSCOGGIN RIVER



There were no differences in T or E2 in female suckers between any pair of stations above and below a mill that were consistent for all years (Figures 3.3.11 and 3.3.12). Nor were there any differences in T or 11-KT in male suckers that were consistent at any pair of stations for all years (Figures 3.3.13 and 3.3.14). T was reduced at ARP in 2002 and 2003; the Berlin NH paper mill was in operation in 2002 with the pulp mill coming back in April 2003. Nor was any general pattern corresponding to the specific conductance evident. Therefore, there was no relationship to mill discharge or nutrient enrichment and restarting the mill had no effect that we could measure on the white sucker population downstream at Rumford Point.

The pattern of responses in steroids found in the 1994 comparison of Gulf Island Pond in the Androscoggin River (AGI) and Androscoggin Lake (ALW) were not found in the 2001-2003 studies of these waters. Apparently the responses noted in 1994 have gone away possibly as a result of the changes in bleaching technology at the mills.

In 2002 we added a second reference station, Pocasset Lake in Wayne. Since there were significant differences in biomaker and population indices responses with Lake Umbagog, we sampled both again in 2003. Pocasset Lake is a reference for Androscoggin Lake, immediately downstream, where dioxin has been discovered in fish since 1994. There were no consistent differences in steroid levels in fish from Gulf Island Pond, Androscoggin Lake, or Pocasset Lake. Preliminary analysis of the data show that K and GSI of suckers are reduced at Androscoggin Lake relative to Pocasset Lake, but not to compared to Umbagog Lake. In fact there are often more difference between the two reference stations than between Pocasset Lake and Androscoggin Lake.

Many studies have also documented effects of heavy metals, PAHs, sewage, and pulp and paper mill waste on fish immune systems (Voccia et al,1994; Holliday et al, 1998; Secombes et al, 1992; Ahmad et al, 1998). In 2002 and 2003 we looked at the spleen somatic index (SSI) and kidney somatic index (KSI) as rough indicators of immune system effects. There was no siginificant increase in SSI below the mills for either sex of either year (Figures 3.3.15 and 3.3.16). In fact there was a general pattern of decreasing SSI beginning at AUL and progressing downstream. This may represent some effect on the integrity of the immune system. More definitive studies are necessary to make a better determination.

Studies of caged mussels in 2003 on the Androscoggin River showed no negative impacts on growth rate or induction of vitellin, a reproductive protein marker of endocrine disruption. This result is consistent with studies of fish in the river from 2001-2003 which also show no clear evidence of endocrine disruption. The most obvious response to the discharges seems to be one of organic and nutrient enrichment.

Figure 3.3.11 T IN FEMALE SUCKERS FROM THE ANDROSCOGGIN RIVER 2001-2003

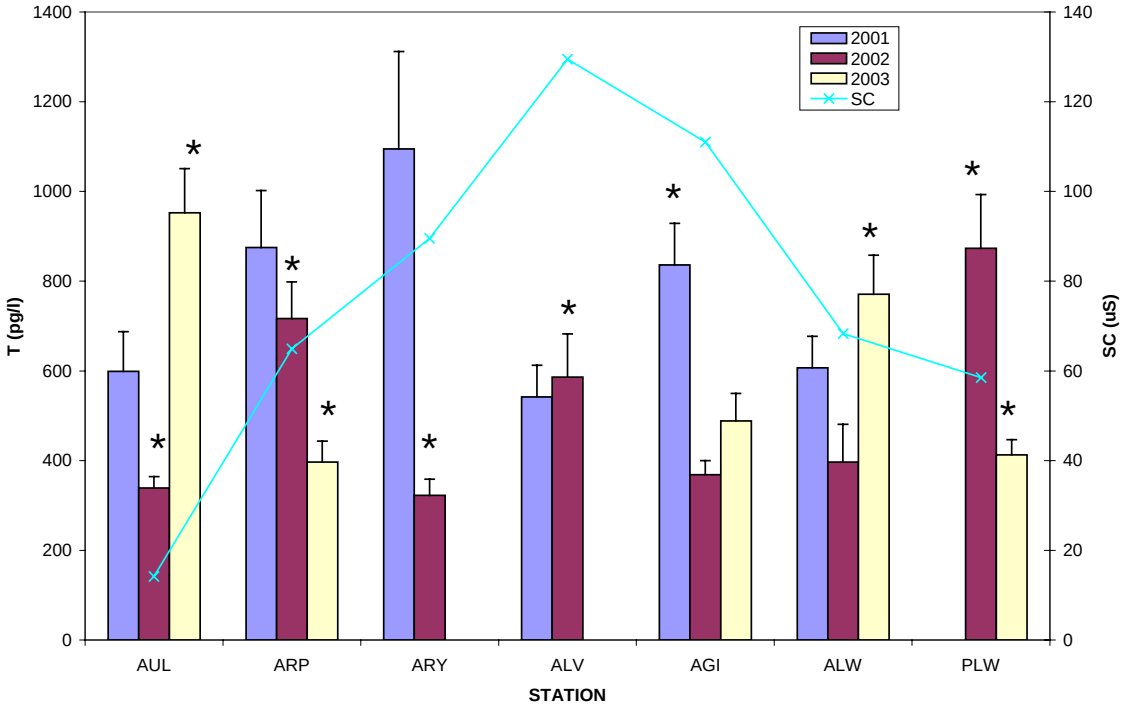


Figure 3.3.12 E2 IN FEMALE SUCKERS 2001-2003 AND SPECIFIC CONDUCTANCE (SC) IN THE ANDROSCOGGIN RIVER

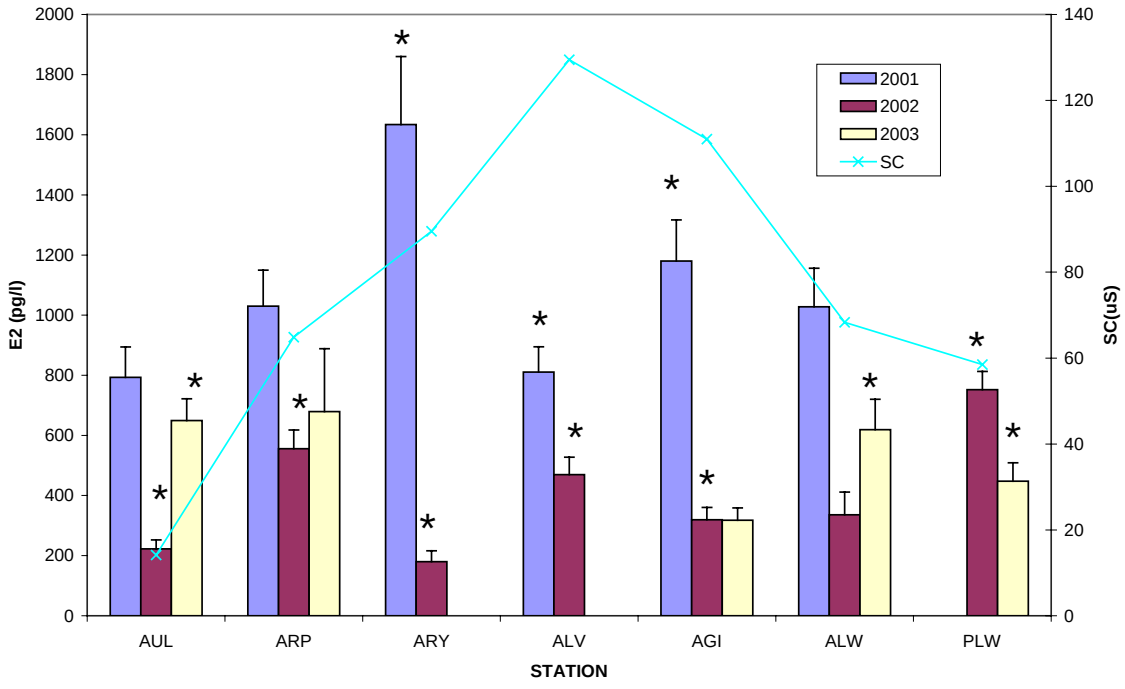


Figure 3.3.13 T IN MALE SUCKERS 2001-2003 AND SPECIFIC CONDUCTANCE (SC) IN THE ANDROSCOGGIN RIVER

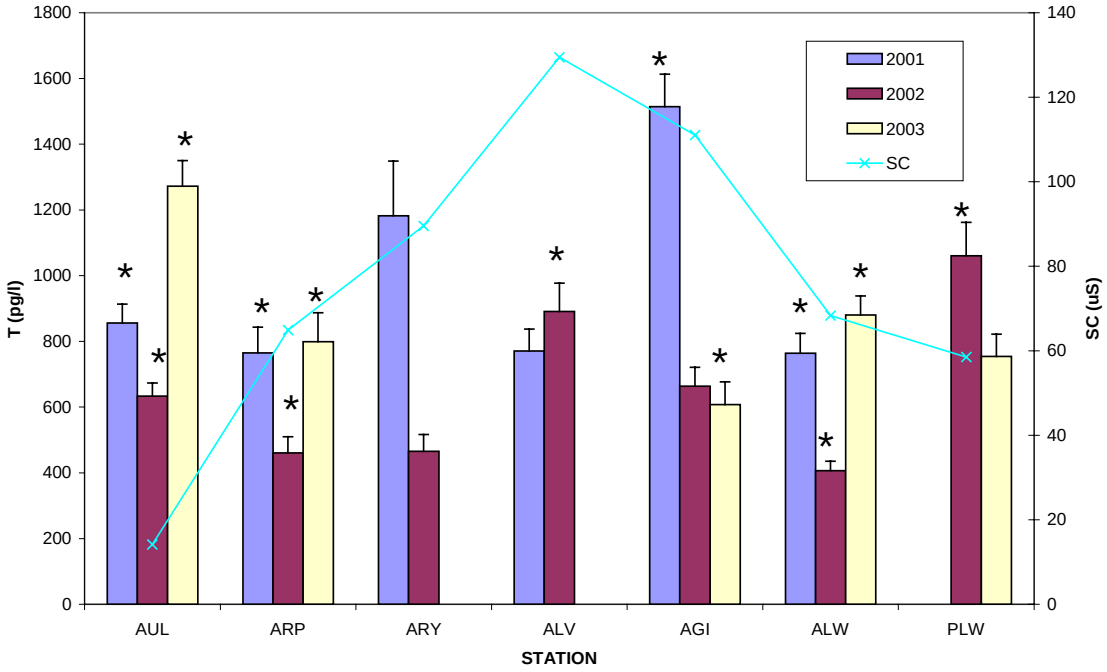


Figure 3.3.14 11KT IN MALE SUCKERS 2001-2003 AND SPECIFIC CONDUCTANCE IN THE ANDROSCOGGIN RIVER

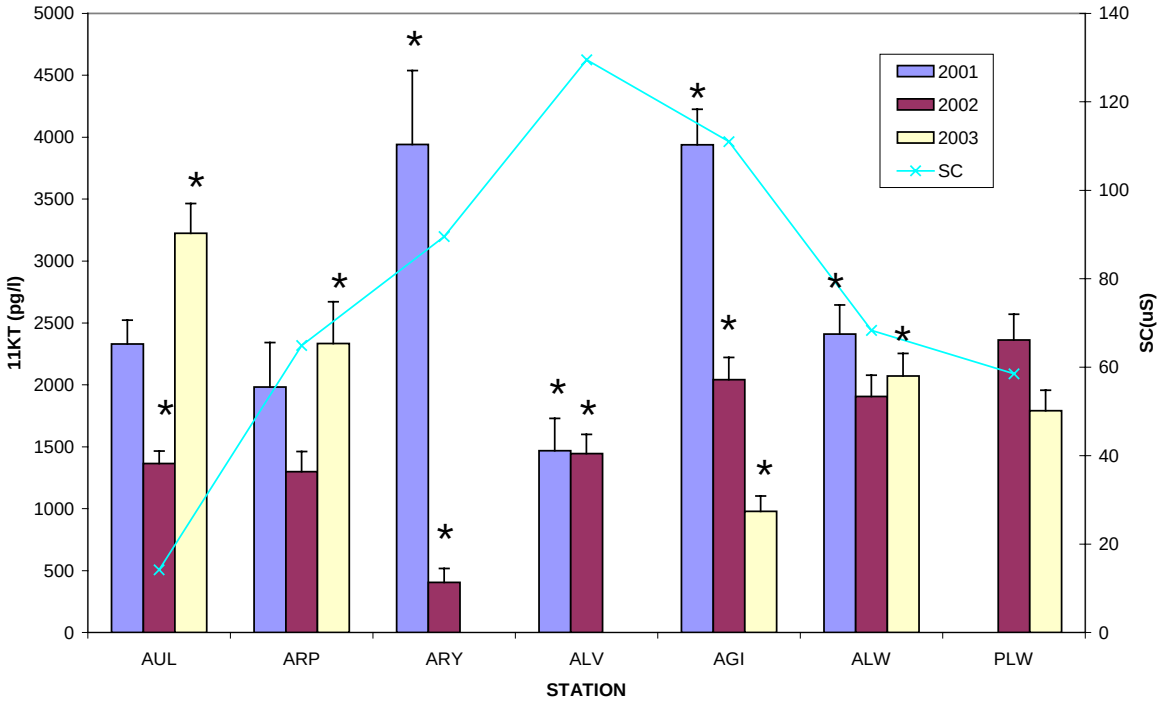


Figure 3.3.15 SSI IN FEMALE SUCKERS FROM THE ANDROSCOGGIN RIVER 2002-2003

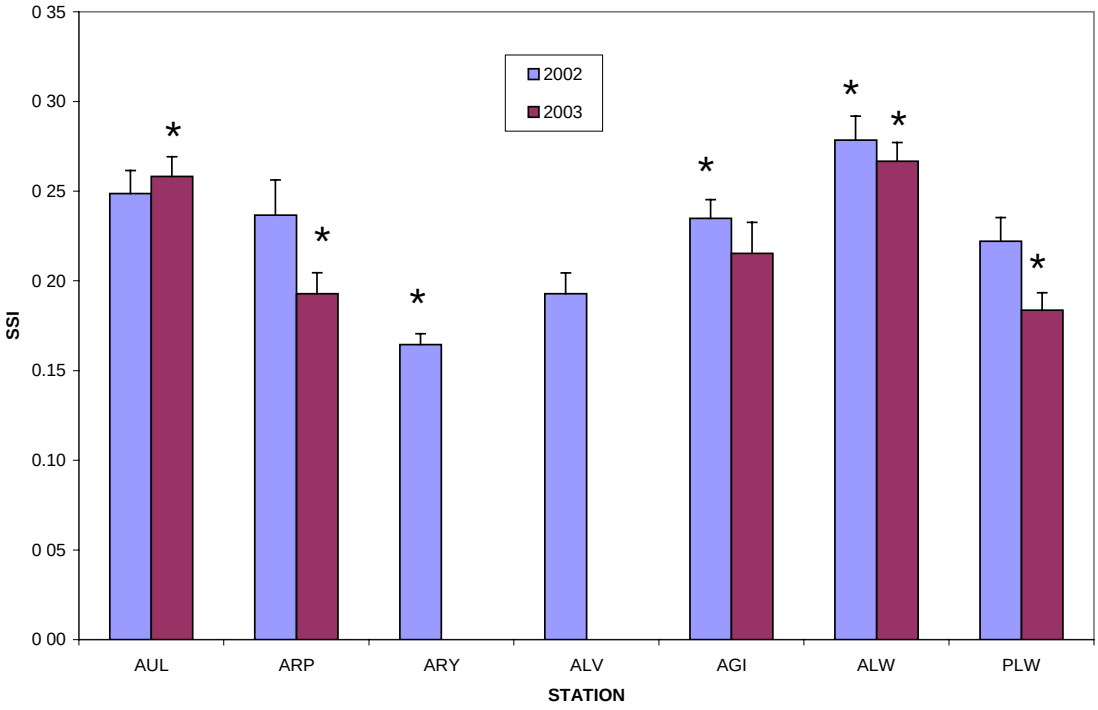
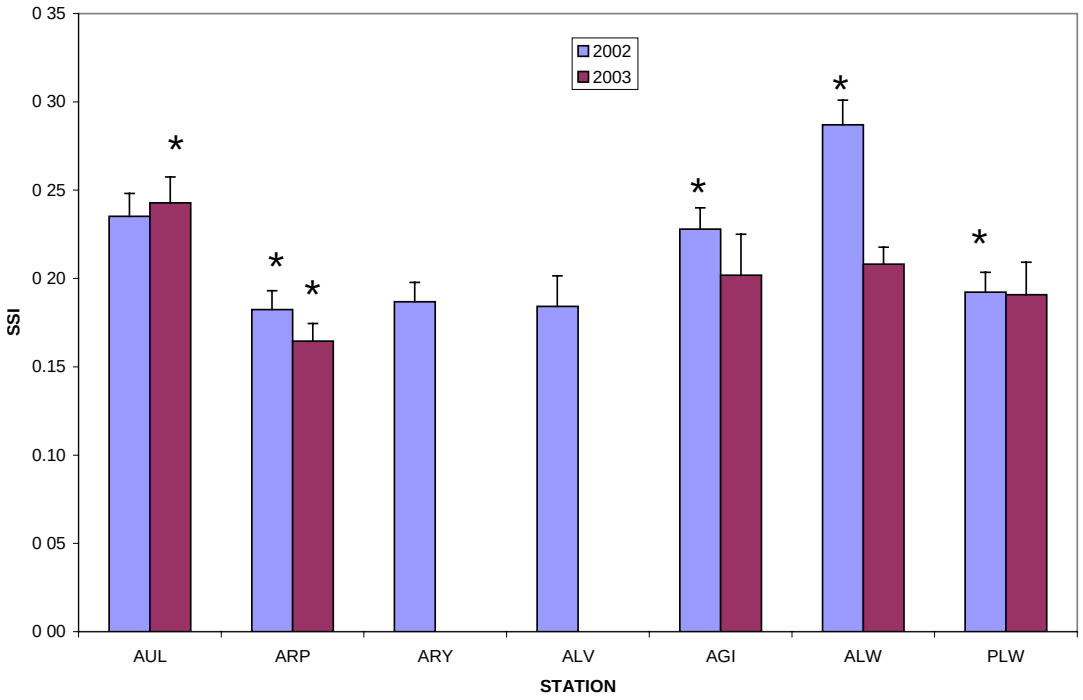


Figure 3.3.16 SSI IN MALE SUCKERS FROM THE ANDROSCOGGIN RIVER 2002-2003



3.4

DNA DAMAGE ASSESSMENT IN SUCKERS USING THE COMET ASSAY

DNA DAMAGE ASSESSMENT IN SUCKERS USING THE COMET ASSAY

Dr. Blake Whitaker, Lewiston-Auburn College, USM

During September and October of 2002, the Maine Department of Environmental Protection collected suckers above and below dam sites on the Androscoggin River for use in an endocrine disruption study. Anticoagulated blood samples from these fish were assessed by the comet assay for evidence of DNA damage. Statistical analysis of the mean comet areas grouped by location of fish capture revealed statistically significant differences. This study utilized a double blinded protocol. The code was broken after mean comet areas were determined to allow for ANOVA linear regression analyses.

Materials and Methods: Erythrocytes were obtained from sucker fish captured by netting. Two hundred microliters of venous blood was drawn into a heparinized syringe, ejected into labeled microfuge tubes, and stored on ice protected from light. Comet assays were performed essentially according to Singh's (1988) alkaline modified single cell DNA electrophoresis procedure with minor changes (Morris et al. 1999). Clear microscope slides were etched in a simple grid pattern using a diamond-tipped engraver to ensure adherence of the three agarose layers. A base layer of 75 l 1.0% SeaKem (BioWhitaker Molecular Applications, Rockland, ME Cat # 50152) normal melting point agarose in phosphate buffered saline, pH 7.2 was added to etched slides and allowed to dry at room temperature. The sample layer consisted of 75µl of 0.5% SeaPlaque (BioWhitaker, Cat # 50101) low melting point agarose (LMPA) containing ~10,000 erythrocytes covered with a 22 x 50 mm coverslip. The final layer was applied by adding 75µl of LMPA atop the sample layer. All subsequent steps were performed under reduced yellow light. After complete polymerization of the agarose, the slides were lowered into lysing solution (2.5 M NaCl, 100 mM EDTA, 10 mM Tris, 10% DMSO) at pH 10.0 and held at 4^{o}C overnight in the dark. The slides were then drained of lysing solution and covered with an alkaline buffer (0.3 N NaOH, 1 mM EDTA) for forty minutes to allow the DNA to unwind. Electrophoresis was achieved by subjecting the slides to 265-275 mA at 25 V in the alkaline buffer for 20 minutes. After electrophoresis, the slides were held in neutralizing buffer (0.4 M Tris, pH 7.5) in the dark for 5 minutes. The buffer was replaced once and drained. The slides were stained by dropwise addition of 60 microliters of Sybr Gold (Molecular Probes, Inc., Eugene, OR- Cat #S-11494) prepared according to the manufacturer's instructions, held for 20 minutes, and then assessed for comet formation. Digital micrographs were obtained by examining the slides at 200X with a Nikon fluorescent microscope equipped with a B-2A filter cube and a digital SPOT camera. Serial, non-overlapping comets were photographed and the total comet areas (head and tail) for approximately 50 nuclei per fish were measured using SPOT™ image analysis software (Diagnostic Instruments, Inc., Sterling Heights, MI Version 3.0.4 for Windows 95/98).

Statistical analyses were accomplished using Microsoft® Excel 97 to perform regression analyses and single factor ANOVA. An level of 0.01 was chosen as the threshold for significance.

Results and Discussion: We are disappointed with the low frequency of samples that provided Comets of sufficient quality to be scored. Out of 234 samples received, 121 provided

quality Comet images. This amounts to an assay success rate of only 52%. Our lab's success rate with self-collected samples exceeds 98%. The failed samples from the DEP included those where all the images were apoptotic indicative of hypoxia/stress, microbially contaminated samples, clotted samples, and biochemically degraded samples.

Recommendation- *The Maine DEP and the Whitaker laboratory should collaborate in the field to improve sample handling.*

Statistical analysis of the sample means by location indicated significant differences between the means. This suggests that some agent or agents were affecting the integrity of the DNA in the sucker fish sampled.

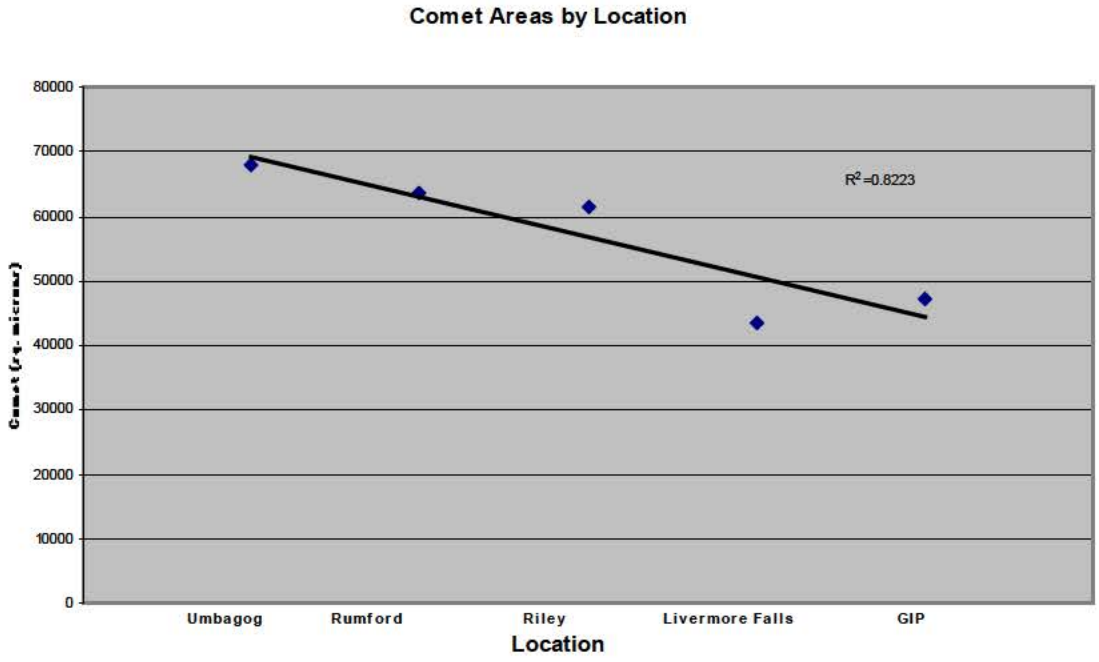
ANOVA

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
UMB	30	2037617	67920.55	1.07E+08
RUM	11	698611.5	63510.14	31942872
RIL	12	737710	61475.83	2.12E+08
LVR	18	783544.5	43530.25	1.58E+08
GIP	24	1159247	48301.94	1.02E+08

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	9.37E+09	4	2.34E+09	19.56564	1.3E-11	3.534979
Within Groups	1.08E+10	90	1.2E+08			
Total	2.01E+10	94				



Linear regression of Comet Area (square microns) by Location demonstrates a decreasing amount of genetic damage as one samples fish downstream. The R^2 value indicates that approximately 82% of the change in comet areas is attributable to a factor associated with location in a downstream gradient. Factors that might be considered include: elevation, Teqs for anthropogenic chemicals, distance and time from sampling to laboratory, methods of collection.

The mean comet area for fish sampled in Androscoggin Lake (46,979 sq. microns) is intermediate between those for Livermore Falls and Gulf Island Pond.

Recommendation- *We feel that this data and analysis indicates the need for additional studies with greater attention paid to sample handling.*

Conclusion: This initial collaborative study of DNA damage in suckers indicates significant differences between sample sites with a downstream increase in DNA integrity. This observation is contrary to that made concerning samples obtained from smallmouth bass taken from similar locations on the Androscoggin River in 2001 (Chamberland et al., 2002). Suckers and bass feed at different trophic levels and this may account for the observed divergence in DNA damage as assessed by the comet assay.

Recommendation: *Additional longitudinal, blinded genotoxicity studies utilizing both species of fish should yield highly pertinent information. Such data may reconcile the current discordance.*

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3.5

PICES

PISCES : APPLICATION OF PASSIVE SAMPLERS TO ENVIRONMENTAL PROBLEMS IN MAINE

Due to the dissolution of the organics section at the University of Maine Environmental Chemistry Lab, the PICES project was not conducted. The funds were rebudgetted to help cover the increased cost of analyses of the 2002 PCB samples by a commercial lab.

3.6

SEMI-PERMEABLE MEMBRANE DEVICES (SPMDS)

SPMDS

Beginning in 1999 DEP has funded 3 graduate students at the University of Maine's George J. Mitchell Center for Environmental and Watershed Studies to develop the use of semi-permeable membrane devices (SPMDs) for the dioxin above/below test. This report gives the results of the 2002 study, conducted by Bjorn Lake, and the 2003 study, conducted by Lucner Charlestra, both with field assistance from DEP. This is DEP's summary. Bjorn Lake's thesis is available in paper copy only at DEP and the University of Maine.

2002 Study.

Semipermeable Membrane Device (SPMD) research conducted in 1999, 2000, and 2001 has elucidated the ability of SPMDs to be a monitoring technique for dioxin. SPMDs are excellent sequestering devices for trace organic contaminants when deployed for at least 28 days in Maine Rivers. Detectable levels of all toxic dioxin/furan congeners have been quantified by high-resolution gas chromatography/mass spectrometry (HRGC/MS) at the University of Maine. The first 3 years involved refinement of field deployment methods and analytical methods. Compositing of a number of SPMDs is necessary to minimize the detection limit to be able to detect relatively low levels 2378-TCDD if present. One potential advantage of SPMDs over fish is that by nature of tight tolerances in manufacturing, variability in uptake should be lower than in fish, that are different. This has not been the case in the first 3 years and remained the most significant goal in development of the capability. Cleanup, dialysis, and analysis of the SPMDs has proven to be the obstacle to lower variability.

Variable environmental conditions in the river, such as temperature, total suspended solids (TSS), and dissolved organic carbon (DOC) affect uptake and should be similar at both sites to be compared. Because pulp and paper mill discharges are significant sources of these factors, downstream stations have significantly higher levels than the upstream. A new method to account for these differences is the use of permeability reference compounds (PRCs), other organic compounds with similar solubility to the dioxin but that would not be expected to be found in the rivers. The PRCs are spiked into the SPMDs prior to deployment. Through aqueous diffusion the PRCs leave the SPMDs at an elimination rate assumed to be similar to the uptake rate of dioxins. By measuring the elimination rate during deployment, uptake or sampling rate of dioxin can be estimated.

In 2002 the SPMDs were deployed above and below the Meadwestvaco mill in Rumford. There were 8 canisters each with 5 SPMDS, 4 of which were combined into a single samples for dioxin analysis, and the fifth that was the PRC sample. Therefore there were 8 dioxin samples and 8 PRC samples at each station. Four deuterated polynuclear aromatic hydrocarbons (PAHs, acenaphthylene, phenanthrene, benzo(a)pyrene, and pyrene, LOG Kow 3.45-6.35) were used as PRCs.

Results show that 2378-TCDD was detected in only 3 of 8 samples above and only 1 of 8 samples below the mill at a method detection limit of 0.221ug/g. 2378-TCDF was detected in all samples at a method detection limit of 0.229 ug/g. TCDF was significantly higher above the mill than below the mill. The variability (CV) for TCDF, the two PeCDFs, and TEQ was is

slightly better than the norm for fish. More fish samples had measurable concentrations of TCDD than did the SPMDs. One reason may be that the SPMDS may be less efficient in sampling TCDD than are fish. Another reason may be that the exposure time is too short for the SPMDs. It may also be that the fish are sampling historical discharges and the SPMDs current discharges.

Figure 3.6 Dioxin and furan in 2002 SPMD samples (pg/g)

sample ID	RU2D1	RU2D2	RU2D3	RU2D4	RU2D5	RU2D6	RU2D7	RU2D8	MEAN	CV
congener										%
2378-tcdf	8.4	9.3	9.7	10.6	13.4	11.1	9.6	12.9	10.63	16.6
12378-pecdf	1.35	1.33	1.3	1.2	1	1.54	1.39	1.72	1.35	15.8
23478-pecdf	2.01	2.18	2.05	2.22	3.62	2.46	2.31	2.83	2.46	17.8
123478-hxcdf										
123678-hxcdf										
234678-hxcdf										
123789-hxcdf										
1234678-hpcdf										
1234789-hpcdf										
ocdf										
2378-tcdd	0.267	<DL	<DL	<DL	1.77	<DL	<DL	0.711	0.92	155
12378-pecdd										
123478-hxcdd										
123678-hxcdd										
123789-hxcdd										
1234678-hpcdd										
ocdd										
TEQ	2.31	2.16	2.13	2.33	3.7	2.51	2.27	3.92	2.67	26.9

sample ID	RD2D1	RD2D2	RD2D3	RD2D4	RD2D5	RD2D6	RD2D7	RD2D8	MEAN	CV
congener										%
2378-tcdf	7.01	7.18	7.1	6.74	8.3	6.54	2.16	5.62	6.33	11.6
12378-pecdf	0.0637	0.055	0.639	0.851	0.796	0.71	ND	0.624	0.53	15.3
23478-pecdf	1.22	0.892	1.18	1.08	1.46	1.09	0.783	0.924	1.08	17.2
123478-hxcdf										
123678-hxcdf										
234678-hxcdf										
123789-hxcdf										
1234678-hpcdf										
1234789-hpcdf										
ocdf										
2378-tcdd	0.287	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.29	244
12378-pecdd										
123478-hxcdd										
123678-hxcdd										
123789-hxcdd										
1234678-hpcdd										
ocdd										
TEQ	1.63	1.16	1.33	1.25	1.6	1.27	1.77	1.06	1.38	16.3

There was no difference in loss of the polynuclear aromatic hydrocarbons (PAH) used as PRCs between the stations above and below the mill, indicating that the uptake rate of dioxins was probably relatively equal at both sites. However, given the lower log Kow of the PAHs compared to dioxins, there is some question about whether PAHs are good surrogates for dioxins. Some PAHs were completely eliminated while others were not eliminated much at all.

2003 study

In 2003 SPMDs were deployed above and below the International Paper Co mill in Jay at one location above and 3 locations below. These are the same stations where caged mussels were also deployed . The station above the mill and one of those below were also stations were fish were sampled. There were 4 canisters each with 5 SPMDs at each station. From each canister 4 of the SPMDs were combined into one sample for dioxin and furan analysis, while the remaining SPMD was the PRC sample. In order to improve the performance of the PRCs from that of 2002, compounds with a log Kow closer to that of the dioxins were used. Three PCBs (- 2,2' dichlorobiphenyl (PCB-4), - 4,4' dichlorobiphenyl (PCB-15), - 3 44' trichlorobipenyl (PCB-37)), from a group in the same class as dioxins, were used.

Results show that no TCDD was detected at any station (Figure 3.6.2). TCDF was not increased below the mill, and in fact was significantly lower immediately below the mill discharge. These results are similar to those for smallmouth bass for TCDF. However TCDD was detected in suckers and was significantly higher downsteam.

The PRC results were variable. PCB 4 and 15 indicate that the elimination (=uptake of dioxins) rates were similar at ARY above the mill and the first two stations below the mill, ASN and ALV, but were perhaps lower at the station furthest below, ALF. This would suggest that uptake rates of dioxins were similar above and below and that the raw data may be compared directly. On the other hand PCB 37 indicates elimination rate was lower at ARY than the stations below the mill, perhaps due to the lower temperature, dissolved organic carbon (DOC), and total suspended solids (TSS) at ARY. This would suggest that an exposure adjustment factor (EAF) was needed which would cause a decrease in adjusted concentrations below the mill with the result that the overall conclusion would be the same.

Figure 3.6.2 Dioxins in 2003 SPMD samples

SPMD	LOCATION	TCDDL **ng/spmd**	TCDFL **ng/spmd**	DTEoL **ng/spmd**
AR-S1-03 SPM	above	<0.1	0.0622	0.0134
AR-S2-03 SPM		<0.1	0.0679	0.0152
AR-S3-03 SPM		<0.1	0.0627	0.0139
AR-S4-03 SPM		<0.1	0.061	0.0136
mean			**0.0635**	**0.0140**
stdev(s)			**0.0031**	**0.0008**
CV			**0.05**	**0.06**
SN-S1-03 SPM	below 1	<0.1	0.030	0.008
SN-S2-03 SPM		<0.1	0.036	0.008
SN-S3-03 SPM		<0.1	0.040	0.009
SN-S4-03 SPM		<0.1	0.037	0.009
mean		**<0.1**	**0.036**	**0.009**
stdev(s)			**0.004**	**0.001**
CV			**0.11**	**0.09**
MSD E2=[(s1E2+s2E2/r)		**0.000**	**0.000**	**0.000**
MSD=		**0.00**	**0.006**	**0.001**
MSD % ref			9	9
p			3E-05	4E-05
ALV-S1-03 SPM	below 2	<0.1	0.045	0.01035
ALV-S2-03 SPM		<0.1	0.0467	0.01059
ALV-S3-03 SPM		<0.1	0.0485	0.01079
ALV-S4-03 SPM		<0.1	0.0377	0.008335
mean		**<0.1**	**0.0445**	**0.01001625**
stdev(s)			**0.0047**	**0.00114**
CV			**0.11**	**0.11**
AF-S1-03 SPM	below 3	<0.1	0.0465	0.01084
AF-S2-03 SPM		<0.1	0.0472	0.011
AF-S3-03 SPM		<0.1	0.0461	0.01076
AF-S4-03 SPM		<0.1	0.0491	0.01169
mean		**<0.1**	**0.0472**	**0.0110725**
stdev(s)			**0.0013**	**0.00042**
CV			**0.03**	**0.04**

3.7

KENNEBEC RIVER CAGED MUSSEL STUDY

The following report is that of Michael Salazar of Applied Biomonitoring and does not necessarily represent the views of the Maine DEP.

2003 Kennebec River Caged Mussel Study **Final Report**

Prepared for Ed Friedman, Friends of Merrymeeting Bay
In Cooperation With: Barry Mower, Maine Department of Environmental Protection
Prepared by **Applied Biomonitoring,** 11648 – 72nd Place NE, Kirkland, WA 98034
20 February 2004

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1.0 EXECUTIVE SUMMARY

A caged mussel study was conducted in the Kennebec River, Maine during the summer of 2003 to determine the feasibility and scientific value of using transplanted mussels to monitor the effluent from the SAPPI mill at Hinckley, Maine. The study was designed to test whether caged mussels are a viable fish surrogate for monitoring the effluent discharged by kraft mills. Results suggest that caged mussels are a viable option and can provide more detailed information over fine spatial scales that cannot be provided by collecting fish in the impoundments above and below the mill. Although the tissue chemistry results suggest that neither 2,3,7,8-TCDD or 2,3,7,8-TCDF, the most toxic dioxin-furan congeners, are currently being discharged by the mill, growth rate and vitellin induction results suggest that the effluent could be causing some adverse effects on the environment. There were substantial uncertainties associated with the tissue chemistry results, which limits their use for determining whether or not the mill is in compliance. Assuming the tissue chemistry data are correct, the mill is in compliance. The caged mussels survived, grew, and demonstrated the ability to accumulate dioxins and furans in their tissues if these compounds were present in the water column.

The ***primary*** objective was to determine whether the mill is ***currently discharging*** dioxins and furans, particularly 2,3,7,8-TCDD and 2,3,7,8-TCDF, into the Kennebec River by measuring the accumulation of these compounds in mussel tissues. The ***secondary*** objective was to determine if there are any ***adverse ecological effects*** associated with the discharge of mill effluent to the Kennebec River. Potential ecological effects were assessed using a suite of mussel growth rate metrics and the vitellin assay for reproductive status and potential endocrine disruption. An ecological risk assessment approach was used to characterize potential exposure and effects of dioxin-furan congeners, particularly 2,3,7,8-TCDD and 2,3,7,8-TCDF. The main emphasis was on the use of a gradient design to identify potential sources of these chemicals on the river and a weight of evidence approach for reaching conclusions. The working hypothesis of the gradient design was that increasing and decreasing concentrations of chemicals in mussels deployed along the gradient can be used to indicate potential sources. Caged freshwater mussels (*Elliptio complanata*) were deployed in the Kennebec River at 6 stations over a distance of approximately 24 miles. Two stations were positioned above the mill discharge, three stations within the mixing zone, and one station below the Shawmut Dam. A total of 432 freshwater mussels were used.

Average mussel survival was 99%. Increases in shell lengths and whole-animal wet-weights were small, but statistically significant at all stations. Mean percent increase in shell length was about 1% while mean percent changes in whole animal wet-weight (WAWW) were 6%. Of all growth metrics, tissue weights had the greatest increases, based on comparing the end-of-test (EOT) tissue weights with the estimated tissue weight determined from the beginning-of-test (BOT) mussels used for tissue chemistry analysis. Estimated mean tissue weight increased by 43% over the study period. Although increases in shell lengths and whole-animal wet-weights were small, they were statistically significant at all stations. Some statistically significant differences were found in mussel growth (i.e., changes in shell length and WAWW) among stations and along the suspected chemical gradients. Mussels accumulated a limited number of congeners at all stations in the low to sub-parts-per-trillion range. A total of three congeners were detected at all six stations, two dioxins (1,2,3,4,6,7,8-HpCDD, OCDD) and one furan (2,3,7,8-TCDF). 2,3,7,8-TCDF was the most toxic congener detected. The concentrations of 2,3,7,8-TCDF were highest just above the mill discharge and 11 miles below, where the TEQs were also highest. Total PCDD-F concentrations were driven by the presence of OCDD, and total TEQs by the presence of 2,3,7,8-TCDF. The most significant gradient detected was an increasing gradient of 2,3,7,8- TCDF with distance from the mill. The tissue chemistry data suggest that the two most toxic dioxin-furan congeners on which the regulations are based (i.e., 2,3,7,8-TCDD and 2,3,7,8-TCDF) are not being discharged by the SAPPI Mill. The only other congeners detected were octachloro dibenzo-dioxin (OCDD) and heptachloro dibenzo-dioxin (1,2,3,4,6,7,8-HpCDD), but these congeners are generally considered to originate from sources other than mill effluents. Within the impoundment, concentrations of 2,3,7,8-TCDF in mussel tissues were significantly higher above the mill diffuser than below. Concentrations of 2,3,7,8-TCDF in mussels deployed immediately below the diffuser were the lowest measured in this study. The high concentrations of 2,3,7,8-TCDF above the mill and 11 miles below the mill suggest that there may be other sources of these dioxins and furans in those areas. The distribution of lipid-normalized 2,3,7,8- TCDF was identical to the non-normalized data. There was no significant difference in 2,3,7,8-TCDF concentrations in any above-below comparisons.

The increasing gradients away from the mill suggest that it is not appropriate to use stations 13 miles above and 11 miles below for the above-below comparisons to assess current mill discharges. The increasing gradients and variable concentrations of dioxins-furans at other locations within this 24 mile stretch of the river preclude an accurate assessment of current mill discharges using these stations. The weight of evidence from the effects measurements (mussel growth rate and induction of vitellin) suggests that the mill may be discharging some chemicals with the potential for adverse effects. The caged mussel methodology provides an effective alternative for measuring effects, particularly if tissue chemistry analysis remains problematic. Because the focus of DEP's dioxin monitoring program (DMP) is on measuring chemical exposure in fish, effects have never been measured on the Kennebec River, either inside or outside the impoundment. Apparently, dioxins and furans have not been measured in fish within the impoundment either. Interestingly, the DEP has a macroinvertebrate biomonitoring program that has sampled twice within the impoundment. One of the reasons for initially proposing the caged mussel approach was that it would be consistent with DEP's current biomonitoring approach that includes rock baskets, riffle bags, and cones. These techniques are similar to the caged mussel approach in that they are experimental approaches that can be used along suspected chemical gradients but only measure effects. DEP's overall monitoring strategy would be

enhanced by including caged mussels at their biomonitoring stations. This would allow for the characterization of other chemicals of concern. Mussels have been well established throughout the world as good sentinel organisms to evaluate the status and trends of chemicals in a variety of environments. In a similar study conducted in 2000, the BOT concentrations of dioxins-furans in mussels collected from Lake Nequasset, Woolwich, Maine were below detection limits. In the 2003 study, mussels were collected from the same lake and the BOT tissue samples analyzed by two different laboratories. One laboratory reported Total PCDD-F concentrations of approximately 1 pptr while the other reported concentrations ranging from 5 to 20 pptr. This discrepancy made it difficult to clearly establish BOT concentrations of dioxins and furans in mussel tissues. In the 2000 study, approximately 15 congeners were detected in tissue samples from Stations 1 and 6, while only three congeners were detected in the 2003 study. In addition to the discrepancies between laboratories in the BOT tissue chemistry, a serious error was made for the EOT data in that 2,3,7,8-TCDD was reportedly detected at the station just above the mill. Upon request by DEP, a re-analysis of the data sheets showed that no 2,3,7,8-TCDD ???????????

The full report can be see at DEP's website at http://www.maine.gov/dep/blwq/docmonitoring/swat/index.htm

DEP note:

DEP does not agree that the distances from the mill for the fish study are inappropriate. The stations are selected to provide barriers between the mill and sample stations. There are no other likely significant sources of dioxin between. Furthermore, this study was designed to measure differences in concentrations of dioxin, as prescribed by statute; it was not designed to measure effects. DEP has been conducting cumulative effects assessment (CEA) using fish since 1999 on other rivers and will continue those studies on the Kennebec and other rivers in the future. DEP's macroinvertebrate program is another method that complements the fish CEA.

After this report was written by Michael Salazar, DEP investigated the alleged discrepancy in the time zero dioxin concentrations in mussels from the two labs and found no such discrepancy. Some people had inadvertently compared wet weight results from one lab to lipid weight results from the other lab. Comparison of wet weight to wet weight values showed very good correspondence between the results from the two labs.

MODULE 4 SPECIAL STUDIES

4.1

PCB IN HATCHERY FISH-DEP/DIFW

PCB IN HATCHERY FISH-DEP/DIFW

A preliminary study in 2001 indicated slightly elevated concentrations of PCB in feed and fish from Maine hatcheries. The study needed to be repeated to confirm these results. The Maine Department of Inland Fisheries and Wildlife (DIFW) supplied landlocked salmon from 2 hatcheries. The ten salmon were combined into 2 composites of 5 fish each. We were also to collect feed and a sediment sample from the settling pond of each hatchery for PCB analysis, but due to an oversight no samples were collected. In order to determine any reductions in concentrations due to depuration and growth dilution, DIFW provided 20 landlocked salmon from each of 2 lakes that had been stocked with fish from 2 of the hatcheries we tested, but no brown trout were collected. The two lakes represented both slow and fast growing salmon.

The results showed that PCB concentrations in salmon from the hatcheries were lower than those in 2001 (Table 4.1). Contrary to expectations, concentrations in salmon that had been in the lakes for 2 years were not lower than those in fish directly from the hatcheries. In fact, salmon from Pleasant Pond in Casco seemed to be higher than those from the source hatchery at Casco, but sample size (n=2) of the hatchery fish was too small for meaningful statistical analysis.

Table 4.1. PCBs in fish from Maine hatcheries and stocked lakes (ug/kg)

		FISH ID					
WATER	**SPECIES**	**1**	**2**	**3**	**4**	**5**	**mean**
Casco Hatchery 2001	LL Salmon						55.3
Casco Hatchery 2002	LL Salmon	30.1	33.8				32.0
Grand L. Str Hatchery 2001	LL Salmon						39.1
Grand L. Str Hatchery 2002	LL Salmon	21	21.9				21.5
New Gloucester Hatchery	brown trout	19.7	14.2				17.0
Palermo Hatchery	brown trout	36	41.1				38.6
Pleasant P Casco	LL Salmon	82.1	71.9	84.8	68.8	113.2	
		83.4	38.9	81.3	61.1	45.6	
		70.5	84.9	77.8	57.3	56.6	
		76.7	63.8	54.4	58.7	55.5	71.9
West Grand Lake	LL Salmon	40.6	39.7	48.5	34.3	59.4	
		22.9	39.9	27.1	32.8	33	
		20.8	61.1	34.6	38.5	42.6	
		56.2	43.5	42.3	44.7	53.3	38.4

4.2

INVESTIGATION OF THE BIOLOGICAL EFFECTS OF AGROCHEMICALS

In vitro Endocrine Effects of Selected Agrochemicals

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Final Report

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Introduction:

Numerous toxicants of natural and anthropogenic origin have been released into the environment in quantities sufficient to disrupt developing endocrine and nervous systems in wildlife and humans (Oberdoster and Cheek, 2001; Damgaard *et al*., 2002; Kirk, *et al*., 2003). Many such toxicants have been identified as acute problems in Maine, including organophosphates and other pesticides, herbicides, organo-arsenic, organo-mercury, dioxins and polychlorinated biphenyls (PCBs). Consequences of endocrine disruption can be profound because of the pivotal role that hormones play in controlling development and reproduction (Colborn and Clement, 1992; Birnbaum, 1994). Since the endocrine system is enormously complex, a single chemical can induce alterations through multiple mechanisms.

Nineteen agricultural chemicals are currently registered for use in maintaining blueberry fields of Maine. The fish and shellfish resident in rivers of eastern Maine are potentially exposed to these chemicals through runoff into the watershed. Very little is known about the effects of these agrochemicals on aquatic populations. Four of the chemicals used on Maine blueberry fields (hexazinone, diazinon, malathion and methoxychlor) had previously been tested for estrogenicity using an *in vitro* E-SCREEN assay (Soto *et al.*, 1995). Of these four, only methoxychlor tested positive at a concentration of 10μM. There are no data available on the estrogenicity of the formulation actually applied to the fields. In addition, no data exist on the biological effects of the other eight active components of other herbicides/pesticides used in Maine (guthion, benomyl, phosmet, glyphosate, propiconazole, sethoxidim, clethodim and fluazifop-p-butyl). The degree of estragenicity of these twelve chemicals relative to 17 •-estradiol was determined using E-SCREEN (Soto *et al*., 1995). Those with low estrogenic activity include diazinon, propiconizol, terbacil, sinbar, benomyl, and carbendazim.

These results suggested that the work should be expanded to include additional formulations and their active compounds and other endocrine effects. In addition to being able to screen individual chemicals, the E-SCREEN assay can also be used to test mixtures of chemicals. Soto *et al.* (1994) have shown that estrogenic chemicals may act in a cumulative fashion.

Relatively little work has been done to demonstrate androgenic activity of environmental contaminants. We tested the same battery of agrochemicals for their ability to act as anti-androgens using MCF7-AR1 cells that stably express a complete human androgen receptor. These cells still

proliferate when 17 β-estradiol is added to charcoal-dextran stripped serum media, but do not obtain the ability to proliferate when androgens were added to the same media. Therefore, androgenic potential can be detected by a decrease in cell proliferation when a test compound is added (Szelei, *et al*., 1997). Assays were run in parallel with the MCF-7 (estrogen-responsive) cell line.

Objectives

The Specific Aims of this project are:

(1). To complete the determination of estrogenic activity of herbicides, pesticides and mixtures using the E-SCREEN assay to measure proliferation of estrogen-responsive MCF-7 cells.

(2) To assess the ability of these compounds to act as androgens, using androgen-responsive cell lines and reporter genes.

Materials and Methods:

(1) E-SCREEN

The E-SCREEN assay is based on the observations that: (1) a protein inherent in serum specifically inhibits proliferation of human estrogen-sensitive MCF-7 cells; and (2) estrogens (or compounds that mimic estrogen) induce cell proliferation by overriding the inhibitory effect (Soto *et al*., 1995). Human breast cancer cells (MCF-7) and the protocols for maintaining cells and running the E-SCREEN were generously provided by Drs. Ana Soto and Carlos Sonnenschein (Tufts University, Boston, MA). The cells were maintained in Dulbecco's Modified Eagle Medium (GIBCO, Grand Island, NY) supplemented with 5% fetal bovine serum (Hyclone, Logan, UT) in an atmosphere of 6.7% CO_2/93.3% air under saturating humidity, at 37°C. All agricultural chemicals were donated by Dr. David Yarborough (Extension Blueberry Specialist, University of Maine). The 17β-estradiol reference compound was purchased from Calbiochem (Richmond, CA).

MCF-7 cells were plated into Falcon 12-well plates at a concentration of 30,000-40,000 cells/well. The test compound was added directly to the medium, at three different concentrations (10 pM, 1 nM and 10 nM) and cells incubated at 37°C for 5 days. Scoring of the estrogenic effects of each xenobiotic was done by first measuring the proliferative effect (PE), which is the ratio between the highest cell yield counted with the test chemical to the yield of negative control cells (Soto *et al*., 1995). PE was then used to determine RPE, which is calculated as 100 times

the ratio of the highest cell yield from the chemical-exposed cells to cells exposed to 17β-estradiol (Soto *et al*., 1995). Estradiol is assigned a RPE score of 100%, and all test xenobiotics compared to estradiol. A score of RPE of 100% or greater indicates a full xenoestrogen, while a RPE score between 20 and 50% indicates a partial xenoestrogen. A score of <20% indicates no estrogenic activity. These experiments were repeated up to five times. Assay results that deviated more than two standard deviations from average were not used in the RPE calculations. As of January, 2004, all assays were counted with using a Beckman Coulter Counter ViCell. Accuracy was verified using a hemacytometer.

In addition to being able to screen individual chemicals, the E-SCREEN was also be used to test mixtures of chemicals. Soto *et al.* (1994) have shown that estrogenic chemicals may act in a cumulative fashion. Mixtures of compounds were also tested, based on what we would expect to see applied to the fields. We also tested methoxychlor, Velpar and SuperBK 32 at higher concentrations (up to 10μM). These higher levels, although not considered environmentally relevant, allowed us to compare our data to values previously reported in the literature.

(2) A-SCREEN Assay

An MCF-7 AR-1 cell line and the protocols for maintaining the cells and running the A-SCREEN were kindly provided by Dr. Ana Soto (Tufts University, Boston, MA). The cells were maintained at 37°C in Dulbecco's Modified Eagle Medium (GIBCO, Grand Island, NY) supplemented with 5% fetal bovine serum (GIBCO) in an atmosphere of 6.7% CO_2 under saturating humidity. Purified active ingredients were obtained from EPA repositories by Brian Perkins (University of Maine). All formulations applied in the field were provided by Dr. David Yarborough (Extension Blueberry Specialist, University of Maine). The 17 ß-estradiol was purchased from Sigma Chemical Co. (St. Louis, MO) and the synthetic androgen steroid, methyltrienolone (R1881), was purchased from NEN/Perkin Elmer.

Maintaining cell cultures - Cells were grown in 25cm^2 flasks with 5mL DMEM Dulbecco's Modified Eagle Medium) in 5% FBS with a media change every 3-4 days. Cells at 90% confluency (~every 6-7 days) were split (1:10) into 2 new flasks. Cells were passed 2-3 times prior to the assay.

A-SCREEN - MCF-7 AR1 cells were plated at a concentration of 45,000 cells/well. The MCF-7 androgen-transfected cells still proliferate in the presence of estrogen and 5% CDFBS/DMEM medium, but proliferation is inhibited when R1881

is added (see Fig. 10). When cells are dosed with R1881 (the synthetic androgen, methlytrienolone) and grown in 5% CDFBS/DMEM media supplemented with 1nM estradiol, proliferation is decreased. The next pesticides that will be tested for androgen activity will be Velpar, and 2,4D Acetic acid.

Dosing - Test media was added 24 hours (+/-3 hours) after subculturing cells. Growth media was removed, cells were rinsed and 1ml of CDFBS 5% experimental media was added to each well (DMEM without phenol red, with charcoal/dextran stripped FBS). Test chemicals were added, in three replicates, at 10nM, 1nM, 0.1nM, 10pM, 1pM. Cells were harvested on Day 5 after treatment by trypsinization and counted using a Beckman Coulter Counter ViCell. A standard curve of R1881 at the final concentrations of 0.1pM, 1pM, 10pM, 100pM, 1000pM in the presence of 1nM estradiol was run in parallel with test samples.

Work accomplished:

(1) E-SCREEN Assay

Growth curves – Completion of the ESCREEN assays required purchase of additional serum of a new lot number. Serum batches were pre-screened by Gibco for the best match. Growth of MCF-7 cells in new serum (lot # 1156246) was compared to growth in the previous lot # (1125122) over a period of five days. **Fig. 1** shows that growth of MCF-7 cells in both lots was not significantly different. Growth curves were also done to compare our laboratory stocks with the parent cultures from Tufts University. Under our conditions, the two cell subcultures exhibited the same growth characteristics (**Fig. 1**).

Sample stability - In an attempt to improve the reproducibility of the ESCREEN assays, we tested the stability of our pesticide/herbicide stock solutions. Most of the organophosphates, such as diazinon, malathion, and glyphosate were found to be less stable than other compounds we tested and new stocks are now diluted every few weeks. Stocks of phosmet and 2,4-dichlorophenoxyacetic acid (2,4-D), which were maintained at -20°C for over one year, were very stable, giving the same RPE values as freshly made stocks (**Figs. 2 & 3**). We modified the procedure to make formulation stock dilutions in water, rather than ethanol, which is more relevant to their use in the field. Each compound is tested up to five times.

(1) F

Formulations and their active chemical ingredients tested in this project period are listed in **Tables I & II**. A comprehensive summary of all the data collected to date is given in **Table III**. Compounds that tested positive for partial estrogen-like activity (RPEs greater than 20%) include: methoxychlor (10μM), Diazinon 50W (diazinon), propiconizole, terbacil, Sinbar, and carbendazim. Velpar and active compound hexazinone were marginally positive at 15.5% and 18% RPE, respectively. Stability of the compounds, such as Round Up/glyphosate and phosmet, may be contributing to the variability in some of the data. Compounds that were positive for partial estrogen-like activity at environmentally relevant levels were re-tested at the higher concentration of 10μM.

Mixtures - Two mixtures (0.5 ppm each compound) were tested, as part of ongoing *in vivo* studies on the effect on Atlantic salmon. The combination of Velpar, Orbit, 2,4-D gave an RPE of 27%. The mixture of Imidan

2.5EC, Sinbar and Orbit was negative at 15% RPE (see **Figs 4 & 5)**.

(2) A-SCREEN

A standard curve was completed to show that proliferation is inhibited when the MCF7-AR1 cells are dosed with R1881 (**Fig. 9**). A second standard curve was completed to show the decrease in proliferation when the cells are supplemented with 1nM 17β-Estradiol and dosed with R1881 (**Fig. 10**). Hexazinone was tested once using the A-SCREEN; no androgenicactivity was detected (**Fig. 10**). Hexazinone, Velpar and 2,4 D were tested at environmentally relevant levels as well as the higher levels.

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Table I Formulations and their active ingredients tested by E-SCREEN

Compound	Active ingredient
Benlate	Benomyl[1]
Diazinon 50W	Diazinon
Imidan 2.5EC	Phosmet
Orbit	Propiconizole[1]
Poast	Sethoxydim
Round Up	Glyphosate
Sinbar	Terbacil
Super BK32	2,4-D (acetic acid form)[2]
Velpar	Hexazinone
Carbendazim	Metabolite of Benomyl

[1]No longer used on blueberries.
[2] widely used historically in Maine; although still used extensively worldwide, it is not currently used on blueberry fields in Maine.

Mixtures tested (0.5ppm of each pesticide)

Velpar, Orbit, 2,4-D
Imidan 2.5EC, Sinbar, Orbit

Table II Summary RPEs of compounds tested in E-SCREEN Assay

Test Compound	N	RPE (Ave + SD)
Clethodim	3	18 ± 4
Diazinon	5	21 ± 8.8
Diazinon 50W	3	21 ± 10.6
Fluazifop p butyl	6	15.3 ± 6.7
Hexazinone	3	18 ± 11
Velpar	4	15.5 ± 7.6
Methoxychlor	3	18 ± 10.6
Phosmet	4	15 ± 7
Imidan 2.5EC	5	16.2 ± 6
Propiconizole	4	20.5 ± 5.2
Orbit	4	16.5 ± 6.2
Sethoxydim	2	12.5 ± 7.8
Poast	2	9
Terbacil	4	21 ± 9.6
Sinbar	3	33 ± 22.6
Benomyl	3	20.3 ± 11
Benlate	3	10.3 ±6.4
Glyphosate	4	15.2 ± 4
Round Up	5	17.4 ± 9.9
Carbendazim	4	23 ± 7.3
2,4 D acetic acid	4	13 ± 5.8
Mixture (Velpar, Orbit, 2,4D)	2	18.5 ± 12
Mixture (Imidan 2.5EC, Sinbar, Orbit)	2	14 ± 1.4

N = # of assays completed

Table III: Comparison of E-SCREEN Assays at high and low contaminant levels

Test Compound	N	range tested	RPE (Ave + SD)
2,4-D acetic acid	3	0.0001-1nM	13 ± 5.8
	1	0.01-10μM	12
Hexazinone	3	0.0001-1nM	18 ± 11
	1	0.01-10μM	32
Hexazinone[1]			
Methoxychlor[2]	3	0.0001-1nM	18 ± 10.6
	1	0.01-10μM	54
Sinbar	3	0.0001-1nM	33 ± 22.6
	1	0.01-10μM	4
Terbacil	4	0.0001-1nM	21 ± 9.6
	1	0.01-10μM	5
Propiconizole	4	0.0001-1nM	20.5 ± 5.2
	1	0.01-10μM	6
Round Up	5	0.0001-1nM	17.4 ± 9.9
	1	0.01-10μM	7
Carbendazim[1]	4	0.0001-1nM	23 ± 7.3
	1	0.01-10μM	9
Benomyl[1]	3	0.0001-1nM	20.3 ± 11
	1	0.01-10μM	5
Phosmet[1]	4	0.0001-1nM	15 ± 7
	1	0.01-10μM	6
Glyphosate[1]	4	0.0001-1nM	15.2 ± 4
	1	0.01-10μM	6

[1] 5/24/04 received new stocks of pesticides.
[2] used as positive control.

ASCREENS:

Test Compound	N	range tested	Result
2,4D Acetic acid see graph	1	0.0001-1nM	non androgenic,
2,4D Acetic acid see graph	1	1nM-10uM	non androgenic,
Hexazinone[1]	1	1nM-10uM	non androgenic
Hexazinone[1]	2	0.0001-1nM	non androgenic

[1] 5/24/04 received new stocks of pesticides.

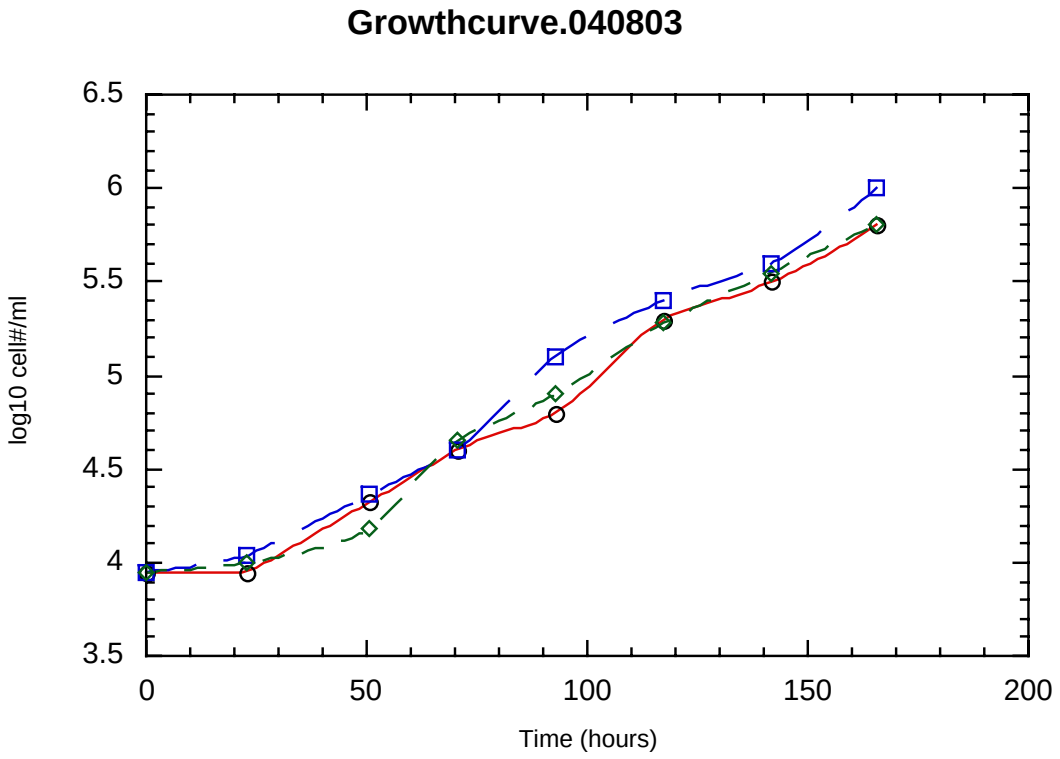

Fig. 1 E-SCREEN Assay: (a) Comparison of University of Maine cultures of MCF-7 cells grown in two different lots of serum [serum lot #1156246 (—•—) and serum lot #1125122 (—•—)] showed very similar growth characteristics. (b) Inter-laboratory comparison of Tufts University parental stocks. (—¤—) to both University of Maine cultures tested at the University of Maine showed no differences in growth.

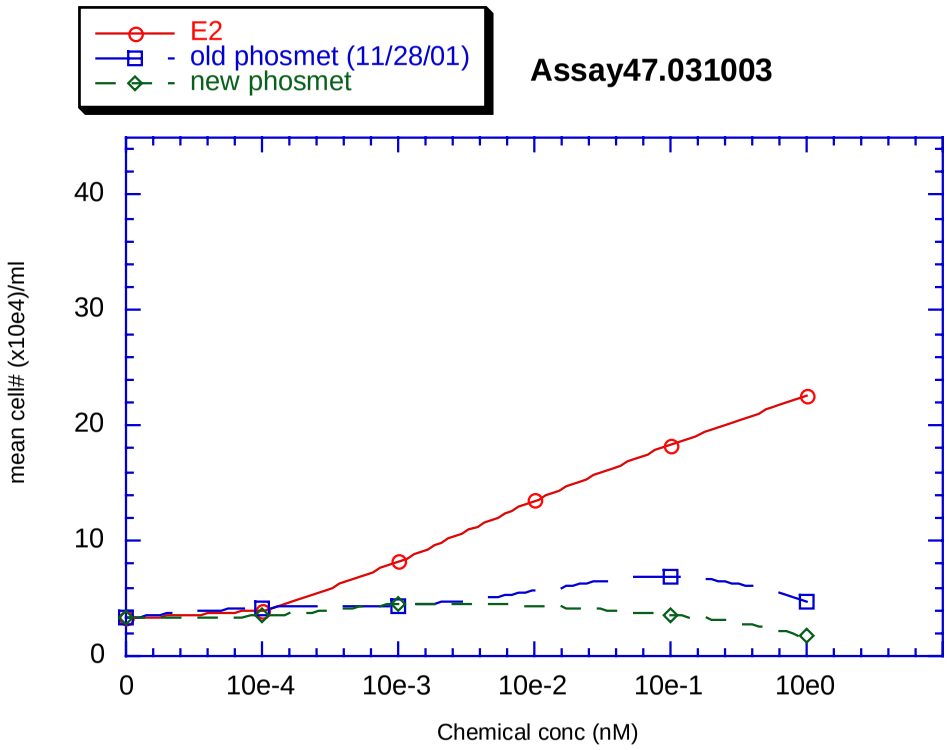

Fig. 2 E-SCREEN assay: Comparison of MCF-7 cell growth in media containing 17β-estradiol (—o—) to cells exposed to phosmet to compare stability of stock #1 [>1.5 years old, maintained at -20°C, (—•—)] to stock #2 [made fresh on day of testing,
(—•—)].

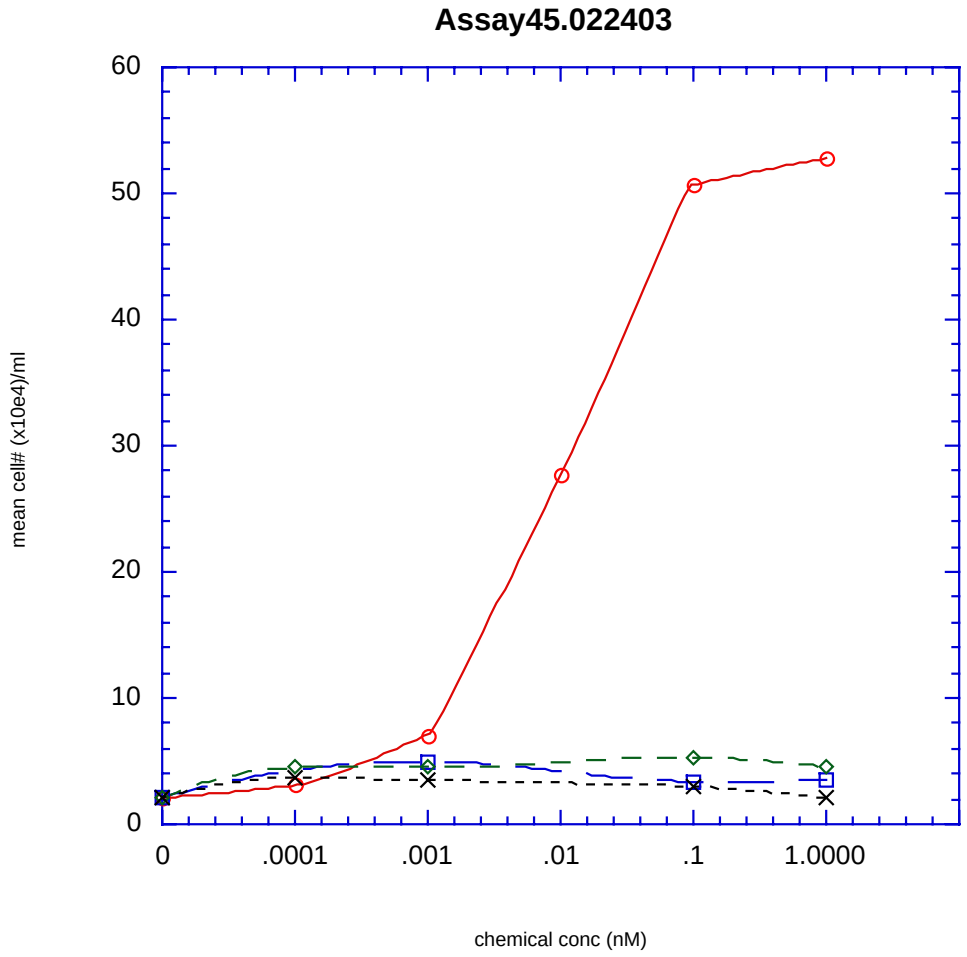

Fig. 3 E-SCREEN assay: Comparison of MCF-7 cell growth in media containing 17β-estradiol (—o—)to cells exposed to stock #1 of 2,4-dichlorophenoxyacetic acid (2,4-D) [> one year old, maintained at –20°C] (—•—) to stock #2 [made day of testing] of 2,4-D
(—•—) or the Super BK32 formulation (---**x**---).

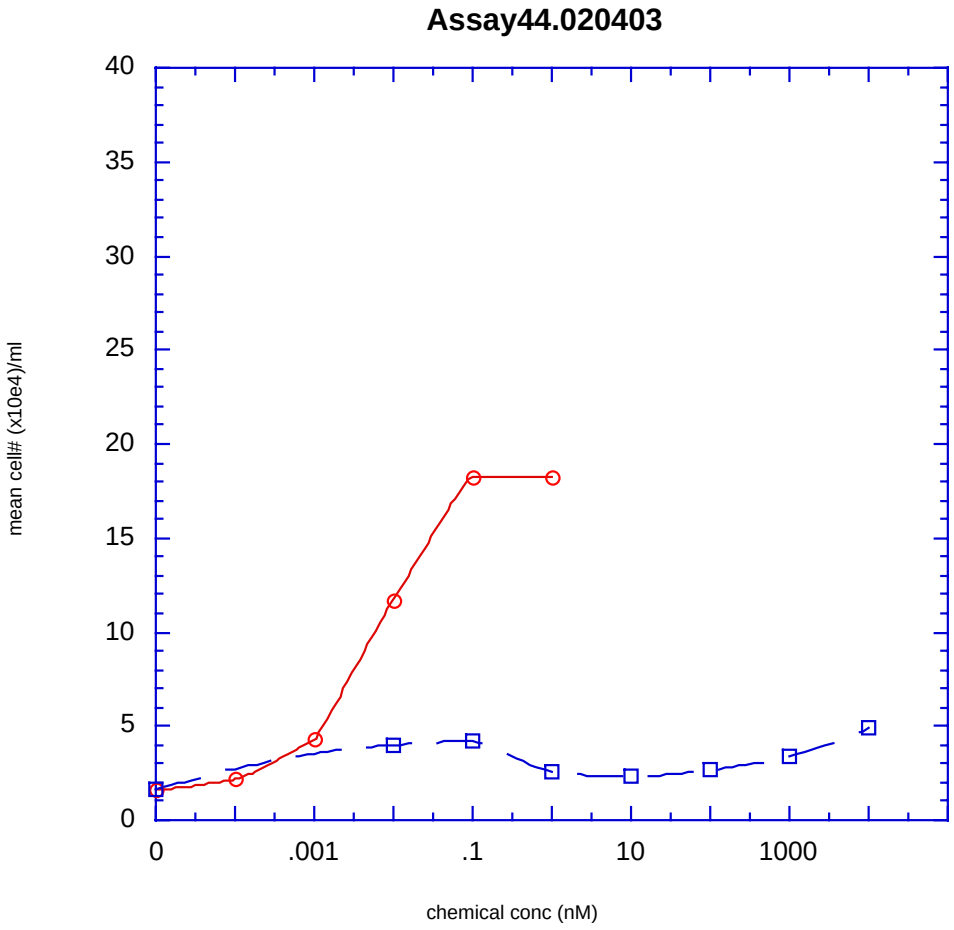

Fig. 4 E-SCREEN assay: Comparison of MCF-7 cell growth in media containing 17β-estradiol (—o—) to cells exposed to a mixture of 2,4-D, Velpar and Orbit (—•—).

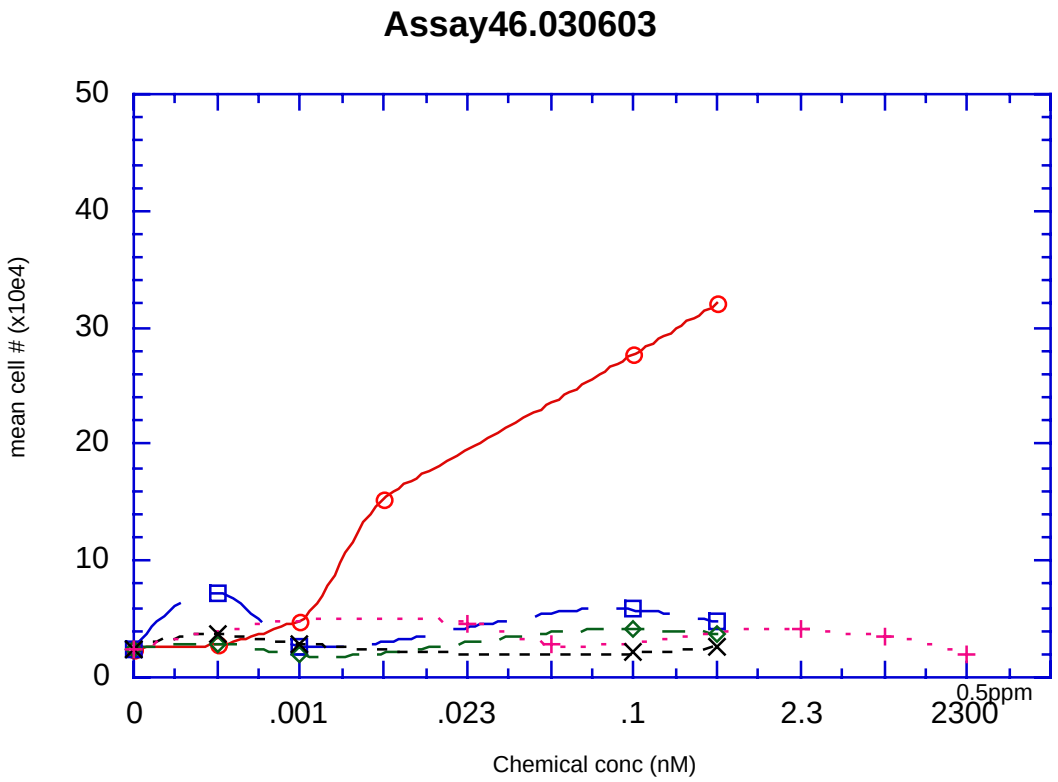

Fig. 5 E-SCREEN assay: Comparison of MCF-7 cell growth in media containing 17β-estradiol (—o—) to cells exposed to Imidan (—•—), Orbit (—•—), Sinbar or (---X---), or a mixture of the three (---+---).

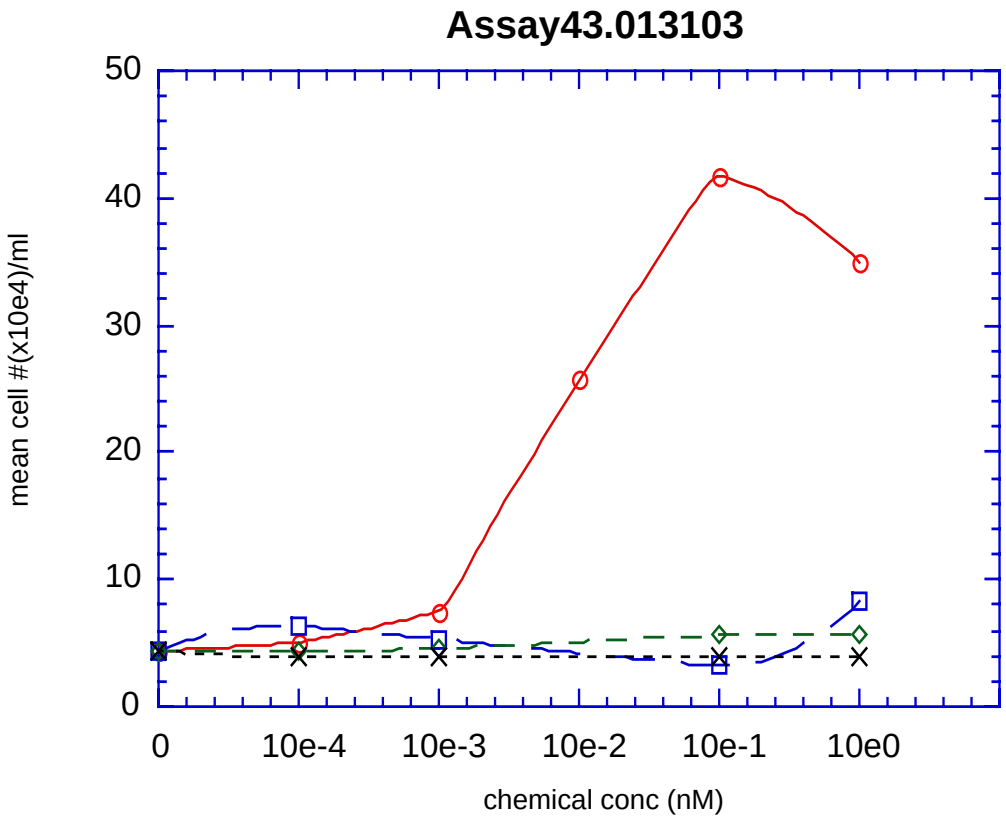

Fig. 6 E-SCREEN assay: Comparison of MCF-7 cell growth in media containing 17β-estradiol (—o—) to cells exposed to 2,4- Dichlorophenoxyacetic acid (—•—), Velpar (—•—) or Orbit (---X---).

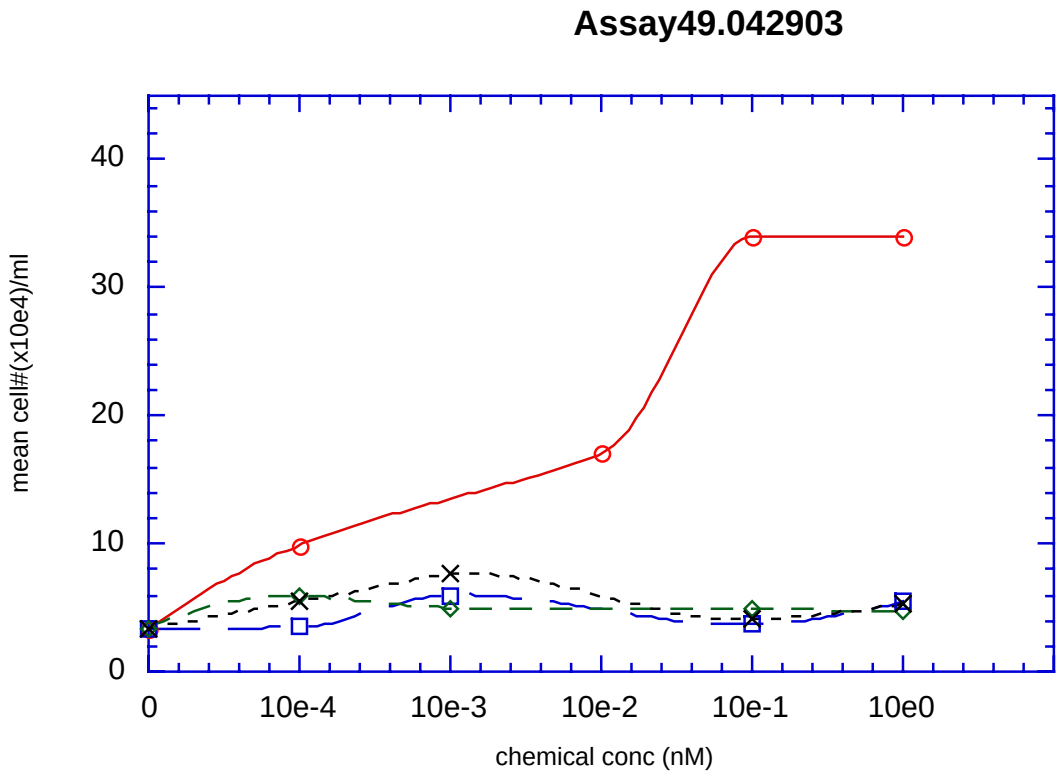

Fig. 7 E-SCREEN assay: Comparison of MCF-7 cell growth in media containing 17β-estradiol (—o—) to cells exposed to Clethodim (—•—), Diazinon (—•—) or Diazinon 50W (---X---).

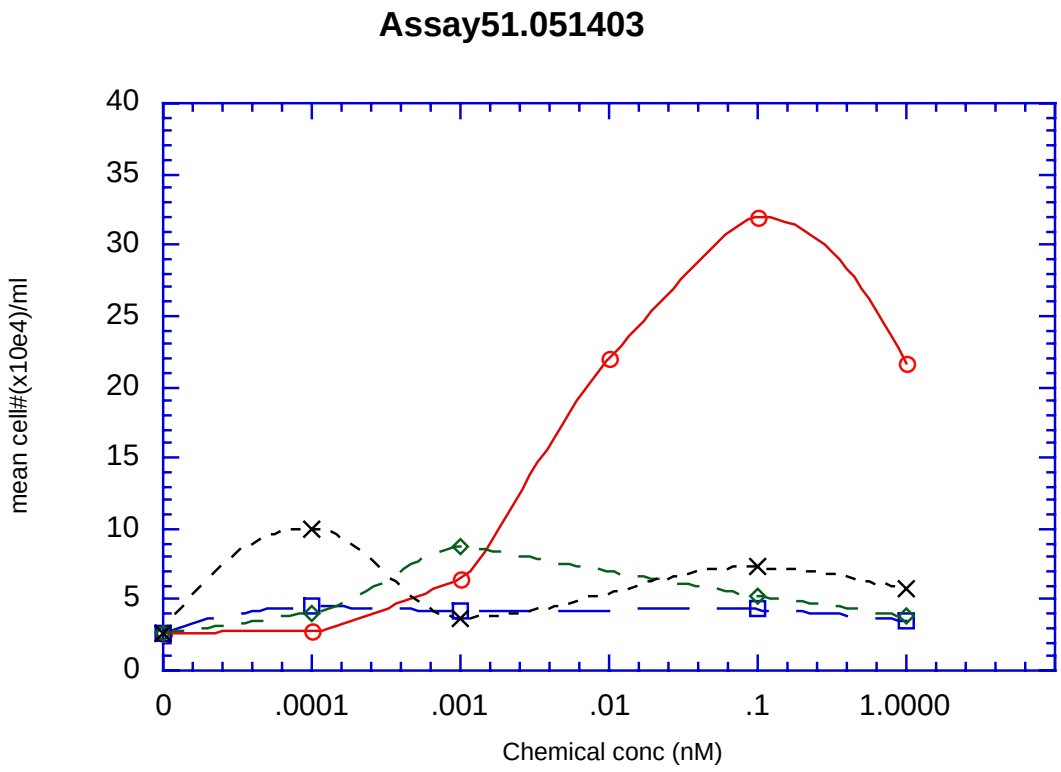

Fig. 8 E-SCREEN assay: Comparison of MCF-7 cell growth in media containing 17β-estradiol (—o—) to cells exposed to Fluazifop (—•—), Velpar (—•—) or Hexazinone (---X---).

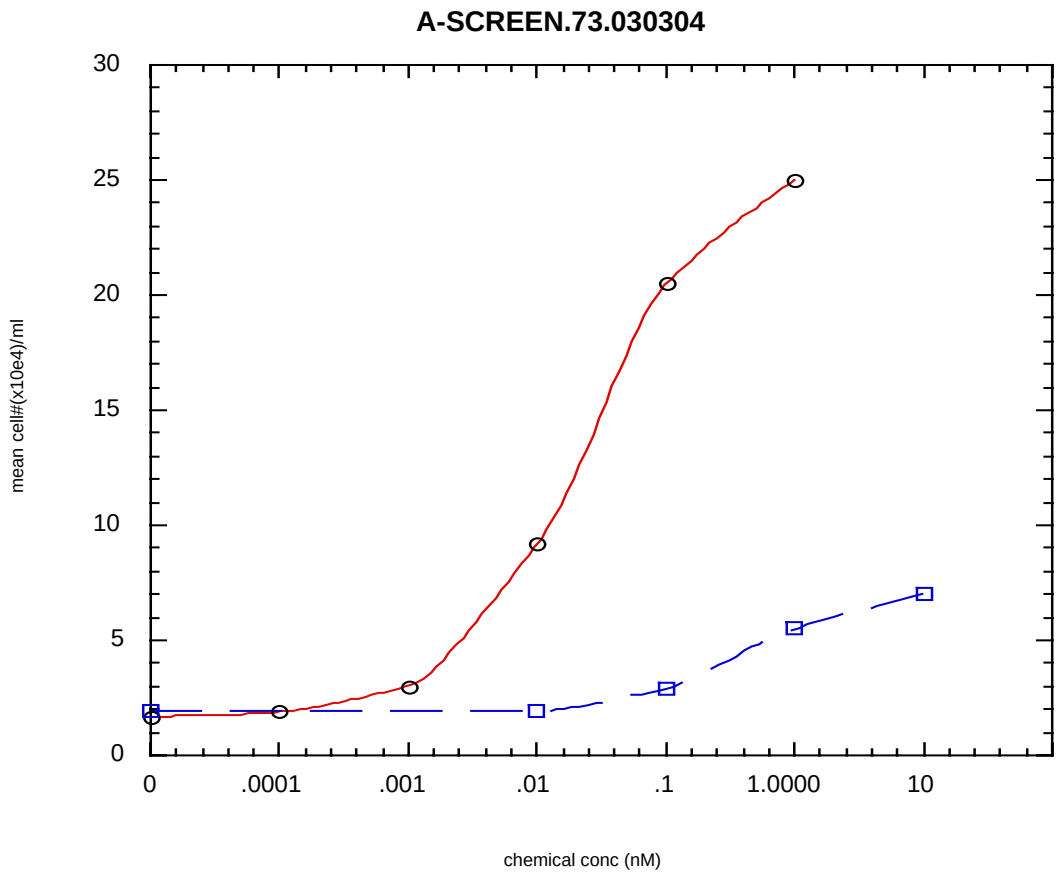

Fig. 9 A-SCREEN assay: Comparison of MCF7-AR1 cells grown with 17β-Estradiol (---o--) and with R1881 (--□--).

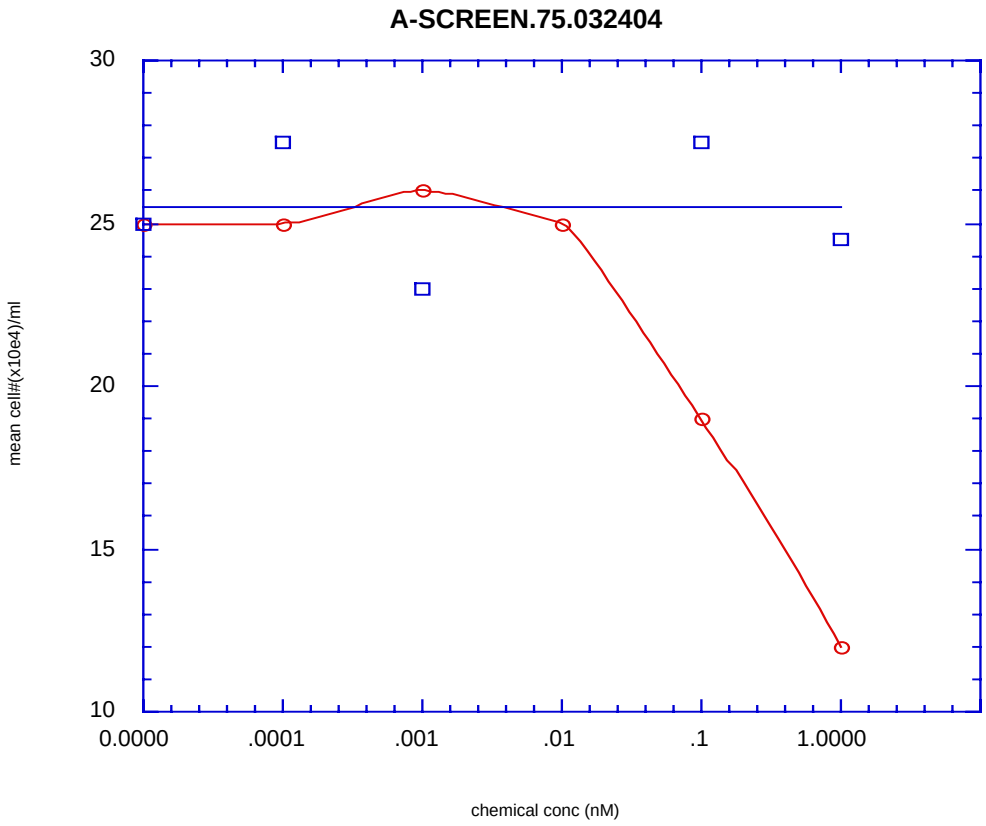

Fig. 10 A-SCREEN assay: Standard curve showing the decrease in proliferation when the cells are supplemented with 1nM 17β-Estradiol and dosed with the synthetic androgen R1881 (--o--). Hexazinone was non-androgenic (--□--).

4.3

EVALUATION OF BROMINATED ORGANIC COMPOUNDS IN THE PENOBSCOT WATERSHED, MAINE

EVALUATION OF BROMINATED ORGANIC COMPOUNDS IN THE PENOBSCOT WATERSHED, MAINE

Therese Anderson, EES Ph.D Candidate, University of Maine (advisor Dr. Jean MacRae)

Brominated Flame Retardants on the Penobscot River.

In recent years, concerns have been rising about the global presence of brominated flame retardants (BFRs) in all areas of the environment. In contrast to the declining levels of polychlorinated biphenyls (PCBs), dioxins and DDT in the environment, levels of BFRs have increased exponentially (1). These compounds are highly lipophilic and readily bioaccumulate in the food chain in a manner similar to dioxins and PCBs.

One class of BFRs is the Brominated Diphenylethers (BDPEs). Different degrees of bromination on the diphenyl ether backbone can result in 209 possible congeners, however only a limited number are actually formed due to the chemical directing properties of the ether group.They are commercially produced in mixtures, similar to the Aroclor mixes associated with PCBs. The mixes of concern are the Penta, Octa and Deca formulations. The State of Maine has recently banned the use of the Penta and Octa mixes. The Penta mix is comprised of two major congeners, BDE-47 and BDE-99. These account for over 70% of the total product by weight. BDE-100, BDE-153 and BDE-154 make up the majority of the remaining 30% of the mix. Trace amounts of BDE-17 and BDE-28 are also present. The Octa mix contains predominately BDE-183. BDE-153 and several additional octa and nona substituted BDE are found in minor amounts. The commercial Deca mix is 97% deca with the remainder being nona substituted BDEs. The Deca congener is more difficult to separate and analyze and was not specifically looked for in this study. Trace amounts were found in two wastewater samples.

While the toxicity of these compounds is currently being extensively studied, preliminary work has shown that the pentaBDE mixtures exhibit both dioxin-like Ah receptor mediation and competition with thyroid hormones (T3 andT4) for the transport protein, transthyretin, which could disrupt normal thyroid activity (2, 3). While these hormone effects appear to be lower than exhibited by coplanar PCBs, PBDEs background levels are correspondingly higher and are rising exponentially in North America (1, 4). Many textiles and foams treated with BFRs end up in the solid waste stream and are landfilled or incinerated along with other materials.

The predominant PBDE levels were examined in fish tissue procured for the SWAT/DMP project on the Penobscot River. Separate extractions were performed and the extracts cleaned to maximize the detection of these compounds. Wastewater and sludge samples from Orono Wastewater District were obtained and analyzed. Analysis was performed with low resolution mass spectrometry

instead of the high resolution technique outlined in the proposal because the instrument was not available. Also due to the increased costs associated with the low resolution method, the scale of the testing had to be reduced.

Fish samples from sites PBM, PBC, PBV and PBO were analyzed for predominate BFR congeners. Small mouth bass from PBM, PBC and PBM, white suckers from PBV and PBC and eels from PBO were sampled. Wastewater influent and effluent 24-hr composite samples and grab samples of activated sludge were obtained from the Orono wastewater treatment facility. Dewatered biosolids were also obtained and are in process at the time of this report. Results are presented in Table 1. (Concentrations range from noon-detect to 80 ppb in SMB fillets, wet weight, depending on the congener and from non-detect to 500 ppb in whole suckers, wet weight. Wastewater samples ranged from non-detect to 2 ppb. Fish data are in •g/Kg wet weight and wastewater samples are reported on a volume basis. Values lower than the stated detection limits are not reported. Table 2 reports the fish data in •g/g.

The results for the samples mirror the penta mix composition with BDE-47 and BDE-99 predominating. Totals for some of the congeners decrease as we move down the river but this does not account for all the BDEs found. Since all point sources have yet to be identified this type of analysis cannot be applied to this data set.

These data are consistent with values obtained in previous studies done in both the United States and Europe. Values obtained from the Great Lakes show concentrations for fillets ranging from non-detect to 80 ppb wet weight for congeners other then deca-BDE. Congeners BDE-47 and BDE-99 are the major peaks found after deca. Influent and effluent samples from the Netherlands show concentrations from non-detect to 10 ppb for BDE-47. (5, 6) A target dose for unlimited consumption based on EPA’s reference dose for the most toxic mixture, PeBDE is 530 ug/kg. Future work includes looking at the fate of BDEs in sludge disposal and attempting to map the major potential point sources in the Penobscot watershed.

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Table 4.3 Poly-Brominated Diphenyl Ethers in Fish and Wastewater Treatment Plants

FISH

Congener	Detection limits	PBV-SMB -1	PBV-SMB -3	PBV-SMB -6	PBV-SMB -7	PBV-SMB -8
Initial weight/volume	grams	20.57	20.76	20.85	20.68	20.66
	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
TriDPE - 17	1.00					
TriDPE - 28	1.00					
TetraDPE - 47	1.00	63.7	47.7	44.1	35.3	18.4
TetraDPE - 71	0.50	1.46	2.89	3.84	2.90	1.45
PentaDPE - 100	0.50	16.5	16.9	6.24	4.84	9.68
PentaDPE - 99	0.50	80.2	62.1	23.5	13.1	43.6
PentaDPE - 85	0.50	0.49				
HexaDPE - 154	0.50	5.83	5.30	2.40	1.93	2.42
HexaDPE - 153	0.50	5.35	5.78	1.92	1.93	1.94
HexaDPE - 138	0.50					
HeptaDPE - 183	5.00					
HeptaDPE - 191	5.00					
DecaDPE - 209	25.00					
TOTAL		**173.6**	**140.7**	**82.0**	**60.0**	**77.4**

Congener	Detection limits	PBC-SMB -8	PBC-SMB -9	PBC-SMB -10	PBC-SMB -11	PBC-SMB -12
Initial weight/volume	grams	20.22	20.93	20.55	19.96	20.4
	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
TriDPE - 17	1.00					
TriDPE - 28	1.00					
TetraDPE - 47	1.00	48.0	72.1	10.2	20.5	3.92
TetraDPE - 71	0.50	1.98	4.30	0.97	1.00	
PentaDPE - 100	0.50	9.40	15.8	6.33	2.51	5.39
PentaDPE - 99	0.50	12.9	33.9	28.7	10.0	5.88
PentaDPE - 85	0.50					
HexaDPE - 154	0.50	5.93	10.5	2.43	6.51	0.98
HexaDPE - 153	0.50	1.48	2.39	2.92	4.01	
HexaDPE - 138	0.50	0.49	1.91		2.51	
HeptaDPE - 183	5.00					
HeptaDPE - 191	5.00					
DecaDPE - 209	25.00					
TOTAL		80.1	140.9	51.6	47.1	16.2

Table 4.3 Poly-Brominated Diphenyl Ethers in Fish and Wastewater Treatment Plants

FISH

Congener	Detection limits	PBC-WHS -C	PBV-WHS -C	PBM-SMB -7	PBM-SMB -9	PBM-SMB -10
Initial weight/volume	grams	19.99	19.76	20.06	20.17	20.2
	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
TriDPE - 17	1.00	1.50	4.55			
TriDPE - 28	1.00	35.5	64.3			
TetraDPE - 47	1.00	430	597	3.49	1.98	
TetraDPE - 71	0.50	4.00	4.55	2.99		
PentaDPE - 100	0.50	279	116	4.99	0.50	1.49
PentaDPE - 99	0.50	3.00	126	12.0	4.46	9.90
PentaDPE - 85	0.50		13.7			
HexaDPE - 154	0.50	60.0	22.3	1.00	0.50	1.98
HexaDPE - 153	0.50	21.5	10.1			1.49
HexaDPE - 138	0.50					3.96
HeptaDPE - 183	5.00					
HeptaDPE - 191	5.00					
DecaDPE - 209	25.00					
TOTAL		**834.9**	**959.0**	**24.4**	**7.4**	**18.8**

Congener	Detection limits	PBO-EEL -C1	PBO-EEL -C1	BLK 1 fish		BLK water
Initial weight/volume	grams	19.99	20.34	20.00		1.00
	µg/Kg	µg/Kg	µg/Kg	µg/Kg		µg/L
TriDPE - 17	1.00					
TriDPE - 28	1.00					
TetraDPE - 47	1.00	114	29.0	0.50		0.08
TetraDPE - 71	0.50	2.50	1.97			
PentaDPE - 100	0.50	58.5	33.4			
PentaDPE - 99	0.50	2.00	4.92			
PentaDPE - 85	0.50	39.5	18.7			
HexaDPE - 154	0.50	1.00	1.97			
HexaDPE - 153	0.50		0.98			
HexaDPE - 138	0.50					
HeptaDPE - 183	5.00					
HeptaDPE - 191	5.00					
DecaDPE - 209	25.00					
TOTAL		217.1	91.0	0.5		0.1

WATER

Congener	detection limits	effluent	effluent	Influent	influent	activated sludge	activated sludge
Initial weight/volume	liters	1.00	1.00	1.00	1.00	1.00	1.00
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
TriDPE - 17	0.10						
TriDPE - 28	0.10						
TetraDPE - 47	0.10	0.09		1.55	1.73	0.98	0.47
TetraDPE - 71	0.05			0.06	0.08	0.06	0.04
PentaDPE - 100	0.05			0.46	0.42	0.28	0.22
PentaDPE - 99	0.05		0.11	1.59	1.61	0.52	1.15
PentaDPE - 85	0.05					1.33	
HexaDPE - 154	0.05			0.13	0.10		0.10
HexaDPE - 153	0.05			0.12	0.09	0.33	0.14
HexaDPE - 138	0.05						
HeptaDPE - 183	0.50						
HeptaDPE - 191	0.50						
DecaDPE - 209	2.50	3.03			2.66		
TOTAL		**3.1**	**0.1**	**3.9**	**6.7**	**3.5**	**2.1**

4.4

DIOXIN INTERLAB COMPARISON

DIOXIN INTERLAB COMPARISON

This study was developed during discussion of the Dioxin Monitoring Program at the 2002 SWAT TAG meeting on June 14, 2002. Because the intial splits of 12 fish from the Androscoggin River at Rumford and Lisbon showed descrepancies of an order of magnitude between Midwest Research Institute (MRI) and the University of Maine's Environmental Chemistry Lab (ECL), DEP had queried both labs and the USF&WS lab in Columbia Mo about reasons. MRI used a new automated FMS cleanup and a confirmation column for furans that ECL did not. When ECL reran some of the samples on the confirmation column, furan levels were closer, but still higher than those from MRI. In the discussion it also became known that the samples for the two labs were handled differently. Those that went to MRI had been frozen and thawed at least once more than those used by ECL.

In this study, 10 samples of suckers (5 whole and 5 fileted) were handled the same way and analyzed by ECL and Alta Analytical Perspectives using similar methods. Samples were run with and without the confirmation column to see if there are any differences. There were 2 blind duplicates. The results were to shared with the TAG and then a decision made about use of confirmation column for 2002 samples.

The results showed very good correspondence between the two labs. All samples were within the 30% relative percent difference (RPD) goal and the average RPD was low and random for TCDD. For TCDF the average RPD was higher and positively biased at ECL. The data were validated by an outside reviewer, Joe Palusky, formerly dioxin analyst of Midwest Research Institute. Following is an except from the validated report:

"Window defining and isomer specificity requirements
Resolution criteria for 2378TCDD was met, a valley of 25% or less was demonstrated between 2378 TCDD and the non-toxic isomers. An isomer specificity solution for 2378 TCDF was analyzed for this batch of samples; there is a demonstration of baseline separation between 2378 TCDF and its closest eluter. Based on available literature for the DB-5ms column, no confirmatory column is required, as there is adequate separation between the toxic tetra PCDD/PCDF and their non-toxic isomers."

SUMMARY split sample analysis of sucker samples by UM Environmental Chemistry Lab (ECL) and Alta Analytical Perspectives (AAP)

SAMPLE	TCDD ECL	TCDD AAP	TCDD % RPD	TCDF ECL	TCDF AAP	TCDF % RPD
	May-03	Aug-02				
WHS01	0.249	0.296	-17.2	8.25	8.25	0.0
WHS02	0.148	0.192	-25.9	4.80	4.53	5.8
WHS03	0.145	0.151	-4.1	4.59	3.88	16.8
WHS04	0.121	0.121	0.0	3.35	2.53	27.9
WHS05	0.13	0.163	-22.5	4.2	4.20	0.0
WHS06	0.213	0.165	25.4	7.05	4.61	41.9
WHS07	0.289	0.200	36.4	8.32	5.11	47.8
WHS08	0.162	0.170	-4.8	5.96	4.93	18.9
MEAN	**0.182**	**0.182**	**-1.6**	**5.82**	**4.76**	**19.9**
STDEV	0.061	0.052	22.2	1.89	1.62	18.2
Ftest p (homogeniety of variance)			0.68			0.70
Lillefors p (normality)	0.144	0.203		0.488	0.049	
Mann Whitney p			**0.563**			**0.293**
t-test p			1.00			

4.5

DATABASE DEVELOPMENT

DATABASE DEVELOPMENT - DEP

All of the SWAT data and dioxin data are in spreadsheets by year and by contaminant. This makes it difficult for others to efficiently analyze the data in various ways. There is currently no easy way to download data for use in evaluating time trends, comparing data sets from location to location, comparing across species, or easily comparing various parameters (e.g., length, weight, percent lipid, contaminant concentration). This severely limits the value of the data.

The Department has begun development of a comprehensive database to house all surface water quality data including the SWAT and Dioxin data. The project will be comprised of the following 4 phases:

Phase I Business Analysis
Phase II Systems Analysis will begin in winter and last 4-6 months.
Phase III System Design or Purchase depends on recommendations from Phase II.
Phase IV System Install and Testing

Phase I is nearing completion and Phase II will begin soon.

4.6

PCB METHODS COMPARISON STUDY

PCB METHODS COMPARISON STUDY

PCBs are a class of 209 compounds that were sold as proprietary mixtures. Unfortunately, as those mixtures biodegrade and bioaccumulate, the relative concentrations of the individual congeners change. For the purposes of advisories, the Bureau of Health (BOH) is interested in the total amount of PCBs that someone is potentially exposed to. Additionally, the BOH also evaluates congener profiles – both for an evaluation of the consistency of the data, as well as for fingerprint analysis. Historically, the University of Maine Environmental Chemistry Lab (ECL) has provided the data based on chemical classes (homologue analysis), which, is an effective measure of total PCBs. Additionally, approximately 20 congeners were provided and used for both some congener analysis and for fingerprinting. In part, homologue analysis was chosen as a cost effective as well as accurate way of measuring total PCBs. However, the new managers at the lab suggest that the cost difference between congener analysis and homologue analysis has decreased. Additionally, they recommend congener analysis providing more detailed congener data as well as a more informative measure of total PCBs. The BOH and DEP have agreed and plan to switch to congener specific methods. To calibrate our thinking about past homologue data, we propose to analyze several samples using both methods to directly compare.

Specifically, we analyzed fish from 6 locations using both the congener method and the homologue method. At each location there were 5 individual fish analyzed for a total of 30 samples. Our objective was to analyze fish from a range of concentrations and characteristics. For example, we chose some fish with high levels of contaminants compared, as well as fish with lower levels of contaminants. We used 2002 samples that have not yet been analyzed.

The samples were analyzed by Texas A & M University's Geological and Enrvironmental Research Group (GERG) using GERG method 2005 for all 2009 congeners and EPA method 680 for homologue groups. The results showed that both methods gave similar results (Table 4.6). Average relative percent difference was within the acceptable range (30%) and neither method had a dominant bias. The homologue method was less expensive ($400 per sample) compared to the congener specific method ($500). The congener specific method provides more information and is the choice for many new investigations.

Figure 4.6 TOTAL PCBS IN FISH BY TWO METHODS

Client Sample ID	Total PCBs (ng/g) dw		RPD	Higher	% solid	Total PCBs (ng/g) ww	
	EPA 680	GERG 0205		Total		EPA 680	GERG 0205
ARB-STB-01	1285.35	906.0	34.6	EPA 680	25.4	326.5	230.2
ARB-STB-02	1144.12	911.7	22.6	EPA 680	22.9	261.8	208.6
ARB-STB-03	1594.43	1281.9	21.7	EPA 680	25.9	413.8	332.7
ARB-STB-04	1025.74	880.3	15.3	EPA 680	24.1	247.1	212.0
ARB-STB-05	1390.25	1240.7	11.4	EPA 680	24.5	340.0	303.4
KSD-STB-01	585.38	541.3	7.8	EPA 680	23.6	138.2	127.8
KSD-STB-02	220.11	165.8	28.2	EPA 680	21.5	47.3	35.6
KSD-STB-03	443.28	453.9	2.4	GERG 0205	24.3	107.6	110.1
KSD-STB-04	478.93	542.0	12.4	GERG 0205	24.2	115.9	131.2
KSD-STB-05	268.82	256.6	4.7	EPA 680	22.6	60.7	57.9
KAG-SMB-01	616.81	811.1	27.2	GERG 0205	22.1	136.4	179.4
KAG-SMB-02	392.49	502.5	24.6	GERG 0205	22.6	88.6	113.5
KAG-SMB-03	506.53	620.7	20.2	GERG 0205	22.4	113.6	139.2
KAG-SMB-04	491.71	531.0	7.7	GERG 0205	21.1	103.8	112.1
KAG-SMB-05	246.31	281.7	13.4	GERG 0205	23.0	56.7	64.9
SFB-SMB-01	1133.63	1496.2	27.6	GERG 0205	20.1	227.4	300.1
SFB-SMB-02	349.25	351.3	0.6	GERG 0205	22.5	78.6	79.1
SFB-SMB-03	379.34	357.4	6.0	EPA 680	21.5	81.6	76.9
SFB-SMB-04	283.06	291.0	2.8	GERG 0205	20.4	57.8	59.4
SFB-SMB-05	321.87	364.0	12.3	GERG 0205	19.7	63.6	71.9
ALV-SMB-04	54.68	29.4	60.1	EPA 680	19.5	10.7	5.7
ALV-SMB-05	88.45	98.6	10.8	GERG 0205	23.1	20.4	22.8
ALV-SMB-07	73.37	62.8	15.5	EPA 680	20.9	15.3	13.1
ALV-SMB-09	82.93	70.3	16.5	EPA 680	21.4	17.8	15.0
ALV-SMB-10	133.91	146.6	9.1	GERG 0205	22.4	30.0	32.9
KFF-BNT-01	56.30	41.3	30.8	EPA 680	27.7	15.6	11.4
KFF-BNT-02	46.21	38.7	17.6	EPA 680	27.0	12.5	10.5
KFF-BNT-03	39.47	34.3	14.1	EPA 680	26.9	10.6	9.2
KFF-BNT-04	33.04	26.5	21.9	EPA 680	27.5	9.1	7.3
KFF-BNT-05	28.20	25.6	9.6	EPA 680	28.5	8.0	7.3
NIST 2978	850.59	659.1	25.4	EPA 680			
NIST 2978	480.08	662.4	31.9	GERG 0205			
		Average RPD	17.7				