

Toxics source reduction and sewage upgrades eliminated winter flounder liver neoplasia (1984–2017) from Boston Harbor, MA, USA

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Table S1 - Locations of Stations shown in Figure 1

<u>Station Name</u>	<u>Abbreviation</u>	<u>Latitude</u>	<u>Longitude</u>
Deer Island Flats (Boston Harbor)	DIF	42° 20.4'N	070° 58.4'W
Off Nantasket	NB	42° 17.6'N	070° 52.2'W
Outfall Site	OS	42° 23.1'N	070° 49.3'W
Eastern Cape Cod Bay	ECCB	41° 56.2'N	070° 06.6'W

Table S2 –Summary of sample size, gender ratio, average +/- SD Total length, weight and age for each year and each station. See <http://www.mwra.state.ma.us/harbor/enquad/trlist.html>

Year, Station		Gender		Age (years)			Total Length (mm)			Weight (g)		
		N	% Female	N	Mean	STDDEV	N	Mean	STDDEV	N	Mean	STDDEV
1991	DIF	167	75	163	4.9	1.27	167	359.7	38.62	0	.	.
	ECCB	60	65	59	4.1	1.12	59	334.1	32.95	0	.	.
	NB	58	50	58	4.6	0.95	57	350.7	33.14	0	.	.
	OS	67	73	67	4.3	0.96	67	337.7	44.61	0	.	.
1992	DIF	55	65	56	4.0	0.93	56	335.5	39.91	0	.	.
	ECCB	49	59	49	3.9	1.05	49	331.8	42.96	0	.	.
	NB	49	45	49	4.5	0.82	49	337.5	28.89	0	.	.
	OS	50	82	49	4.2	0.77	50	330.3	33.55	0	.	.
1993	DIF	28	36	29	4.7	1.07	29	340.9	32.35	29	594.0	218.42
	ECCB	50	72	50	4.3	0.84	50	341.1	28.61	48	559.9	139.50
	NB	50	86	50	5.0	1.01	50	355.6	36.11	50	641.0	208.72
	OS	50	82	50	4.4	0.84	50	336.6	31.03	50	578.5	174.82
1994	DIF	47	89	50	4.4	1.26	50	366.0	40.78	50	675.0	181.05
	ECCB	18	83	49	3.9	0.86	50	342.8	33.38	50	567.0	129.60
	NB	47	77	50	4.0	0.88	50	340.9	29.17	50	586.0	120.39
	OS	50	92	50	3.8	1.00	50	329.8	38.45	50	531.0	202.76
1995	DIF	49	49	50	3.6	0.81	50	344.6	32.43	50	450.9	113.92
	ECCB	50	70	50	4.0	0.81	50	329.9	22.19	50	409.8	93.54
	NB	50	56	50	4.4	0.76	50	333.9	24.11	50	428.0	114.81
	OS	50	84	50	4.1	1.00	50	331.4	33.89	50	405.3	135.04
1996	DIF	30	97	30	4.3	0.87	30	352.4	31.93	30	466.4	117.23
	ECCB	50	94	50	4.0	0.86	50	342.1	24.30	50	449.3	99.71
	NB	50	74	50	4.2	1.04	50	338.2	26.38	50	422.0	119.50
	OS	49	94	49	4.5	0.84	49	344.8	32.16	49	474.1	138.39
1997	DIF	16	88	16	4.2	0.75	16	338.1	22.72	16	437.1	67.88
	ECCB	67	93	67	4.5	0.76	67	344.2	25.47	67	479.1	119.53
	NB	50	64	50	4.2	0.77	50	337.1	33.67	50	450.5	192.83
	OS	67	93	66	4.5	0.81	67	335.8	31.48	67	442.7	142.60
1998	DIF	50	90	49	4.3	0.91	50	362.5	36.99	50	527.5	147.47
	ECCB	50	86	50	3.5	0.71	50	341.1	30.08	50	435.5	131.32
	NB	50	78	49	4.1	0.67	50	341.8	23.13	50	441.1	108.25
	OS	50	86	50	3.8	0.88	50	340.0	36.11	50	470.0	195.48
1999	DIF	50	100	50	3.9	0.76	50	372.3	35.59	50	472.7	246.81
	ECCB	50	86	50	4.1	0.71	50	342.7	28.43	50	437.9	140.65
	NB	50	64	50	4.1	0.77	50	336.2	32.80	50	433.2	149.36
	OS	50	92	49	4.4	0.84	50	347.4	36.52	50	492.3	192.52
2000	DIF	26	100	26	4.9	1.12	26	371.0	42.97	26	648.5	209.39
	ECCB	50	90	50	5.0	1.02	50	354.4	39.21	50	588.0	205.64
	NB	50	70	50	4.0	0.65	50	331.9	25.41	50	484.6	107.42
	OS	50	100	50	4.7	0.94	50	353.3	28.84	50	562.8	150.70
2001	DIF	50	94	50	5.1	1.37	49	389.1	44.36	50	727.6	217.05
	ECCB	50	96	50	4.2	0.88	50	349.7	34.83	48	540.0	191.74
	NB	50	86	50	4.0	0.83	49	340.4	25.88	49	497.5	114.95

Year, Station		Gender		Age (years)			Total Length (mm)			Weight (g)		
		N	% Female	N	Mean	STDDEV	N	Mean	STDDEV	N	Mean	STDDEV
2002	OS	50	94	50	5.0	1.09	50	348.5	30.10	50	530.7	156.24
	DIF	50	98	50	5.0	1.03	50	385.3	33.96	50	743.9	199.16
	ECCB	50	94	50	3.8	0.69	50	345.2	29.47	50	499.6	135.75
	NB	50	98	50	4.6	0.93	50	364.8	32.18	50	623.4	231.73
	OS	50	98	50	4.7	0.80	50	357.5	28.00	50	570.4	127.07
2003	DIF	50	78	50	5.1	0.99	50	376.2	39.30	50	640.3	210.58
	ECCB	50	88	49	4.4	1.12	50	347.3	28.46	50	507.7	140.88
	NB	50	88	50	4.7	1.08	50	355.1	34.96	50	536.1	155.74
	OS	120	88	50	5.3	1.31	120	366.9	36.58	50	623.5	200.00
2004	DIF	50	96	50	4.7	1.05	50	385.3	38.91	50	710.9	214.97
	ECCB	50	98	50	4.8	0.79	50	355.9	31.77	50	557.9	152.89
	NB	50	92	50	4.9	0.89	50	372.9	26.23	50	626.8	146.88
	OS	50	92	50	5.2	0.95	50	373.8	33.13	50	652.6	189.68
2005	DIF	50	94	50	4.8	1.14	50	391.0	39.67	49	731.2	217.86
	ECCB	50	100	50	4.4	1.01	50	365.2	28.74	50	558.6	155.96
	NB	50	90	50	4.3	0.87	50	372.3	30.72	50	613.6	167.00
	OS	50	94	50	5.0	1.28	50	385.4	39.29	50	674.8	197.23
2006	DIF	50	100	50	4.7	1.28	50	370.9	36.93	50	605.6	194.02
	ECCB	50	88	50	4.2	0.98	50	359.4	33.12	50	547.2	151.15
	NB	29	97	29	4.3	1.11	29	357.7	33.12	29	576.6	163.56
	OS	50	88	50	5.3	1.42	50	384.3	39.05	50	681.4	215.67
2007	DIF	50	98	50	5.3	1.04	50	398.9	35.27	50	777.0	207.10
	ECCB	50	98	50	4.6	1.11	50	368.5	34.88	50	605.3	179.50
	NB	50	96	49	4.7	1.13	50	377.7	40.89	50	676.3	270.07
	OS	50	94	50	4.7	1.06	50	387.0	37.70	50	721.0	248.01
2008	DIF	50	82	50	4.2	0.92	50	352.0	35.52	50	527.5	165.42
	ECCB	50	92	50	4.2	1.17	50	355.5	34.73	50	528.9	170.44
	NB	50	96	49	4.2	0.86	50	353.5	28.35	50	532.2	124.17
	OS	50	92	50	4.0	1.17	50	335.8	34.80	50	455.6	158.84
2009	DIF	50	98	50	4.3	1.18	49	370.8	42.68	50	614.1	182.67
	ECCB	50	98	50	4.2	0.96	50	348.1	27.17	50	502.4	109.65
	NB	50	86	50	4.5	1.07	50	356.2	34.24	50	532.0	155.14
	OS	50	76	50	4.2	0.87	50	339.7	22.17	50	440.2	95.27
2010	DIF	50	86	50	4.9	1.41	50	375.0	38.86	50	648.9	197.62
	ECCB	50	88	50	4.6	0.83	50	366.8	31.23	50	591.2	172.37
	NB	50	94	50	4.6	1.24	50	364.7	41.05	50	581.6	194.13
	OS	38	76	37	4.8	1.06	38	357.1	31.23	38	523.0	143.61
2011	DIF	50	64	49	4.8	0.97	50	361.7	42.40	50	574.0	241.60
	ECCB	50	94	50	5.4	1.03	50	354.9	28.40	50	505.2	124.02
	NB	50	84	50	5.0	1.07	50	355.8	30.74	50	494.0	111.11
	OS	50	78	49	5.7	1.49	50	365.9	32.05	50	579.4	163.44
2012	DIF	50	98	49	4.9	0.86	50	377.1	30.81	50	607.1	140.76
	ECCB	50	98	49	4.9	1.10	50	360.0	36.79	50	529.0	159.71
	NB	50	96	49	4.3	0.87	50	351.9	31.38	50	501.6	129.97
	OS	50	80	50	4.7	0.77	50	336.5	27.62	50	447.2	126.60

Year, Station		Gender		Age (years)			Total Length (mm)			Weight (g)		
		N	% Female	N	Mean	STDDEV	N	Mean	STDDEV	N	Mean	STDDEV
2013	DIF	50	66	50	4.9	1.25	50	353.4	29.35	50	522.3	124.62
	ECCB	50	98	50	5.4	1.47	50	360.0	22.76	50	560.4	125.91
	NB	50	74	50	4.8	1.27	50	343.6	29.66	50	477.2	140.83
	OS	50	94	50	5.5	1.45	50	347.1	33.93	50	500.6	145.76
2014	DIF	50	96	49	5.2	1.58	50	361.7	28.10	50	584.3	126.27
	ECCB	50	92	50	5.5	1.50	50	354.2	30.15	50	498.1	150.12
	NB	50	76	50	5.1	1.54	50	340.3	28.48	50	424.2	106.45
	OS	50	84	50	5.4	1.54	50	337.1	29.48	50	414.9	124.77
2015	DIF	50	94	49	4.3	1.40	50	357.0	36.61	50	517.5	160.12
	ECCB	50	88	50	5.1	1.42	50	352.3	28.77	50	501.6	140.61
	NB	50	74	50	4.3	1.43	50	340.5	24.62	50	463.1	120.56
	OS	50	88	50	5.3	1.78	50	334.5	25.35	50	426.7	116.49
2016	DIF	50	98	50	4.0	0.47	50	347.2	29.63	50	500.9	126.77
	ECCB	50	100	50	4.7	0.66	50	381.9	27.61	50	667.2	145.20
	NB	50	80	50	4.2	0.62	50	340.8	31.54	50	428.7	132.69
	OS	50	92	50	4.1	0.47	50	330.3	27.23	50	402.2	119.00
2017	DIF	50	98	50	4.1	0.79	50	341.5	27.87	50	476.4	125.84
	ECCB	50	98	50	5.7	1.07	50	382.3	29.29	50	639.4	160.86
	NB	50	82	50	4.3	1.08	50	345.5	35.39	50	488.4	122.98
	OS	50	80	50	4.5	1.09	50	331.7	22.52	50	445.0	112.20

Table S3 - Mean CHV prevalence at DIF compared to fillet and liver contaminant concentrations (using the two years after the chemistry year plus the chemistry year to create the mean values for 1992 through 2015). Stepwise linear regression was significant for total chlordane in flounder fillet ($r^2 = 0.3736$, $P = 0.0155$). * = No data.

Year/CHV Prevalence (%)	Total PCBs (ng/gdw)		Total chlordanes (ng/gdw)		p,p'-DDE (ng/gdw)	
	Fillet	Liver	Fillet	Liver	Fillet	
1992	48.2	458.53	2609.25	35.48	206.98	30.01
1993	55.2	197.11	1797.00	15.40	122.70	17.49
1994	54.0	520.03	3615.00	18.78	207.93	30.15
1995	38.0	613.90	9243.00	15.47	283.00	35.00
1996	43.3	285.77	3672.00	11.30	169.87	26.67
1997	50.0	325.10	4638.00	13.93	243.67	40.67
1998	32.0	238.43	3060.67	13.86	176.13	22.01
1999	28.0	141.53	2761.00	9.73	225.83	17.42
2000	46.2	203.30	1856.33	10.03	95.71	17.00
2001	50.0	348.60	3611.33	10.38	91.88	25.34
2002	26.0	211.37	3059.00	6.03	77.17	13.74
2003	29.3	345.47	4462.33	9.18	84.81	26.41
2006	25.3	317.53	3309.33	5.39	*	25.23
2009	25.5	180.03	1789.33	4.56	31.87	12.65
2012	20.0	396.27	4139.33	5.24	124.10	24.00
2015	28.7	254.77	2144.00	3.22	15.71	12.52