PCB Concentration Trends Report

for

Seafood Sampled

between

2003 to 2024

from

New Bedford Harbor Superfund Site

by

Massachusetts Department of Environmental Protection

April 2025

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1. Introduction

This report documents the trends of the PCBs (polychlorinated biphenyls) measured in edible seafood species caught in New Bedford Harbor and surrounding Buzzards Bay in southeastern Massachusetts from 2003 to 2024. This seafood monitoring program is part of the ongoing PCB cleanup program for the New Bedford Harbor (NBH) Superfund Site and was a collaborative effort involving the MA Department of Marine Fisheries (DMF), the MA Department of Environmental Protection (MassDEP), and the U.S. Environmental Protection Agency Region I (EPA). The seafood sampling program has been on-going since 2002, the Annual Seafood Monitoring Reports can be found at the EPA's web site at www.epa.gov/new-bedford-harbor under "Technical Documents" (MassDEP, 2003-2024). The 2002 data are not included in this trend summary because only a subset (28 vs. 136) of the congeners were analyzed that year.

Due to the identification of high PCB levels in area seafood, the MA Department of Public Health in 1979 promulgated regulations restricting seafood consumption in three closure areas in and around NBH as shown on Figure 1 (MADPH, 1979). NBH was subsequently listed as a Superfund site in 1983. The Remedial Action for the Site resulted in over 1.1 million cubic yards (cy) of PCB-contaminated sediments removed to date by dredging and shoreline excavation. The annual dredging started in 2003 and ended in March of 2020. The shoreline remediation and restoration were completed in 2024. This seafood monitoring program will aid in the evaluation of the overall effectiveness of the harbor cleanup, as well as assist in the implementation of institutional controls and seafood recommendations.

2. Seafood Monitoring Program Design

Based on previous investigations and risk assessments performed for the NBH Site, a variety of species were selected for this monitoring program that are considered locally caught seafood; are generally available for field collection; and which bracket potential worse case tissue levels (MassDEP, 2003a-2024a). The species collected and the dates the species were collected are shown on Table 1. The goal of this seafood monitoring program is to acquire annual collections of these species in sufficient numbers from all three closure areas to enable statistical comparisons between them, but with the understanding that some species will not necessarily be caught in sufficient numbers every year.

To meet this goal, the monitoring design calls for five composite samples for each species from each of the three closure areas. Based on previous site sampling experience, modifications have been made to the original sampling approach. Each composite sample consists of legally harvestable organisms.

Consistent with CERCLA and the NCP, the selected remedy for the Site (EPA, 1998, Section X) uses a site-specific risk-based seafood criteria of 0.02 ppm PCBs based on local patterns of seafood consumption which involve more frequent consumption of local PCB-contaminated seafood than that used by the FDA standard of 2 ppm PCBs.

In addition to seafood, surface water samples were also collected in 2011, 2023 and 2024 and analyzed for total PCBs. In 2024, surface water samples were also analyzed for dissolved PCBs. The water samples were collected at most of the quahog locations, and additional samples north of the Coggeshall Street Bridge were collected in 2024. The water column PCB data is presented in Table 18. The target level for surface water PCBs, discussed in the 1998 ROD, is the Ambient Water Quality Criteria (AWQC) of 0.03 ug/l (or ppb).

3. Analytical Chemistry

The seafood and water samples were analyzed for 148 PCB congeners by GC/MS-SIM (gas chromatography/mass spectrometry-selective ion monitoring) based on EPA Methods 680 and 8270D. In previous sampling rounds starting in 2003 to 2016, 136 PCB congeners had been analyzed. The additional twelve PCB congeners did not significantly add to the total concentrations see Appendix E (MassDEP, 2017-2024), thus allowing comparisons with previous site data. The 148 congeners measured included the eighteen NOAA (National Oceanic and Atmospheric Administration) list congeners and the twelve WHO '98 (1998 World Health Organization) list of dioxin-like congeners. Two congeners, BZ #105 and #118, appear on both lists. The NOAA congener list was used by the MA DMF in its analysis of Area III lobsters from 1988 to 1998, while Aroclors had been used previous to this. The NOAA list typically represents approximately 45% of the total PCB in marine tissue (NOAA, 1993).

The congeners quantitated in this effort are listed in the New Bedford Harbor Superfund Site Quality Assurance Project Plan Revision 18 **(**MassDEP, 2024a**).** The WHO '98 congeners were included to enable the evaluation of risks to human health due to the presence of any dioxin-like PCB congeners, if deemed necessary.

Tissue from the collected specimens was filleted, sub-sampled and/or composited as necessary for sample homogenization, extraction and analysis. Species included quahog, conch alewife, black sea bass, blue crab, blue fish, lobster, scup, striped bass, and tautog.

- The first step in the analytical process for the quahog and conch samples was the compositing of twelve to thirteen individual samples from each location; these were combined to form one composite sample per location and were homogenized using a tissuemizer.
- The first step in the analytical process for the bluefish and striped bass was to take the tissue for each sample location and homogenize using a tissuemizer. Bluefish fillets were processed with the skin on, with one split sample prepared with the skin off. Striped bass fillets with the skin off and striped bass stomach contents were processed as individual samples.
- The first step in the analytical process for the black sea bass, scup, and tautog was the compositing of the tissue from up to five specimens per location (if multiple caught) and homogenize using a tissuemizer to obtain one sample per location. Scup fillets were processed with the skin off, with one split sample prepared with the skin on. Tautog fillets were processed with the skin on, with one split sample prepared with the skin off. Black sea bass fillets were processed with the skin off.

- The first step in the analytical process for the alewife was to take the tissue for the one sample location and homogenize using a tissuemizer. Alewife fillets with the skin off and alewife roe were processed as individual samples.
- The first step in the analytical process for the blue crab was the compositing of the tissue from up to five specimen per location (if multiple caught) and homogenize using a tissuemizer to obtain one sample per location. Blue crab consisted of leg and claw meat.
- The first step in the analytical process for the lobster was the compositing of the tissue from up to five specimens per location (if multiple caught) and homogenize using a tissuemizer to obtain one sample per location. Lobster meat, consisting of tail and claw, and lobster tomalley were processed as individual samples.

From each seafood group, approximately five grams of wet sample tissue were collected. This sample tissue was then extracted using EPA Method 3570 Microscale Solvent Extraction (MSE) techniques (spin extraction with acetone/methylene chloride in a sealed vessel).

The extracts were concentrated. The lipid portion of the extract was removed and separated from the PCB portion, which was cleaned up prior to analysis. Following sample cleanup, extracts were dried and concentrated using the Kuderna-Danish (K-D) method, brought up to final volume and analyzed. Extract cleanup was performed using Alumina Column Cleanup. Gel Permeation Chromatography (GPC), Sulfuric Acid Cleanup, and/or Silica Gel Cleanup are also employed as appropriate, based on the sample extracts and tissue species.

Sample analysis of water and tissue using GC/MS-SIM allowed identification and quantitation of congeners using selected PCB congeners from BZ1 to BZ209. The identification of the specific congeners was accomplished by comparing their mass spectra with the electron impact spectra of the calibration standards. Congener concentrations were determined using mean relative response factors from a multi-level calibration curve. Response factors for congeners were determined relative to internal standard technique. A multi-point curve was used for the individual congeners to demonstrate the linear range of the instrument.

Continuing calibrations assured linearity remained for the duration of the analysis. Laboratory SOPs are available in the Quality Assurance Project Plan Revision 18 (MassDEP, 2024a) should further details on chromatographic conditions, quality control criteria, and other elements of the analysis be needed. While lipid content was reported, the wet weight PCB concentrations reported herein are not lipid normalized.

The data validation summary for the laboratory analysis is presented in Appendix B (WSP, 2025).

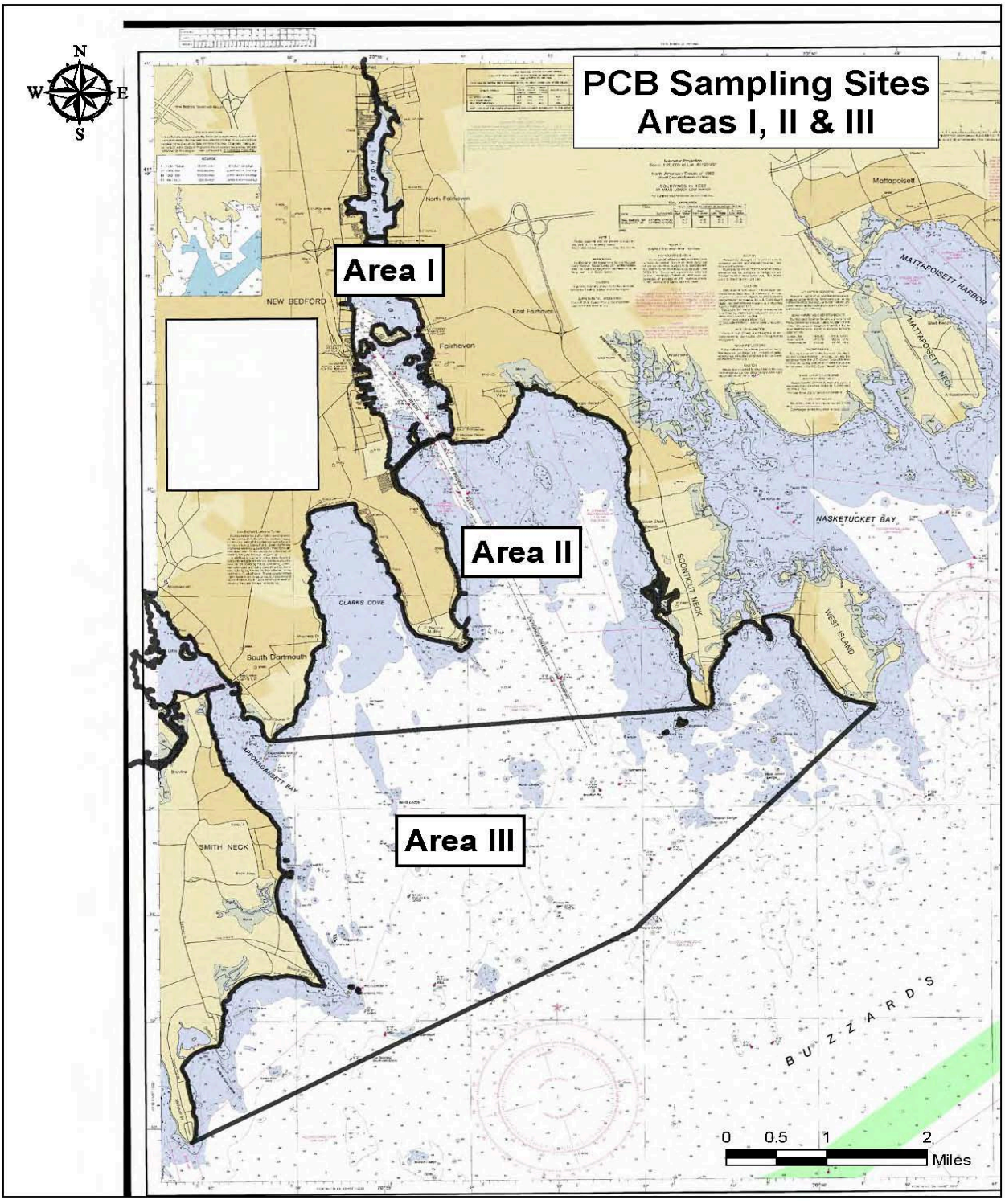


Figure 1 Fish Closure Areas I to III

Table 1: New Bedford Harbor Seafood Species Sampled - 2003 to 2024

Finfish/Shellfish Caught in the New Bedford Harbor Area				
Species	Years	Areas	Locations per Area	Fish per Location
Alewife	2005 - 2014 2019, 2024	1	1-2	5
American Eel	2004 - 2007 2012	1 & 2	3-5 for Area 1 1 for Area 2	1 - 3
Black Sea Bass	2003 – 2014 2019, 2024	2 & 3	2-5 for Area 2 5 for Area 3	1 - 5
Blue Crabs	2003 – 2007 2012, 2019, 2024	1	4	3
Bluefish	2008 – 2013 2019, 2022 - 2024	2 & 3	1-2 for Area 2 2 for Area 3	1 - 6
Summer Flounder	2003 - 2004	2 & 3	1	2 - 13
Winter Flounder	2003 - 2006	1 - 3	1-2 for Area 1 1 for Areas 2 & 3	1 - 2
Lobster	2003 - 2007 2012, 2019, 2024	1 - 3	1 for Area 1 5 for Areas 2 & 3	1 - 4
Quahogs - pre-spawn	2003 – 2024	1 - 3	5 for Area 1 5-7 for Area 2 4-5 Area 3	12 - 20
Quahogs - post spawn	2003 - 2014	1 - 3	5 for Area 1 5-7 for Area 2 4-5 Area 3	12 - 20
Scup	2003 - 2014 2019, 2024	2 & 3	4-5 for Area 2 5 for Area 3	3 - 6
Striped Bass	2010 - 2016 2019, 2022 - 2024	1 - 3	1-5	1
Tautog	2012 - 2014, 2019, 2024	2 & 3	1-5	1 - 5
Channel Whelk - Conch	2009 - 2014 2016 - 2024	2 & 3	1-5 for Area 2 3-5 for Area 3	4 - 14

4. Results and Discussion

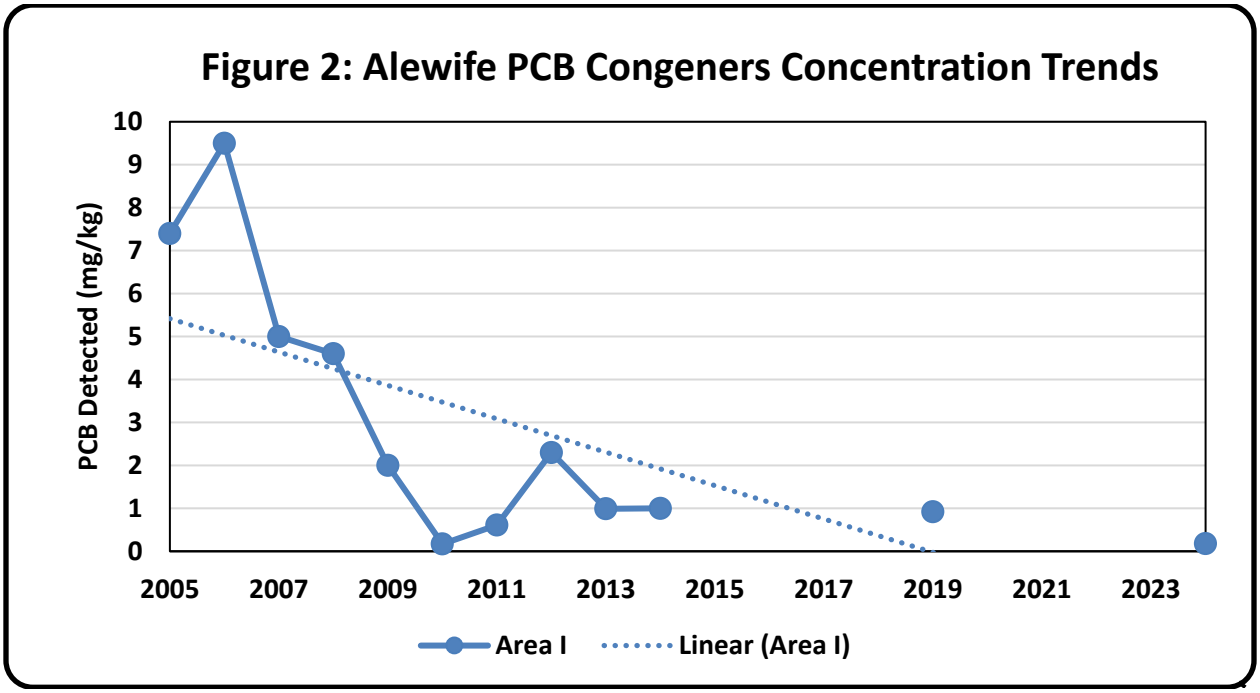
Overall, most of the seafood species indicate a decrease in PCB congener concentration since the start of the dredging in 2003. The following are summaries for each species. Note that only the detected values (*i.e.,* "Hits") are reported on this Trends Report. For the results with the ½ detection level used for non-detections, see the Annual Reports (MassDEP, 2003-2024). The figures were designed to include all the data values, so the Y-axis scale may differ in the three Areas for a particular species (i.*e.,* higher PCB levels in Area 1 seafood than in Area III). Overall, the 1998 ROD estimated that it could take approximately ten years from the completion of remediation to achieve the seafood tissue goal of 0.02 ppm PCBs in all species in all areas."

Alewife

The trend for the PCB concentrations in Alewife has been decreasing from 2005 to 2024 as shown in Table 2 and Figure 2. The sample locations for the Alewife are shown on Figures 3 and 4.

Table 2: Alewife PCB Congener Detected Concentrations (mg/kg)

Station\ Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015 to 2018	2019	2015 to 2018	2024
1A	4.9	11	5.0	4.6	2.0						Not Sampled		Not Sampled	
1B	9.9	7.8												
1C						0.17	0.61	2.3	0.99	1.0		0.92		0.18
Average	7.4	9.5	5.0	4.6	2.0	0.17	0.61	2.3	0.99	1.0		0.92		0.18



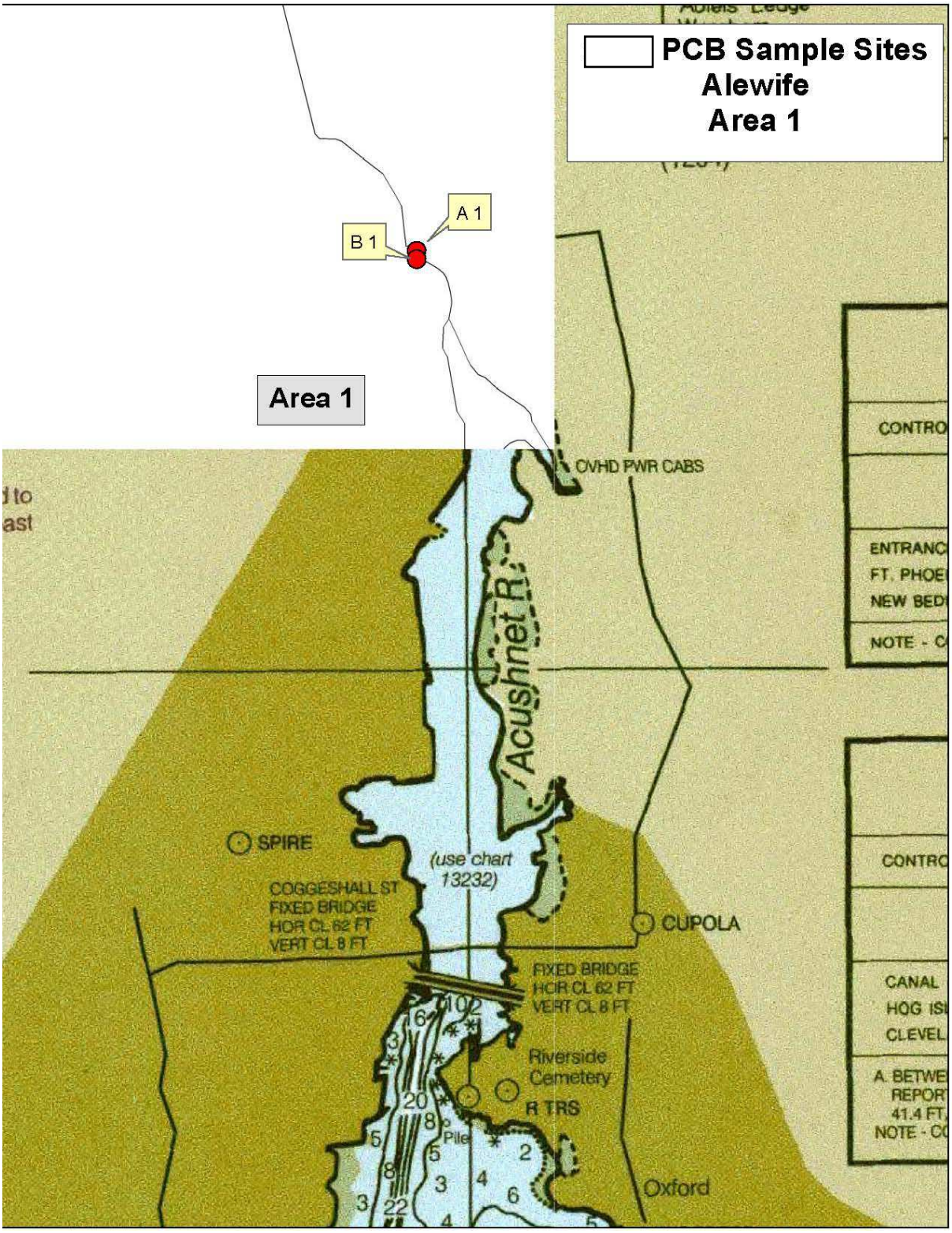


Figure 3 Alewife Sample Locations - Area I
2005 to 2009

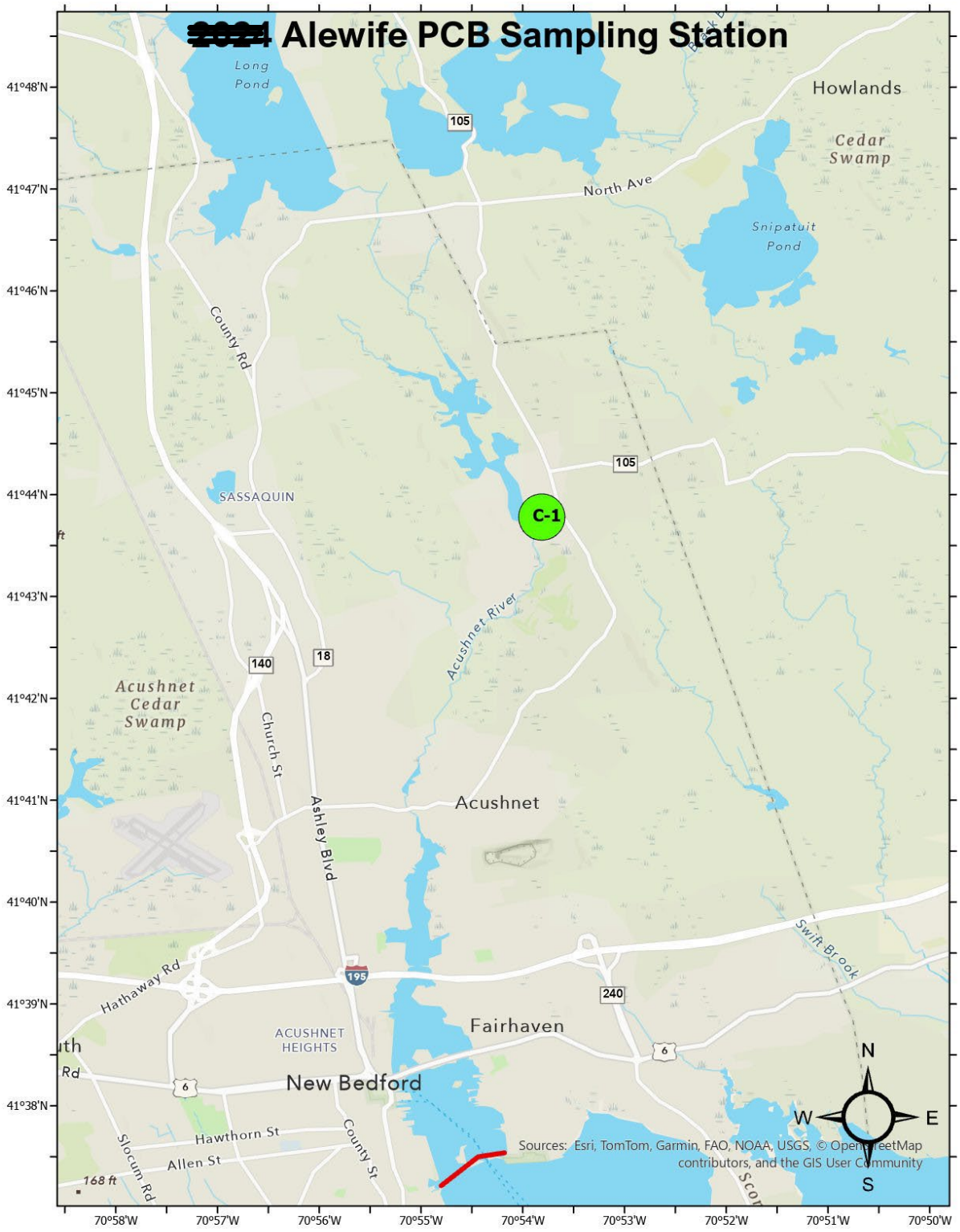


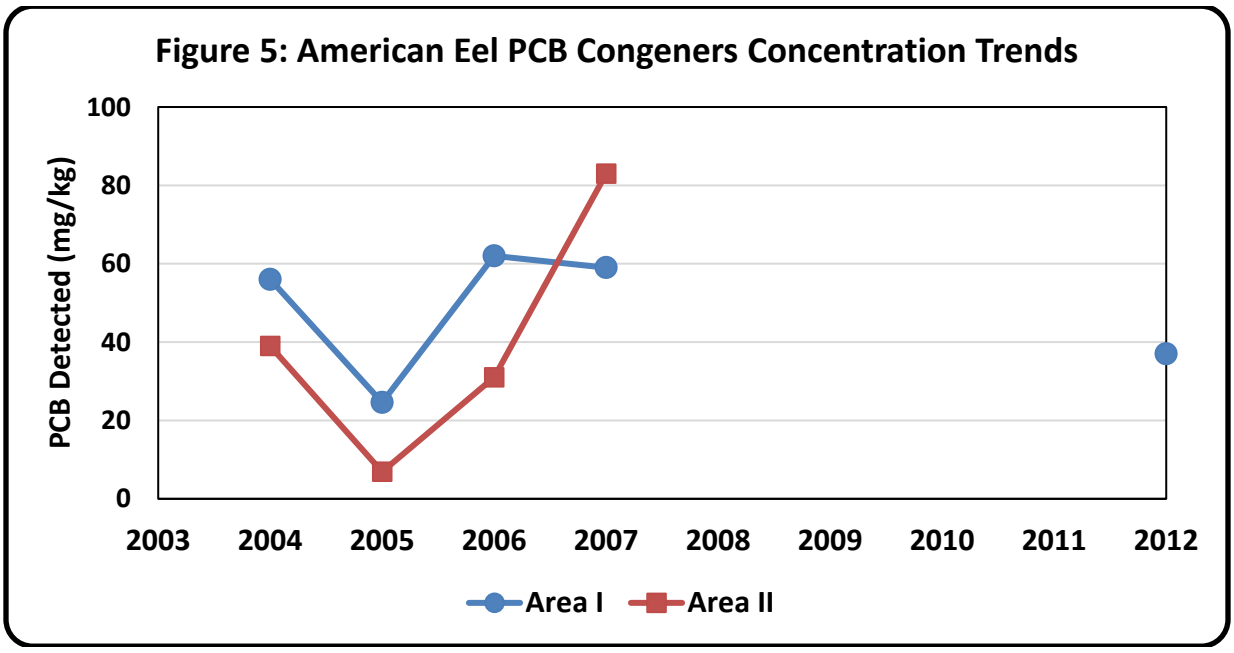
Figure 4 Alewife Locations Area I
2010 to 2014, 2019, and 2024

American Eel

The trend for the PCB concentrations in American Eel cannot be determined because of the limited number of samples collected. The data set is shown on Table 3 and Figure 5. The sample locations for the American Eel are shown on Figure 6.

Table 3: American Eel PCB Congener Detected Concentrations (mg/kg)

Area\Year	2004	2005	2006	2007	2008 to 2011	2012
1A	28	16	81	47	Not Sampled	53
1B	31	15	69	22		20
1C	22	29	37	66		
1D	132	35	70	102		37
1E	67	28	55	59		
Average	56	24.6	62	59		37
2C	39	6.9	31	83		



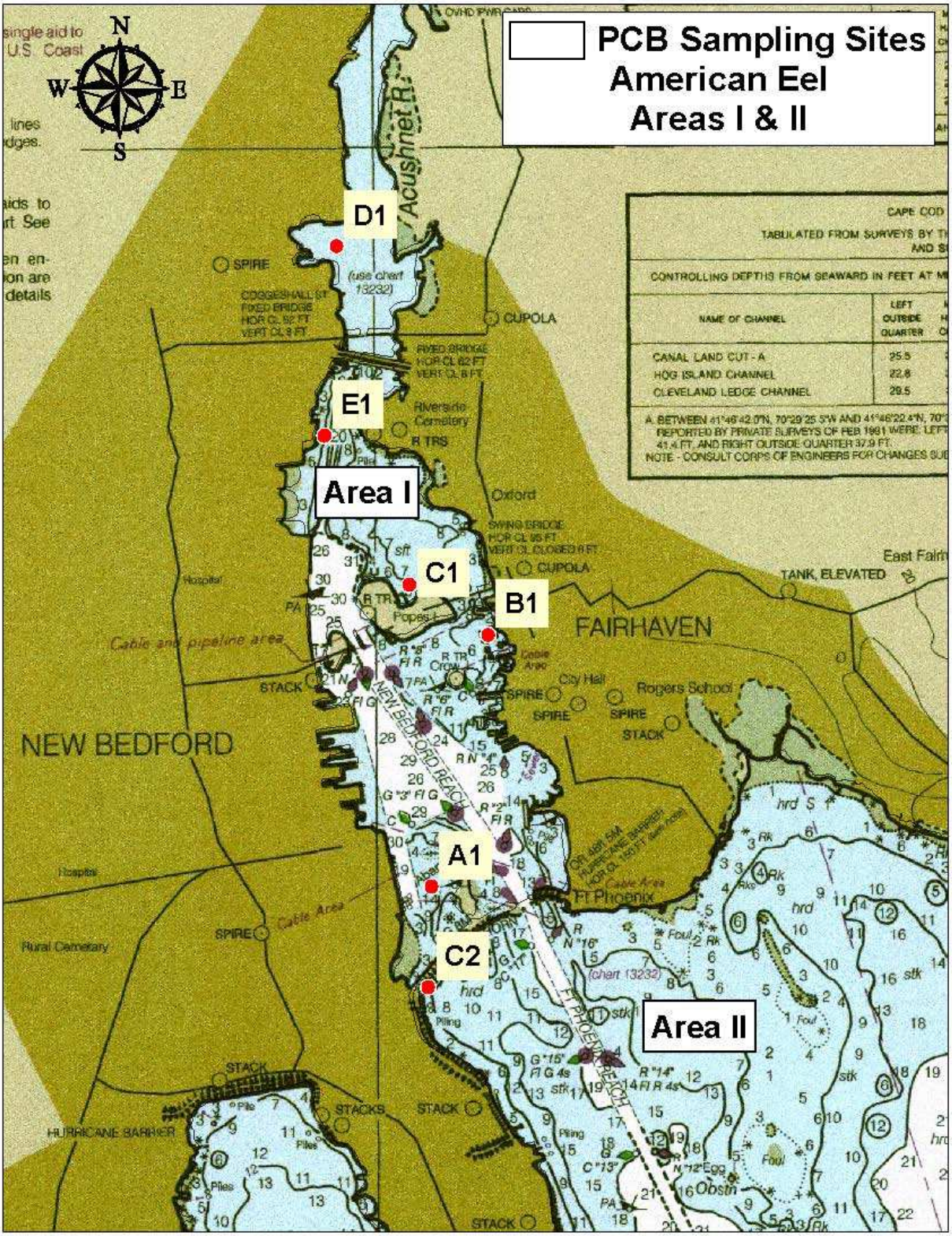


Figure 6 American Eel Sample Locations -Area I & II
2004 to 2007, and 2012

Black Sea Bass

The trend for the PCB concentrations in Black Sea Bass had been decreasing from 2003 to 2024 for Area III, and decreased from 2003 to 2014 in Area II, there was an increase in 2019, however the latest (2024) concentration in Area II is similar to the concentrations before 2015 as shown in Table 4 and Figure 7. The sample locations for the Black Sea Bass are shown on Figure 8.

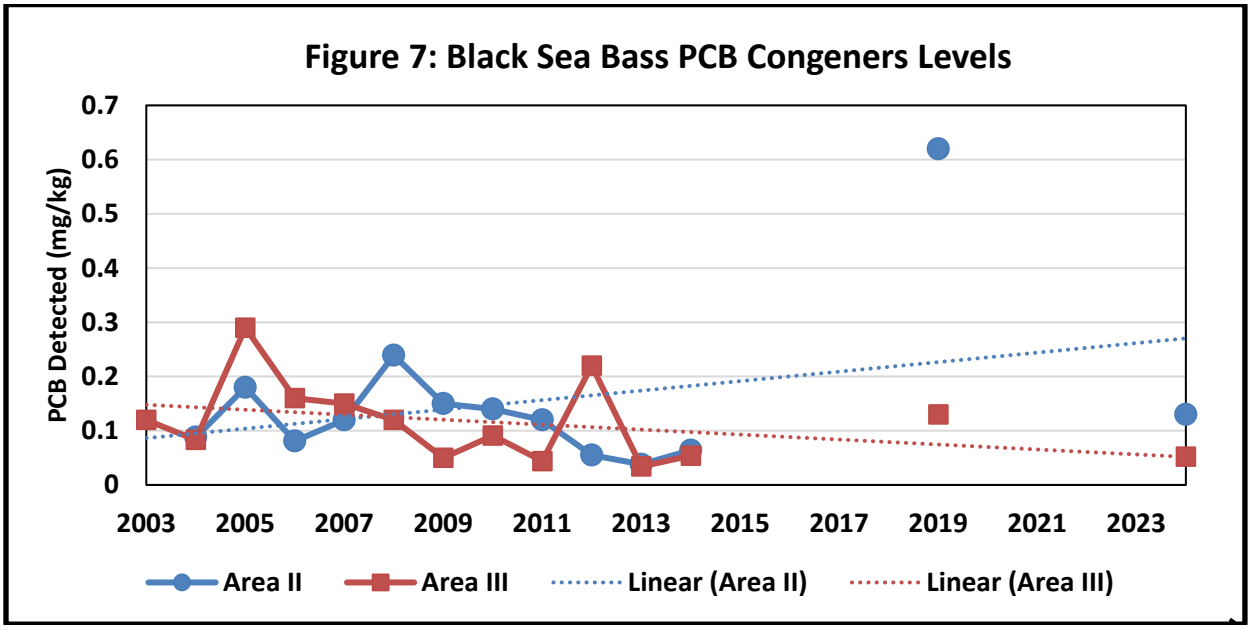


Table 4: Black Sea Bass PCB Congener Detected Concentrations (mg/kg)

Station\ Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015 to 2018	2019	2020 to 2023	2024
2A			0.12	0.05	0.27	0.026	0.018	0.34	0.16		0.069	0.027	Not Sampled	0.34	Not Sampled	0.11
2B		0.077	0.23	0.08	0.023	0.47	0.036	0.18	0.077		0.024	0.038		0.23		
2C					0.079	0.18	0.042	0.11	0.29		0.018	0.13		0.57		0.037
2D		0.099	0.10	0.07	0.058	0.14	0.63	0.051	0.035	0.06	0.028	0.065		1.8		0.24
2E			0.27	0.13	0.15	0.38	0.023	0.036	0.053		0.053	0.057		0.14		
Average		0.088	0.18	0.08	0.12	0.24	0.15	0.14	0.12	0.06	0.038	0.064		0.62		0.13
3A	0.12	0.075	0.13	0.08	0.10	0.12	0.087	0.052	0.036	0.024	0.016	0.035		0.037		0.049
3B		0.056	0.28	0.06	0.23	0.048	0.077	0.029	0.037		0.024	0.044		0.02		0.089
3C		0.096	0.42	0.17	0.093	0.25	0.034	0.026	0.083	0.59	0.081	0.037		0.2		0.036
3D		0.085	0.29	0.27	0.12	0.030	0.028	0.057	0.052	0.056	0.0086	0.057		0.31		0.035
3E		0.10	0.32	0.23	0.19	0.12	0.025	0.29	0.010		0.042	0.096		0.1		
Average	0.12	0.083	0.29	0.16	0.15	0.11	0.05	0.091	0.044	0.22	0.034	0.054		0.13		0.052

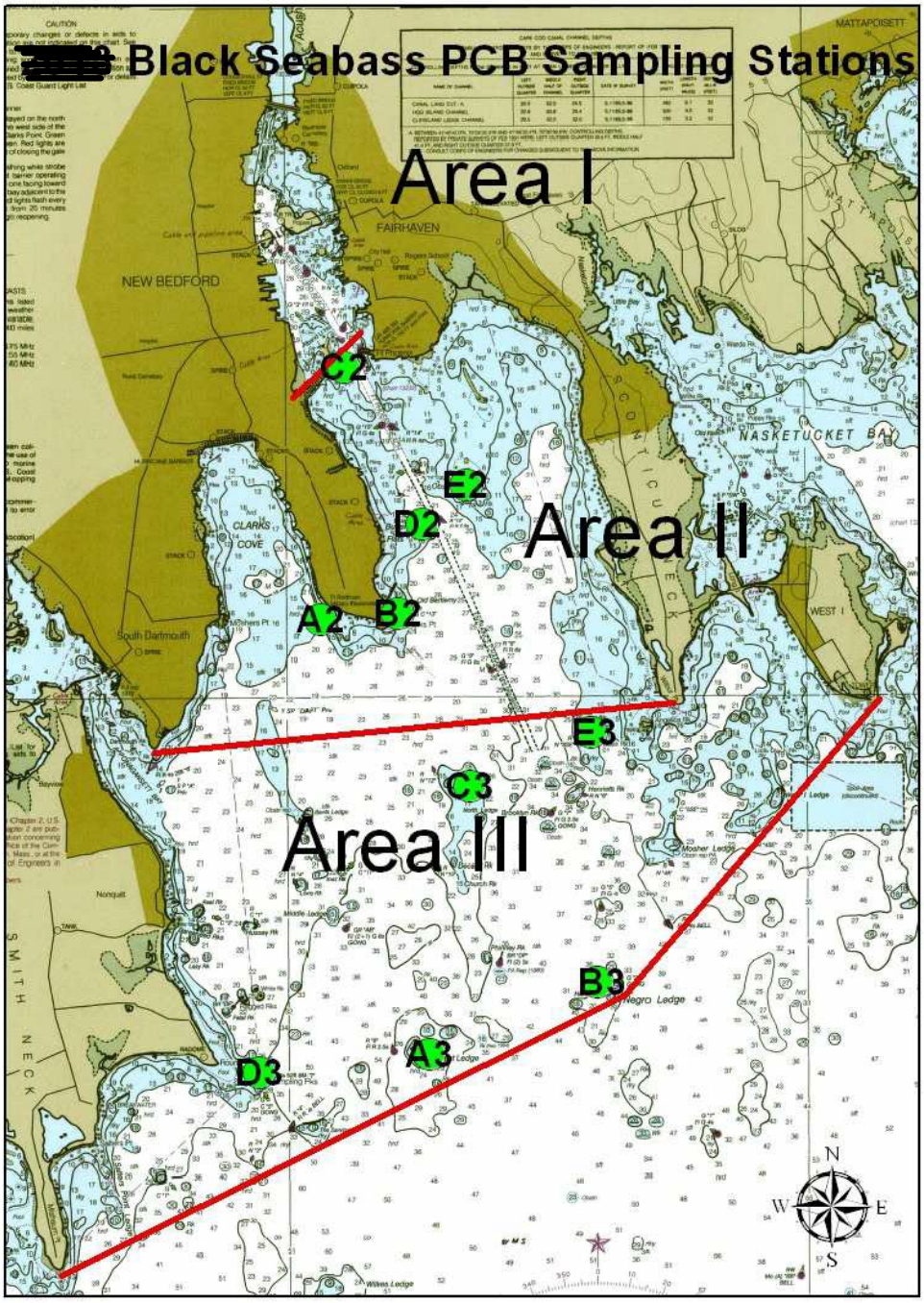


Figure 8 Black Sea Bass Sample Locations -Area II & III
2003 to 2014, 2019, and 2024

Blue Crab

The trend for the PCB concentrations in Blue Crab has been decreasing from 2003 to 2024 as shown in Table 5 and Figure 9. The sample locations for the Blue Crab are shown on Figure 10.

Table 5: Blue Crab PCB Congener Detected Concentrations (mg/kg)

Station\ Year	2003	2004	2005	2006	2007	2008 to 2011	2012	2013 to 2018	2019	2020 to 2023	2024
1A	12	14	16	3.8	9.0	Not Sampled	0.64	Not Sampled	4.4	Not Sampled	0.89
1B	7.8	2.1	3.5	4.7	3.5		1.1		2.1		1.3
1C	1.4	5.9	2.7	3.1	2.7		0.90		1.5		0.46
1D	0.65	6.0	0.80	1.4	3.9		1.3				0.34
1E	3.0										
Average	5.0	6.9	5.8	3.3	4.8		0.97		2.7		0.75

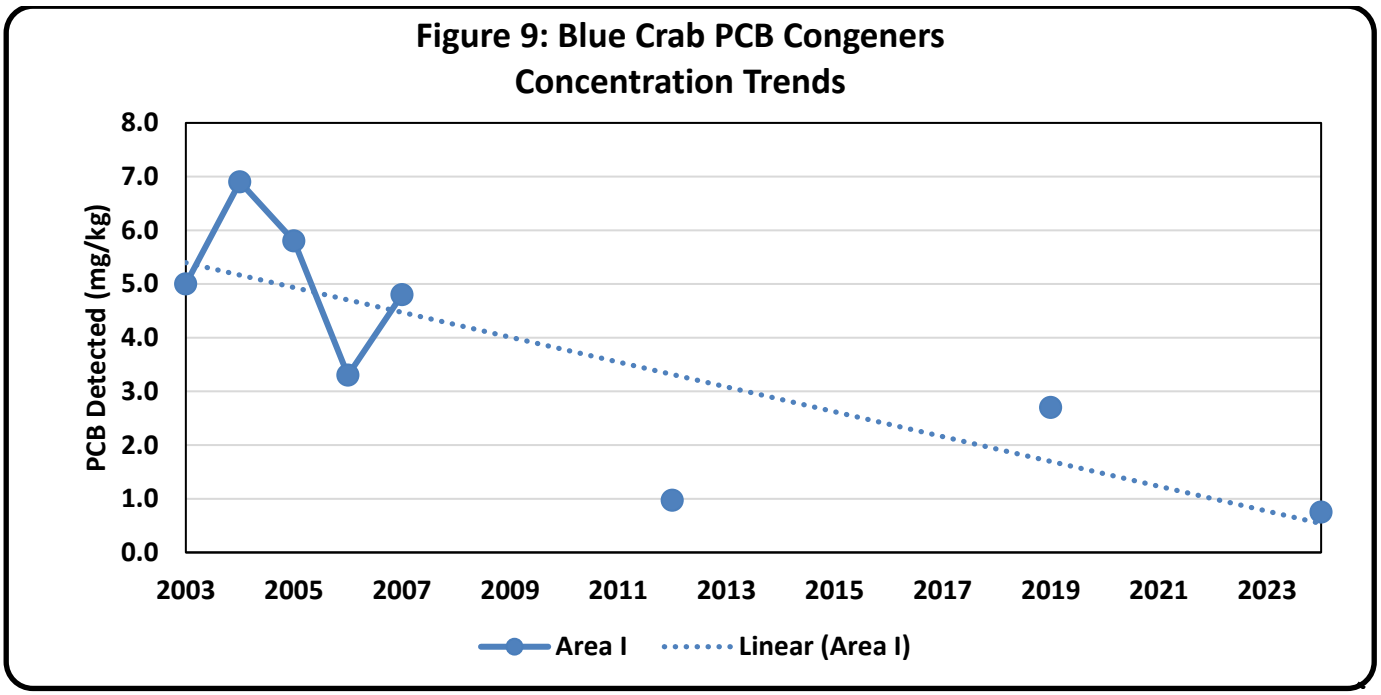


Figure 10 Blue Crab Sample Locations - Area I
2003 to 2007, 2012, 2019, and 2024

Bluefish

The trend for the PCB concentrations in Bluefish has been level for Area III from 2008 to 2024 as shown in Table 6 and Figure 11. The trends Areas I and II cannot be determined because of limited number of years of sampling. The sample locations for the Bluefish are shown on Figure 12.

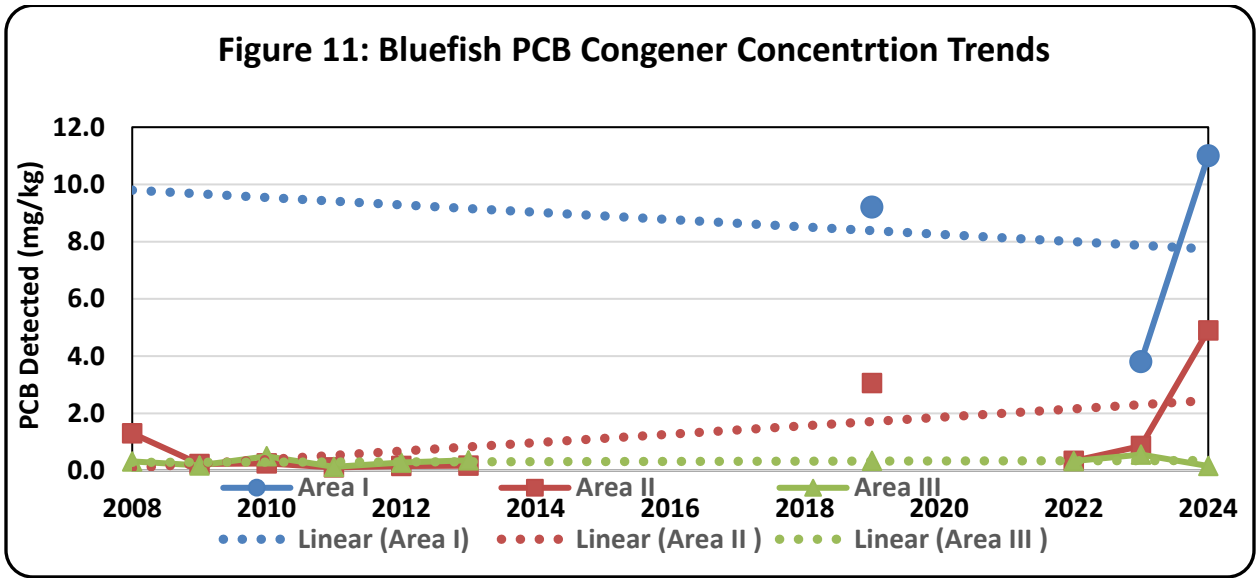
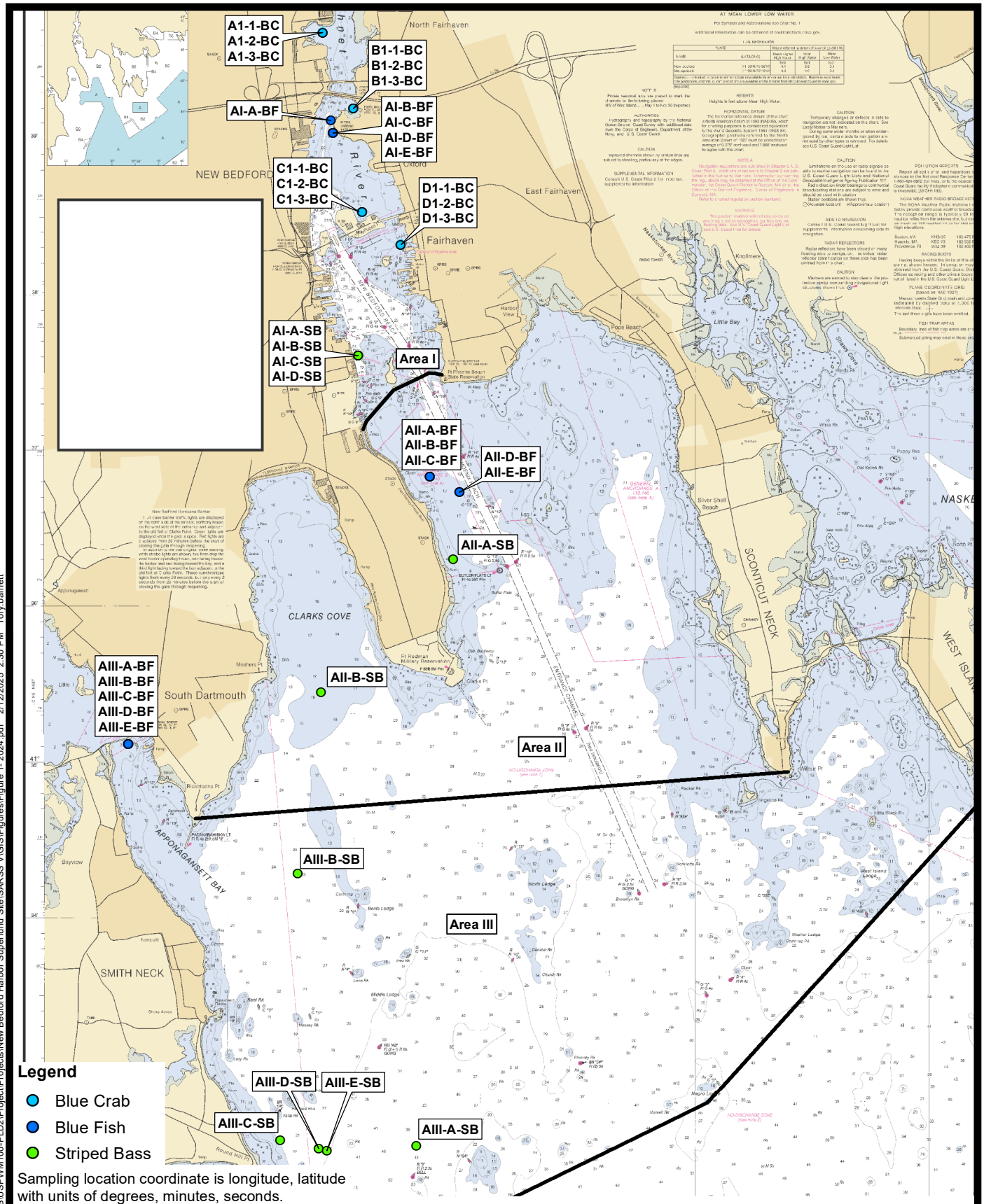


Table 6: Bluefish PCB Congener Detected Concentrations (mg/kg)

Station\Year	2008	2009	2010	2011	2012	2013	2014 to 2018	2019	2022	2023	2024
1A								10.8		5.1	8.4
1B								3.2		2.2	11
1C								5.9		5.0	15
1D								16.5		2.7	17
1E								8.8			23
Average								9.0		3.8	15
2A	1.5		0.13	0.12	0.21	0.13		9.4	0.26	2.3	0.91
2B	1.1	0.23	0.37	0.10	0.11	0.21		0.57	0.52	0.49	2.5
2C							Not Sampled	2.1	0.34	0.61	3.4
2D								1.8	0.33	0.46	4.9
2E								1.4	0.25	0.44	13
Average	1.3	0.23	0.25	0.11	0.16	0.17		3.1	0.34	0.86	4.9
3A	0.39	0.14	0.84	0.15	0.40	0.20		0.25	0.092	0.13	0.29
3B	0.24	0.22	0.16	0.11	0.16	0.51		0.12	0.24	0.38	0.19
3C								0.22	0.74	1.4	0.16
3D								0.94	0.41	0.47	0.13
3E								0.18	0.18	0.44	0.023
Average	0.32	0.18	0.50	0.13	0.28	0.36		0.34	0.33	0.56	0.16

Note: Samples collected between 2008 and 2013 had composited fish per location. Samples collected in after 2019 had one fish per location. The following stations are in the same location: Stations 1A and 1C; 1D and 1E; 2C, 2D, and 2E in 2019: and 1A, 1B, and 1D in 2023.



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Mass DEP
New Bedford Harbor Monitoring
New Bedford, Massachusetts

wsp

Arae I, Area II and Area III
Sampling Locations
Project 3626236242 Figure 12

Conch

The trend for the PCB concentrations in Conch has been level in Areas II (except for 2016 and 2017) and decreasing in Area III from 2009 to 2024 as shown in Table 7 and Figure 13. The sample locations for the Conch are shown on Figure 14.

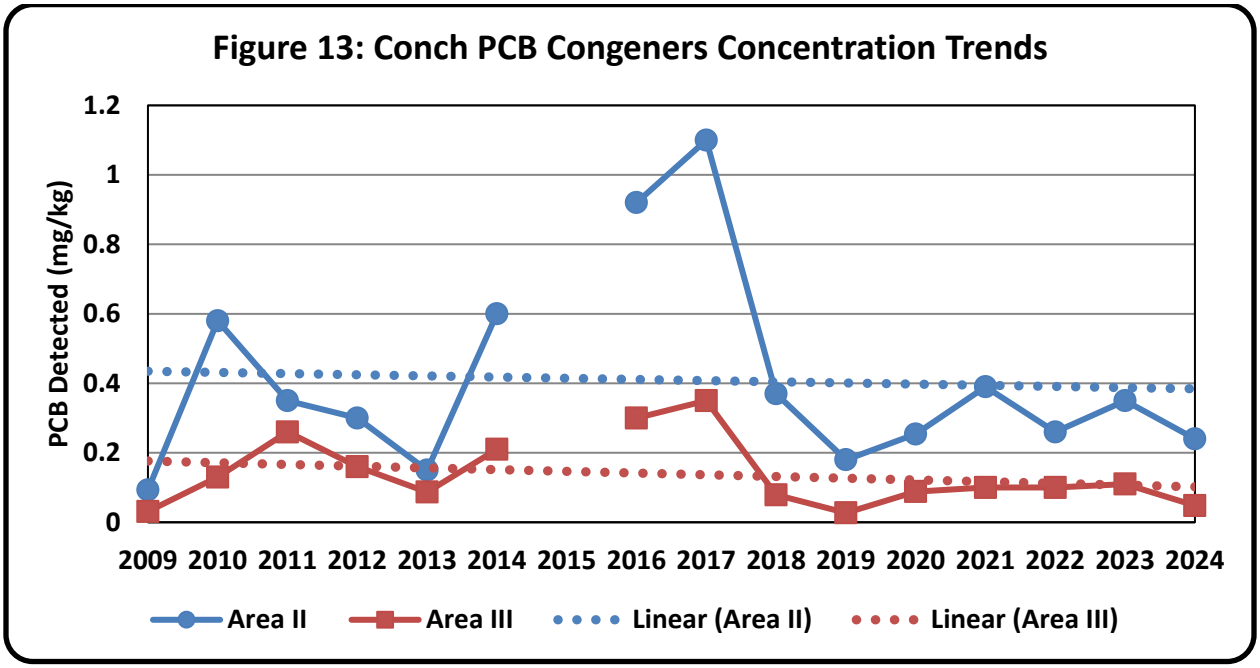


Table 7: Conch PCB Congener Detected Concentrations (mg/kg)

Station\ Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2A	0.068		0.14	0.12	0.028	0.30		0.55	0.36	0.18	0.068	0.15	0.17	0.16	0.15	0.28
2B	0.11	0.58	0.22	0.25	0.12	0.88		0.76	1.4	0.26	0.23	0.23	0.35	0.26	0.41	0.12
2C	0.16		0.56	0.67	0.40	0.65		1.4	2.3	0.74	0.33	0.41	0.73	0.32	0.53	0.21
2D	0.040		0.63	0.23	0.14	0.44		1.5	1.3	0.45	0.17	0.25	0.34	0.40	0.41	0.28
2E	0.089		0.21	0.22	0.078	0.72		0.41	0.26	0.20	0.10	0.23	0.34	0.15	0.27	0.31
Average	0.093	0.58	0.35	0.30	0.15	0.60		0.92	1.1	0.37	0.18	0.25	0.39	0.26	0.35	0.24
3A	0.035	0.13	0.13	0.21	0.066	0.14	Not Sampled		0.40	0.058		0.023	0.070	0.092	0.082	0.036
3B	0.0093			0.098	0.023	0.043			0.15	0.033	0.021	0.069	0.066	0.10	0.067	0.038
3C	0.022	0.091	0.091	0.09	0.078	0.094		0.34	0.80	0.073	0.030	0.20	0.10	0.11	0.12	0.085
3D	0.013	0.17	0.72	0.23	0.21	0.43		0.25	0.13	0.079	0.022	0.050	0.081	0.072	0.16	0.036
3E	0.074		0.10	0.18	0.059	0.36			0.28	0.15	0.035	0.10	0.19	0.15	0.12	0.047
Average	0.031	0.13	0.26	0.16	0.087	0.21		0.3	0.35	0.079	0.027	0.088	0.10	0.10	0.11	0.048

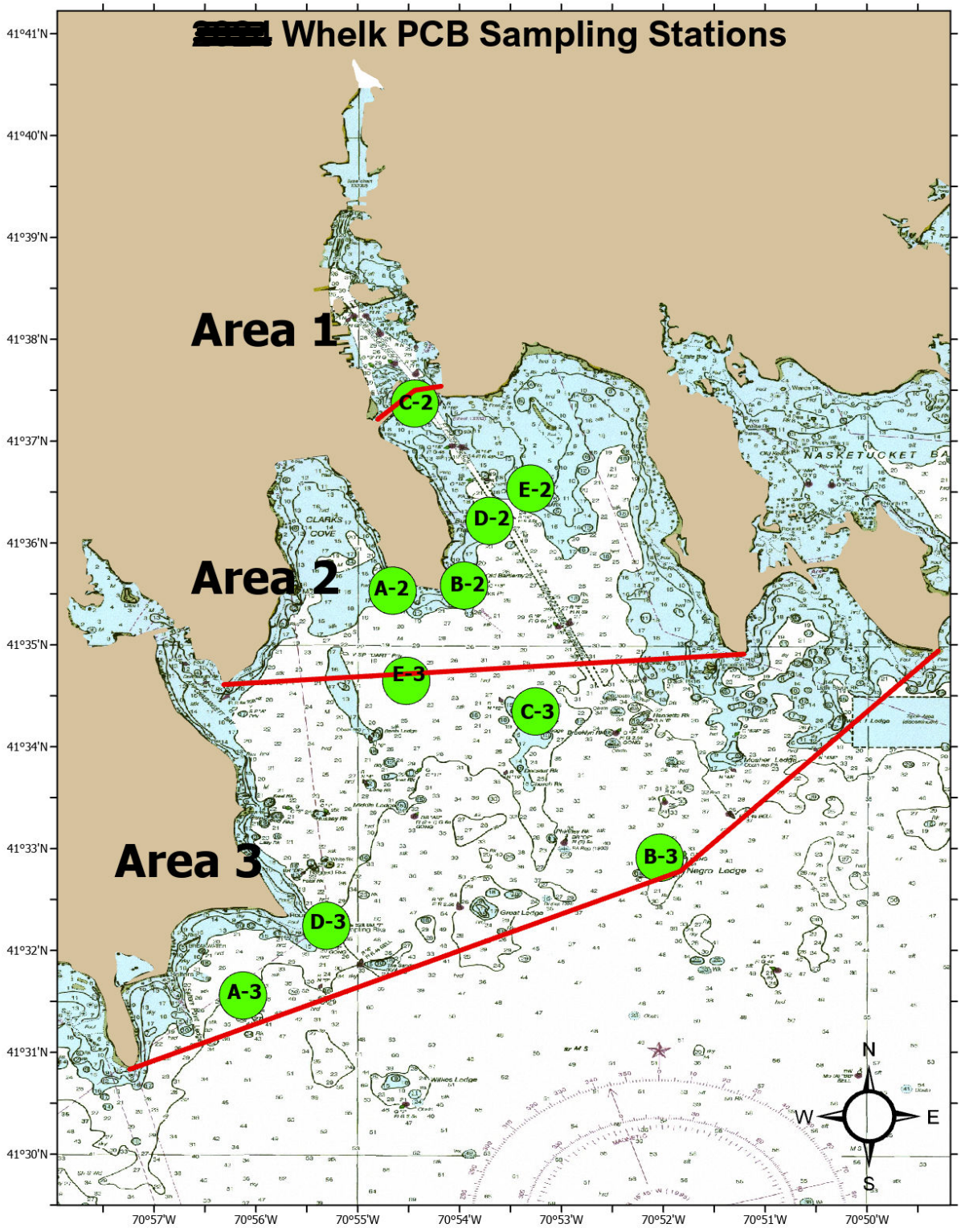


Figure 14 Conch Sample Locations - Area II & III
2009 to 2014, and 2016 to 2024

Flounder

The trend for the PCB concentrations in Flounder cannot be determined because of the limited number of samples collected. The data set for Winter Flounder is shown on Table 8. The data set for Summer Flounder is shown on Table 9.

Table 8: Winter Flounder PCB Congener Detected Concentrations (mg/kg)

Station\Year	2003	2004	2005	2006
1A	1.8			
1B	3.9			
Average	2.8			
2C			2.0	0.042
3A	0.61			

Table 9: Summer Flounder PCB Congener Detected Concentrations (mg/kg)

Station\Year	2003	2004
2A		0.087
2E		0.81
Average		0.45
3A	0.097	

Lobster – Meat

The trend for the PCB concentrations in Lobster meat decreases for Area II and III from 2009 to 2024 as shown in Table 10 and Figure 15. The sample locations for the Lobster are shown on Figure 16.

Table 10: Lobster Meat PCB Congener Detected Concentrations (mg/kg)

Station\ Year	2003	2004	2005	2006	2007	2008 to 2011	2012	2013 to 2018	2019	2020 to 2023	2024
1E		0.098	0.08	0.079	0.16	Not Sampled		Not Sampled		Not Sampled	
2A	0.11	0.043	0.13	0.10	0.25		0.23		0.14		0.071
2B	0.095	0.058	0.13	0.067	0.094		0.13		0.057		0.033
2C	0.31	0.14	0.10	0.12	0.13		0.074				0.030
2D	0.20	0.068	0.090	0.13	0.085		0.11		0.17		0.11
2E	0.14	0.11	0.12	0.095	0.27						
Average	0.17	0.085	0.11	0.10	0.17		0.14		0.12		0.061
3A	0.092	0.034	0.083	0.14	0.15		0.10				0.019
3B	0.071	0.058	0.10	0.11	0.089		0.081		0.032		0.031
3C	0.10	0.025	0.047	0.074	0.083		0.017		0.045		
3D	0.073	0.054	0.030	0.084	0.038		0.068		0.03		0.0079
3E	0.31	0.024	0.049	0.089	0.076		0.045		0.056		0.035
Average	0.13	0.039	0.062	0.10	0.088		0.062		0.041		0.023

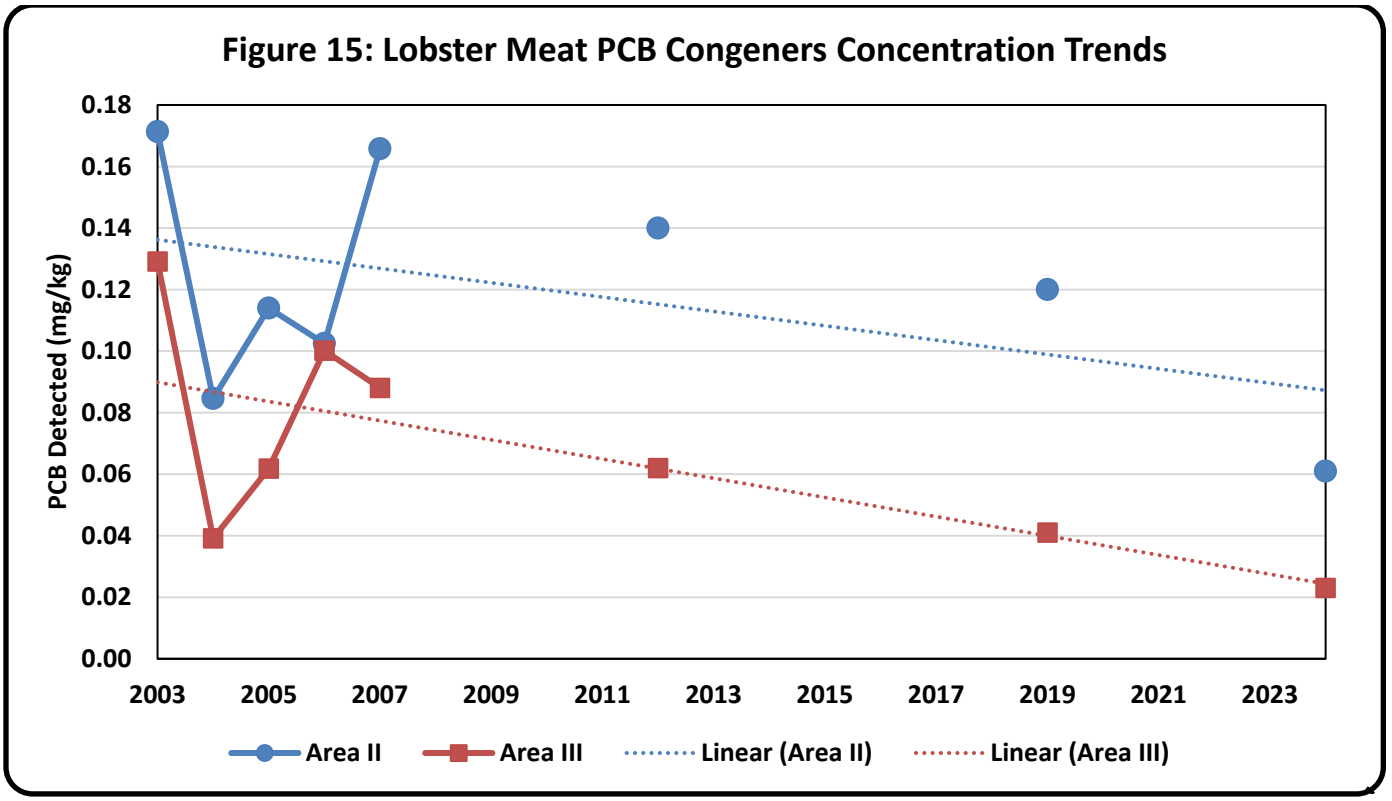


Figure 15: Lobster Meat PCB Congeners Concentration Trends
PCB Detected (mg/kg)
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
Area II
Area III
Linear (Area II)
Linear (Area III)

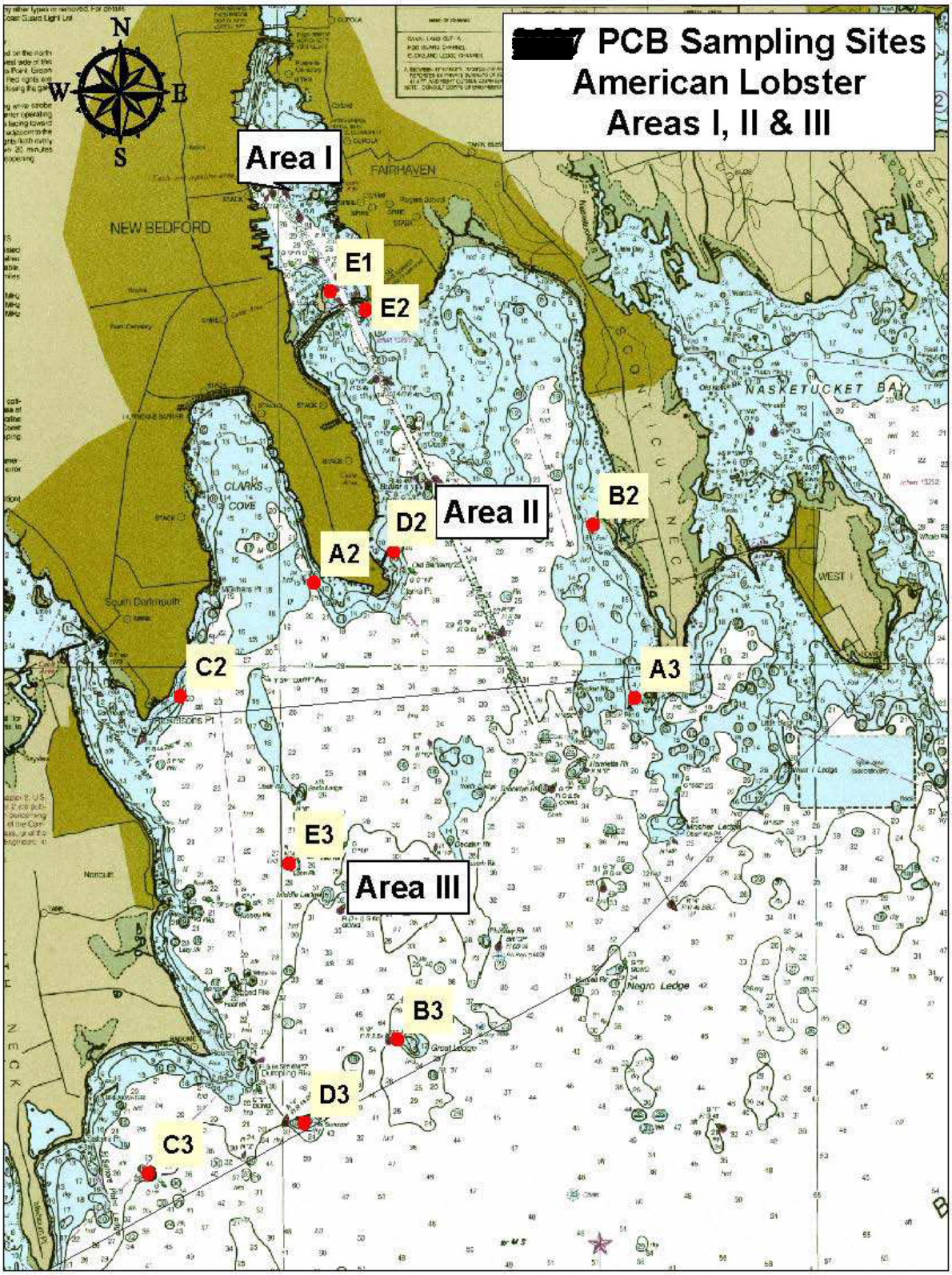


Figure 16 American Lobster Locations - Area I, II, & III
2003 to 2007, 2012, 2019, and 2024

Lobster - Tomalley

The trend for the PCB concentrations in Lobster tomalley decreases from 2003 to 2024 as shown in Table 11 and Figure 17.

Table 11: Lobster Tomalley PCB Congener Trend - Detected Values (mg/kg)

Station\ Year	2003	2004	2005	2006	2007	2008 to 2011	2012	2013 to 2018	2019	2020 to 2023	2024
1E		31	10	14	14	Not Sampled		Not Sampled		Not Sampled	
2A	12	9.4	13	11	19		10		10		6.8
2B	9.3	11	10	5.3	7.1		10		9		5.8
2C	22	12	14	8.0	6.0		8.5				6.5
2D	25	13	9.0	12	10		13		29		8.0
2E	43	21	26	7.5	25						
Average	22	13	14.4	9	14		11		16		6.8
3A	10	5.0	5.1	8.0	11		5.9				9.2
3B	6.1	6.1	19	5.9	13		3.5		2.9		2.9
3C	4.5	4.9	7.9	3.9	5.1		1.2		5.1		
3D	9.2	7.8	6.8	7.5	4.7		6.2		3.4		5.8
3E	25	4.9	4.5	5.8	6.4		3.3		2.3		6.0
Average	11	5.7	8.7	6.2	8.0		4.0		3.4		6.0

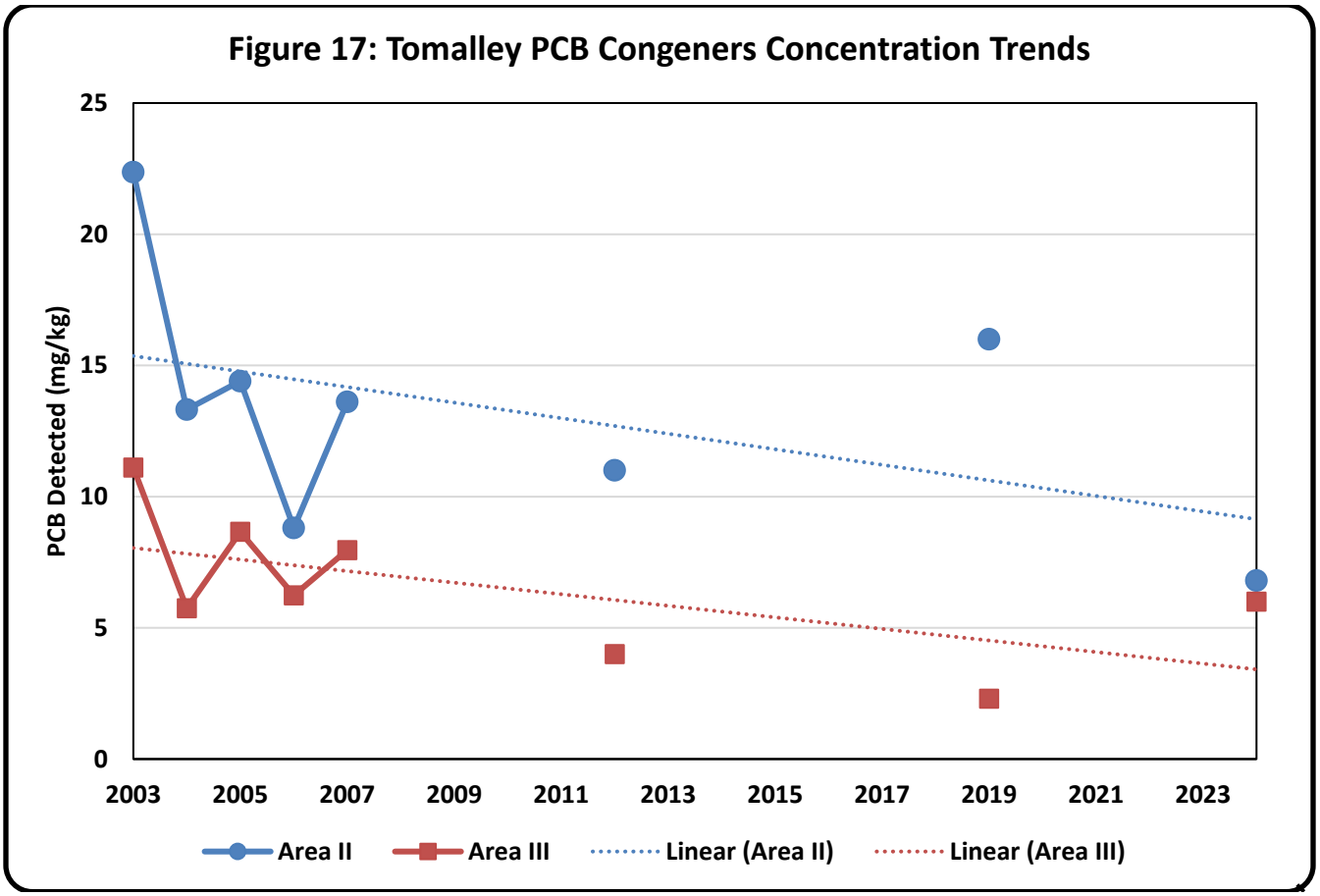


Figure 17: Tomalley PCB Congeners Concentration Trends
PCB Detected (mg/kg)
25
20
15
10
5
0
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
Area II
Area III
Linear (Area II)
Linear (Area III)

Lobster – Meat and Tomalley Combination

The trend for the PCB concentrations in combination Lobster meat and tomalley (weighted average) decreases from 2003 to 2024 as shown in Table 12 and Figure 18.

Table 12: Lobster Meat and Tomalley PCB Congener Detected Concentrations (mg/kg)

Station\ Year	2003	2004	2005	2006	2007	2008 to 2011	2012	2013 to 2018	2019	2020 to 2023	2024
1E		4.2	1.4	1.4	1.8	Not Sampled		Not Sampled		Not Sampled	
2A	1.4	1.0	1.8	1.2	2.8		1.4		1.4		0.91
2B	1.1	1.0	1.4	0.54	1.0		1.3		1.3		0.76
2C	1.4	1.2	2.1	0.93	0.78		1.1				1.3
2D	1.7	2.3	1.8	1.4	1.3		1.7		3.8		1.1
2E	4.0	2.1	3.6	0.82	2.7						
Average	1.9	1.5	2.1	1.0	1.7		1.4		2.2		1.0
3A	1.4	0.67	0.70	0.93	1.4		0.81				0.94
3B	1.1	0.93	2.2	0.56	1.8		0.5		0.45		0.41
3C	0.82	0.89	1.2	0.45	0.69		0.17		0.77		
3D	1.4	1.4	0.99	0.83	0.69		0.83		0.55		0.57
3E	3.4	0.88	0.80	0.65	0.88		0.45		0.31		0.93
Average	1.6	0.95	1.2	0.68	1.1		0.55		0.52		0.71

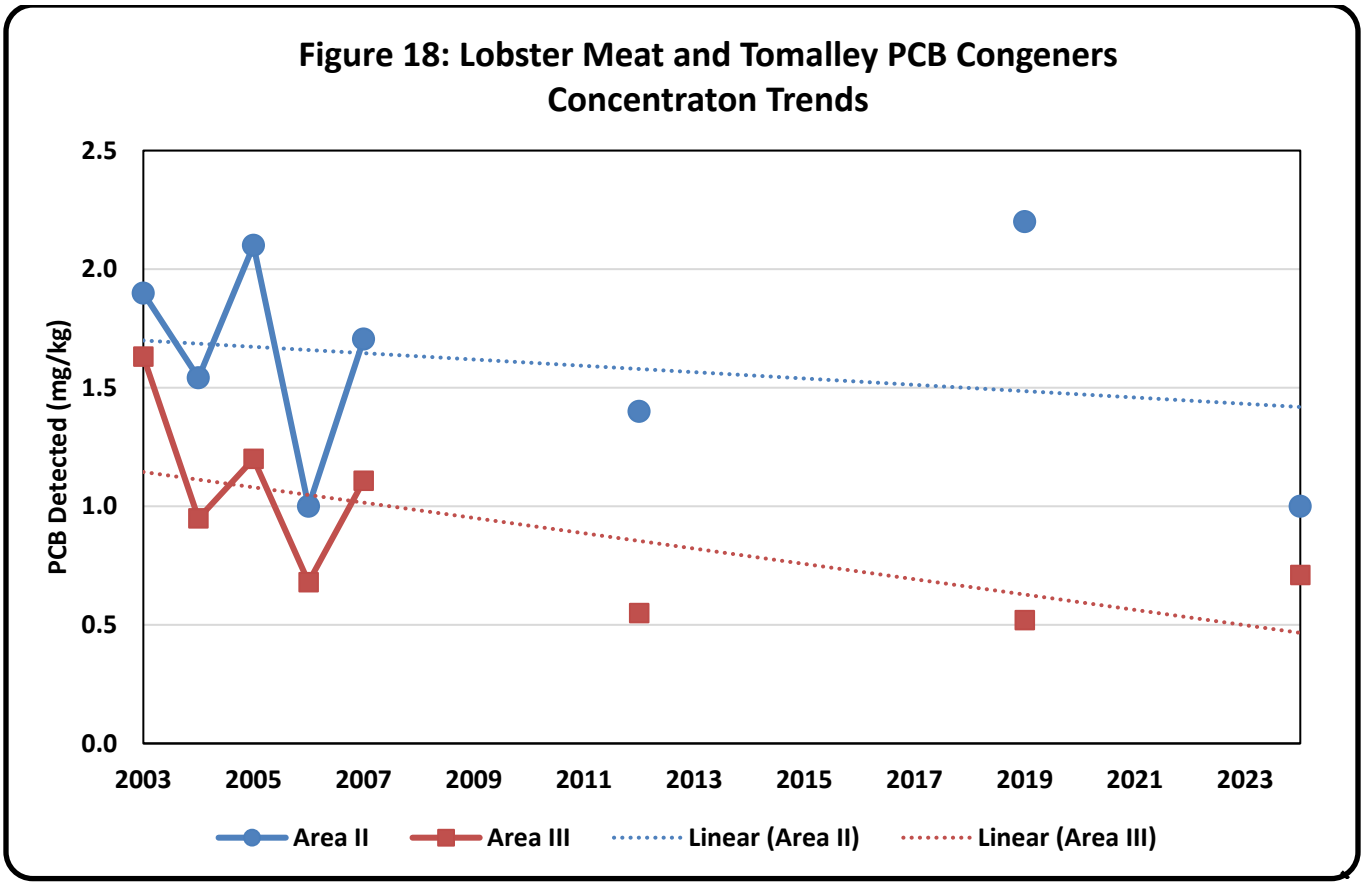


Figure 18: Lobster Meat and Tomalley PCB Congeners Concentraton Trends
PCB Detected (mg/kg)
2.5
2.0
1.5
1.0
0.5
0.0
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
Area II
Area III
Linear (Area II)
Linear (Area III)

Quahog - Pre-Spawn

The trend for the PCB concentrations in Pre-Spawn Quahog decreases for all locations from 2003 to 2024 as shown in Table 13 and Figures 19 to 24. The sample locations for the Quahog are shown on Figure 25. The sampling generally occurred during or before May. However, there were some years that the sampling was performed in June and July. Locations 2A, 2E, 2O, 3A, 3C, 3E and 3F are not shown on the figures because the sampling at these locations were not sampled after 2007 or have limited number of samples.

Note there is one sample location (3E) collected in September in 2004 that would be considered a Post-Spawn Quahog sample but was left in the Pre-Spawn Quahog data because only one round of sample was collected. The Post-Spawn Quahog sampling events (2007 to 2014) presented in the next section were specifically performed after a round of Pre-Spawn Quahog samples were also collected.

Table 13: Quahog Pre-Spawn PCB Congener Detected Concentrations (mg/kg)

Station\ Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1A	0.73	0.72	0.77	0.60							0.53					1			0.39	0.14	0.16	0.21
1B	1.1	0.63	1.2	1.4	1.2				0.40		0.23	0.83	0.45		0.54	1	0.4		0.27	0.17	0.12	0.21
1C	1.5	1.65	1.6	1.6					0.50		0.34				0.65				0.36	0.15	0.36	0.35
1D	1.7	2.3	1.8	1.8					0.96		0.90	1.1	0.44		1.2	1.8	0.8		0.54		0.24	0.41
1E	2.9	6.1	4.0	4.1	6.0				1.3		0.90	2.1	0.79	1.3	1.5	2.7	0.92		0.59		0.36	0.35

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2A	0.079	0.086	0.08	0.13																		
2B	0.036	0.053	0.037	0.056	0.075	0.036	0.027	0.037	0.036	0.071	0.029	0.035	0.013	0.030	0.043	0.069	0.033	0.056	0.038	0.037	0.042	0.022
2C	0.26	0.28	0.46	0.48	0.72	0.33	0.31	0.39	0.37	0.36	0.24	0.31	0.17	0.22	0.28	0.33	0.22	0.19	0.086	0.14	0.11	0.17
2D	0.88	0.17	0.24	0.20	0.15	0.13	0.12	0.28	0.068	0.094	0.056	0.099	0.064	0.057	0.056	0.12	0.073	0.087	0.080	0.040	0.055	0.060
2E	0.12	0.77	0.81	0.50					0.050													
2F					0.083	0.053	0.046	0.087	0.050	0.056	0.049	0.046	0.043	0.050	0.049	0.11	0.052	0.043	0.037	0.025	0.035	0.033
2G					0.064	0.050	0.040	0.051	0.027	0.067	0.021	0.032	0.016	0.032	0.045	0.077	0.028	0.024	0.030	0.025	0.025	0.028
2H					0.29	0.16	0.069	0.15	0.088	0.095	0.12	0.091	0.059	0.080	0.11	0.14	0.071	0.046	0.062	0.086	0.046	0.10
2O									0.16													

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
3A	0.028	0.062	0.045	0.19																		
3B	0.034	0.050	0.016	0.19	0.10	0.026	0.014	0.024	0.021	0.054	0.029	0.033	0.033	0.022	0.035	0.035	0.031	0.025	0.039	0.026	0.022	0.031
3C	0.028	0.038	0.0002	0.064	0.036																	
3D	0.023	0.017	0.14	0.0020	0.029	0.017	0.0067	0.027	0.017	0.022	0.014	0.016	0.0018	0.018	0.024	0.028	0.026	0.020	0.029	0.015	0.017	0.026
3E	0.065	0.036	0.001	0.001	0.0004																	
3F					0.064																	
3I						0.021	0.00058	0.045	0.013	0.028	0.029	0.022	0.013	0.025	0.025	0.041	0.039	0.016	0.013	0.022	0.0082	0.039
3J						0.019	0.0034	0.021	0.0034	0.017	0.011	0.007	0.0017	0.0087	0.0056	0.011	0.0062	0.0030	0.0047	0.0084	0.0055	0.0062

Figure 19: Pre-spawn Quahog PCB Congener Concentration Trends - Locations 1A, 1B, and 1C

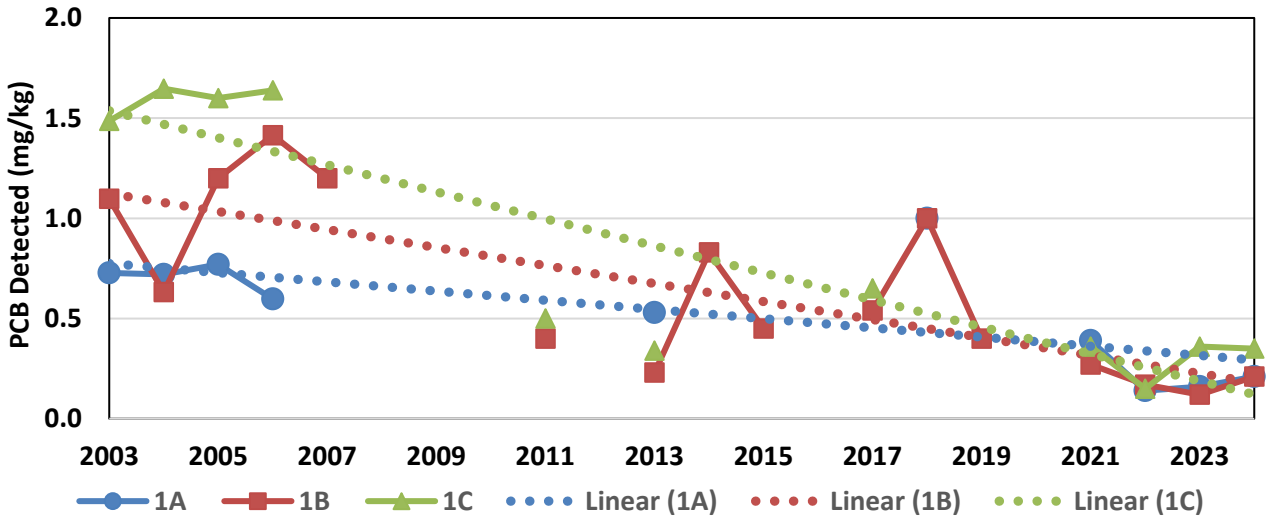


Figure 20: Pre-spawn Quahog PCB Congener Concentration Trends - Locations 1D and 1E

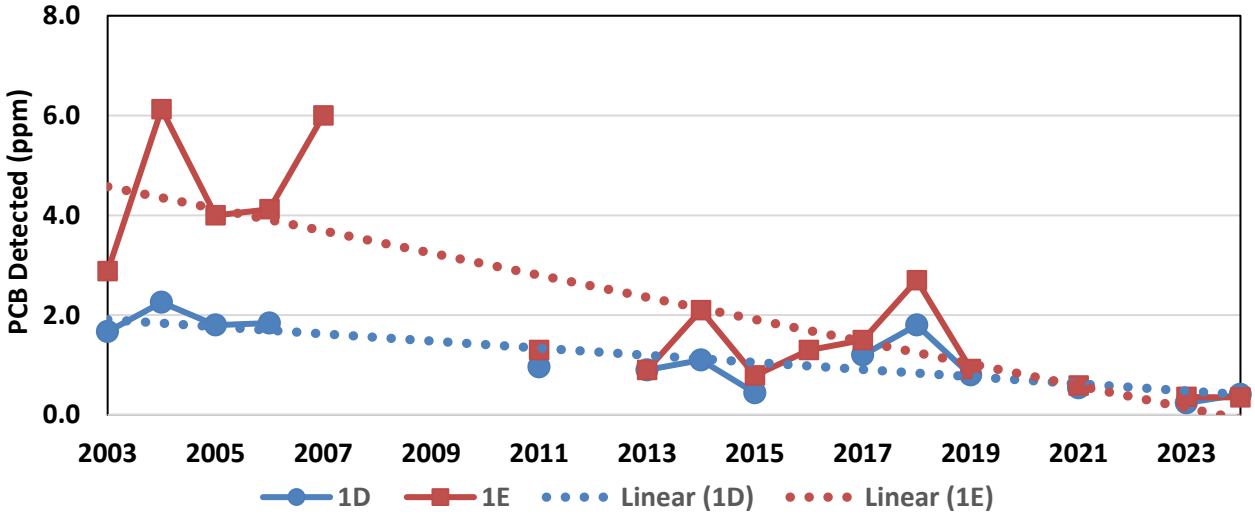


Figure 21: Pre-spawn Quahog PCB Congener Concentration Trends - Locations 2C, 2D, and 2H

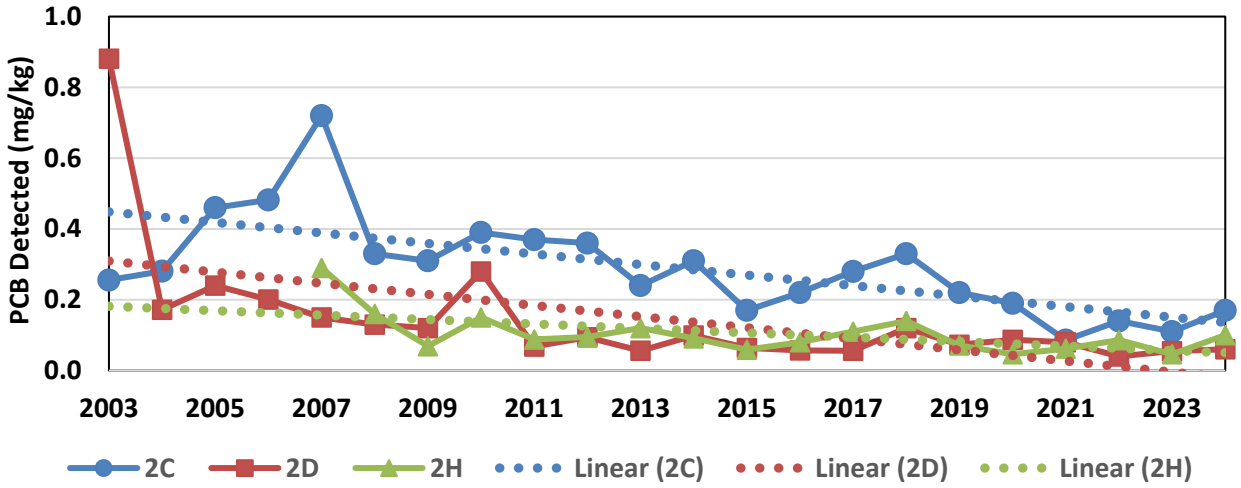


Figure 22: Pre-spawn Quahog PCB Congener Concentration Trends - Locations 2B, 2F, and 2G

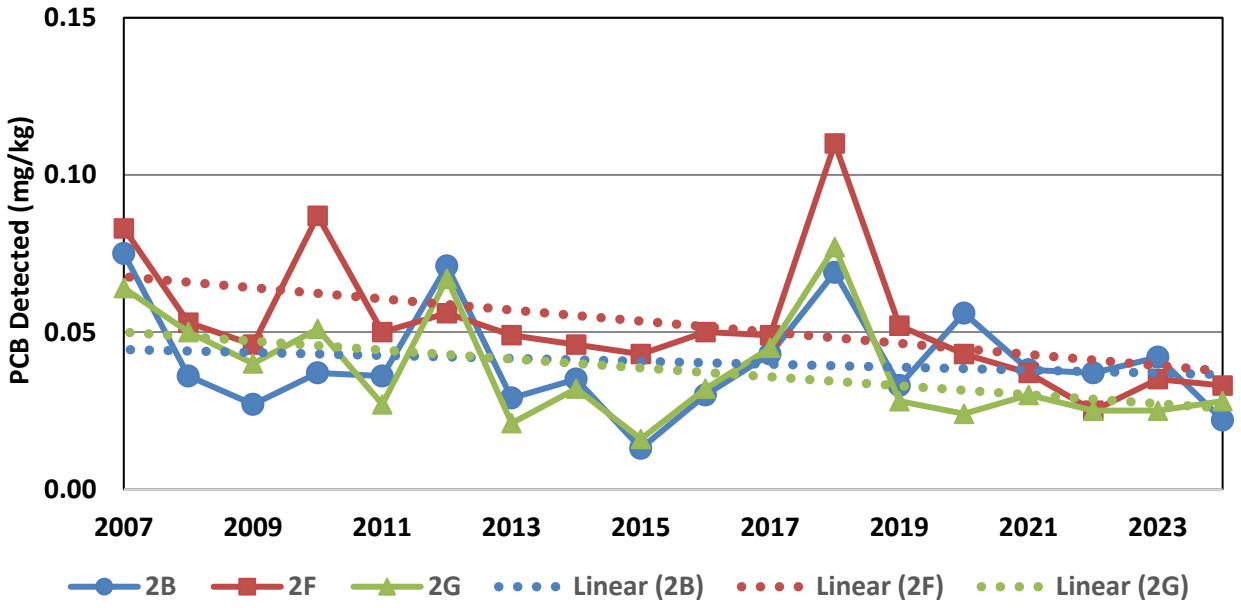


Figure 23: Pre-spawn Quahog PCB Congener Concentration Trends - Locations 3B and 3D

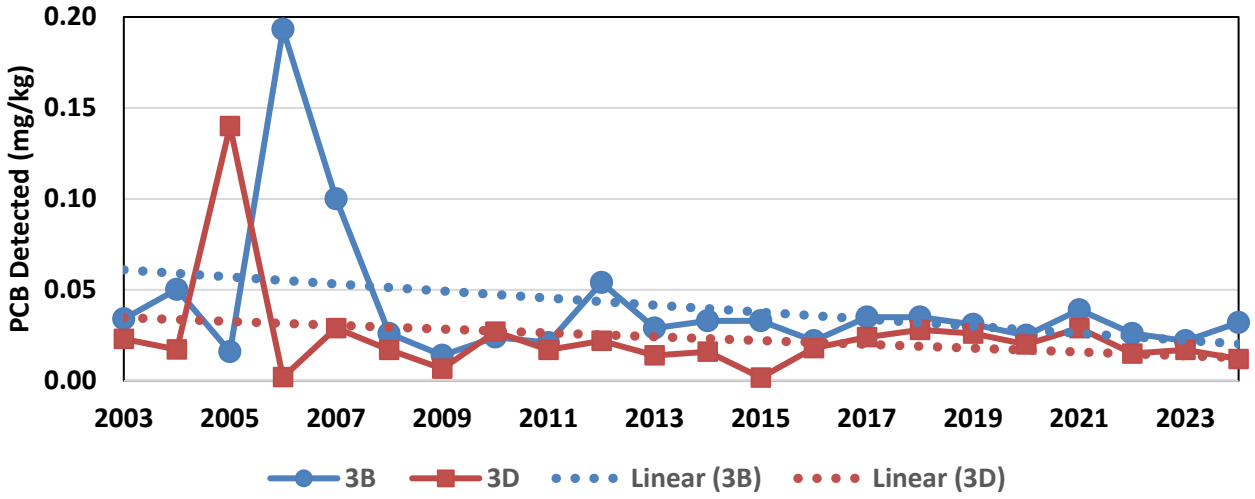
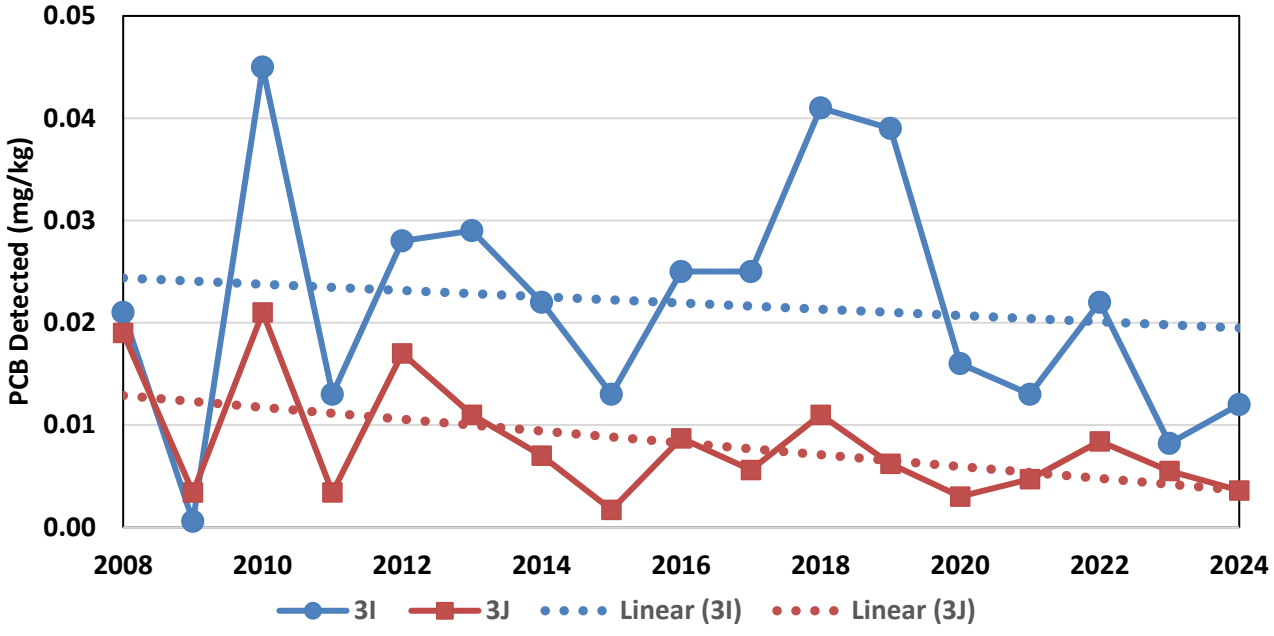


Figure 24: Pre-spawn Quahog PCB Congener Concentration Trends - Locations 3I and 3J



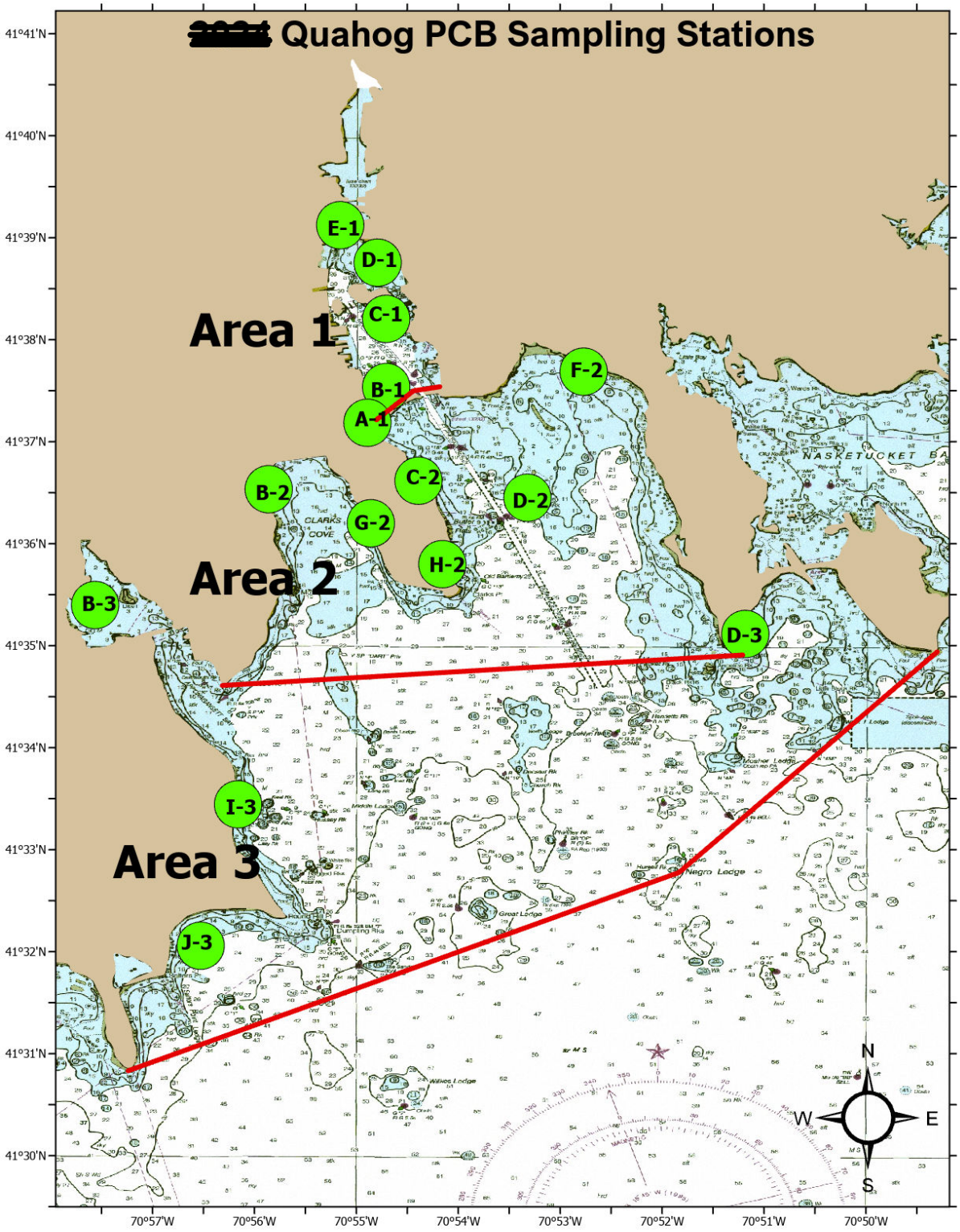


Figure 25 Quahog Locations - Areas I, II, and III
2003 to 2024

Quahog - Post-spawn

The trend for the PCB concentrations in Post-Spawn Quahog generally decreases for each location from 2007 to 2014 as shown in Table 14 and Figures 26 to 35. The sampling events for the Post Spawn Quahog were generally done during the month of August, except in the year 2009 when the sampling was conducted in October. Two rounds of Post-Spawn Quahog were done during 2010 and 2011 in August and October. Figures 25, 28, 30, 32, and 34 show the August sampling events and Figures 27, 29, 31, 33, and 35 show the October sampling events. Trend lines are not shown in the October figures because of the limited number of years of data. Note this data represents the years (2007 to 2014) of Post-Spawn Quahog sampling that were specifically performed after a round of Pre-Spawn Quahog samples were also collected. There is one sample location (3E) collected in September 2004 that would be considered a Post-Spawn Quahog sample but was left in the Pre-Spawn Quahog data because only one round of samples was collected.

Table 14: Quahog Post-Spawn PCB Congener Detected Concentrations (mg/kg)

Station\ Year	2007 Aug	2008 Aug	2009 Oct	2010 Aug	2010 Oct	2011 Aug	2011 Oct	2012 Aug	2013 Aug	2014 Aug
1A									0.39	
1B	0.66								0.38	
1C									0.43	0.50
1D									0.75	0.77
1E	3.8								1.7	1.4
2B	0.044	0.023	0.027	0.074	0.048	0.072	0.059	0.026	0.028	0.025
2C	0.25	0.30	0.57	0.45	0.41	0.50	0.44	0.17	0.19	0.23
2D	0.13	0.13	0.10	0.090	0.025	0.10	0.12	0.069	0.079	0.10
2F	0.11	0.023	0.097	0.080	0.025	0.038	0.052	0.025	0.023	0.031
2G	0.064	0.045	0.062	0.040	0.053	0.051	0.054	0.036	0.030	0.025
2H	0.29	0.18	0.33	0.089	0.097	0.12	0.12	0.059	0.16	0.12
2O										
3B	0.055	0.12	0.037	0.023	0.025	0.080	0.072	0.026	0.038	0.029
3C	0.023									
3D	0.029	0.0082	0.013	0.019	0.019	0.034	0.022	0.019	0.0067	0.015
3E	0.11									
3F	0.046	0.022								
3G										
3I		0.00026	0.031	0.031	0.027	0.039	0.060	0.016	0.014	0.027
3J			0.0061	0.021	0.0041	0.017	0.016	0.0073	0.0045	0.00093

Figure 26: August Post-Spawn Quahog PCB Congener Concentration Trends - Locations 2B and 2G

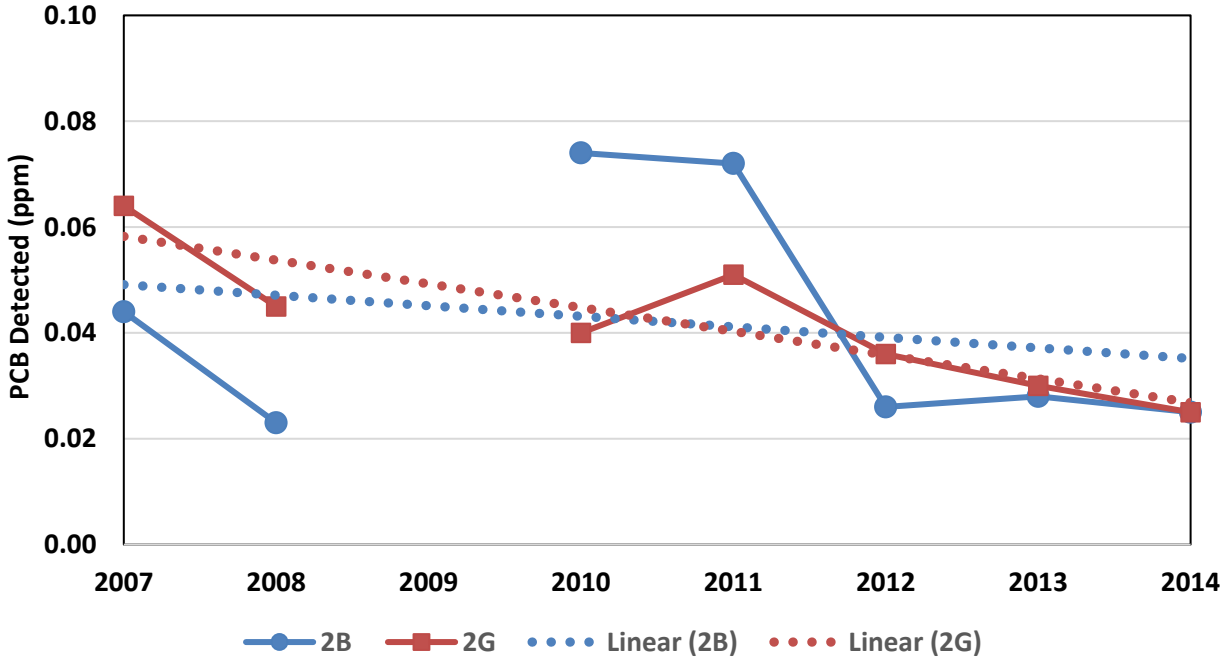


Figure 27: October Post-Spawn Quahog PCB Congener Concentration Trends - Locations 2B and 2G

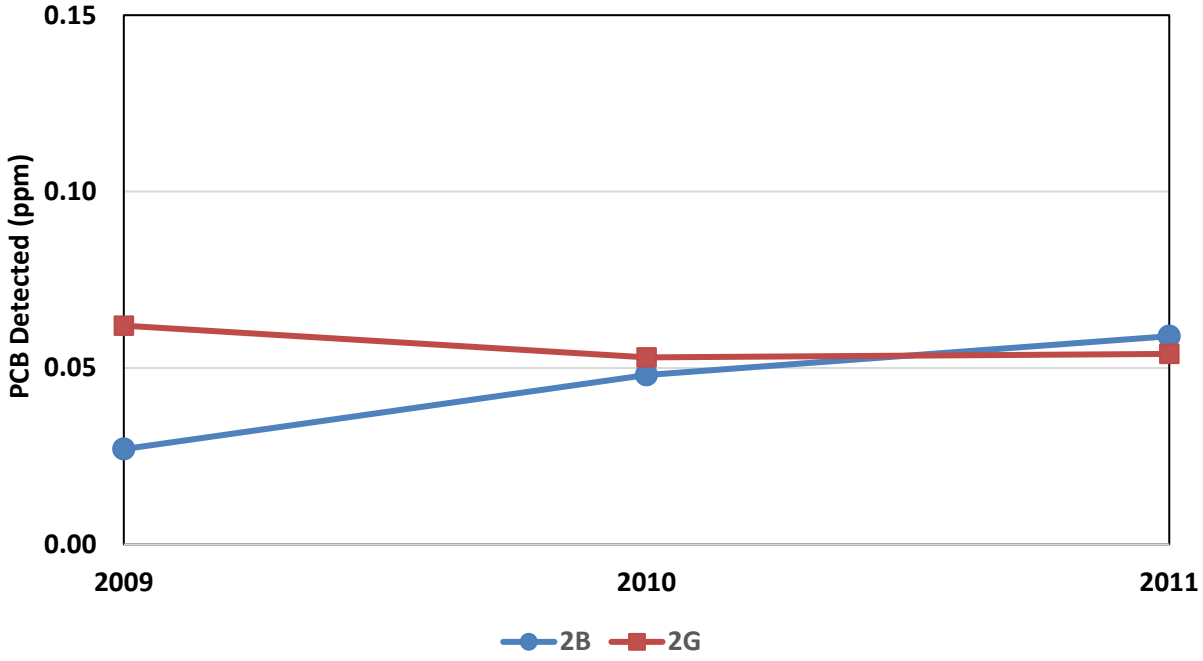


Figure 28: August Post-Spawn Quahog PCB Congener Concentration Trends Locations 2C and 2H

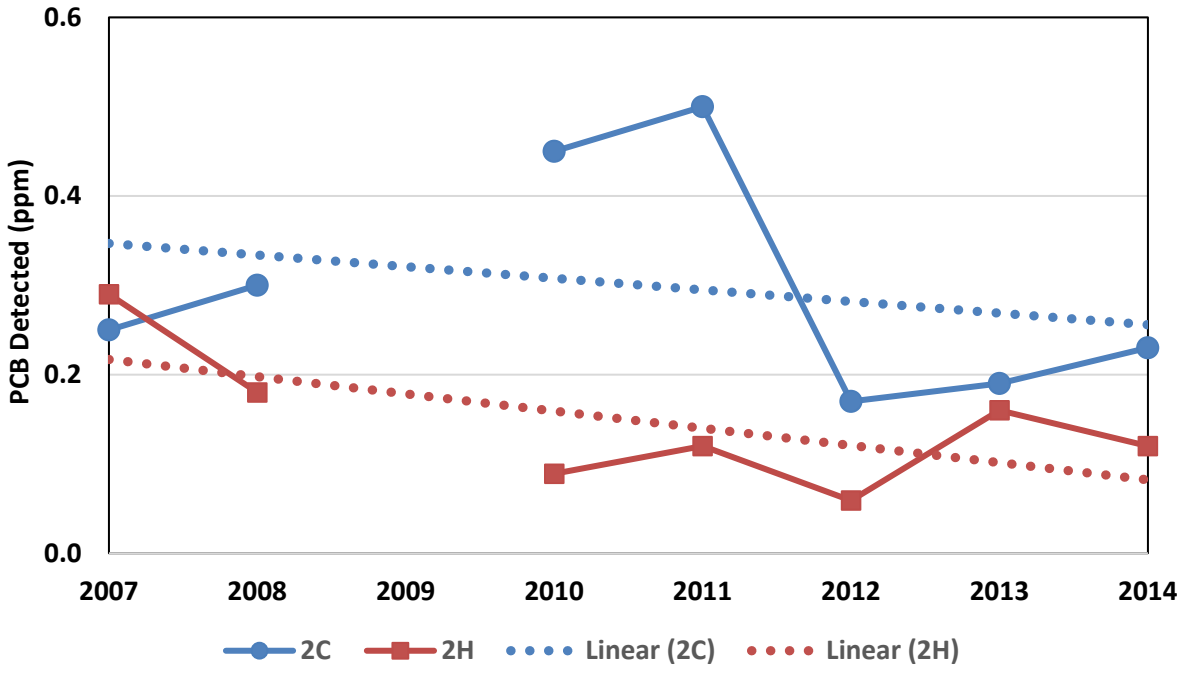


Figure 29: October Post-Spawn Quahog PCB Congener Concentration Trends - Locations 2C and 2H

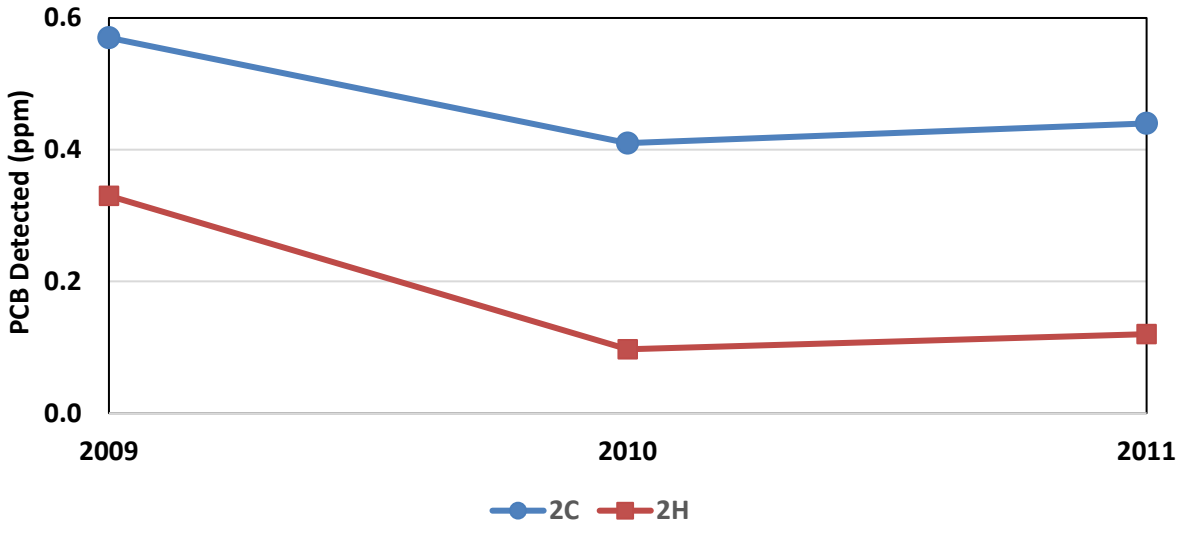


Figure 30: August Post-Spawn Quahog PCB Congener Concentration Trends - Locations 2D and 2F

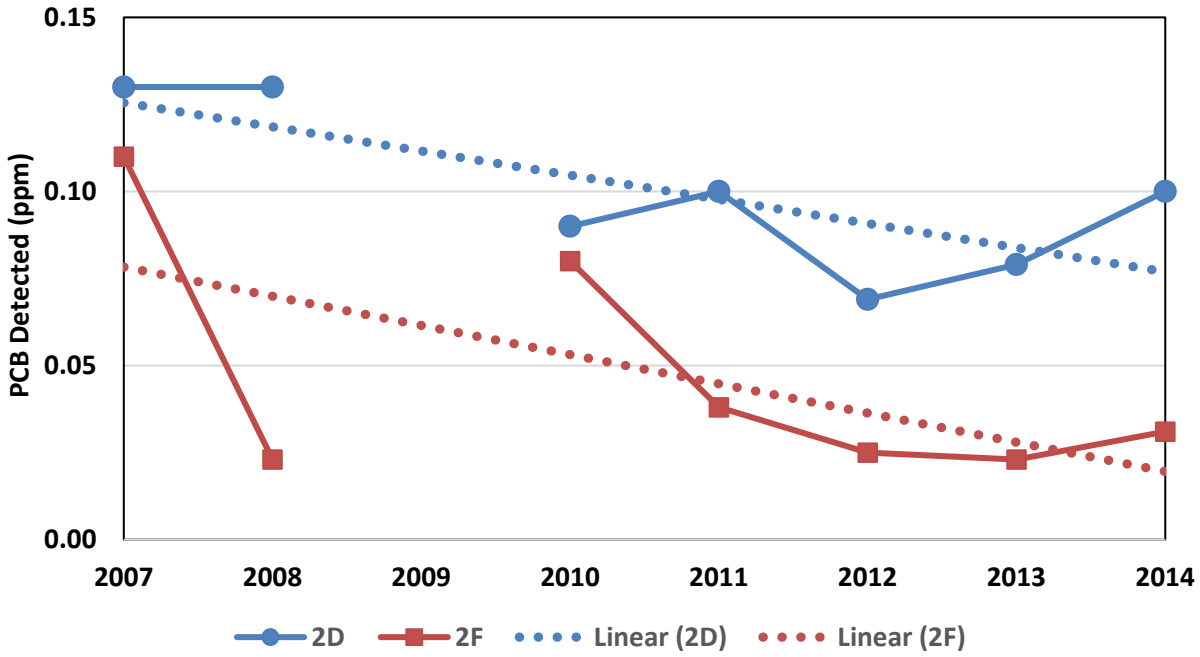


Figure 31: October Post-Spawn Quahog PCB Congener Concentration Trends - Locations 2D and 2F

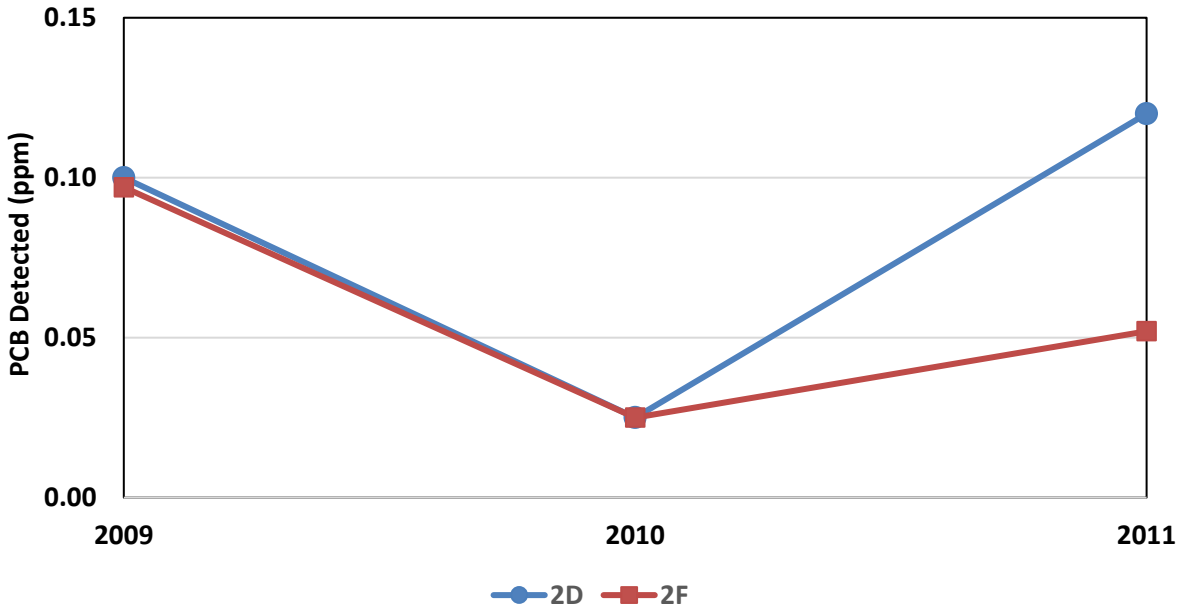


Figure 32: August Post-Spawn Quahog PCB Congener Concentration Trends - Locations 3B and 3D

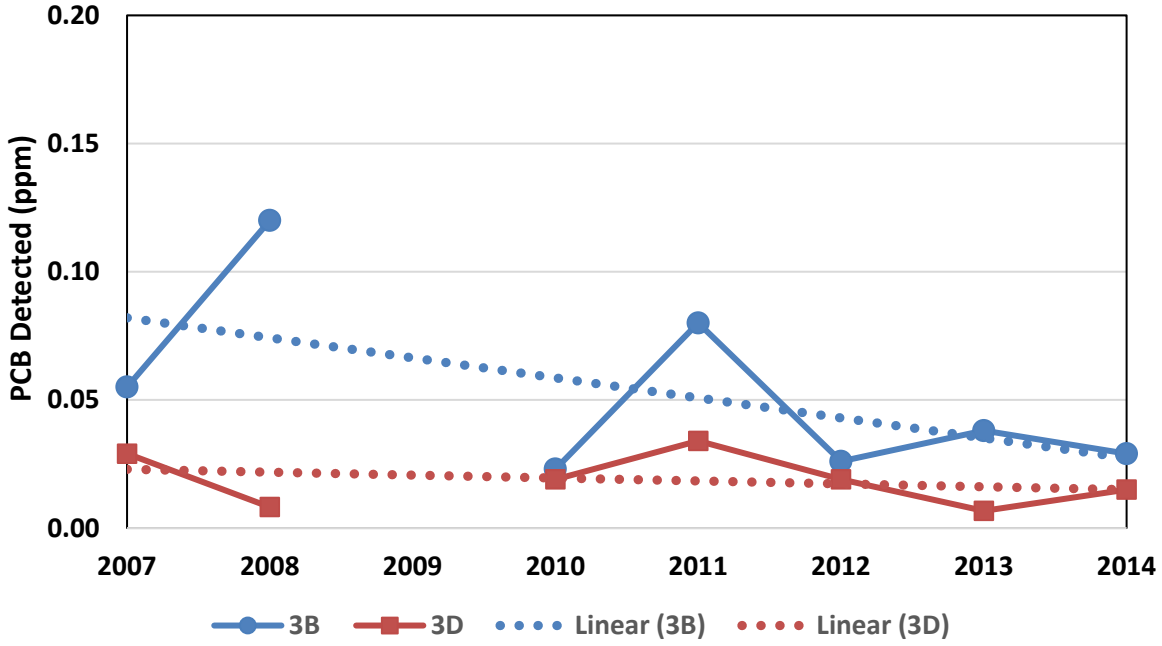


Figure 33: October Post-Spawn Quahog PCB Congener Concentration Trends Locations 3B and 3D

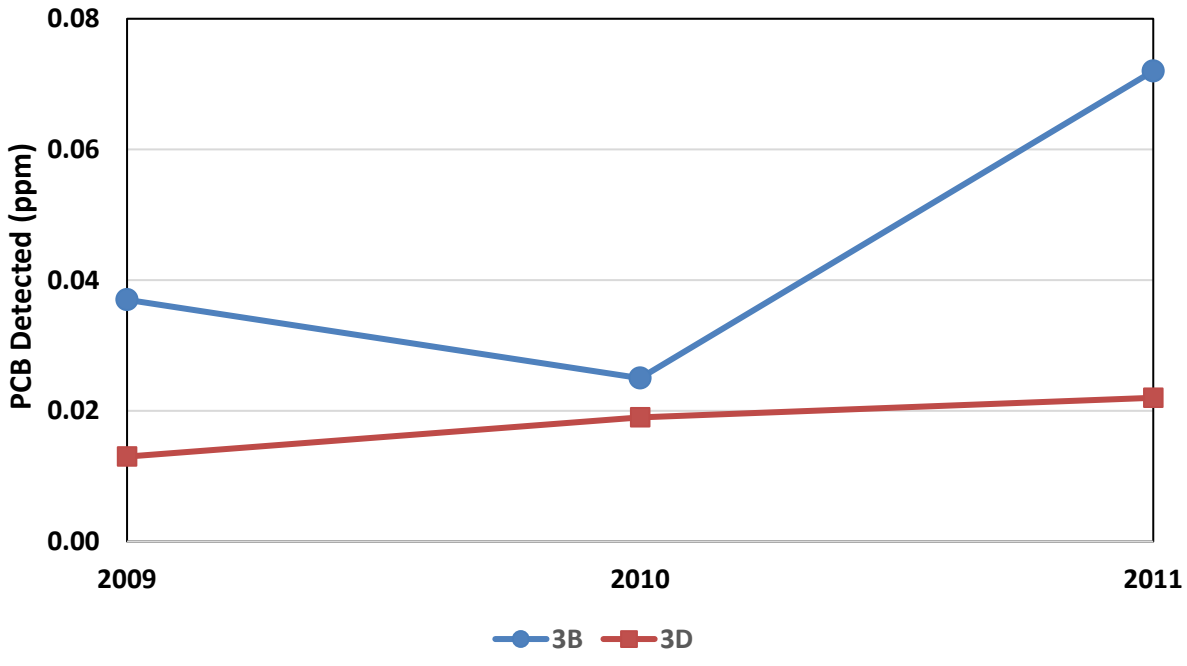


Figure 34: August Post-spawn Quahog PCB Congener Concentration Trends Locations 3I and 3J

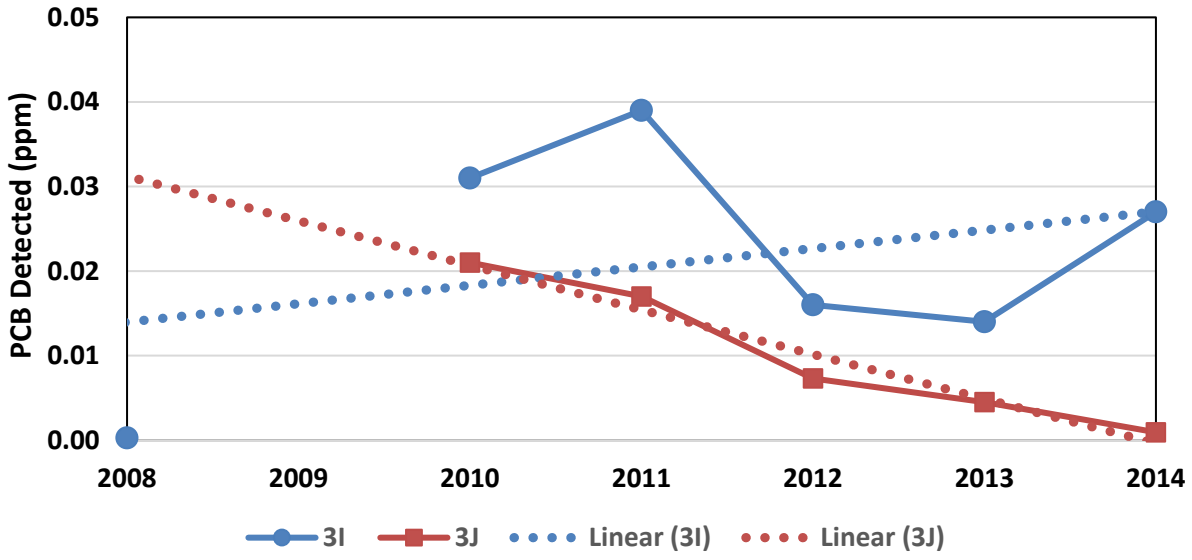
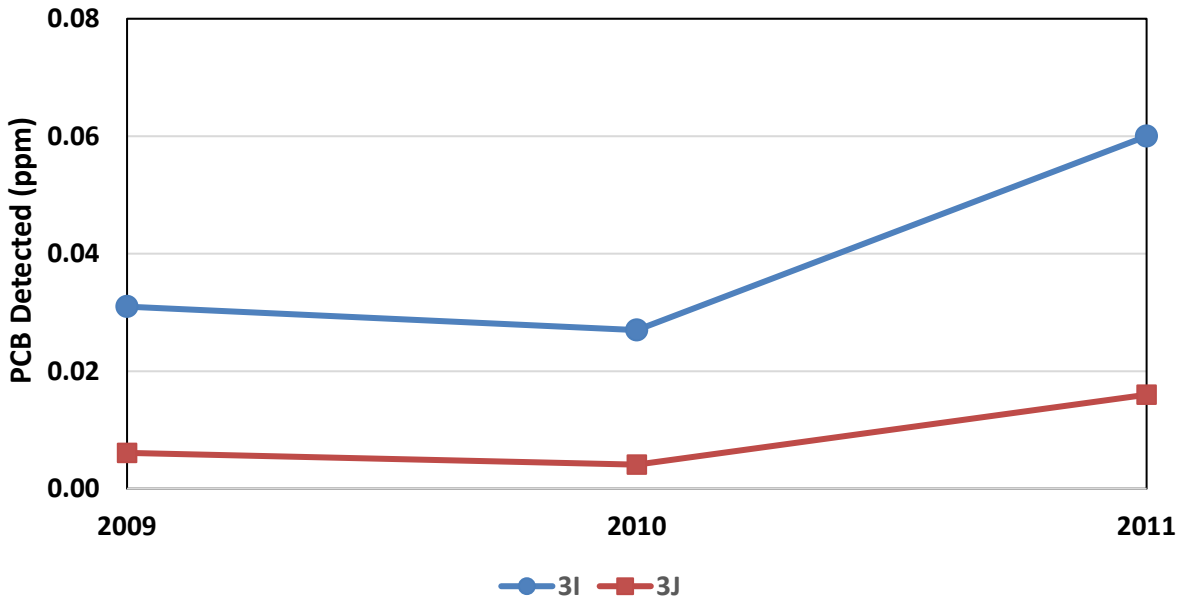


Figure 35: October Post-Spawn Quahog PCB Congener Concentration Trends - Locations 3I and 3J



Scup

The trend for the PCB concentrations in Scup slightly decreased from 2003 to 2024 as shown in Table 15 and Figure 36. The sample locations for the Scup are shown on Figure 37.

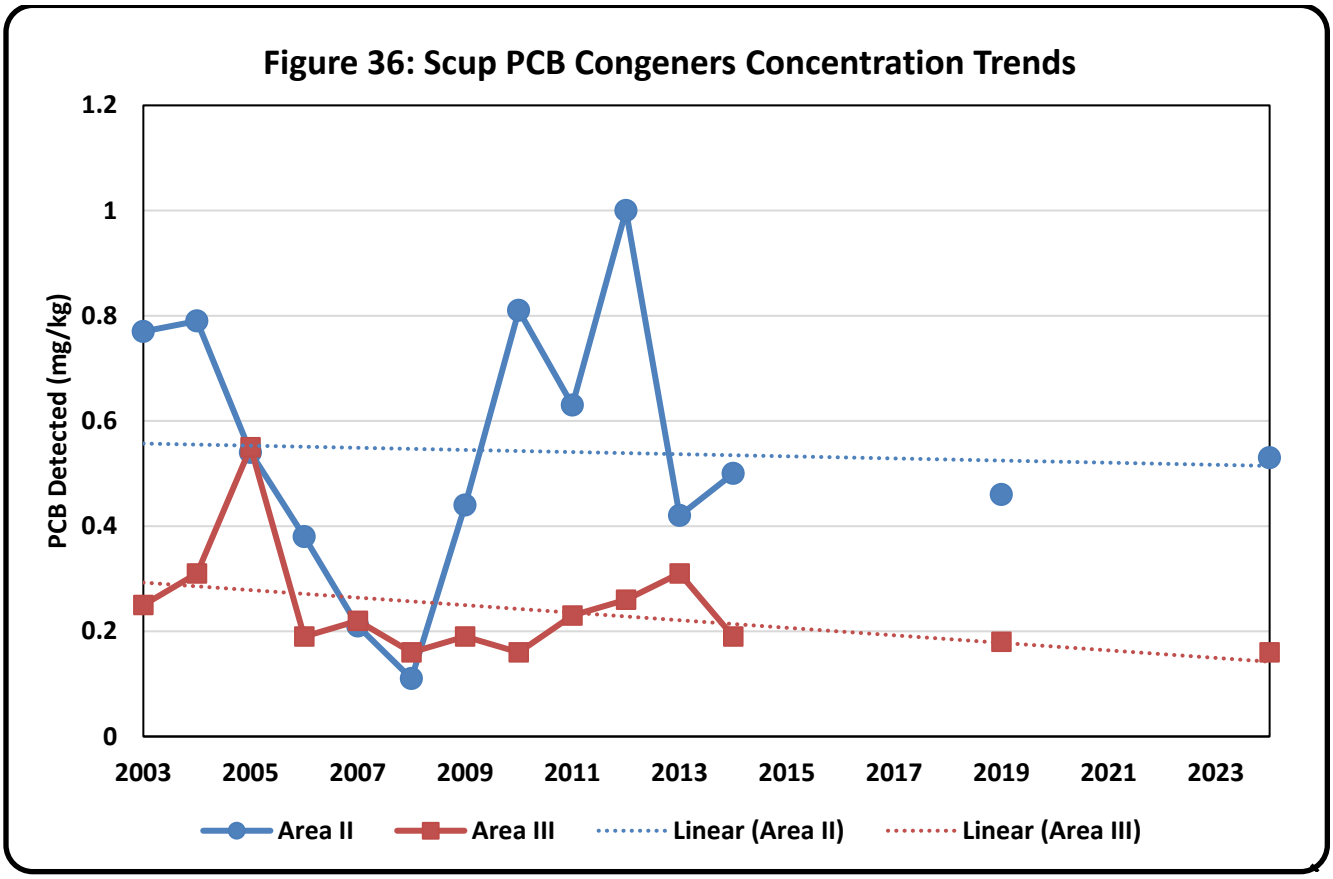


Table 15: Scup PCB Congener Detected Concentrations (mg/kg)

Station\ Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015 to 2018	2019	2020 to 2023	2024
2A	0.23	0.25	0.34	0.15	0.28	0.33	0.52	0.43	0.30	0.21	0.46	0.56	Not Sampled	0.52	Not Sampled	0.27
2B	1.1	0.55	0.86	0.53	0.053	0.32	0.78	0.83	0.41	0.83	0.67	0.35		0.26		0.76
2C	0.59	0.56	0.89	0.70	0.24	0.75	0.15	1.3	0.84	2.4	0.22	0.28				0.87
2D	1.2	0.94	0.31	0.15	0.34	0.14	0.38	0.91	1.2	1.0	0.095	0.73		0.59		0.72
2E	0.72	1.67	0.29	0.38	0.067	0.11	0.39	0.57	0.32	0.80	0.66	0.59				0.047
Average	0.77	0.79	0.54	0.38	0.20	0.33	0.44	0.81	0.61	1.0	0.42	0.50		0.46		0.53
3A	0.18	0.28	0.17	0.14	0.13	0.16	0.15	0.15	0.11	0.34	0.062	0.064				0.039
3B	0.14	0.29	0.29	0.22	0.30	0.20	0.29	0.16	0.12	0.45	0.12	0.12				0.081
3C	0.20	0.24	0.65	0.14	0.13	0.17	0.091	0.27	0.32	0.19	0.24	0.25		0.13		0.19
3D	0.29	0.38	1.3	0.33	0.084	0.35	0.16	0.12	0.084	0.18	0.082	0.27		0.21		0.18
3E	0.41	0.34	0.36	0.14	0.38	0.16	0.24	0.086	0.41	0.16	1.1	0.27		0.20		0.29
Average	0.25	0.31	0.55	0.19	0.20	0.208	0.19	0.16	0.21	0.26	0.31	0.19		0.18		0.16

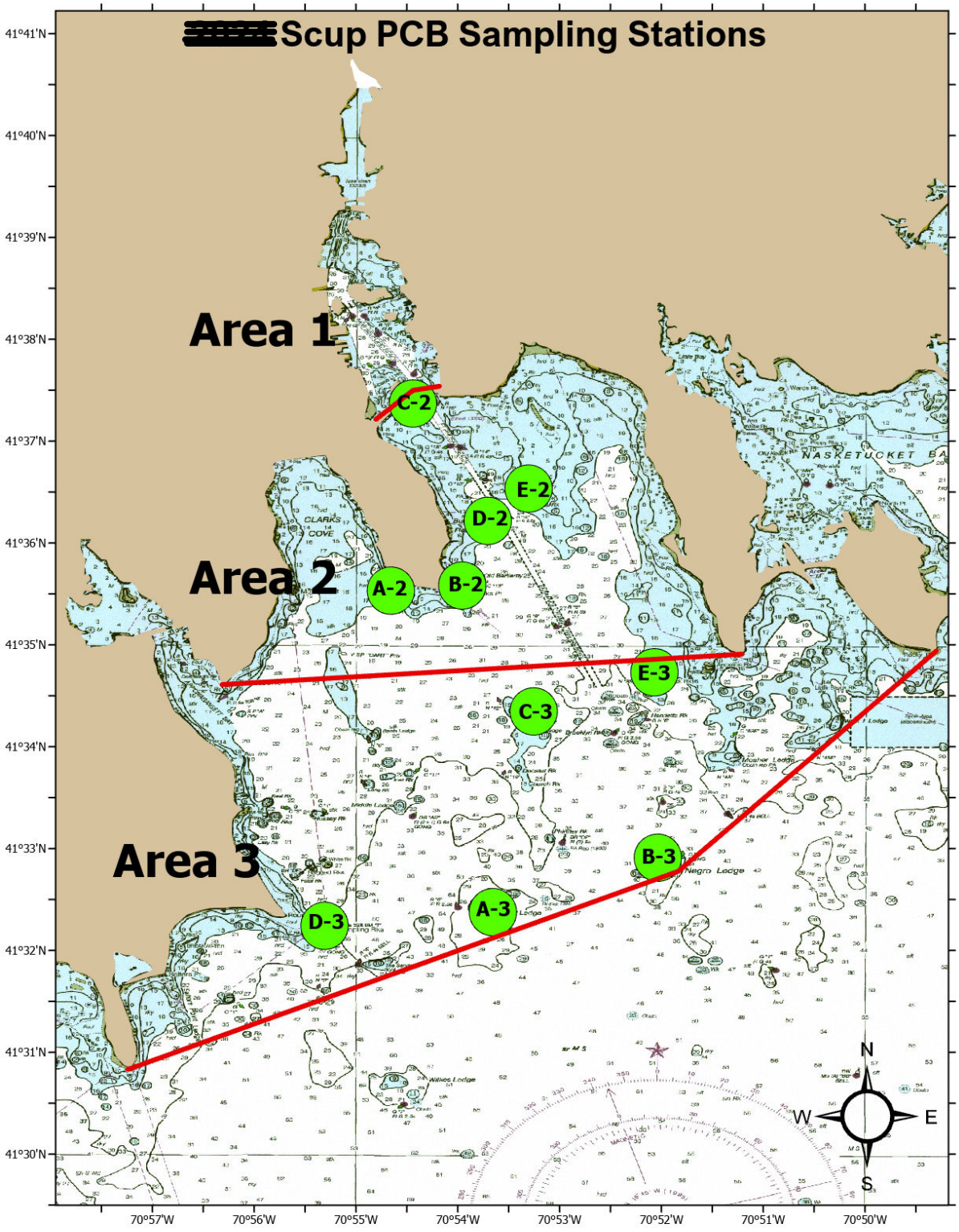


Figure 37 Scup Sample Locations - Area II & III 2003 to 2014, 2019, and 2024

Striped Bass

The trend for the PCB concentrations in Striped Bass cannot be determined for all three closure Areas because of the limited number of samples collected. However, it does appear that in Area I, PCB levels in Striped Bass are getting lower as shown on Figure 38. The data set for Striped Bass is shown on Table 16.

Table 16 Striped Bass PCB Congener Detected Concentrations (mg/kg)

Station\ Year	2010	2011	2012	2013	2014	2015	2016	2017 to 2018	Station\ Year	2019	2022	2023	2024
1B-1							0.31		1A	5.0	1.2	0.26	0.45
1B-2							2.8		1B	0.9	0.35	0.29	0.32
1C-1							0.73		1C	0.79	1.8	2.5	0.61
1C-2							4.6		1D	3.6	1.0	0.65	0.70
1C-3							21.0		1E	10.5	0.18	0.46	
Average							6.0		Average	4.2	0.91	0.83	0.52
2A		2.0	5.3	0.19	1.1				2A		3.6	0.5	0.21
2E - 1						0.63	0.17		2B		2.4	0.48	0.61
2E - 2						0.63			2C		0.68	2.6	
									2D		0.19	2.0	
									2E		0.83		
								Not Sampled	Average		1.5	1.4	0.41
3A	0.24			0.32	0.45				3A	1.2	2.5	0.11	0.64
3B	2.5			0.20	0.85				3B	0.41	0.90	0.69	0.12
3C	30.0			0.19	0.15				3C	0.2	0.50	0.16	0.15
3D				0.26	0.18				3D	0.14	0.17		0.16
3E				0.12	1.8				3E	0.53	0.22		0.19
3F-1						0.18							
3F-2						0.18							
Average	11.0			0.22	0.69				Average	0.5	0.86	0.32	0.25

Note: Samples for 2015 locations (E-2 and F-2) were the composite of two fish each. The following stations are in the same locations: Stations 3A, 3B, and 3C in 2010; 1B-1 and 1B-2; 3A, 3B, and 3C in 2014; 1B-1 and 1B-2; 1C-1 and 1C-2 in 2016; all Area 1 Stations in 2019, 2022, and 2023; and 3D and 3E in 2019.

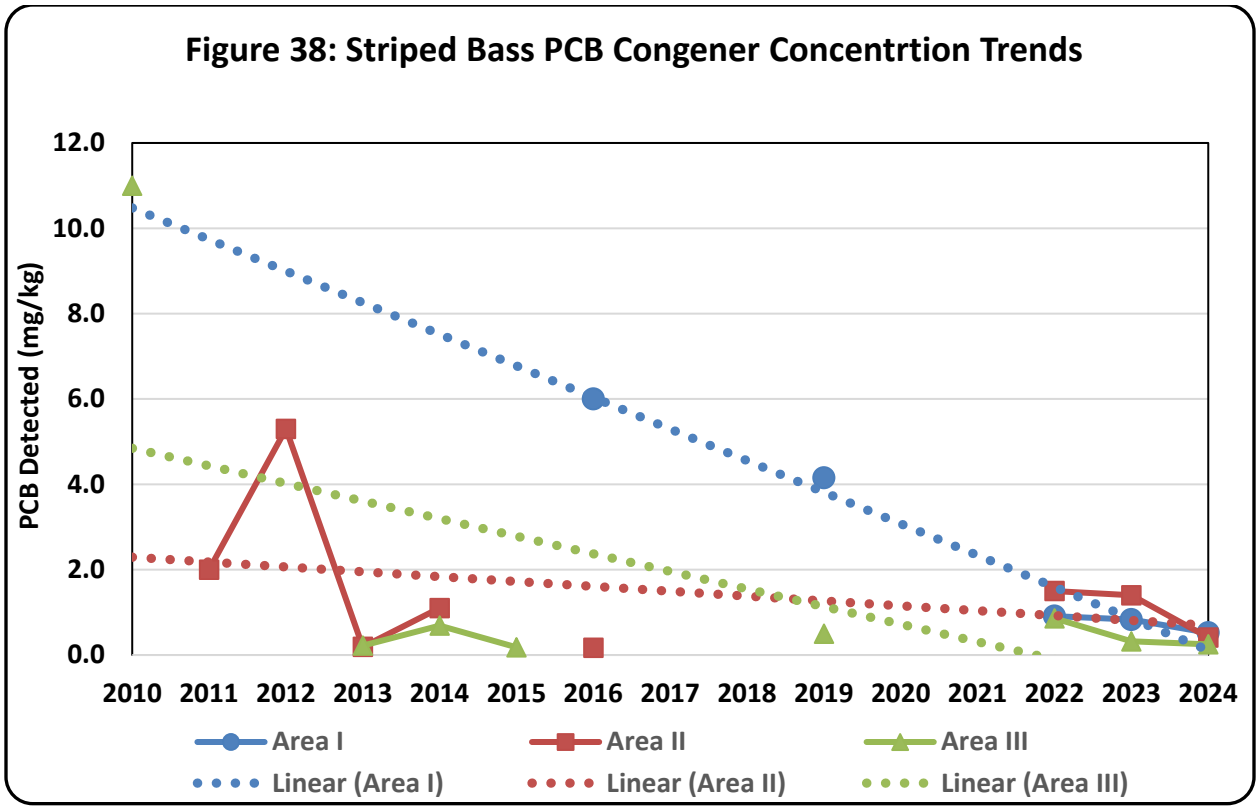


Figure 38: Striped Bass PCB Congener Concentrtion Trends
PCB Detected (mg/kg)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024
Area I
Area II
Area III
Linear (Area I)
Linear (Area II)
Linear (Area III)

Tautog

The trend for the PCB concentrations in Tautog decrease in Area II and is level in Area III from 2003 to 2024 as shown in Table 17 and Figure 39. The sample locations for the Scup are shown on Figure 40.

Table 17 Tautog PCB Congener Detected Concentration (mg/kg)

Station\Year	2012	2013	2014	2015 to 2018	2019	2020 to 2023	2024
2A		0.41	0.16	Not Sampled	0.14	Not Sampled	0.15
2B	0.46	0.13	0.14		0.31		0.16
2C	1.9	1.2	0.97		0.68		0.62
2D		0.19	0.83		0.50		0.15
2E		0.87	0.12		0.19		0.25
Average	1.19	0.56	0.44		0.36		0.27
3A		0.060	0.019		0.0096		0.022
3B		0.027			0.028		0.016
3C		0.065	0.072		0.021		0.094
3D		0.089	0.074		0.056		0.083
3E		0.18	0.042		0.10		
Average		0.085	0.052		0.043		0.054

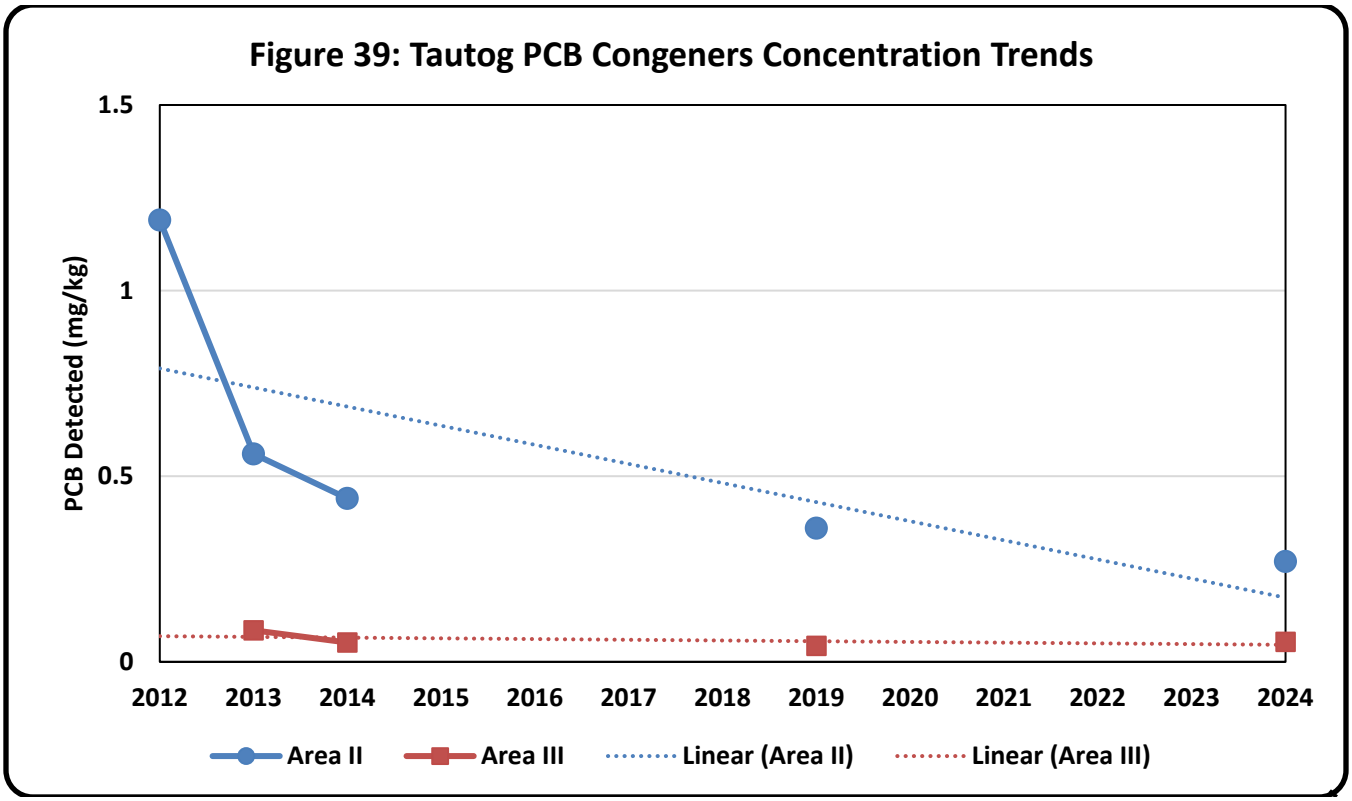


Figure 39: Tautog PCB Congeners Concentration Trends
PCB Detected (mg/kg)
1.5
1
0.5
0
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Area II
Area III
Linear (Area II)
Linear (Area III)

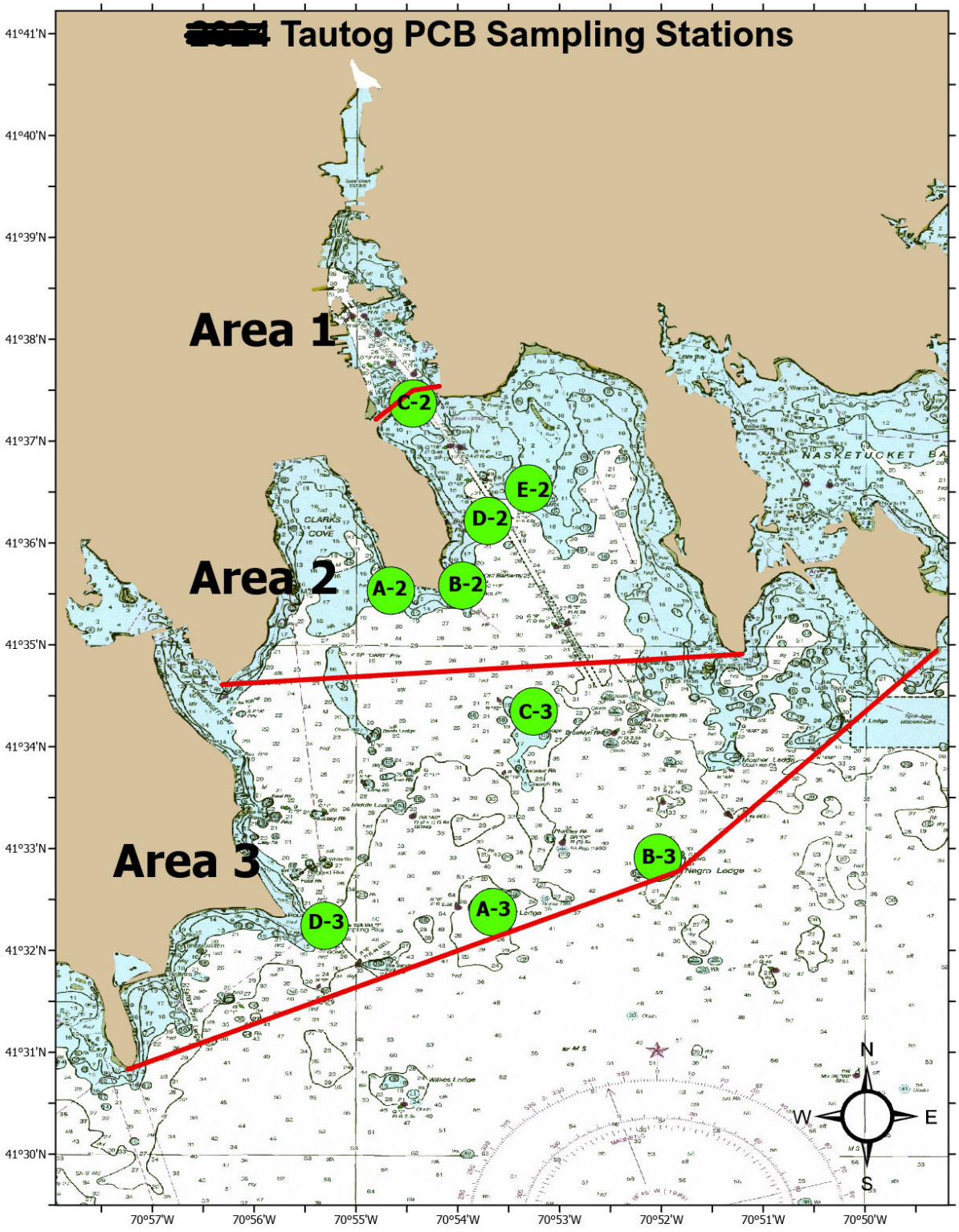


Figure 41 Tautog Sample Locations - Area II & III
2012 to 2014, 2019, and 2024

Surface Water

Although limited to three more recent data sets (2011, 2023 and 2024) the data does indicate a trend towards reduced water column PCB levels. Compared to 1987 water column PCB levels as presented in the 1998 ROD (see Figure 13), the more recent water column levels are significantly lower: the average of the ten Area I samples in 1987 was 1,006 ng/l (or 242 ng/l with the highest outlier 7,635 ng/l near the Aerovox location being removed). The more recent surface water results are shown on Table 18. The surface water sample locations are shown on Figures 25to 27. Note the results on this table are reported in parts per trillion (ng/l) not parts per billion (ug/l). The site-specific target level for surface water is the Ambient Water Quality Criteria (AWQC) of 0.03 ug/l (which is 30 ng/l).

Table 18 Sample Data for Surface Water (ng/l)

Station\Year	Total 2011	Total 2023	Total 2024	Dissolved 2024
AVX			20	15.7
Mid-River			52.1	31
Coggeshall Bridge			64.7	21.4
Average			45.6	22.7
I A	64			
I B	100	24	30.5	12.4
I C	220	35	41.3	18.1
I D	430	52	36.6	12.4
I E	770	100	41.9	32.2
Average	320	53	37.6	18.8
II B	4.1	4.5	0.92	ND
II C	31	14	8.2	4.42
II D	17			
II F	16	3.1	1.6	0.34
II G	4.7			
II H	16	5.4	7.0	3.25
II O	63			
Average	22	6.8	4.4	2.0
III B	54	0.84	ND	ND
III D	0.29	ND	0.28	ND
III I	0.37	ND	ND	ND
III J	0.27	ND	ND	ND
Average	13.7	0.21	0.066	ND

5. References

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