

Supplementary Materials – Maine toxicity – noteworthy details and commentary. Toxicity in $\mu\text{g STX } 100\text{g}^{-1}$.

Year	Notes	West		East	
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1977	<p>1977 is not an ideal year to use in the HAB Index, for several reasons:</p> <ol style="list-style-type: none"> 1) The western Maine “onset” was triggered by a relatively isolated bloom initiated at Lumbos Hole, which did not appear to spread and maintain intensity in the rest of the western Maine coast until a massive spike appeared at Monhegan Is. On Oct 7, 1977; the bulk of the “Biomass Score” for western Maine in 1977 occurred from Oct 7 to Nov 2, which makes the “Duration” metric appear artificially long, at 196 days, when the majority of the toxin load was delivered in only 27 days. 2) There seems to have been an irregular sample strategy in eastern Maine in 1977, in that no <i>Mytilus</i> samples were taken in eastern Maine until Sep 28, while <i>Mya</i> samples were taken consistently for most of the summer, showing toxin in that species as early as Jul 19. This produces artificially lowered metrics for all three categories, since only <i>Mytilus</i> is used to calculate them. <p>The general characteristics of the 1977 HAB event in Maine could be summarized as beginning in late summer in eastern Maine, and hitting an unusual spike in western Maine in the fall. Despite the “official” onset of low-level, isolated toxicity in April, it would be reasonable to consider 1977 as a “fall bloom” year for western Maine. Heaviest impacts in western Maine were limited to Monhegan Island, tips and outer areas of peninsulas, and along the southern Maine coast. No evidence of intrusion</p>	Apr 21	Nov 2	Sep 26	Nov 5

Year	Notes	West		East	
	<p>or significant residence time in far-inland areas.</p> <p>Residual toxin detected in other molluscs (snails and surf clams) sampled in January of 1977 suggests that there was a late bloom and/or high toxin levels at the end of the 1976 season. Note, however, that detoxification rates are very slow in surf clams, and thus making interpretations of bloom duration difficult.</p>				
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1978	<p>Eastern Maine patterns were a little unusual, with <i>Mytilus</i> toxicity showing up early for the area (May), and especially high levels showing up in the coastal area just east of MDI, around the Schoodic peninsula, with levels there far surpassing any in Cobscook Bay at any point in the season, which is unusual. The high scores for the Cobscook Bay area did not appear until much later in the summer (late July), which is a more typical seasonal pattern for the area.</p> <p>Scores at Monhegan Island reached extremely high levels (>11,000) in late June. The rest of western Maine experienced a severe bloom in 1978, with scores reaching extremely high levels and intruding far up into inland areas during that same period of time (late June).</p> <p>There was an unexplained spike at the Boothbay Harbor lab float station on May 5 (5,162), which does not appear to track with subsequent samples from that station or from the surrounding area. Other causes should be considered for that score (e.g. perhaps the</p>	Mar 3	Sep 24	May 16	Aug 17

Year	Notes	West		East	
	<p>Culture Collection had an accidental discharge, or other experiments at the DMR wet lab were impacting the area).</p> <p>Residual toxicity measured in January of 1978 in <i>Mya</i> in eastern Maine and <i>Modiolus</i> in western Maine suggests late input from the 1977 bloom season.</p>				
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1979	<p>Nothing noteworthy about season or patterns; Monhegan Island did not get any toxicity greater than 108 µg.</p> <p>Residual toxin detected in other molluscs (snails and surf clams) sampled in January of 1979 suggests that there was a late bloom and/or high toxin levels at the end of the 1978 season. Note, however, that detoxification rates are very slow in surf clams, and thus making interpretations of bloom duration difficult.</p>	Apr 18	Sep 26	May 4	Aug 8
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1980	<p>Although toxicity was still measured until December at Pemaquid Point, this area was exposed to the most extreme toxicity along the entire coast, and the residual toxicity in December does not likely represent a vegetative input. The date of November 13 is being used to denote the end of the bloom input, because the Head Beach station showed a >60% reduction in toxicity on that date, with only residual levels persisting after that date until mid-December.</p>	Apr 22	Nov 13	Jan 29	Oct 17

Year	Notes	West		East	
	<p>After a fairly “normal” start to the season, with low to average scores showing up in late April and May, western Maine had a stunning spike in toxicity scores around the Pemaquid peninsula and the surrounding areas in late August and early September of 1980 (high scores >10,000 µg).</p> <p>Eastern Maine showed toxicity in <i>Mytilus</i> in a January 1980 sample in Cobscook Bay, which represents some sort of low-level toxicity input during the winter or early spring in that region; residual toxicity from 1979 is unlikely, since that station and others around it were tested in August 1979 as toxin-free. Additionally, low-level toxicity is consistent in early spring in this area of eastern Maine, therefore the “onset” date of toxicity is being accepted as January 29, 1980. Eastern Maine also exhibited a fall toxicity spike in early September. A “fall bloom” was present for both regions of the state in 1980.</p>				
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1981	<p>Toxicity measured in January and February at the western Maine stations of Head Beach and Pemaquid Point are capturing residual toxicity from 1980, since these stations remained toxic in testing through December of 1980. Because of this, the “onset” date for western Maine in 1981 is adjusted to April 14, when toxicity first appeared at the Cundy’s Harbor station.</p> <p>Toxicity was measured in <i>Mya</i> from eastern Maine</p>	Apr 14	Sep 3	Mar 8	Sep 21

Year	Notes	West		East	
	<p>stations in January 1981, which was present at the end of 1980. In addition, toxicity continued to persist in <i>Mya</i> samples in eastern Maine through December of 1981.</p> <p>Extremely high residual toxin (>3,000) in surf clams from western Maine tested in January 1981 indicates impacts from a late bloom and/or high toxicity event in 1980. Note, however, that detoxification rates are very slow in surf clams, and thus making interpretations of bloom duration difficult.</p>				
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1982	<p>There is an unexplained high toxin score at the Widgeon Cove station in Harpswell (western Maine) of 1,620 µg on March 17, 1982. Since there are no other toxin scores from any other areas in western Maine at that time, this data point is not considered in the 1982 HAB Index data set.</p> <p>Toxin measured in <i>Mya</i> samples from several stations around Cobscook Bay in January and February of 1982 are showing residual toxicity from late 1981.</p> <p>Residual toxin (>600) in surf clams from western Maine tested in January 1982 indicates impacts from a late bloom and/or high toxicity event in 1981.</p>	May 4	Sep 29	May 17	Sep 28

Year	Notes	West		East	
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1983		Apr 21	Aug 24	May 3	Sep 19
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1984		Apr 19	Aug 2	May 7	Aug 28
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1985		May 21	Sep 9	May 21	Sep 24
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1986	There is an unexplained high toxin score at the Ewin Narrows station in Harpswell (western Maine) of 203 μg on February 8, 1986. Since there are no other toxin scores from any other areas in western Maine at that time, and subsequent samples at that station in the following weeks are negative, this data point is not considered in the 1986 HAB Index data set.	Apr 14	Sep 25	Mar 13	Sep 23
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1987	Although the duration of this event looks “normal”, the bulk of the toxicity spikes in western Maine occurred in late August and early September 1987, and it would be reasonable to categorize this year as a fall bloom for western Maine.	Apr 13	Oct 6	May 6	Oct 2

Year	Notes	West		East	
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1988		May 2	Aug 5	May 1	Aug 22
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1989		May 15	Sep 21	May 17	Sep 29
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1990		Apr 10	Jul 24	May 14	Sep 24
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1991		Apr 16	Jul 16	Jun 10	Aug 13
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1992		May 1	Jul 9	May 19	Sep 29
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1993		May 3	Jul 13	May 17	Sep 27

Year	Notes	West		East	
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1994		May 23	Jun 28	Jun 6	Aug 2
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1995		May 2	Jun 29	May 15	Aug 15
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1996		Apr 25	Jun 26	Jun 17	Sep 3
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1997		May 27	Jun 19	Jun 24	Jul 14
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1998		May 11	Jun 30	May 25	Jul 13
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
1999		May 10	Jun 2	Jun 7	Aug 3

Year	Notes	West		East	
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2000	Unusual year due to no toxin measured at all in Cobscook Bay/far eastern Maine; what happened in Canada that year? Low impact from the BOF?	May 1	Jun 21	Jun 6	Jul 31
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2001		May 24	Aug 3	May 30	Aug 21
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2002	No changes or comments.	Apr 23	Jul 18	May 13	Aug 12
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2003	A mild year in western Maine, with “normal” season and spatial patterns, but eastern Maine had a late start, with the bulk of their toxicity appearing in the fall. This was a fall bloom year for eastern Maine. Also interesting to note that <i>Arctica</i> samples were taken in eastern Maine all season, and showed no detectable toxicity until mid-September, when scores jumped from negative to >2,000. Indicates a strong downwelling event in eastern Maine in the fall.	May 11	Oct 21	Jul 7	Nov 6
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2004	Largest toxicity inputs for eastern Maine slightly later than usual, from mid-July to late August. Also, <i>Arctica</i> samples showed residual toxin from 2003	Apr 20	Sep 14	May 11	Oct 13

Year	Notes	West		East	
	through spring and early summer, with toxicity levels deparating over the summer to very low levels (<80 µg), but a new pulse of toxicity appeared in <i>Arctica</i> in early September, indicating a strong down-welling event in eastern Maine in early fall.				
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2005	<p>Although eastern Maine experienced a “mild to average” season, western Maine experienced toxicity levels and inshore intrusion of toxicity that had not been documented at these levels for nearly two decades, since the 1980s.</p> <p>Also of note, <i>Arctica</i> showed no detectable toxicity most of the summer, through mid-July, until they showed a moderate spike of toxicity in late July, indicating a strong downwelling event in eastern Maine on or around July 28.</p>	May 2	Aug 23	May 4	Aug 30
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2006	<p>Incorporated dealer database and buoy data into this data set, since similar data were already merged into the main PSP data sets in previous years, and was used in calculated HAB Index values.</p> <p>The addition of so many MER buoys in 2006, with a dense spatial coverage, would create an artificial</p>	Apr 19	Jul 23	May 11	Aug 21

Year	Notes	West		East	
	<p>boost to both “Num of Stations” and “Biomass Score” in western Maine, if all points were used; therefore, MER buoy stations were clustered in groups that were spatially similar. The groupings are clustered as follows: 4/5, 10/11, 12/13, 14-18, 19/20, 22/23, 24/26, and 27/28. These groups are treated as a single station in the “Num of Stations” count, and the “Biomass Score” is averaged from each of these groups when scores were recorded in the same week. Also, experimental “intertidal” buoys were not included in these metrics. These standardizations resulted in a change from “64” to “80” for the “Num of Stations” metric.</p> <p>In a previous data table, a sample result at Goose Rocks Beach was mistakenly recorded as “<i>Mytilus</i>” when it was actually a “<i>Spisula</i>” sample, which set the end date of the western Maine bloom on August 11. The actual end date is July 23 at the Ogunquit R station, which changes the “Duration” metric from 115 days to 96 days.</p>				
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2007	See notes for 2006 regarding dealer database and how to handle MER buoy stations. These same adjustments will be carried forward to all years past this point.	Apr 30	Aug 14	May 30	Sep 10
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2008	Fifteen additional buoy stations were added to Cobscook Bay this year. Because these stations were distributed across a wide area, with no spatial overlap,	Apr 24	Jul 9	May 5	Sep 23

Year	Notes	West		East	
	all of the data from these sites will be included in the HAB Index, without adjustments.				
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2009	Although the 2009 seasonal length and toxicity patterns were fairly “average” for both regions of the state, there was an unusual spike in toxicity in early and mid-July that resulted in the bulk of toxicity in the “Biomass Score”, reaching a level in that metric that has not been reported since the 1980s for western Maine, and breaking all “Biomass Score” records for eastern Maine.	Apr 22	Sep 8	May 18	Nov 5
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2010	Western Maine had an unusually early start to the season, but it was otherwise unremarkable, and ended by mid-summer. The eastern Maine “Biomass Score” is artificially high due to an extraordinary spike at Mount Desert Rock in early July (>14,000).	Mar 22	Jun 21	Apr 26	Oct 13
		<i>Onset</i>	<i>End</i>	<i>Onset</i>	<i>End</i>
2011		Apr 20	Jul 5	May 9	Sep 19