

Contingency Plan Quarterly Report on Ambient Monitoring Results Third Quarter 2021

MWRA gathers data near the outfall discharge location in Massachusetts Bay on various Contingency Plan thresholds related to its Deer Island Treatment Plant (DITP) NPDES discharge permit. This report shows ambient monitoring results for Contingency Plan thresholds that became available in July through September 2021. Previous Contingency Plan reports are available at <http://www.mwra.state.ma.us/harbor/html/contingency.htm>.

Included in the report are 2021 flounder liver disease and tissue contaminant results, spring/summer (May through July) nuisance algae abundances, and summer/early fall dissolved oxygen results. There is one Contingency Plan threshold exceedance in this report — results of bottom water dissolved oxygen percent saturation collected from September survey in Stellwagen basin have exceeded both warning level threshold and background value.

FISH AND SHELLFISH

Flounder liver disease – April 2021

The prevalence in winter flounder (*Pseudopleuronectes americanus*) of centrotubular hydropic vacuolation (CHV), a liver disease associated with contaminant exposure and considered a precursor to liver tumors, is a useful measure of the effects of pollution in the coastal waters. In Boston Harbor, rates of this disease were historically quite high but dropped considerably during the 1990s.

The Caution Level threshold for the prevalence of flounder CHV liver disease is 45%, which is based on measurements collected from Boston Harbor during the baseline period (1991-2000). Since Massachusetts Bay monitoring began in 1991, prevalence of the early-stage liver disease near the outfall site has been much lower than the threshold. The result for 2021 is 4% from a survey conducted on April 28, which is one of the lowest among the post-diversion observations, and much lower than that observed at the site during the baseline period (Figure 1).

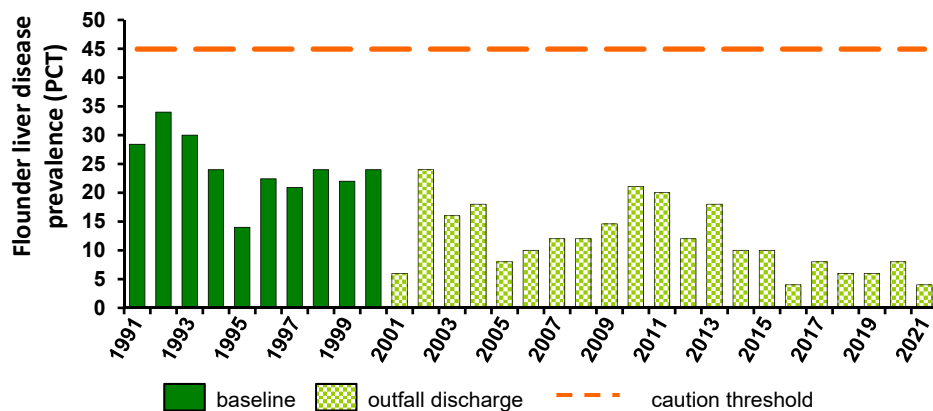


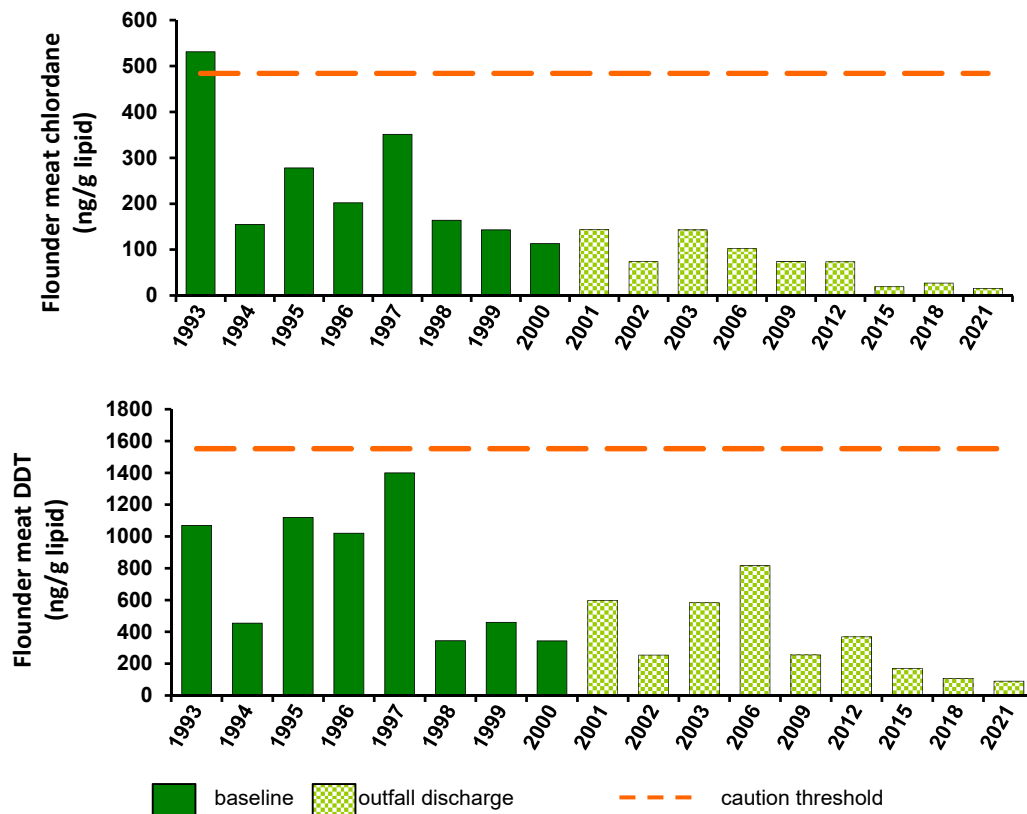
Figure 1. Flounder liver disease prevalence at outfall site (1991 - 2021)

Flounder tissue chemistry – April 2021

The fish tissue contamination thresholds are designed to evaluate the level of toxic chemicals in the edible tissues of fish and shellfish. Contaminants are measured in three species of seafood: winter flounder (*Pseudopleuronectes americanus*), lobster (*Homarus americanus*), and blue mussel (*Mytilus edulis*). For mercury and PCBs in the three species, caution and warning thresholds are set at 50% and 80% of the FDA action limits. The threshold for lead in mussels is based on EPA risk assessment of lead in drinking water. The threshold values for chlordane, DDT, dieldrin, PAHs are based on measurements taken during baseline years at the outfall site.

The tissue contaminant results of winter flounder are included in this report. Results for lobster and mussel samples will be available by the end of next quarter.

Flounder tissue contaminant tests have been performed every 3 years since 2003. Winter flounder were sampled at the outfall site in late April 2021. Results indicated that mercury and PCB concentrations in flounder fillet remained low and similar to previous years (Figure 2). DDTs and Chlordane concentrations were among the lowest years since the monitoring started in 1993. Dieldrin has not been detected since 2009.



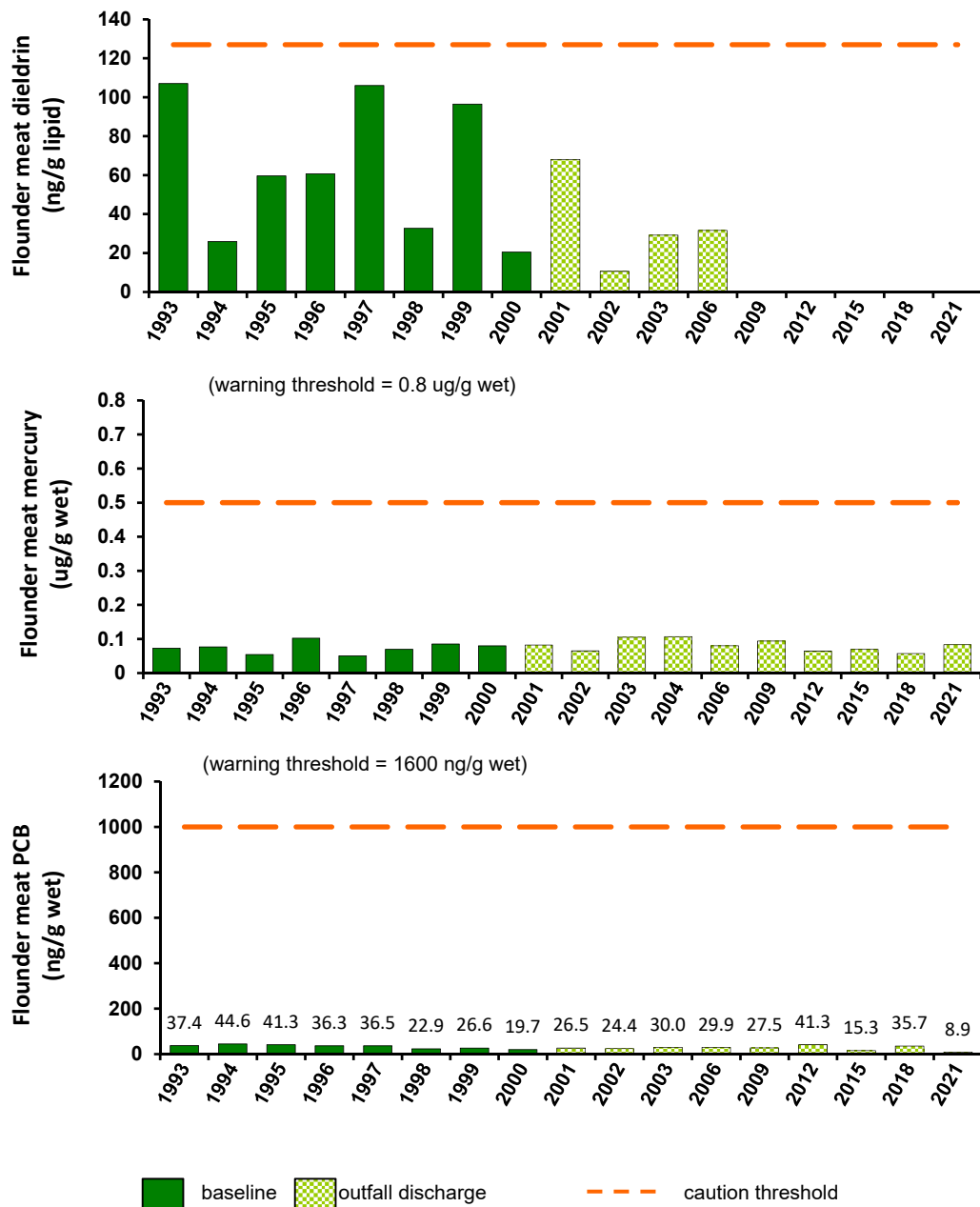


Figure 2. Tissue contaminants in winter flounder at outfall site (1993 – 2021)

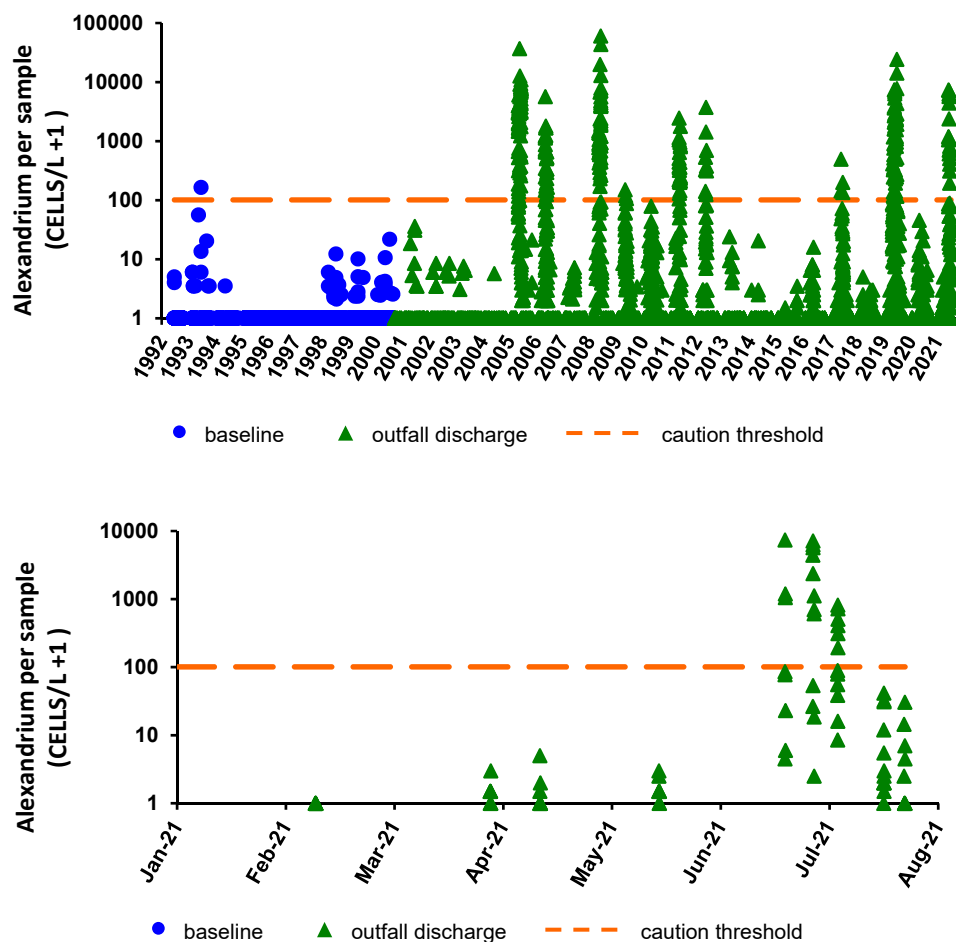
NUISANCE ALGAE

ALEXANDRIUM – May - July 2021, including three rapid response surveys

The [nuisance algae](#) *Alexandrium catenella* (“*Alexandrium*”) can cause paralytic shellfish poisoning (PSP, “red tide”) in Massachusetts Bay. MWRA measures *Alexandrium* abundance in its monitoring program, and checks observations of shellfish PSP toxicity from state fisheries agencies and other regional monitoring programs to keep track of the course of Gulf of Maine *Alexandrium* blooms.

The bloom of *Alexandrium* in Massachusetts Bay reported last quarter continued into the period covered by this report. The report for last quarter noted that preliminary results from June *Alexandrium* samples activated a series of rapid-response *Alexandrium* surveys and triggered a caution level exceedance for this nuisance algae species (see notice <https://www.mwra.com/harbor/pdf/20210629amx.pdf>). This report includes the final results from all surveys conducted through July 31. By the end of July the *Alexandrium* bloom had subsided bay wide. In results from the routine water column survey on July 27 and preliminary results from the routine survey on August 25, *Alexandrium* counts in samples from nearfield and farfield stations were all well below 100 cells per liter. The very low cell counts from the end of July and August surveys show that the *Alexandrium* bloom in Massachusetts Bay had ended for this year.

In the figure below, we compare nearfield *Alexandrium* data to the threshold for each sample collected through July 2021. Figure 3 (top) includes data since the start of the monitoring program in 1992. To better display recent results, Figure 3 (bottom) shows data for 2021 only, including six regular water column surveys and three rapid response surveys. Note logarithmic scale for each graph.



Alexandrium per-sample abundance (cells/liter)

Caution threshold	100
May-July 2021	7,386*
* maximum of all nearfield samples collected May – July 2021	

Figure 3. *Alexandrium* cell concentrations in Nearfield. Top: baseline and post-discharge years. Bottom: 2021 results only.

PHAEOCYSTIS – summer (May-July) 2021

In February 2017, EPA approved changes in the Contingency Plan to remove the threshold for the seasonal abundance of the nuisance alga *Phaeocystis pouchetii* in the nearfield water column. During bloom conditions, *Phaeocystis* can form large, gelatinous colonies, which may accumulate as foam as they disintegrate on beaches. Evaluations of prior threshold exceedances for this species have indicated that they resulted from natural fluctuations in Massachusetts Bay, do not represent degradation, were not a result of MWRA's discharge, and have not occurred in concentrations that would pose problems for recreation. MWRA agreed to continue to report each quarter on nearfield survey mean abundances of *Phaeocystis pouchetii* compared to its historical results.

Figure 4 shows the 2021 survey mean *Phaeocystis* results against the results from all prior years since 1992. Due to reductions in the number of surveys conducted each year, the historical results encompass more time-points than shown for the current year.

Both the timing and magnitude of survey mean *Phaeocystis* abundance from May to July 2021 was within the range of the historical observations.

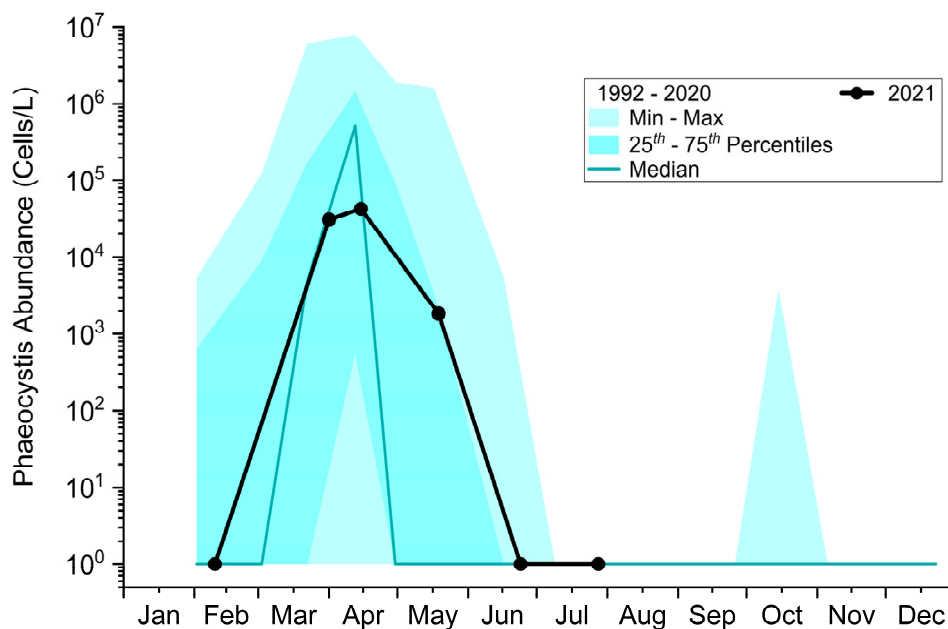


Figure 4. Nearfield Survey Mean abundance of *Phaeocystis* (1992 – 2021)

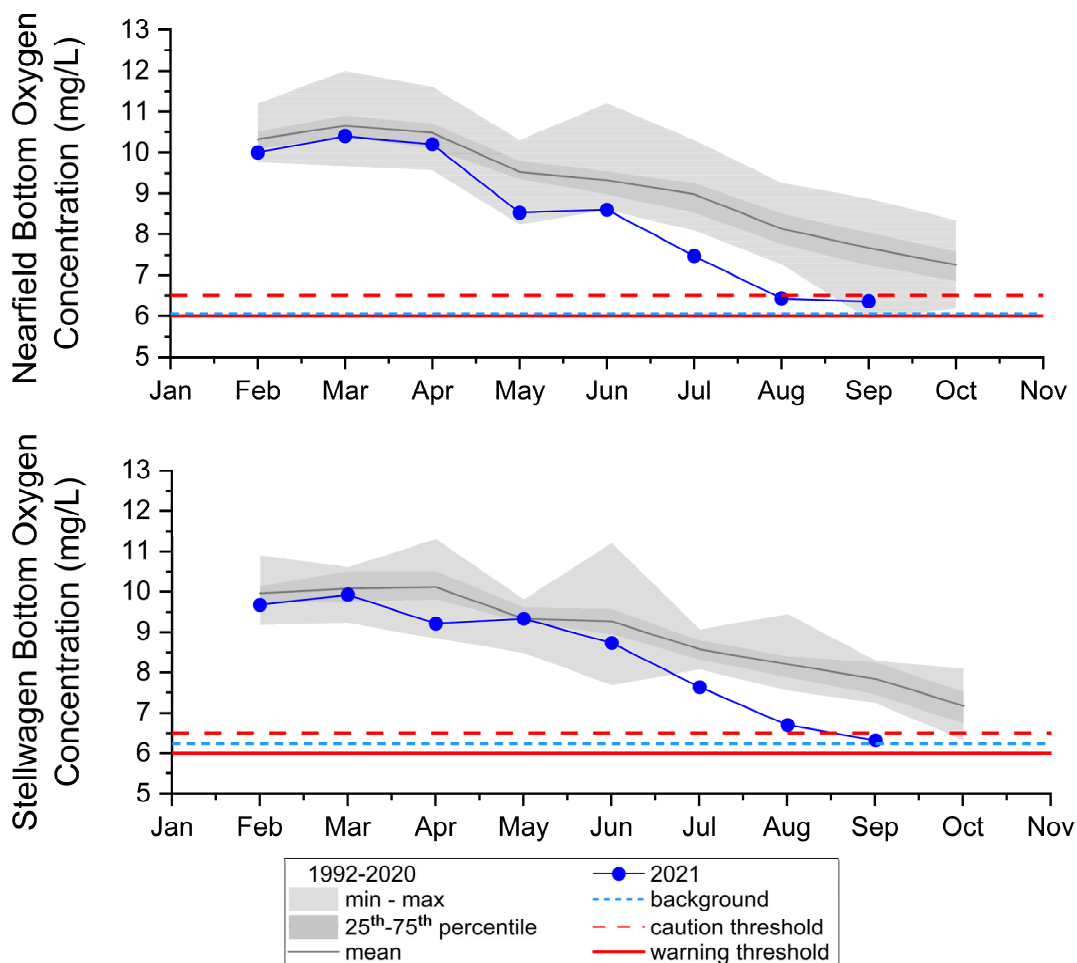
DISSOLVED OXYGEN (DO) – June- September 2021

The DO thresholds are tested on results collected in the bottom water from nearfield and Stellwagen Basin stations during June through October each year. During this period, warmer temperatures cause lower solubility and water column stratification can further reduce dissolved oxygen concentration and saturation in bottom water.

The DO Caution and Warning Level thresholds are based on state water quality standards that were in effect during the baseline monitoring period. To reflect the level of natural fluctuation, background level thresholds were established from measurements collected during the baseline sampling between 1992 and September 2000 from the two areas.

From June – September 2021, four routine water column surveys were conducted. There was one dissolved oxygen threshold exceedance during the period. Results of bottom-water oxygen percent saturation from September survey in Stellwagen Basin were below both the warning threshold and background level, requiring regulatory and public notification under the Contingency Plan (see notice https://www.mwra.com/harbor/pdf/20210924_amx.pdf). There is currently no evidence this exceedance is related to the Deer Island Treatment Plant outfall discharge. It is important to note that because dissolved oxygen concentrations remain above state water quality standards of 6 mg/L, the threshold exceedance does not indicate an adverse impact to marine life.

All dissolved oxygen concentration results from nearfield and Stellwagen Basin stations were above warning thresholds and their background levels. Although dissolved oxygen saturation results from nearfield were below warning threshold during August and September surveys, they were all above the background level. So there were no other threshold exceedances (Figure 5).



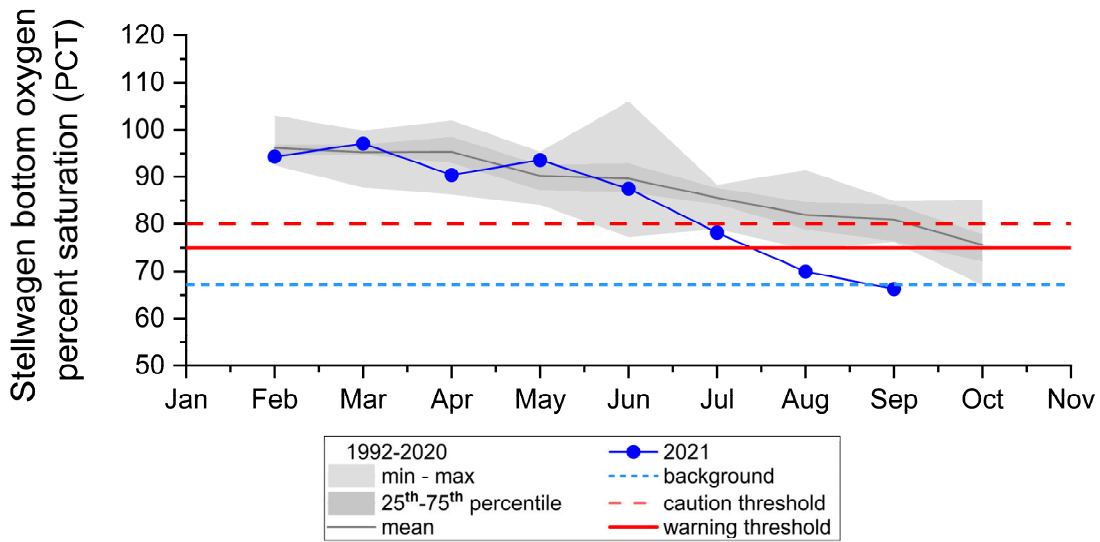
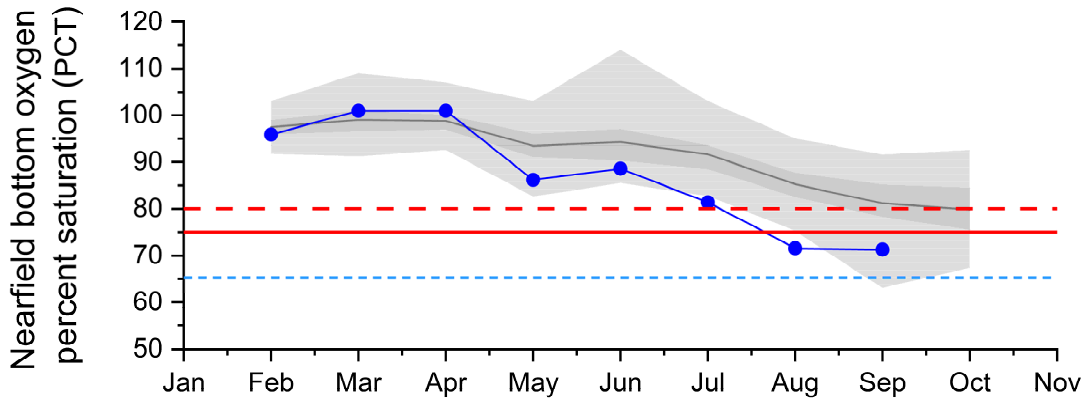


Figure 5. Bottom water dissolved oxygen concentration and percent saturation in nearfield and Stellwagen Basin stations.