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A BAYESIAN SURVIVAL-BASED MODEL TO PREDICT THE TIMING OF ALEXANDRIUM FUNDYENSE PROMOTED SHELLFISH TOXICITY IN THE GULF OF MAINE

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ABSTRACT: Shellfish toxicity in the Gulf of Maine is a frequent occurrence and is responsible for shellfish bed closures. The toxicity is a result of paralytic shellfish poisoning caused by Alexandrium fundyense blooms. We developed a Bayesian parametric survival model that is capable of predicting the timing of the toxicity events based on a set of gulf-scale hydrographic variables. The results indicate that cross-shore and along-shore sea surface temperature gradients play an important role in modulating the dynamics of observed toxicity events. Both alongshore and cross-shore advection of Alexandrium fundyense seem to drive the timing as well as the hazard of observing toxic events along the shoreline. The impacts of river flow into the gulf were found to be minor, yet significant. Additionally, we found that stations in the Western portion of the gulf tend to experience toxicity events at an earlier date than their counterparts in the Eastern section of the Gulf of Maine. Moreover, stations near Penobscot Bay showed on average delayed toxicity and lower hazards. The developed Bayesian modeling framework has the potential to be used as a forecasting model that can guide local monitoring agencies in decisions pertaining to the closure of shellfish beds.

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