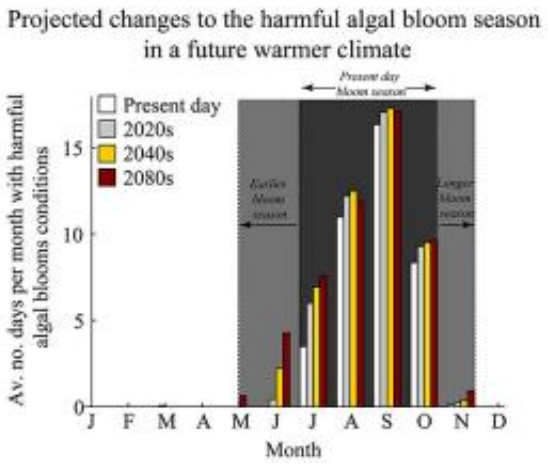
Climate projections show human health impacts possible within 30 years

February 19 2011



Projected changes to the harmful algal bloom season in a future warmer climate.

A panel of scientists speaking today at the annual meeting of the American Association for the Advancement of Science (AAAS) unveiled new research and models demonstrating how climate change could increase exposure and risk of human illness originating from ocean, coastal and Great Lakes ecosystems, with some studies projecting impacts to be felt within 30 years.

"With 2010 the wettest year on record and third warmest for sea surface temperatures, NOAA and our partners are working to uncover how a changing climate can affect our health and our prosperity," said Jane Lubchenco, Ph.D., under secretary of commerce for oceans and

atmosphere and NOAA administrator. "These studies and others like it will better equip officials with the necessary information and tools they need to prepare for and prevent risks associated with changing oceans and coasts."

In several studies funded by NOAA's Oceans and Human Health Initiative, findings shed light on how complex interactions and climate change alterations in sea, land and sky make ocean and freshwater environments more susceptible to toxic algal blooms and proliferation of harmful microbes and bacteria.

Climate change could prolong toxic algal outbreaks by 2040 or sooner

Using cutting-edge technologies to model future ocean and weather patterns, Stephanie Moore, Ph.D., with NOAA's West Coast Center for Oceans and Human Health and her partners at the University of Washington, are predicting longer seasons of harmful algal bloom outbreaks in Washington State's Puget Sound.

The team looked at blooms of Alexandrium catenella, more commonly known as "red tide," which produces saxitoxin, a poison that can accumulate in shellfish. If consumed by humans, it can cause gastrointestinal and neurological symptoms including vomiting and muscle paralysis or even death in extreme cases.

Longer harmful algal bloom seasons could translate to more days the shellfish fishery is closed, threatening the vitality of the $108 million shellfish industry in Washington state.

"Changes in the harmful algal bloom season appear to be imminent and we expect a significant increase in Puget Sound and similar at-risk

environments within 30 years, possibly by the next decade," said Moore. "Our projections indicate that by the end of the 21st century, blooms may begin up to two months earlier in the year and persist for one month later compared to the present-day time period of July to October."

Natural climate variability also plays a role in the length of the bloom season from one year to the next. Thus, in any single year, the change in bloom season could be more or less severe than implied by the long-term warming trend from climate change.

Moore and the research team indicate that the extended lead time offered by these projections will allow managers to put mitigation measures in place and sharpen their targets for monitoring to more quickly and effectively open and close shellfish beds instead of issuing a blanket closure for a larger swath of coast or be caught off guard by an unexpected bloom. The same model can be applied to other coastal areas around the world increasingly affected by harmful algal blooms and improve protection of human health against toxic outbreaks.

More atmospheric dust from global desertification could lead to increases of harmful bacteria in oceans, seafood

Researchers at the University of Georgia, a NOAA Oceans and Human Health Initiative Consortium for Graduate Training site, looked at how global desertification -- and the resulting increase in atmospheric dust based on some climate change scenarios -- could fuel the presence of harmful bacteria in the ocean and seafood.

Desert dust deposition from the atmosphere is considered one of the main contributors of iron in the ocean, has increased over the last 30 years and is expected to rise based on precipitation trends in western

Africa. Iron is limited in ocean environments and is essential to most forms of life. In a study conducted in collaboration with the U.S. Geological Survey, Erin Lipp, Ph.D. and graduate student Jason Westrich demonstrated that the sole addition of desert dust and its associated iron into seawater significantly stimulates growth and persistence of Vibrios, a group of ocean bacteria that occur worldwide and can cause gastroenteritis and infectious diseases in humans.

"Within 24 hours of mixing weathered desert dust from Morocco with seawater samples, we saw a 10-1000-fold growth in Vibrios, including one strain that could cause eye, ear, and open wound infections, and another strain that could cause cholera ," said Lipp. "Our next round of experiments will examine the response of the strains associated with seafood-related infections."

Since 1996 Vibrio cases have jumped 85 percent in the United States based on reports that primarily track seafood-illnesses. It is possible this additional input of iron, along with rising sea surface temperatures, will affect these bacterial populations and may help to explain both current and future increases in human illnesses from exposure to contaminated seafood and seawater.

Increased rainfall and dated sewers could affect water quality in Great Lakes

A changing climate with more rainstorms on the horizon could increase the risk of overflows of dated sewage systems, causing the release of disease-causing bacteria, viruses and protozoa into drinking water and onto beaches. In the past 10 years there have been more severe storms that trigger overflows. While there is some question whether this is due to natural variability or to climate change, these events provide another example as to how vulnerable urban areas are to climate.

Using fine-tuned climate models developed for Wisconsin, Sandra McLellan, Ph.D., at the University of Wisconsin-Milwaukee School of Freshwater Sciences, found spring rains are expected to increase in the next 50 years and areas with dated sewer systems are more likely to overflow because the ground is frozen and rainwater can't be absorbed. As little as 1.7 inches of rain in 24 hours can cause an overflow in spring and the combination of increased temperatures -- changing snowfall to rainfall and increased precipitation -- can act synergistically to magnify the impact.

McLellan and colleagues showed that under worst case scenarios there could be an average 20 percent increase in volume of overflows, and they expect the overflows to last longer. In Milwaukee, infrastructure investments have reduced sewage overflows to an average of three times per year, but other cities around the Great Lakes still experience overflows up to 40 times per year.

"Hundreds of millions of dollars are spent on urban infrastructure, and these investments need to be directed to problems that have the largest impact on our water quality," said McLellan. "Our research can shed light on this dilemma for cities with aging sewer systems throughout the Great Lakes and even around the world."

"Understanding climate change on a local level and what it means to county beach managers or water quality safety officers has been a struggle," said Juli Trtanj, director of NOAA's Oceans and Human Health Initiative and co-author of the interagency report A Human Health Perspective on Climate Change. "These new studies and models enable managers to better cope and prepare for real and anticipated changes in their cities, and keep their citizens, seafood and economy safe."

Provided by NOAA