



WOODS HOLE OCEANOGRAPHIC INSTITUTION

Dr. James M. Cervino
Visiting Scientist Woods Hole Oceanographic Institution
&
Environmental Chair
Community Board 7 Queens New York
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New diseases are devastating coastal ecosystems globally targeting low lying coastal zones in the USA. This testimony is aimed at showing the major ongoing and the emerging threats to endangered coastal ecosystems that affect human health and economically significant marine species. The explosive pathogenic outbreaks of finfish, shellfish and coral reefs have intensified by global warming, sewage inputs, and other forms of pollution appear to pose an immediate ecosystem and human health alert this century has ever faced.

Here we report, that a global warming trend in sea surface temperature is strongly associated with spread of marine vibrio pathogens and infectious diseases, that has caused an emergence of human diseases by these pathogens which also target shellfish, finfish and coral reefs in the tropics. The role of climate change in driving the spread of waterborne infectious diseases, such as those caused by *Vibrio* bacterial pathogens is playing a significant role in the die off of these ecosystems as well as a public health crisis during abnormally warm sea surface temperatures. These trends have intensified during the last 30 years as temperature trends increase.

The Pathogenic Suspects

The target species; *Vibrio vulnificus*, *Vibrio parahaemolyticus* and *Vibrio cholerae*, grow in warm, low-salinity waters, and their abundance in the natural environment mirrors ambient environmental temperatures. In a rapidly warming marine environment, these bacteria mutate and produce toxins that cause infectious diseases in humans, fish farms and coral reefs. During warmer conditions there are greater numbers of human infections, and most notably outbreaks linked to extreme weather events such as heat waves in temperate regions such as Northern Europe. *Vibrio cholerae* is the causative agent of cholera epidemics, including the outbreak in South East Asia, India and the Caribbean island of the Hati this past decade. These pathogens affect the poorest

people around the globe, and as temperature and pathogens intensify so will their hosts, regardless of their zip code.

New York Outbreaks and Other Coastal Areas

In a global warming world, for example, gastrointestinal infections in estuarine environments, are used to assess the environmental suitability for pathogenic *Vibrio* growth in oyster and other shellfish farms that might warrant a temporary harvesting ban. In the summer of 2012, outbreaks of *V. parahaemolyticus* infection caused by Pacific Northwest strains occurred on the Atlantic coast of the United States, this was the first multistate outbreak of *V. parahaemolyticus* illnesses reported in the United States for almost a decade. A total of 12 confirmed and 16 probable outbreak-associated cases were reported between 24 April and 3 August. Illness onset dates ranged from 27 May to 20 July 2012. The median age of patients was 49 y and 46% were female. Two patients were hospitalized; none died. The outbreak was linked to consumption of shellfish harvested from Oyster Bay Harbor in New York State between April and August 2012. The Rhode Island Department of Health advised food establishments to check the tags on any shellfish that they were selling to consumers or using in food preparation and to avoid selling or using shellfish harvested from the Oyster Bay area. Harvesting of shellfish from the area was temporarily prohibited on 13 July.

Mass Mortality In Coral and Shellfish Reef Ecosystems

In the past 30 years periods of increased sea surface temperature have been associated with widespread coral thermal bleaching events coupled with shellfish, finfish and coral disease episodes. Coral reefs are a perfect indicator of Global Warming trends associated with Climate Change coupled with disease outbreaks, (Cervino et. al., 2008). Mass mortalities from disease and thermal coral bleaching events have been associated with Global Warming Hot Spot Events and El Nino anomalies during the 1980s, 90s, 2000s, and have been extensive throughout this past year indicating a major die off of once diverse shellfish and coral reef species along the Great Barrier Reef in Australia and all other tropical locations globally. This year warming trend is predicted to break last years record globally. Tabulating these disease outbreak trends in human health coupled with marine ecosystems can be an important climate change indicator over the next 5 years.

Peer Review References

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