Intersection of water quality, human health, and aquatic ecosystems

Brian D Badgley
Environmental Microbiology
VT School of Plant and Environmental Sciences
badgley@vt.edu

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Flesh-eating bacteria in New Jersey reveal one possible effect of climate change, study says

By Susan Scutti, CNN
Updated 11:49 AM ET, Tue June 18, 2019

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Climate Change May Be Spreading Flesh-Eating Bacteria to Unexpected Waters

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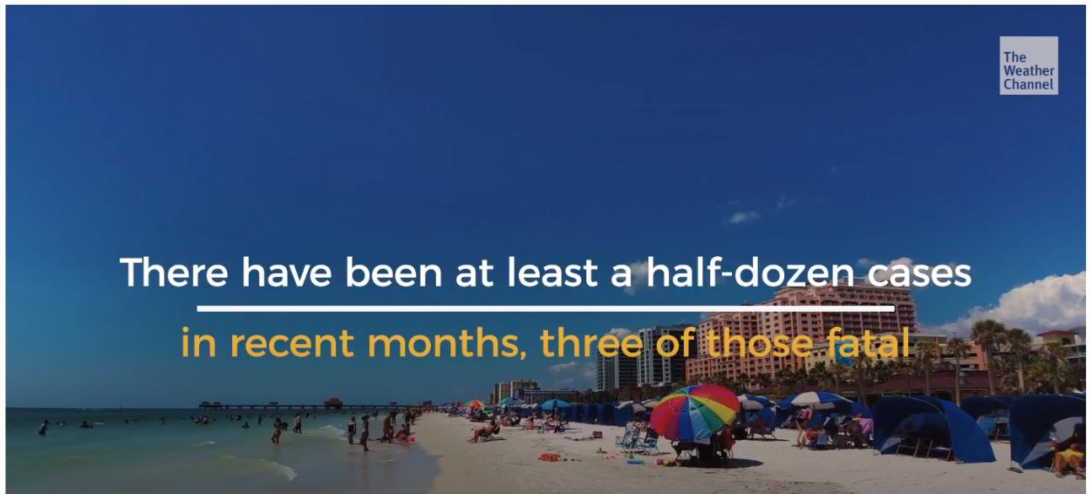


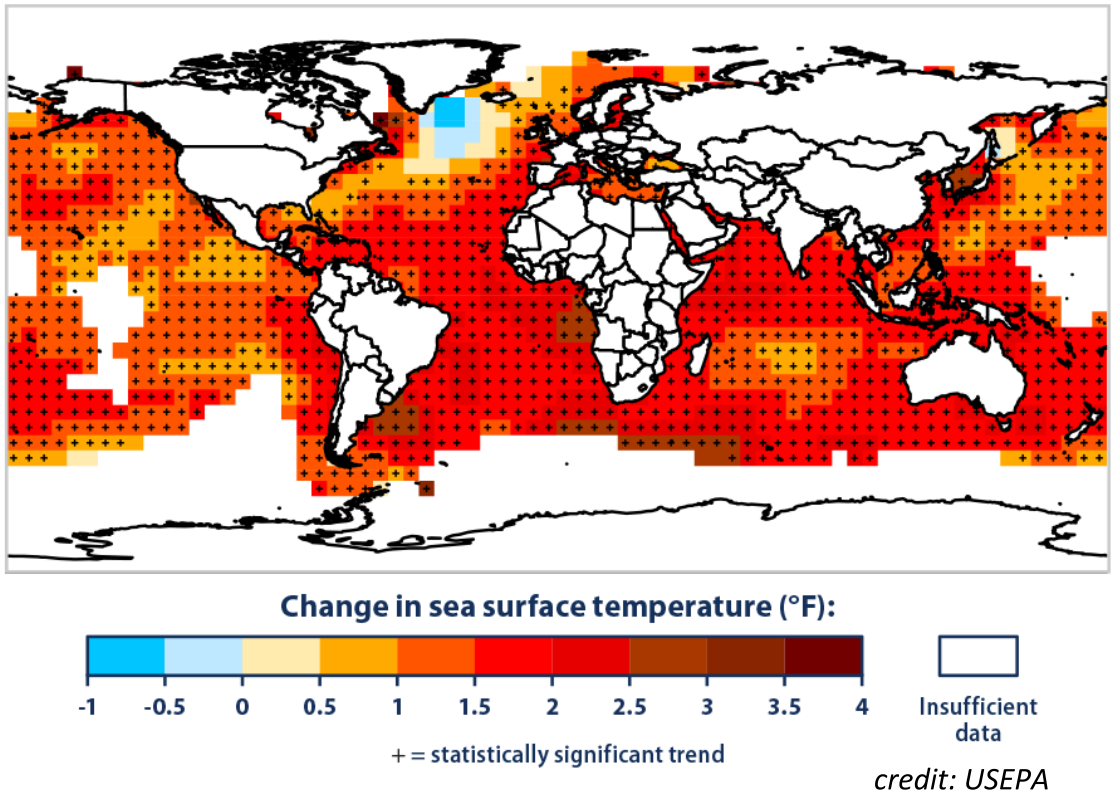
Key Topics

- Global change factors affecting water quality
- Recreational Contact
- Harmful Algal Blooms
- Opportunistic Pathogens (*Vibrio*)
- Next Steps

Change Factors

Increased temperature, sea level, and storm intensity means surface and coastal ground waters are getting:

- Warmer
- Saltier
- Reduced ice cover
- More runoff and connection to coastal infrastructure



credit: USEPA

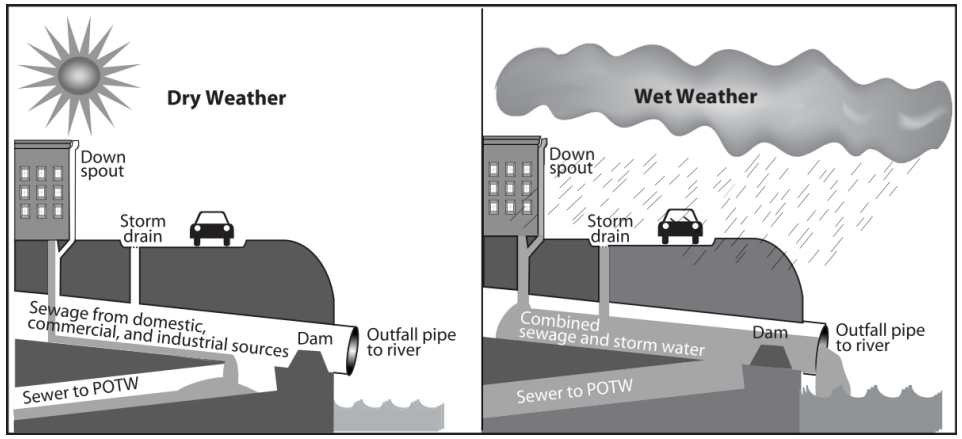
credit: Virginian-Pilot

Recreational Contact

Traditional focus on fecal pathogens resulting from sewage contamination:

- Recreational contact and shellfish harvesting
- Many bacterial, protist, and viral pathogens: *Salmonella, Campylobacter, Giardia,* Norovirus
- 2018 U.S. estimate: 90M illnesses costing ~$3B annually[(1)]

credit: WHOI



credit: Wikipedia

Recreational Contact

Under climate change:

- Survival of fecal pathogens and indicators *generally* decreases in warmer temperatures and salinity
- However, more intense storms and flooding (plus population growth and aging infrastructure) may increase release of sewage into surface waters

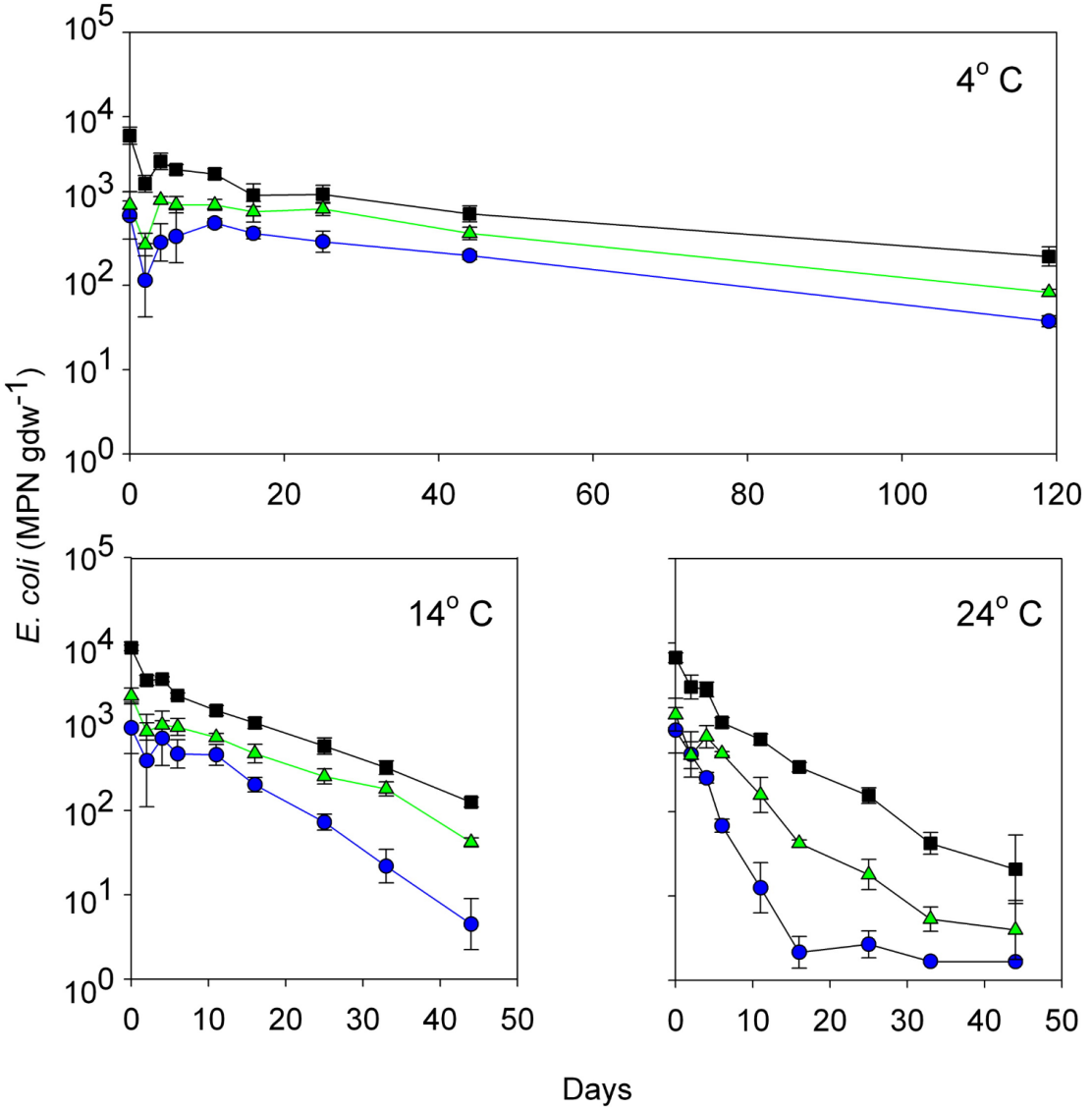


Fig. 3. *E. coli* inactivation in sediments. ● – sediment A, ■ – sediment B, ▲ – sediment C. Error bars show standard deviations computed for logarithms of concentrations.

credit: Grazio-Hadzick et al. 2010[2]

Harmful Algal Blooms (HABs)

Excessive growth of native cyanobacteria or algae:

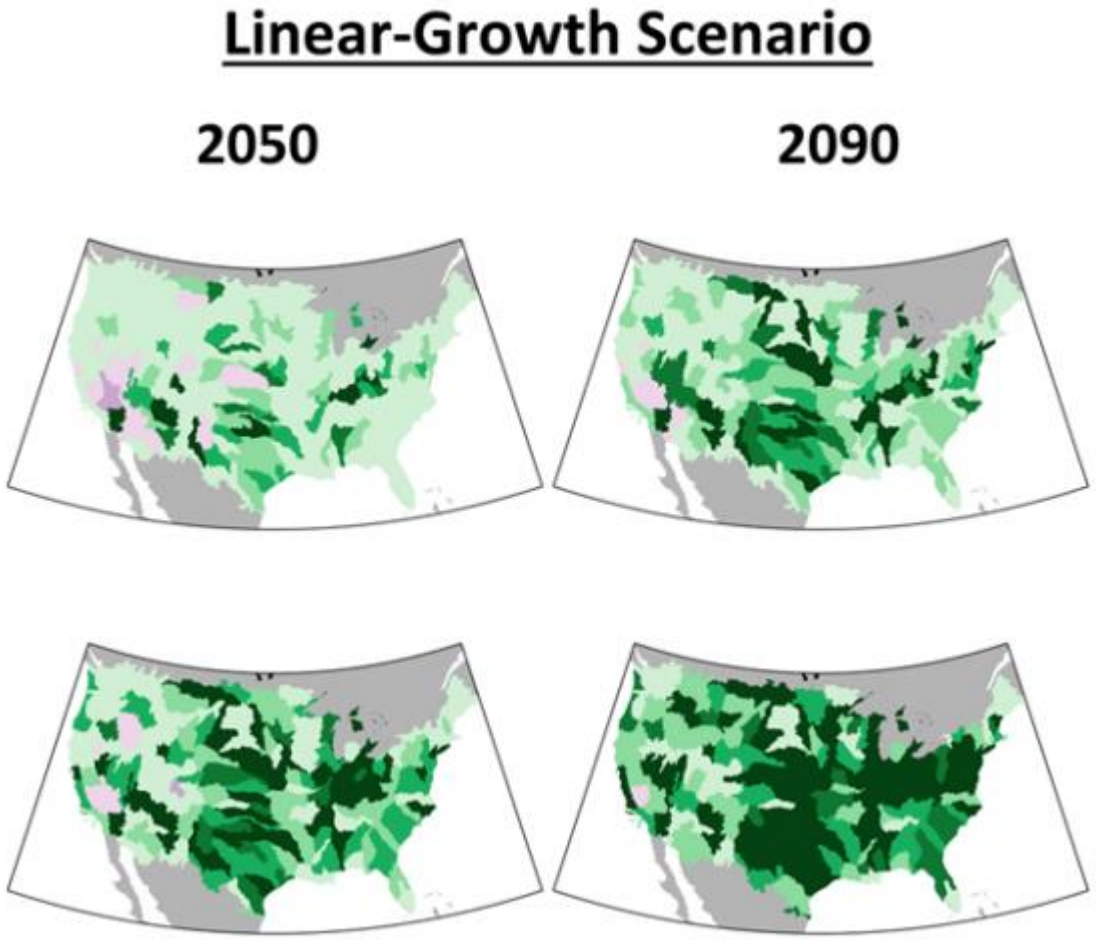
- *Microcystis, Pfisteria, Karenia, Pseudo-nitzschia*
- Produce toxins that contaminate drinking water, shellfish, and coastal aerosols
- Many toxins with symptoms similar to flu, foodborne illness
- Human health impacts poorly understood due to lack of data

credit: European Space Agency via Huisman et al. 2018[3]

Harmful Algal Blooms (HABs)

HABs are natural but increasing[4]:

- Driven mainly by nutrient inputs and warming
- Nutrient inputs driven by land use and changing precipitation
- Mean number of HAB days projected to increase ~3-5X by 2090
- Illness can be reported through OHHABS[5]

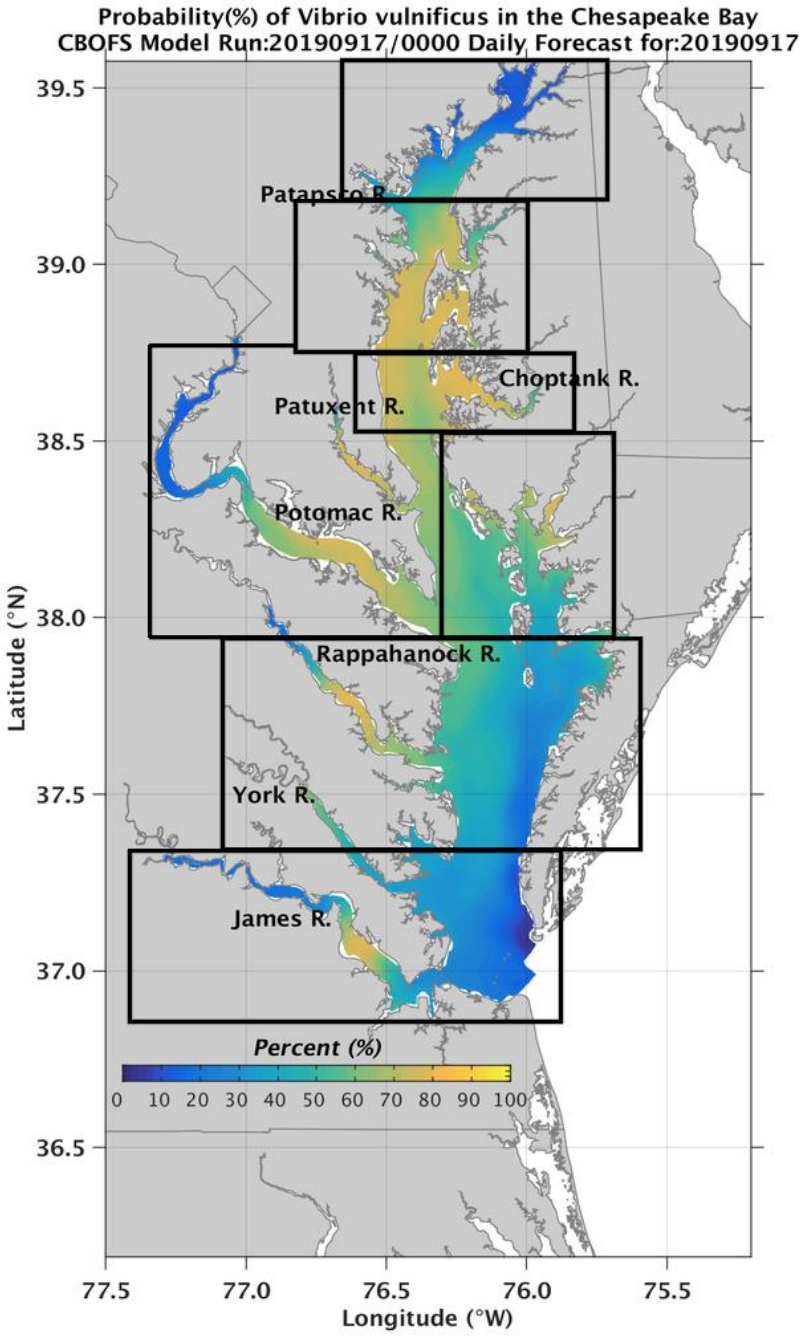


credit: Chapra et al. 2017[4]

Opportunistic Pathogens

Many native aquatic microbes are opportunistic pathogens:

- *Legionella, Mycobacterium, Naegleria*
- *Vibrio* including *cholerae, parahaemolyticus, vulnificus*
- Infection via shellfish ingestion and open wound contact
- Historically considered in Gulf of Mexico but recent Mid-Atlantic infections indicate spread

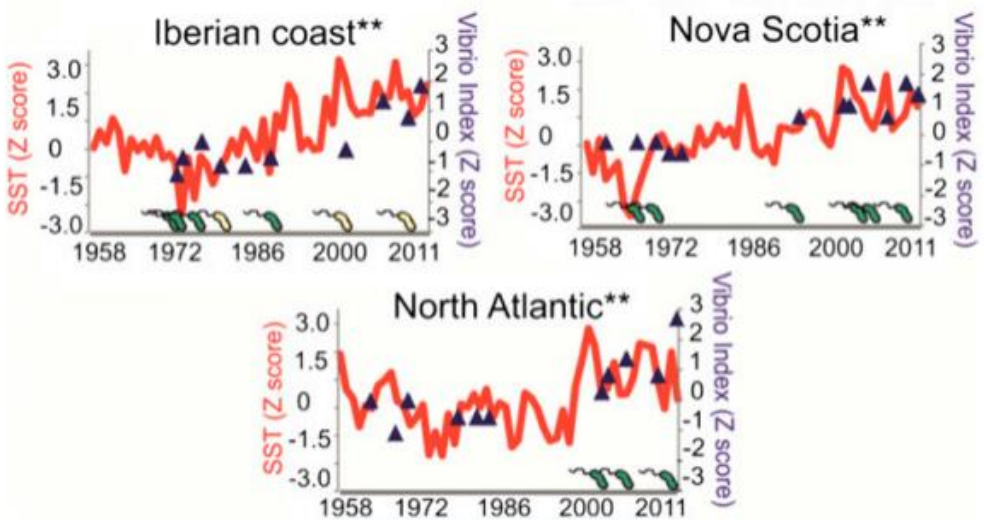


credit: NCCOS[6]

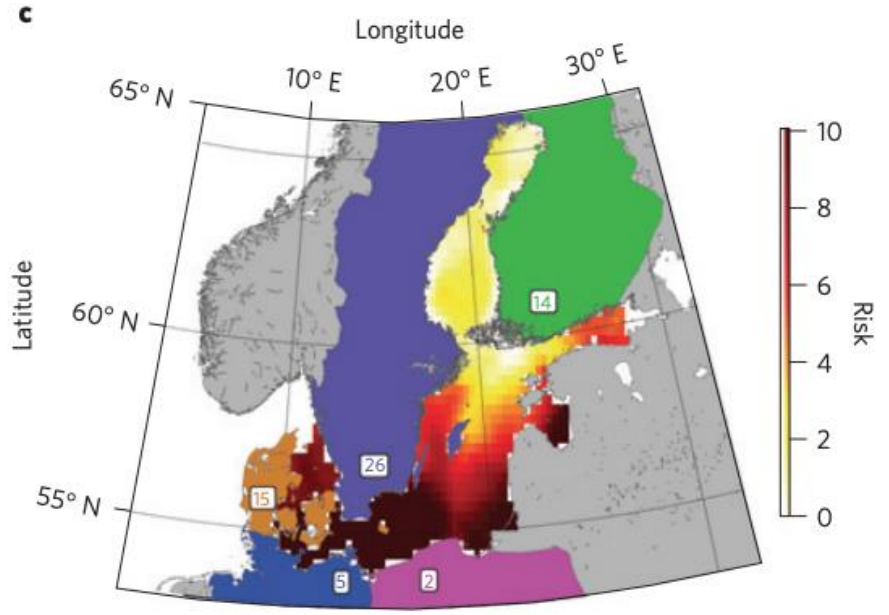
Vibrio expansion

Spread of *Vibrio* to higher latitudes is theorized to be allowed by warmer waters

- Historical data indicate increasing concentrations post-WWII in North Atlantic[7]
- Expected to be problematic on the East coast
- Models attempt to match risk projections with observed illness[8]



credit: Vezulli et al. 2016[8]



credit: Baker-Austin et al. 2012[8]

Possible Next Steps

- Consider recent patient contact with water bodies
- Educate physicians about illnesses and symptoms related to these issues that they may not currently suspect
- Consider contributing to and engaging with health monitoring efforts as an organized group

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