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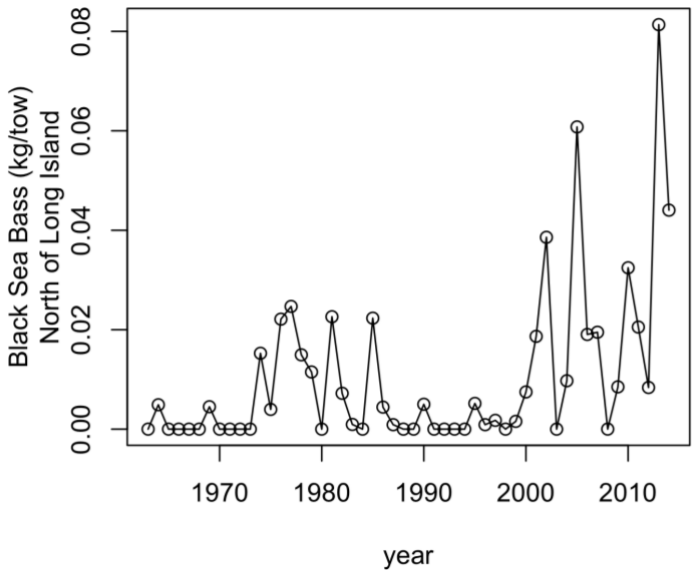
Impacts of Rising Ocean Temperatures on Ecosystems Worksheet

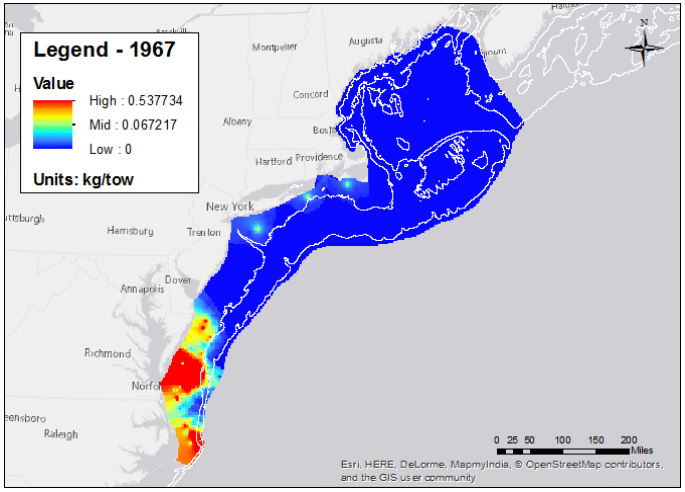
1. Read a story from the docks of New England - What's changing?

- *Overall, how has the amount of black sea bass caught by scientists north of Long Island changed over time?*
- *Are more black sea bass caught in the 1960's and 70's or in the 2000s?*
- *Do these data support the claims by fishermen in Maine that they were catching more black sea bass than normal in 2015?*
- *Why are fishermen concerned about the arrival of the black sea bass? How could the arrival of many black sea bass affect their income?*



Look at the map and watch it scroll through years 1969 to 2015.

- *Off of which cities/towns are most black sea bass found in the 1960's and 1970's? What about in the 2000's and 2010's?*
- *Look at the part of the coastline nearest to Providence and Hartford - when do black sea bass first arrive there? When are they the most abundant there?*
- *Why do you think whole populations of black sea bass might move to a new area?*
- *Could humans have something to do with it? How?*



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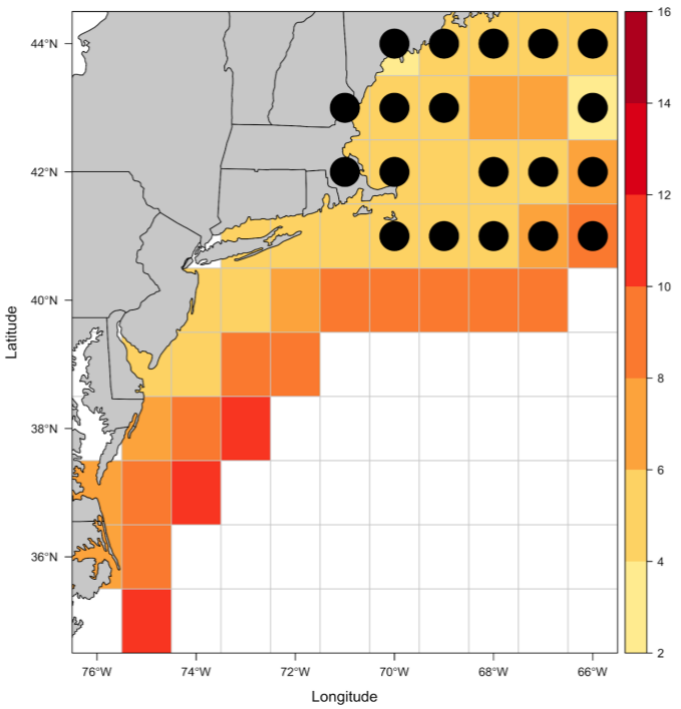
2. Meet a scientist and think like one - how do we collect data on the oceans?

- *Based on this map, do you see a pattern between where Atlantic Cod were caught and the temperature of the water in those places in the 1980s?*

- *Were Atlantic Cod caught in squares on the map with the lowest possible temperature? What about in squares with the highest possible temperature?*

- *Based on this map, do you think that Atlantic Cod has a temperature of water that it prefers? How can you tell?*



3. Think like a fish - Use Data to Model Changes in Fish Populations

Before running the simulation...

- *Which species do you predict will gain and lose habitat over time?*
  - *Species that prefer warm water*
  - *Species that prefer cold water*

- *What geographic direction do you think fish species will move over time?*
  - *Northward*
  - *Southward*
  - *Eastward*
- *How do you think a species' preferred temperature range (thermal preference) affects where fish of that species move to?*
  - *They move to stay in water of their preferred temperature range.*
  - *They stay in the water where they are even if that water has a temperature outside of its preferred temperature range.*

Complete the simulation worksheet "Simulation Activity Worksheet"

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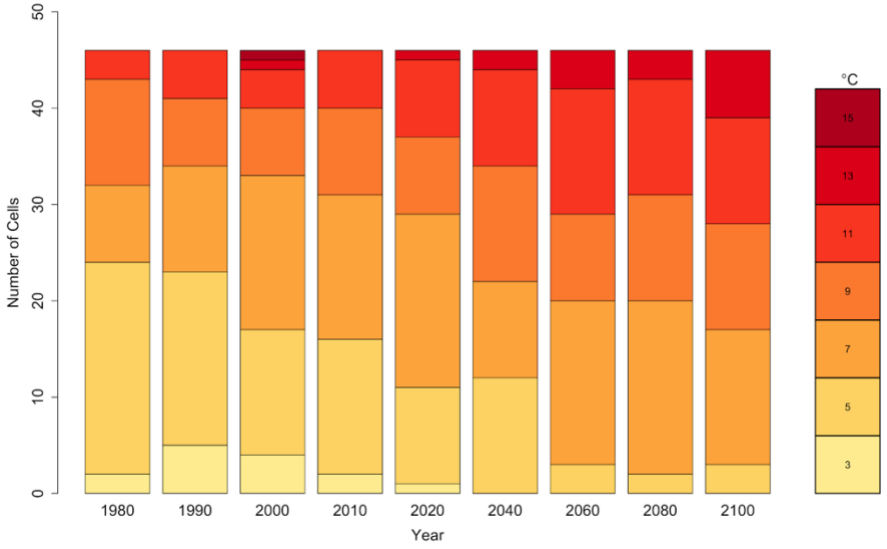
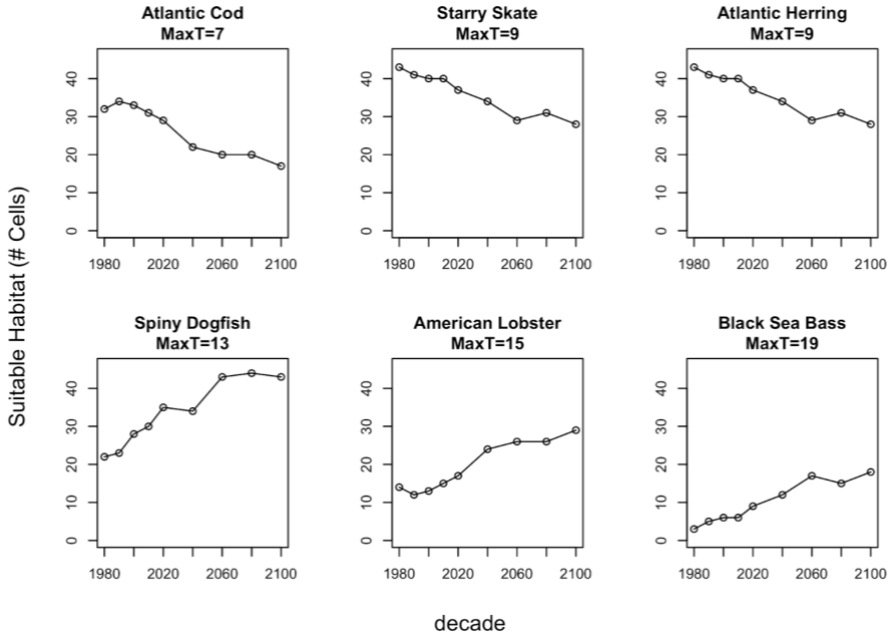
After completing the simulation…

- *What patterns do you see across the different fish species over time (graph on right)?*

- *What patterns do you see across the different amount of habitat over time (graph below)?*





Our original questions: Could the change in the distribution of the black sea bass and other species be related to changes in ocean temperature? What will happen if the ocean continues to warm?

- *What is your claim from the data to answer these questions?*

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- *What is your evidence of that claim?*

- *What is your reasoning of how that evidence supports your claim?*

4. Make predictions - use your model to make predictions and inform the community.

- *Between 1980-2010 this species lived in 5°C - 13°C temperatures of water. Therefore, I predict that silver hake will have _____ amount of habitat in 2100 as compared to 1980-2010.*
- *What do you notice about the available habitat for silver hake from the simulation?*
  - *It gains habitat*
  - *It loses habitat*
  - *It maintains the same level of habitat*
- *Compare what you observed in the simulation data to what your prediction was for silver hake over this time. How does your prediction match the data?*
  - *I predicted what happened in the data.*
  - *I did not predict what happened in the data.*
- *If you were running this computer simulation, what would be your next step(s) be to learn more about where we may find silver hake in 2100?*
  - *Collect more information about the preferred temperature range of silver hake in the wild, to adjust your expectation of where you would see it.*
  - *Collect more information about what silver hake eats and/or who eats silver hake in the wild, to add another variable as to what may influence where you could see silver hake in the future.*
  - *Compare the simulation data from 2000-2020 with the actual data from those years to see how well the simulation models what we are seeing in the real world.*
  - *Other: _____ [fill in what else you would want to do]*

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