Baseline Assessment of Crustaceans Along the Northeastern Continental Shelf

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Rationale

- The ocean is changing, both from human impacts and natural cycles.

- Windfarms and climate change have the potential to be major drivers of environmental change on the continental shelf
  - There are currently 26 leased areas (8,622 km2) and 15 planning areas to be developed
- Gathering baseline quantitative assessments of organisms currently present in the environment and conducting other monitoring programs is key to measure change.

Fishery Monitoring Programs

- Long-term fisheries monitoring programs are vital for inferring how marine populations change over time.
  - These monitoring programs can be costly
  - Funded less often than those conducted less frequency

- Types of Monitoring Programs for Crustaceans:
  - Commercial Trap Port and Sea Sampling
  - Suction Survey for post-settled Lobsters
  - Ventless Trap Surveys
  - Bottom Trawl Surveys

Why Crustaceans and which ones?

- Hare et al (2016) conducted a study to evaluate the vulnerability of marine organisms to climate change.

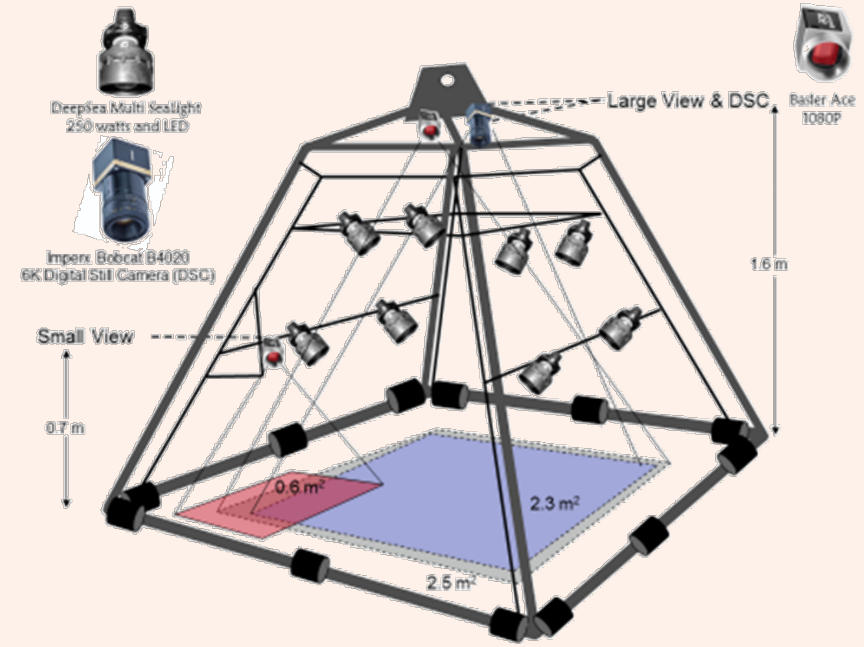
- Keppel et al (2012) reported lower pH levels in seawater reduced growth rate and development in American lobster larvae.

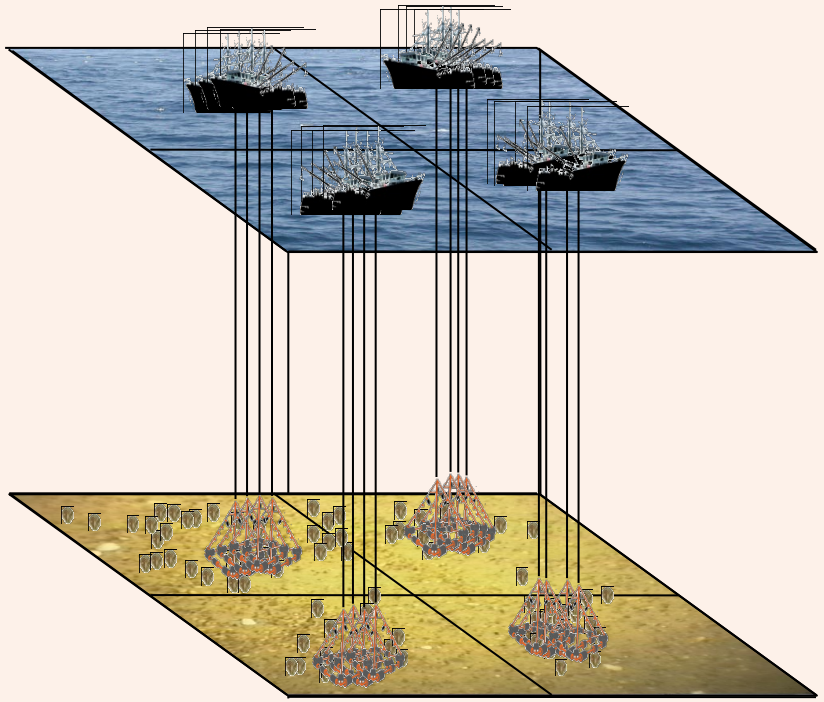
Target Species	2022 Landing Value
American Lobsters	$520,223,703.00
Jonah crabs	$35,169,568.41
Atlantic rock crabs	$1,930,769.69
Snow crabs	$1,431,278.00

Sources: Department of Fisheries and Oceans (2023). Zonal Interchange File [database]. Ottawa and NOAA Landings Database (2023).

Data Collection: Drop Camera Survey

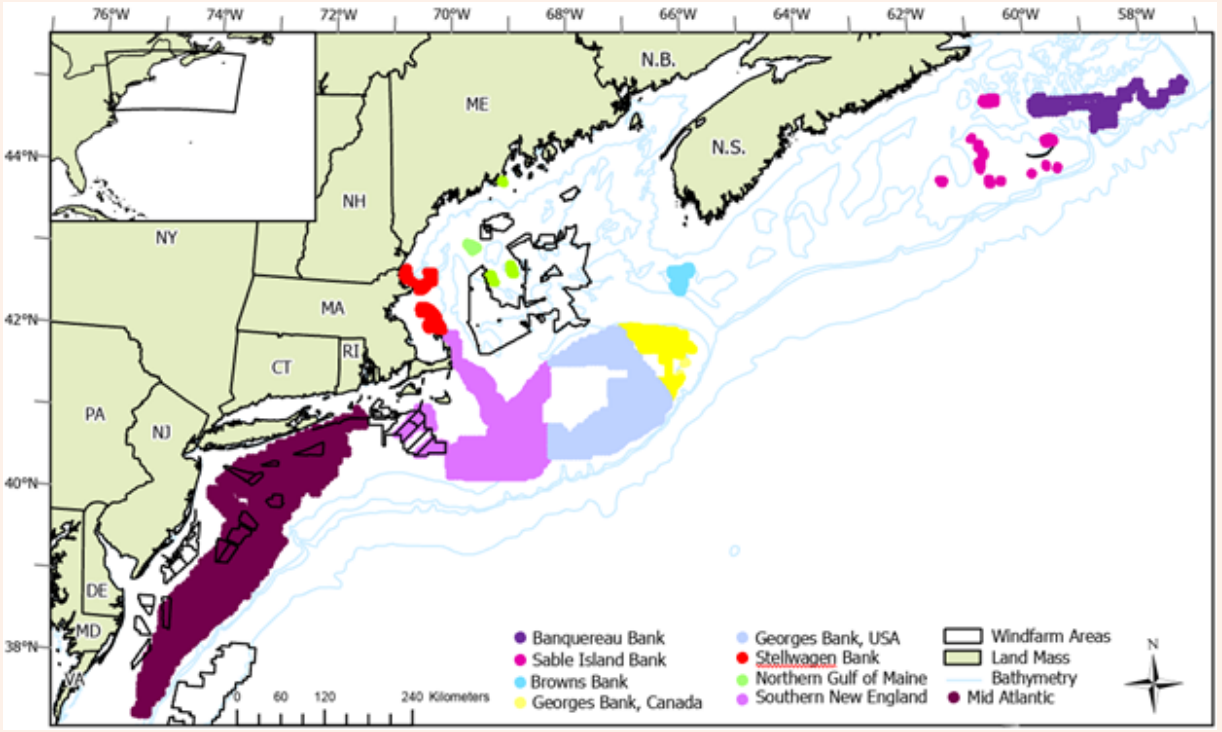
- Primary purpose of this survey to calculate sea scallop abundance for commercial fishers and the Atlantic sea scallop stock assessment.
- This survey utilizes a centric stratified, systematic grid sampling design.
  - Conducting throughout the summer months
- A pyramid, consisting of lights and 3 cameras, is dropped to the ocean floor (4x per station)





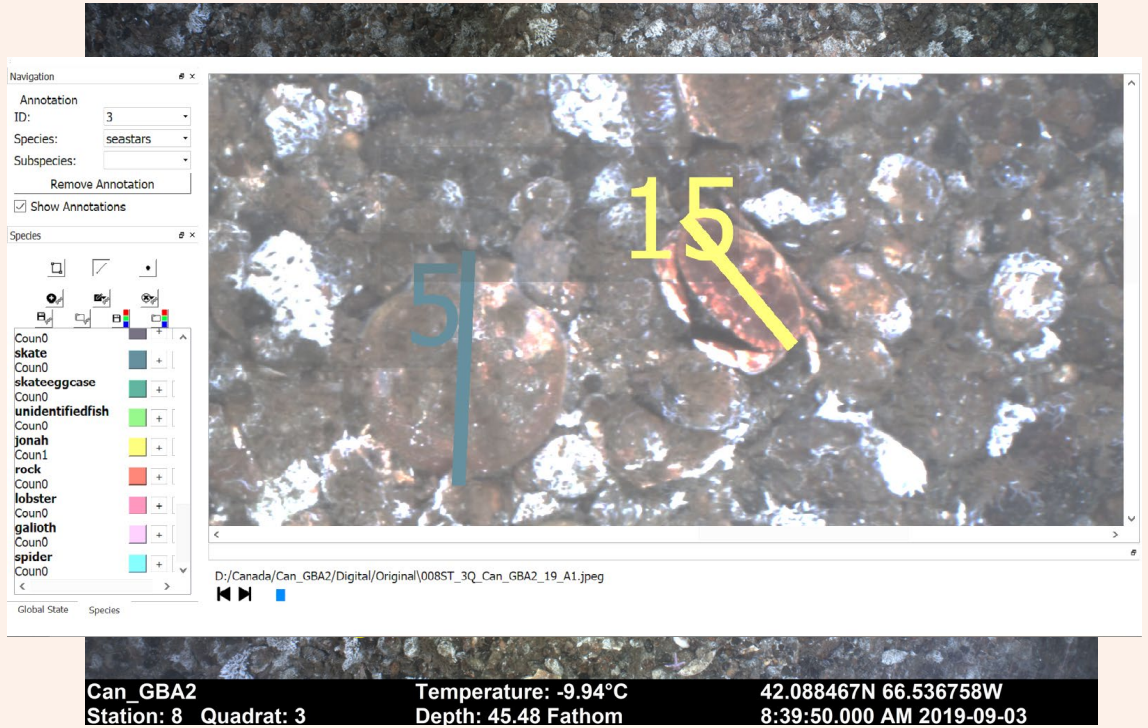
Data Collection: Drop Camera Survey

- There were a total of 18,750 stations photographed from 2016 – 2020
- Images collected from 2016 - 2020 were used to estimate the biomass, density, and distribution of crustaceans
  - Each dot on the map represents a station surveyed from 2016-2020



Data Processing: Drop Camera Survey

- Using those original records, Jonah crabs, Snow crabs, Atlantic rock crabs, and American lobsters were speciated and measured.
  - If distinction between Jonah or Rock crab could not be made the crab was marked as an unidentified cancer species.
- Galatheid crabs, Spider crabs, and Hermit crabs were not identified to species level.



Organism	Annotation
Sea Scallops	Measured
American Lobster	Counted
Crabs	Counted
Hermt Crabs	Counted
Sea Stars	Counted
Fish	Counted
Substrate	Presence/Absence
Colonial Organisms	Presence/Absence

Methods: Biomass Estimates

- Using the Carapace width/length to weight relationship equation

Species	Slope	Intercept	Source
American lobster			
Georges Bank	2.921227	-13.701596	ASMFC 2020
Southern New England	2.936657	-13.793545	ASMFC 2020
Jonah crab			
Southern New England	3.12	-9.27	Truesdale et al. 2019
Mid-Atlantic	3.034	-8.847	Olsen and Stevens 2020
Atlantic rock crab			
Canada	3.0519	-3.9422	Campbell and Eagles 1983
US	To Be Determined	To Be Determined	
Snow Crab			
Canada	3.039	-7.982	H*é*bert et al. 2002

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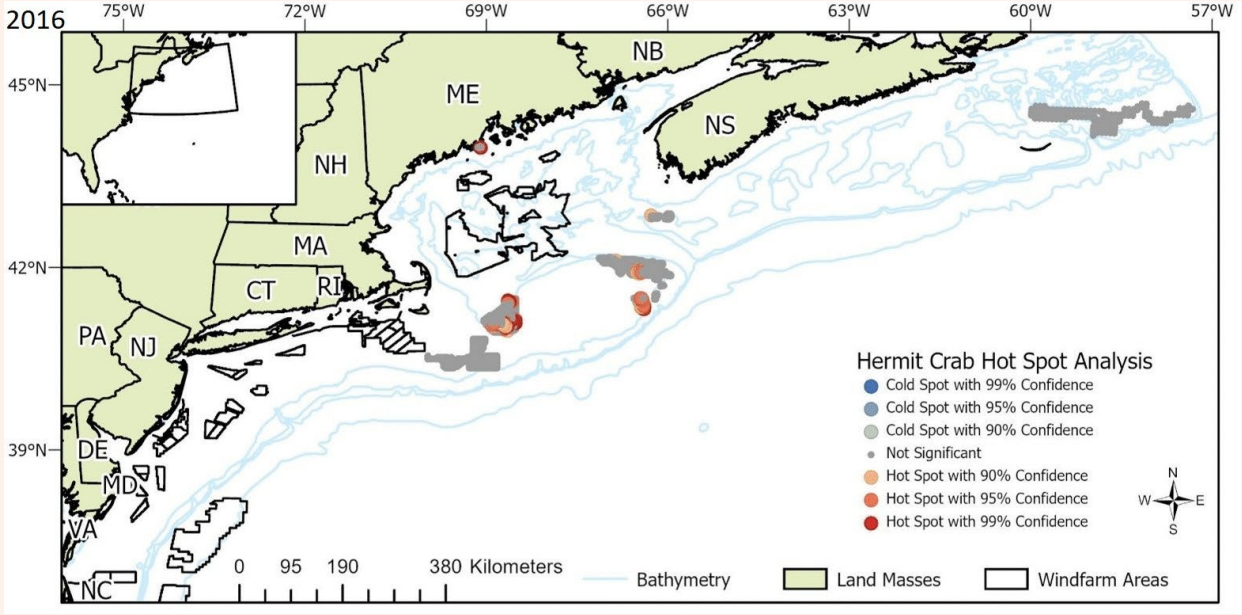
Canada	3.0519	-3.9422	Campbell and Eagles 1983
US	3.0030	-3.7093	
Snow Crab			
Canada	3.039	-7.982	H*é*bert et al. 2002

Results

- This baseline assessment decerned that hermit crabs were the most populated crustacea in the survey, Atlantic rock crabs had the largest biomass, crustaceans aggregate at a wide range of distances in similar locations over time, and temperature, competitors, and sediment have influences in distribution.



Take Aways

- Estimating the absolute abundance, distribution, and preferences of these target species will allow researchers, years from now, to quantify the environmental changes and discern population patterns.

- This study is an example of a cost-effective way to collected data or test a pilot study that may not have been funded as a standalone project.

Future Work

- Having data on the number of pre-recruits and recruits of each population for edible crabs would help fishery management forecast the health of the stock.

- In this study, the summer months were the only time we collected images, but some crustaceans have inshore to offshore seasonal migrations for spawning, so our results only display mapped aggregations during the summer months.
  - Could be used for determining fishery displacement for a seasonal closure, but not very helpful for determining fishery displacement for a permanent structure.

Acknowledgments and Questions ?

- graduate students and digitizers who originally processed the images
- fishers who helped us collect these data.
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