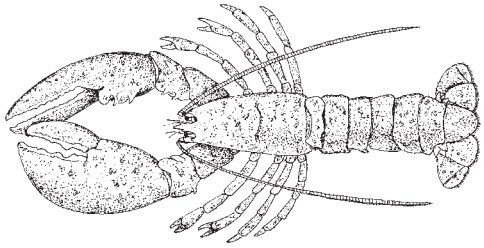
American Lobster Research and Extension Initiative



Issue 1 September 2020
CTSG-20-08

Website: https://seagrant.umaine.edu/extension/american-lobster-initiative/

In 2019, Maine Sea Grant, in partnership with six other Northeast Sea Grant programs (New Hampshire, MIT, WHOI, Rhode Island, Connecticut and New York), received National Sea Grant support for a regionally coordinated **Lobster Extension Program**, to complement and enhance the research component of the NOAA Sea Grant **American Lobster Initiative**. This regional program will help ensure that industry and management stakeholders across the Northeast are aware of, and benefit from, ongoing research undertaken by the Lobster Initiative and have a mechanism by which current concerns about the American lobster resource can be raised. Maine Sea Grant hired Amalia Harrington to serve as the regional extension coordinator.

Each Sea Grant extension program is leading specific components that contribute to the overall effort and engaging in regional activities. Currently, due to restrictions imposed by the pandemic, this entails monthly conference calls. The expectation is to hold an annual research and extension conference, but whether that will be possible in 2021 remains to be determined.

Connecticut's Role:
Connecticut Sea Grant extension contacts for this effort are Anoushka Concepcion (anoushka.concepcion@uconn.edu) and Nancy Balcom (nancy.balcom@uconn.edu). Local members of the regional steering committee for this initiative are Michael Theiler (Jeanette T Fisheries LLC) and Colleen Bouffard (CT DEEP Marine Fisheries).

Connecticut Sea Grant is working collaboratively with the other Sea Grant programs in Northeast to plan the annual conference and share results of the research as it becomes available. We are also helping synthesize previous research on American lobster to provide scientists, managers and extension professionals with a "status of knowledge" summary for this resource. The Connecticut and New York Sea Grant Programs will be conducting interviews with members of the Southern New England lobster fishing community and state resource management agencies to document their experiences before, during, and after the crash of the fishery in the 1990s. These audio oral histories will be uploaded to the NOAA "Voices" site. *If you are interested in being interviewed this fall or early winter, please contact Nancy (**nancy.balcom@uconn.edu**) or Anoushka (**anoushka.concepcion@uconn.edu**).*

What is the NOAA Sea Grant American Lobster Initiative?

The NOAA Sea Grant American Lobster Initiative (ALI) is addressing critical knowledge gaps about American lobster and its iconic fishery in a dynamic and changing environment. The initiative, which began in 2019, supports scientific research and outreach to develop and share new knowledge and understanding with industry stakeholders and resource managers from Maine to New York. The goal of the LRI is to increase the American lobster industry's resilience to the biological, economic and social impacts of ecosystem change in the Gulf of Maine and Georges Bank.

NOAA National Sea Grant held national research competitions focused on American lobster in both 2019 and 2020. The suite of selected research projects aim to improve our understanding of the physical and chemical changes affecting American lobster in the Gulf of Maine and Georges Bank by addressing one or more of the following priorities:

- Increased understanding of life history parameters, including but not limited to, growth, maturity and species interactions;
- Larval studies and early biology;
- Spatial distribution and migration, including but not limited to, habitat and treophic interactions;
- Socio-economic lessons learned from Southern New England as they pertain to Georges Bank and the Gulf of Maine; and
- Socio-ecological investigations to inform future management decisions, including but not limited to, research exploring bait alternatives to herring and their implications for the lobster fishery.

The 16 research projects funded in 2019 and 2020 are listed on the following pages, along with the principal investigator and his/her institution and a brief summary of the objective(s). More information on these projects can be found on the **research page** of the American Lobster Initiative website hosted by Maine Sea Grant.

2019 -2021 Projects

Projecting Climate-related Shifts in American Lobster Habitat and Connectivity: Integrated Modeling to Inform Sustainable Management
PI Brady, University of Maine

Objective: to examine the potential effects of warming on the early life history of the American lobster in order to build a flexible modeling system capable of addressing the fundamental questions being asked by lobstermen and the agency regarding larval transport and supply.

Fish Less, Earn More: Assessing Maximum Economic Yield Effort levels in Gulf of Maine's Lobster Fishery, Incorporating Lessons Learned from Southern New England, Canada and Australia
PI Dayton, Gulf of Maine Research Institute

Objective: to better prepare the Gulf of Maine lobster fishery to prevent economic losses due to declines in landings and increases in operating costs by assessing the effects of moving to maximum economic yield effort levels in the fishery, given the predicted future state of the fishery, to inform management options.

The Potential Influence of Increased Water Temperatures in the Gulf of Maine on the Distribution of Female American Lobsters and the Impacts of These Distribution Shifts on Larval Recruitment
PI Goldstein, Wells National Estuarine Research Reserve

Objective: to better understand the impacts of warming Gulf of Maine (GoM) waters on the movements of sexually mature female lobsters, and the fate of their larvae that recruit into the fishery in order to provide information to help predict the impacts of a changing climate on the future of the fishery in GoM.

Resilience, Adaptation, and Transformation in Lobster Fishing Communities
PI Mills, Gulf of Maine Research Institute

Objective: to utilize quantitative fishery-dependent data and insights from case studies in the Southern New England lobster fisheries and to evaluate how lessons from this experience may be applicable to lobstermen and communities in the GoM. Complied data will assist in planning for resilience and adaptation in culturally, socially, and economically important fishing communities.

Growth in Large Offshore Lobsters: Addressing a Critical Data Gap in the US Lobster Stock Assessment
PI Pugh, MA Division of Marine Fisheries

Objective: to accurately assess the status and trajectory in adult lobster growth rates to inform stock assessment; data collected will inform models utilized by resource managers.

Reproduction in an Era of Rapid Environmental Change: the Effect of Multiple Stressors on Reproductive Success, Embryogenesis, and Emerging Larvae of the American Lobster
PI Rivest, VA Institute of Marine Sciences

Objective: to understand how multiple stressors (rising temperature and ocean acidification) affect the reproductive success of American lobsters in the Gulf of Maine (GoM); compiled data will improve estimates of effects of multiple stressors on natural systems in the GoM and provide baselines for representative physiological markers for future work.

Bridging the 'Great Disconnect': Linking the Gulf of Maine Pelagic Food Web to Lobster Recruitment Dynamics
PI Wahle, University of Maine

Objective: to examine the disconnect between historic highs in Gulf of Maine (GoM) lobster egg production and lows in young-of-year recruitment, in order to better understand the American lobster's link to the pelagic food web.

2020 - 2022 Projects

Assessing the broad-scale distribution and abundance of lobster larvae and their potential food sources throughout the Gulf of Maine and Georges Bank
PI Henninger, Atlantic Offshore Lobstermen's Association

Objective: to investigate spatial/temporal distribution and abundance of early/late stage lobster larvae and likely zooplankton prey to investigate factors affecting recruitment in Gulf of Maine / Georges Bank. This will inform biophysical models, provide context to better understand / model the SSB-recruit relationship under current climate regime, and investigate role of trophic interactions at the larval stage.

Bait alternative development and future visioning in the New England lobster fishery
PI Jordaan, University of Massachusetts Amherst

Objective: to explore bait alternatives to herring and implications for the lobster fishery, and to develop a bait alternative that conforms to state guidelines developed, or being developed; reduce cost uncertainty; and redirect seafood processing waste streams from local resources into a value-added product.

Early life history of American lobsters in coastal southern New England waters
PI Collie, University of Rhode Island

Objective: to measure abundance and spatial distribution of lobster larvae and post-settlement juveniles in Rhode Island waters to identify where recruitment bottleneck occurs. Resulting data will be used to test whether lobster recruitment is limited more by pre- or post-settlement processes and whether a thermal refuge exists for juvenile lobsters at depths deeper than those that have been historically occupied.

Fishing in hot water: defining sentinel indicators of resilience in the American lobster fishery
PI Stoll, University of Maine Orono

Objective: to develop sentinel indicators of resilience for the lobster industry that can be used to detect early signs of vulnerability among harvesters. Understanding vulnerability is vital to informing future management decisions and coastal community resilience.

I***ncorporating changes in thermal habitat and growth to improve the assessment of American lobster stocks and spatial distribution in the Gulf of Maine, Georges Bank and southern New England***
PI Chen, University of Maine Orono

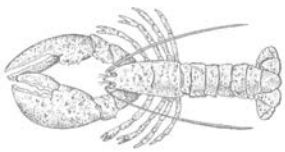
Objective: to develop modeling framework to assess and forecast spatio-temporal dynamics of American lobster in a changing ecosystem. Forecasting model will be built into the AL stock assessment framework that utilizes stock assessment output and projected thermal habitat to predict stock size and catch seasonally, allowing for simulating multiple future climate scenarios and fishing mortalities in Gulf of Maine, Georges Bank and southern New England.

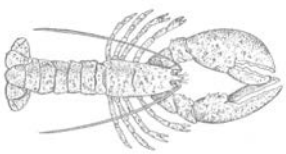
Surface convergences: a critical pelagic microhabitat for American lobster postlarvae?
PI Pineda, Woods Hole Oceanographic Institution

Objectives: to clarify main pelagic habitat of American lobster postlarvae, including open unstructured waters and different types of surfaces; resolve whether postlarvae aggregate differentially in hydrographic or non-hydrographic convergences; evaluate type and variability of convergences that occur in Gulf of Maine; and test whether postlarvae collected from convergences are in better condition than those collected from open, unstructured waters. Study addresses postlarvae microhabitat and microhabitat properties that may enhance survivorship.

Testing and developing effective non-invasive female maturity assessment methods and protocols for the American lobster (Homarus americanus)
PI Waller, Maine Department of Marine Resources

Objective: to evaluate and develop two promising non-invasive maturity assessment methodologies and generate publicly accessible instructional materials that would allow for lobster maturity datasets to be easily updated. MEDMR female lobster maturity research samples previously collected will be used to test effectiveness of these methodologies on females from across the Gulf of Maine, providing insight into most appropriate maturity assessment approach.





Understanding and improving spatial distribution projections for lobster: Considering predation and building expert consensus
PI Mills, Gulf of Maine Research Institute

Objective: to address limitations of lobster distribution models and strengthen ability to accurately quantify, project, explain and apply lobster distribution and abundance models under future climate conditions; advance lobster distribution models from traditional single species, single life stage, "environment-only" models to joint species distribution model, accounting for juvenile and adult life stages, environmental conditions, trophic interactions and unmeasured spatial and spatio-temporal variability. Joint species distribution model will be used to generate future projections of juvenile and adult lobster distribution and abundance, incorporating both changing environmental conditions and spatial distribution and abundance of lobster predators.

Understanding the cause of low dissolved oxygen in Cape Cod Bay and initiating a hypoxia warning system for the lobster fishery
PI Pugh, Massachusetts Department of Fish and Game

Objective: to develop comprehensive understanding of conditions that resulted in the 2019 hypoxic event in southern Cape Cod Bay (CCB) and to improve ability to forecast such conditions. The goal is to be able to predict the onset of hypoxia in CCB, allowing researchers to alert the commercial lobster fleet and other stakeholders of changing conditions.

Photo: UConn

NEW PUBLICATION: *Regulation of Lobster Bait Alternatives in New England* (June 2020)

This guide is a product of the Marine Affairs Institute at Roger Williams University School of Law and the Rhode Island Sea Grant Legal Program. Victoria Rosa, Rhode Island Sea Grant law fellow, provided research and drafting for this study with guidance from Read Porter, senior staff attorney. All errors and omissions are the responsibility of the Marine Affairs Institute. This study is provided only for informational and educational purposes and is not legal advice.

Conclusion *(reprinted with permission of Read Porter):*

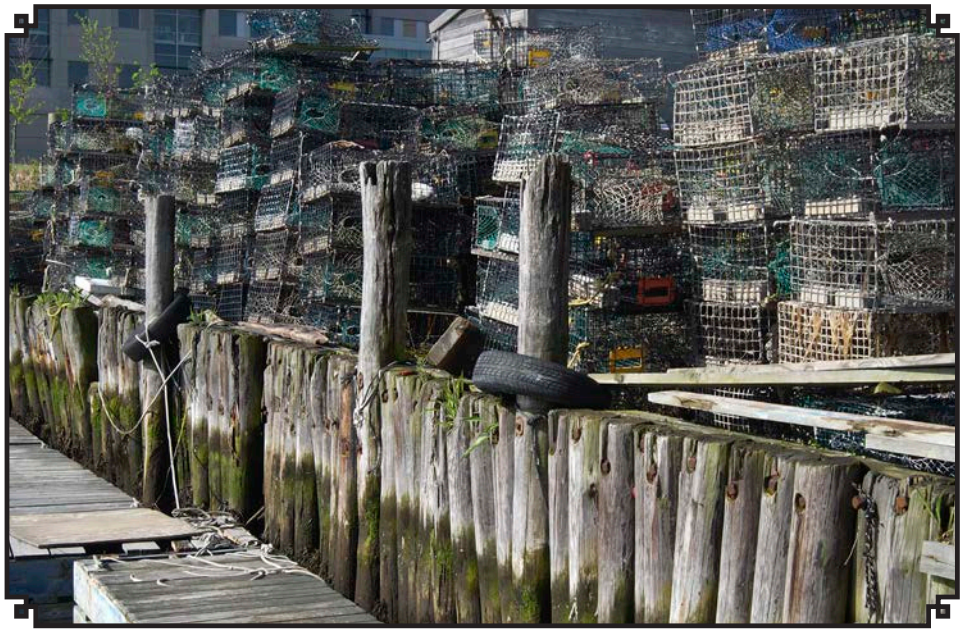
There is a critical need to identify lobster bait sources that can be used as alternatives to Atlantic herring. Alternative baits, such as Asian Carp, farmed salmon scraps and artificial bait may introduce new pathogens or harmful species into the environment or have other unforeseen impacts. Responding to this threat, the Atlantic Lobster Management Board has begun work to develop a recommendation calling for a more consistent regional approach to alternative bait. This study supports efforts to address the biosecurity and other risks of alternative lobster baits by reviewing state laws and regulations governing bait importation, sale, and use; and by identifying potential legal challenges to future state bait management restrictions. It finds that New England states have established varied approaches to lobster bait use. While Maine requires approval for the use of any lobster bait, other states have adopted more limited bait management programs. These may focus more directly on use of bait in freshwater angling rather than commercial marine fisheries; on live rather than dead, packaged, or manufactured bait; and adopt different permitting regimes for bait imports and bait vendor licensing. Attempts to increase regional consistency will need to account for these and other differences from state to state.

State bait management reforms may benefit from a consideration of the three potential legal challenges identified in this study. First, bait restrictions depend on the responsible agency's statutory powers, which may be limited to inland waters or in other ways. New state lobster bait provisions must respect jurisdictional limitations, and in some cases state legislation may be required to authorize alternative bait programs—an approach used in Maine. Second, bait management regulations often affect interstate commerce and may be challenged as violations of the dormant Commerce Clause. Finally, state laws that authorize shipments prohibited by the Lacey Act or other federal laws will be preempted—but this does not affect interstate commerce within the contiguous United States. These three potential challenges may require states to engage in careful drafting and regulatory design when establishing or modifying rules to enable or limit the trade in alternative lobster baits.

The ever-changing fisheries management landscape is requiring states to reconsider whether and how they regulate the import, sale and use of lobster bait. As factors such as climate change and fisheries management decisions continue to impact the population levels of baitfish such as herring, lobstermen and other commercial sectors will look towards other bait sources in order to continue their livelihoods. Careful consideration is needed to understand the biosecurity risks that these alternatives pose and how to mitigate them.

Download PDF of full publication.

Ongoing updates are provided on the news page of the **American Lobster Initiative** website.



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