Community Science in Support of Shellfish Management: A Case Study from the Damariscotta River Estuary, Maine, USA

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Motivations for Community Science

Expand capacity and generate knowledge in a data-poor shellfish fishery:

Ecological knowledge: long-term trends, seasonal trends, and future projections.

Local knowledge: contextual information to frame results and guide questions and methods.

Enhance community and shellfish harvester engagement:

Center local knowledge and needs.

Provide place-based experiences and connections for local students.

Enhance capacity through new research collaborations.

Addressing Local Needs

Municipal shellfish resource managers asked:

1. How many harvestable shellfish are on the flats now, and how many can we anticipate in the future?
2. Relatedly, how diverse are our shellfish resources? And how does this diversity influence harvester behavior–where they harvest, which species, how much?
3. What environmental factors affect shellfish populations, and on what temporal and spatial scales?

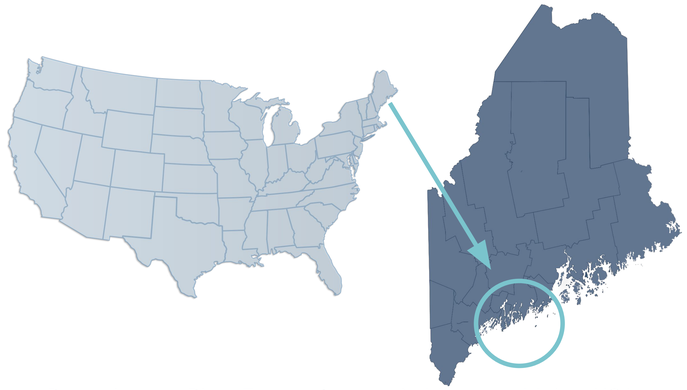
Multiple Methods for Ecosystem-Level Knowledge

WEAVING TOGETHER SOCIAL & ECOLOGICAL KNOWLEDGE:

Our community science program collects social and ecological data on shellfish abundance, distribution, and larval supply, as well as information on shellfish predators and harvester observations of change.

This information offers ecosystem-level understandings and grounds the research in local questions and needs.

Case Study: Damariscotta River Estuary, ME, USA



Damariscotta River Estuary located in Midcoast Maine, USA

How Can We Do Community Science?

Often, programs lead by towns and shellfish committees engage community volunteers and shellfish harvesters for conservation activities. *Photo credit: Gouldsboro Shore.*

Other programs, like the program at the UMaine Darling Marine Center, recruit high school and undergraduate students to learn about shellfish fisheries through volunteer field day programs.

What Have We Learned?

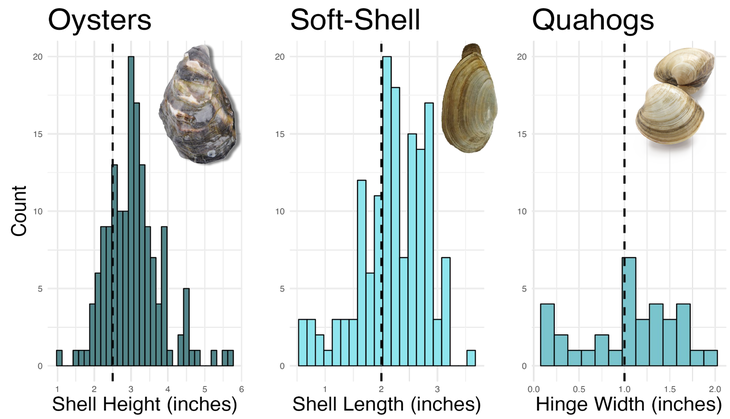


Figure 1: Size distributions for oysters, soft-shell clams, and quahogs in the Damariscotta (2021-2022 surveys). Dashed lines show legal harvesting size limits.

- Shellfish Ecological Survey data can offer insights into the current standing stock of shellfish populations (Figure 1).
- Survey data can help identify trends, e.g., both oyster and soft-shell clam abundance declined from 2021 to 2022, [based on initial general linear models ($p<0.05$, with R^2 values of >0.42 in each case)].
- Green Crab Survey data (Figure 2) can identify seasons and locations of high and low predation to inform timing of conservation activities.
- Additional benefits: centering local knowledge and needs, building capacity and knowledge, and fostering trust and learning communities.

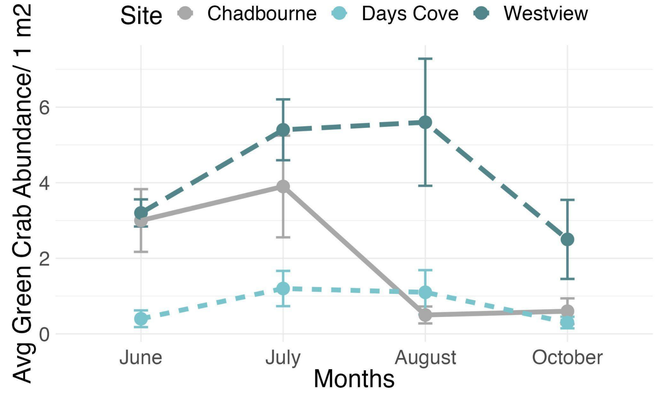


Figure 2: Average abundance of green crabs found in a 1 m² sampling area at three long term monitoring sites across the 2022 summer and fall seasons. Error bars represent standard error of the sample means.

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