

Integrating Local and Environmental Science Knowledge to Understand Complex Relationships in Two Maine Estuaries



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Main Takeaways

Diverse Uses

The estuaries, and access to them, are important to a diverse range of user groups, activities, and species.

Changing Shellfish

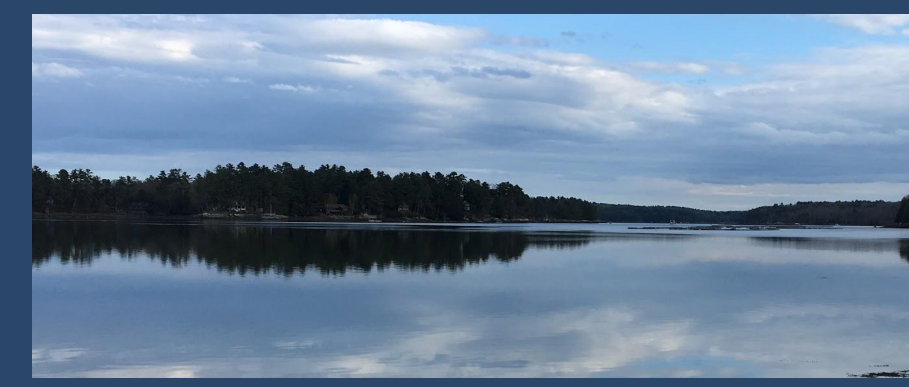
Shellfish populations and shellfish habitats in the estuaries vary spatially, and are changing through time.

Overlapping Uses

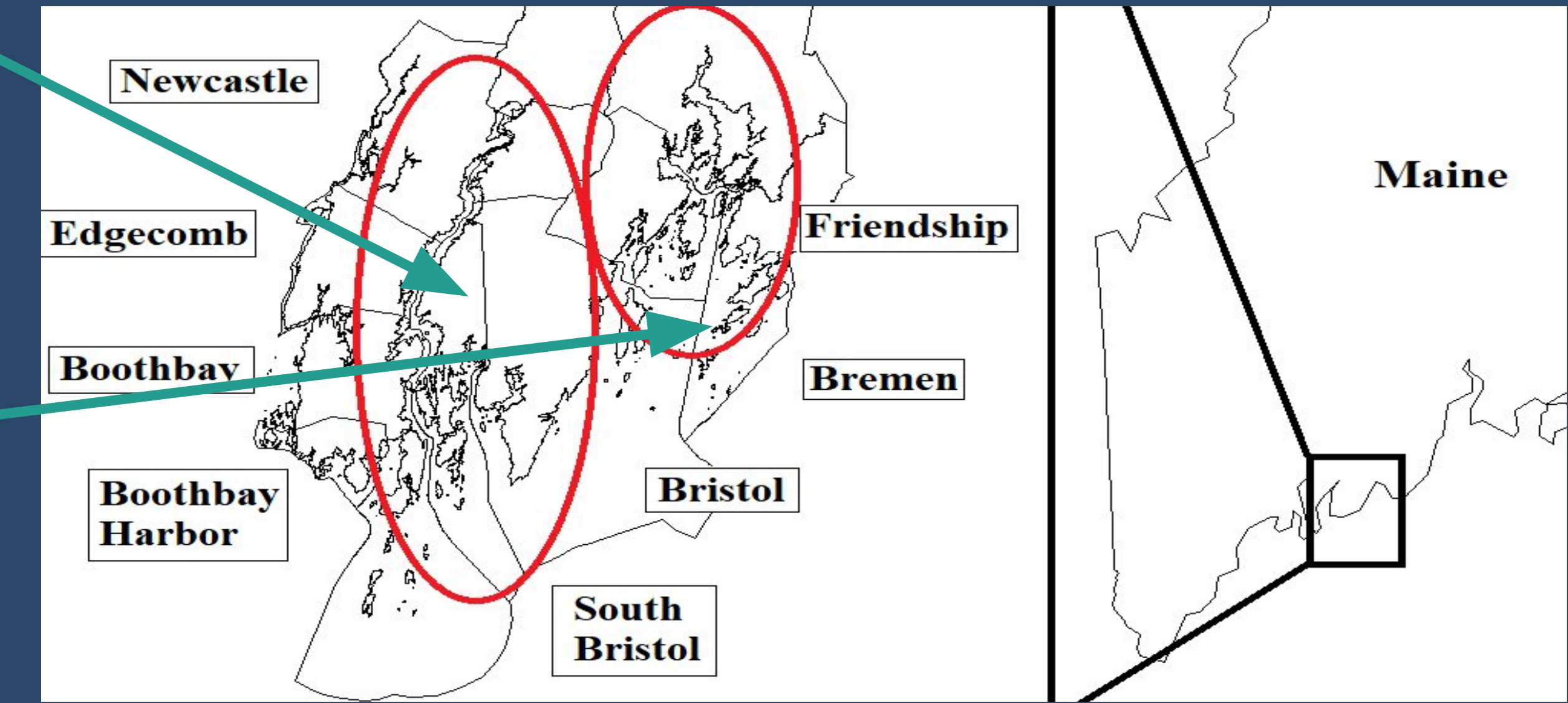
Human use, species, and essential habitat overlap considerably and impact one another in complex ways.

Study Systems

Damariscotta River



Medomak River



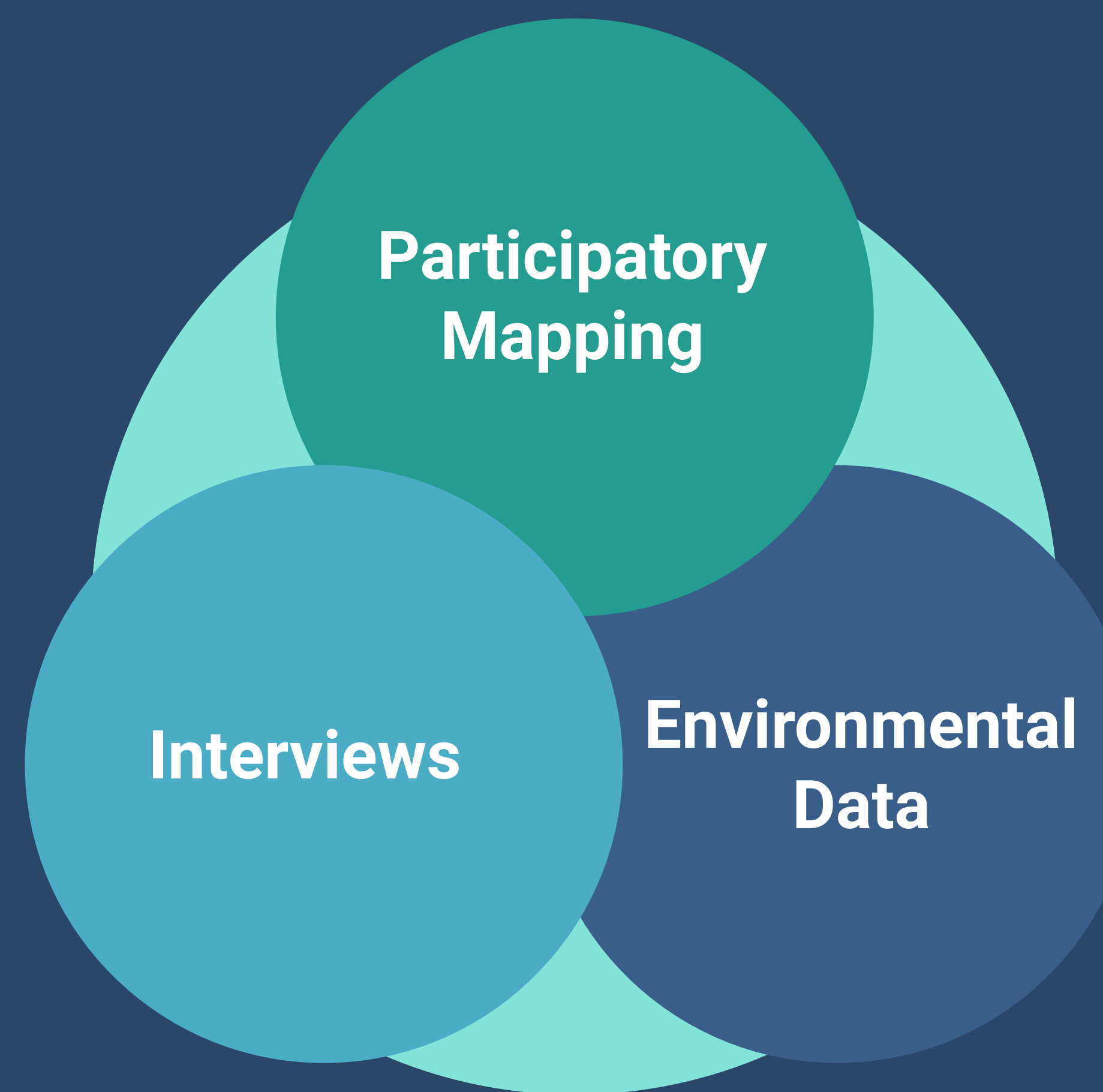
How Do We Document Local Knowledge?

Making Maps

Image	Description	Image	Description
	Softshell Clam Numbers (Low)		Quahog/Hard Clams
	Softshell Clam Numbers (Medium)		Wild Oysters
	Softshell Clam Numbers (High)		Marine Worm Digging
	Razor Clams		Area of Significant Change

FIGURE 1.—Participants placed stickers (shellfish stickers above) on maps to show species location, abundance or areas of change.

Integrating Multiple Forms of Knowledge



What Can We Learn?

FIGURE 2.— Local knowledge maps can be combined with existing map layers, in this case Maine DMR aquaculture lease sites, to help analyze interactions and see diverse uses and overlaps in use.

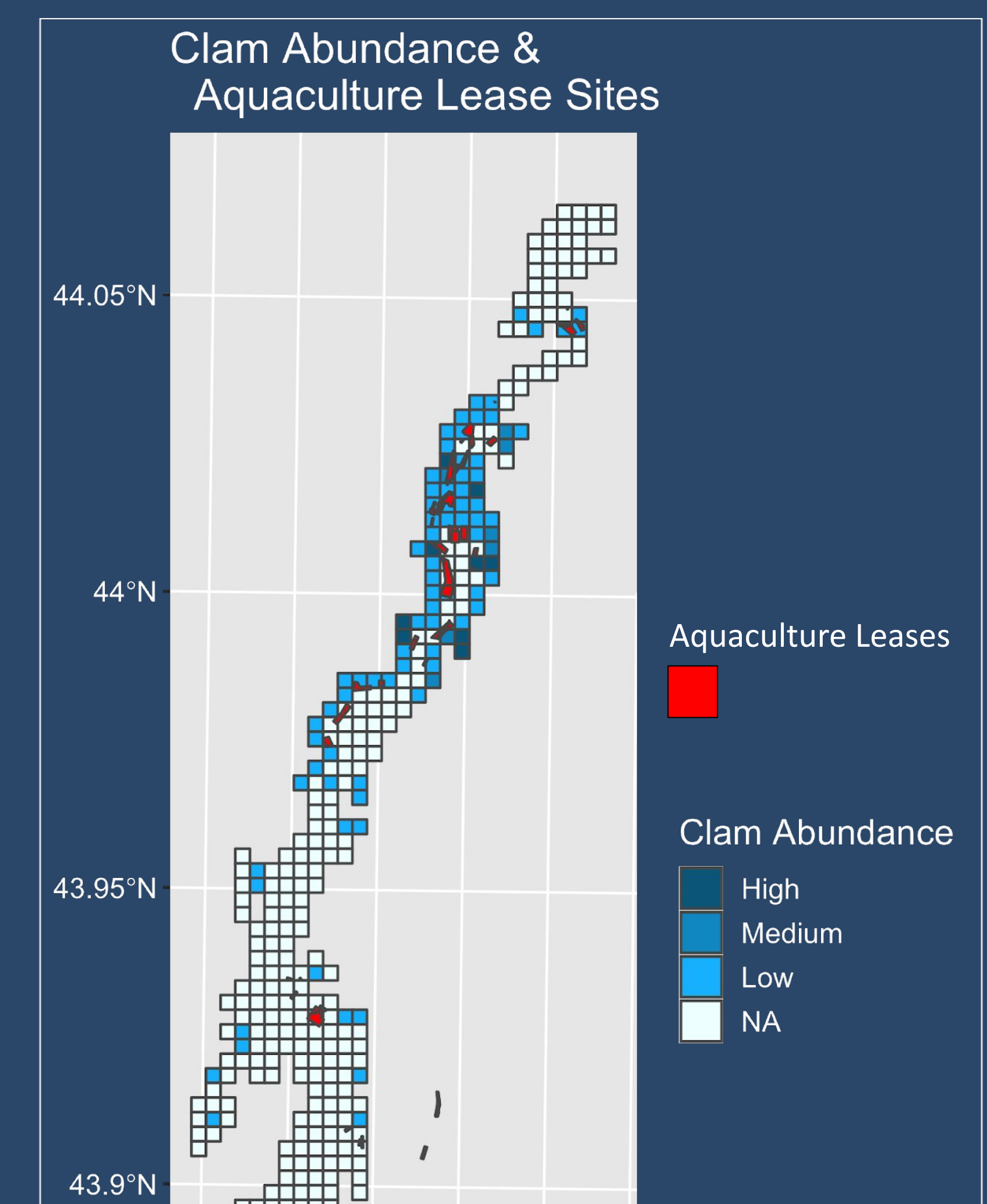
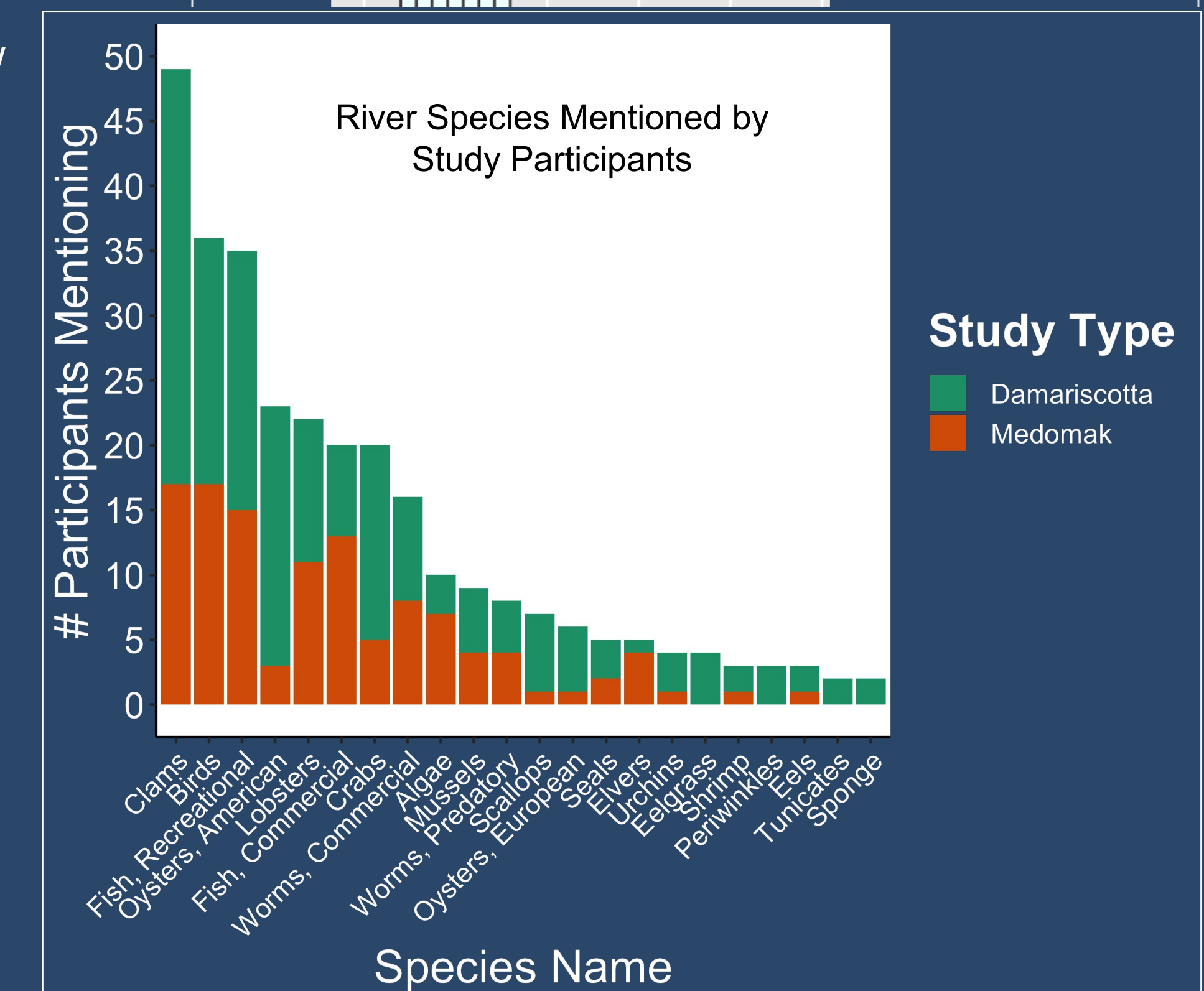


FIGURE 3.— Interview data provides important context. For example, interview participants mentioned many species beyond shellfish, highlighting the biodiversity in the estuary ecosystems. Note: The graph shows counts of people who mentioned species.



Interviews with Experts

Used together as integrated methods, maps and interviews enrich each other and produce more comprehensive results.

	Damariscotta	Medomak
# participants	28	21
Total # participants	49	
Average age	58	55
Average years of river experience	33	27

TABLE 1. Breakdown of study participants by river.

Information about river use came from

- Recreational users
- Commercial lobster fishermen
- Aquaculture farmers
- Harbor masters
- Local business owners and employees

Information about shellfish came from

- Commercial and recreational shellfish harvesters
- Shellfish committee members

- Local knowledge is place-based knowledge from resource users and stakeholders.
- Maps and interviews can be used as tools to document local knowledge from harvesters and other river user groups.
- Local knowledge is essential to fill data gaps and can be integrated with existing environmental knowledge (for example Pellowe & Leslie, 2019; Britsch, 2021) to inform resource management and help us understand how systems are changing (Lima et al., 2017; Loerzel et al., 2017).

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References

Britsch, M. (2021). Marine Aquaculture in Maine: Understanding Diverse Perspective and Interactions at Multiple Scale. UMaine MS Thesis.
 Lima, M. S. P., Oliveira, J. E. L., de NÓBREGA, M. F., & Lopes, P. F. M. (2017). Journal of Ethnobiology and Ethnomedicine, 13(1), 30.
 Loerzel, J. L., Goedeke, T. L., Dillard, M. K., & Brown, G. (2017). Marine Policy, 76, 79–89.
 Pellowe, K., & Leslie, H. (2019). Final Report: Current and historical trends in the shellfish resources of the upper Damariscotta River estuary.