Blue Biotechnology Ecosystem Assessment Executive Summary from July 1 2025 Kick Off

12 August 2025

Bigelow | Laboratory for Ocean Sciences

Background

Maine is strategically advancing both its life sciences and blue economy sectors. At their intersection lies marine "blue" biotechnology: the use of marine organisms and resources to create innovative products and processes. Maine's unique natural assets, robust research institutions, and entrepreneurial ecosystem have positioned it at the forefront of blue biotechnology, with strengths in, for example, aquaculture feed, human and animal health, and biomanufacturing. Despite being identified as a growth sector in the recent Blue Economy Task Force report, Maine lacks a comprehensive roadmap to guide blue biotechnology development.

To address this gap, Bigelow Laboratory, in partnership with Hatch Blue and Ocean House Consulting, launched a 90-day Blue Biotechnology Ecosystem Assessment on July 1, 2025. This initiative aims to deliver:

- An innovation landscape analysis to identify and nurture emerging and disruptive ideas.
- An ecosystem map to pinpoint unique strengths and gaps for targeted development.
- A compelling value proposition to attract capital, entrepreneurs, partnerships, and talent to Maine's blue biotechnology sector.

The July 1 kickoff event convened leading experts from Maine's life sciences and blue economy sectors (Appendix A) to gather insights on opportunities and challenges in building a vibrant blue biotechnology innovation economy, especially for rural communities (Appendix B). Following this kickoff event, there will be further outreach during the 90-day period with other stakeholders, to gather their insights on opportunities and challenges for growing blue biotechnology in Maine. A report synthesizing this feedback with ecosystem landscape data is expected in September 2025. Anyone interested in providing additional input or asking questions is welcome to contact lead organizer Beth Orcutt, Vice President for Research at Bigelow Laboratory for Ocean Sciences, at vpr@bigelow.org.

Workshop Objectives

1. Defining Blue Biotechnology Potential for Maine
    - Develop a shared, Maine-specific understanding of blue biotechnology that reflects the state's resources, innovation landscape, and market opportunities.
    - Establish a foundational framework for future research, funding, and policy, ensuring strategic alignment among stakeholders.
2. Strategic SWOT Analysis for Regional Competitiveness
    - Capture collective insights on Maine and New England's strengths, weaknesses, opportunities, and threats in the global blue biotechnology landscape.
    - Identify competitive advantages, vulnerabilities, and collaborative opportunities for ecosystem growth.

Stakeholder Insights

The recent workshop brought together a diverse group of stakeholders from across Maine's blue economy and life science sectors, with a specific and deliberate emphasis on Blue Biotechnology. The breadth of participation underscored the growing recognition of Blue Biotechnology's potential to drive economic growth, create sustainable market solutions, and position Maine as a leader in a knowledge-based industry sector.

1. Defining Blue Biotechnology in Maine

Stakeholders highlighted that Maine's blue biotechnology opportunity is rooted in leveraging its vast natural resources, especially within algae and seafood, combined with working waterfront and enabling technologies such as biotechnology, big data and advanced life sciences. The state's innovation ecosystem, research institutions, and entrepreneurial talent are seen as key drivers for scalable, exportable business models, particularly benefiting rural communities with natural resources.

2. Maine's Competitive Assets

Key strengths identified include:

- Abundance of marine and bio-resources: 3,000 km of coastline, rich marine biodiversity, wild and cultivated marine biomass (algae, seaweed, fisheries and aquaculture) and abundant access to other bioresources from ag and forestry.
- Research & Innovation: Strong academic and research institutions (Bigelow Laboratory, UMaine, UNE, JAX, MDIBL, Downeast Institute, Colby, and others), with expertise in marine and life sciences, AI, biotechnology, genomics, and nanomaterials.
- Heritage: Strong cultural heritage in harvesting, production and cultivation from fishing, aquaculture, and seafood processing. Active life sciences and animal health sectors in the State.
- Workforce: Established, capable maritime and marine workforce with strong heritage connection to the ocean; generational knowledge around farming, harvesting and processing. . Multi-generational expertise in marine resources, colleges and universities supporting workforce development programs and initiatives.
- Brand & Location: Maine's reputation for food quality and "clean tech," proximity to major East Coast markets, Boston strong biotechnology hub, EU markets and access to global North Atlantic partners.
- Collaborative Ecosystem: Strong networks of partner organizations, and ecosystem support organisations and access to different funding sources (diluted and non-diluted)
- Track-record of Entrepreneurs: An established support system to support and scale entrepreneurs and access to mentor talent.

3. Emerging and Well-Suited Market Sectors

Stakeholders identified several sectors primed for growth:

- Upcycling of waste products from fishing & aquaculture
- Functional Foods & Nutraceuticals: Leveraging clean marine resources for high-value health ingredients (omega-3s, antioxidants).
- Alternative Seafoods & Feed: Developing algae- and seaweed-based proteins and fish-free feed.
- Marine Enzymes & Bioactives: Extracting compounds for pharmaceuticals, diagnostics, and skincare.
- Waste Valorization: Transforming seafood and aquaculture byproducts into fertilizers, bioplastics, and animal feed.
- Biorefining & Separation: Unlocking value from marine biomass through advanced processing, for example to create polymers for biomanufacturing.
- Sustainable Substitutes: Creating natural replacements for plastics and PFAS using marine-derived materials.
- Marine Energy Hydrocarbon: through open / deep-water cultivation of seaweed biomass to unlock new opportunities for the energy sector.
- Aquaculture & Agriculture Support: Technologies to boost yields, improve animal health (diagnostics, vaccines, genetics), to enhance growth and sustainability of blue food systems.

Next steps:

Our ongoing ecosystem mapping initiative, focused on Maine and New England's burgeoning blue biotechnology sector, is a critical component of our strategy development. We are actively seeking to engage with a broader spectrum of stakeholders to gather diverse perspectives and ensure our future strategy is comprehensive and impactful. This outreach will involve:

- Targeted interviews: Conducting in-depth interviews with key players across the blue biotechnology value chain, including researchers, industry leaders, investors, policymakers, and entrepreneurial ventures.
- Online feedback forms: Deploying an online feedback form to continue to collect broader qualitative input from a wider audience within the blue biotechnology ecosystem.
- Close collaboration with Blue Economy Task Force: Maintain close collaboration with Blue Economy Task Force partners and sectors to leverage a unified voice. This collaboration will forward recommendations on critical needs to further scale Maine's Blue Biotechnology sector.

APPENDIX A: Participants in July 1 2025 Kickoff event

Dan Berger, Maine International Trade Center
Denise Bruesewitz, Colby College
Mike Conathan, Upwell Collaborative
Sarah Delmar, Focus Maine
Michael Duguay, Maine Department of Economic and Community Development
Elena Forchielli, Nomadic Ventures
Blaine Grimes, Ocean House Consulting
Herman Haller, Mount Desert Island Biological Laboratory
Tanja Hoel, Hatch Blue
Matthew Hoffner, Maine Technology Institute
Aileen Huang-Saad, Roux Institute at Northeastern University
Renee Kelley, University of Maine
Bill Lenart, Roux Institute at Northeastern University
Mitch Lench, Oceans Balance
Dave Levine, IDEXX
Michael Lomas, Bigelow Laboratory for Ocean Sciences
Craig Muir, Third Rock Ventures
Dana O'Brien, BioHarbor Strategies
Beth Orcutt, Bigelow Laboratory for Ocean Sciences
Marsha Rolle, Roux Institute at Northeastern University
Jim Strickland, Roux Institute at Northeastern University
Dylan Terry, Hatch Blue
Katie Weiler, Viable Gear
Emily Whitmore, Maine Aquaculture Innovation Center
Valerie Young, Bigelow Laboratory for Ocean Sciences

APPENDIX B: Strategic SWOT Analysis (Preliminary Themes from Kickoff conversations)

Strengths: Mainers work well together, Abundant marine resources (3000 km coastline), World-class academic and research institutions, Multi-generational expertise in fishing, aquaculture, and marine industries (cultivation and processing), Strong life sciences and food sector, Maine's clean tech and quality brand of products, Proximity to major East Coast markets, EU and global North Atlantic partners, Collaborative ecosystem with strong partner networks, Diversity of blue economy activities (shipbuilding, ocean energy, aquaculture, sensors, SAAS, etc.), World's largest publicly available source of cellulosic nanomaterials, Maine to Alaska pipeline - northern north america coalition & international partnerships across North Atlantic Rim, Impact investors with social and financial interests, Mainers have easy access to state & federal legislators and strong political power in Washington, Federal govt talking about ocean economy, Experienced mentor network from food & beverage and natural products sectors, High quality of life that helps attract and retain talent.

Weaknesses: Rural areas need better schools and immigrations policy to be welcoming / attractive; Gaps in commercialization pathways; limited access to Contract Manufacturing Organizations (CMOs) for biotech or marine ingredient production, No roadmap and coordination for blue biotechnology, Workforce development needs to support industrial scale of biotechnology manufacturing, Need for better coordination among stakeholders, Talent retention is a challenge, Students and researchers often leave after training, High cost of production and other costs of key inputs (e.g. feedstocks, energy, labor) compared to other regions for early-stage companies, Scale constraints on production capacity / Lack of biorefining capacity, Lack of scale up capital (post $10M) esp in capital intensive industries, Lack of entrepreneurial talent, New companies start here in Maine but then leave to scale in other places more “friendly” (could be solved with policy, infrastructure, workforce, housing), Permitting for new aquaculture sites or water access is time-consuming and costly,

Opportunities: Quick win: national leading position in seaweed production, Exportable rural business models; such as shared infrastructure or community-led innovation, Well positioned to build strategic market alliances (regional, EU and global). Emerging markets such as bioplastics, nutraceuticals, and climate technologies, Fish processing byproduct utilization, valorizing what’s currently wasted (e.g. shells, trimmings) could unlock new value chains and circular business models, Technologies to increase aquaculture yields and sustainability, Natural and organic replacements for plastics and PFAS, Growth in functional foods, nutraceuticals, alternative seafoods, marine enzymes, and bioactives, Support for agriculture and dairy industries with feed supplements and biostimulants, Strong ESG and climate mitigation market pull, Quick win: PR

campaign on blue economy to show progress and reach all areas of Maine, implement BETF recommendations and establish center for blue economy, Potential to power biomanufacturing with clean energy sources, Career center to connect talent with jobs, internships, and training pathways in blue biotech and aquaculture, Improved PR and marketing services could help reframe aquaculture and marine biotech as solutions to global food, climate, and health challenges, Participation in international consortia to expand market access, R&D reach, and global visibility.

Threats: Cultural resistance to how oceans get used and permitted, Global competition from established blue biotechnology clusters, Regulatory hurdles and market access challenges (but not specific for Maine, Resource sustainability pressures on marine resources, Climate change impacts on marine resources, Uncertainty around Maine's competitiveness to attract businesses and investors vs other states, Misinformation and public skepticism around biotech and aquaculture, often amplified by environmental advocacy groups, Lack of strategic narrative to position Blue Biotechnology within the Blue Economy and how it can benefit the heritage industry sectors like fishing and small scale producers, Regulations driven by landowner/viewpoint concerns can complicate site selection and permitting, Affordable housing and labor shortages in coastal communities hinder workforce growth, Power grid instability and electricity outages can threaten production, especially for energy-intensive biotech operations, Competing global regions (e.g. Scandinavia, Asia) have more infrastructure, investment, and commercial readiness