

Massachusetts Aquaculture Situation and Outlook Report 2023

Massachusetts coastal and inland waters have a long history of providing seafood and livelihoods for its inhabitants. As population grew and fishing techniques modernized, overfishing of the local resources became a concern and shifts in thinking on sustainability of seafood production could be seen. For example, in the early 20th century the work of Dr. David Belding and others recommended approaches involving more active management and cultivation of shellfish stocks to maintain harvest (Belding 2004).

Aquaculture has since become an important part of the Massachusetts (MA) seafood and agricultural economy. Aquaculture is the fastest

growing agricultural category in the Commonwealth of MA (Inglis 2021) and ranks in the top seven agricultural commodity areas in the state. Larger more established crops including fruits, vegetables, cranberries, milk, and poultry/eggs still rank higher. Aquaculture in MA has a land-based component focused largely on finfish production, and marine aquaculture which focuses largely on production of shellfish with growing interest in seaweed aquaculture. As a further example of the growing importance of aquaculture, cultured oysters now rank as the third most valuable seafood commodity harvested in the state, trailing only the large and lucrative sea scallop and lobster fisheries (MA DMF 2021).

Massachusetts 2017 Agricultural Economy in \$1,000s

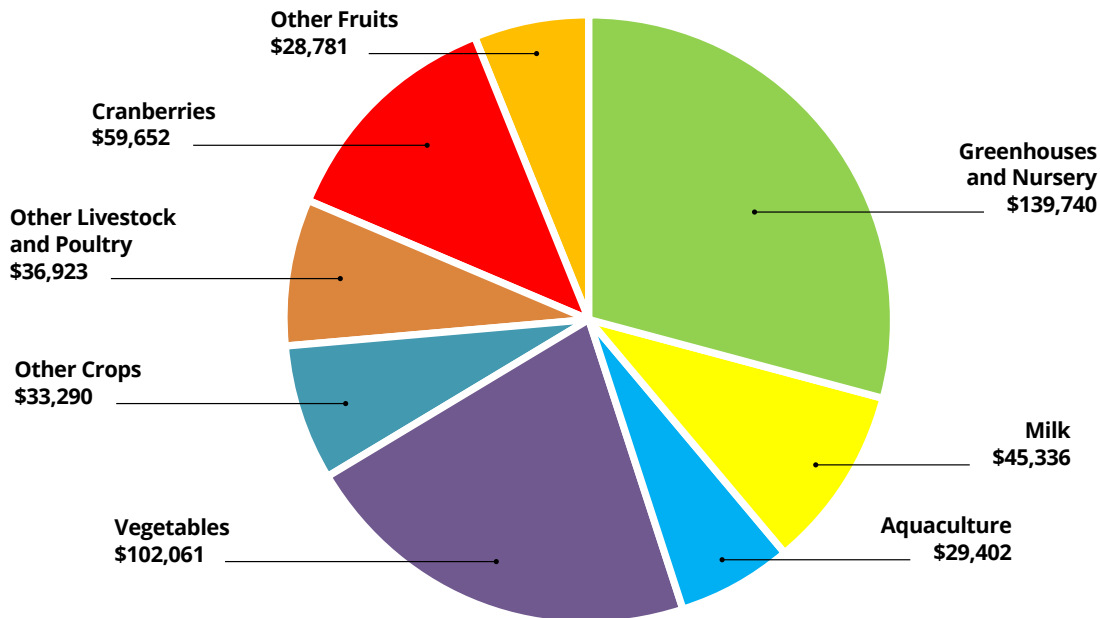


Figure 1: MA agriculture value by sector, source MDAR

Shellfish and Seaweed – Marine Aquaculture

Shellfish aquaculture is the largest segment of MA aquaculture in terms of numbers of farms and production. Oysters, *Crassostrea virginica*, are the most valuable cultured species in the state reaching roughly \$30 million in farm gate value in 2021 (MA DMF Annual Report 2021), and generally compose 95% of the state’s shellfish aquaculture production. Quahogs or hard clams, *Mercenaria mercenaria*, are a distant second in production numbers but are still a traditional MA aquaculture crop that is seeing more interest in the last several years with rebounds in market value. Other species such as bay scallops, *Argopecten irradians*, softshell clams, *Mya arenaria*, blue mussels, *Mytilus edulis*, as well as surf clams, *Spisula solidissima*, have much more limited aquaculture production numbers.

Massachusetts takes a “home rule” type approach to shellfish aquaculture leasing of marine waters where local municipalities license sites in cooperation with the state Division of Marine Fisheries. In 2021 there were 398 permitted shellfish growers in 34 different municipalities combining to a total of 1,352 acres (DMF annual report). These farms are concentrated in shallow or intertidal nearshore waters of Southeastern MA and are generally two-to-three acre or smaller parcels sometimes developed by the town in blocks divided among individuals. New sites are being added



Figure 2: Cultured oysters, photo CCCE

annually but growth in new sites has slowed, with a number of municipalities having moratoriums on new sites and wait lists for existing sites.

The farm gate value for cultured shellfish has been steadily rising in the Commonwealth over the last several decades. Despite ups and downs, including a significant drop due to market fallout as the COVID-19 pandemic ensued in 2020, growth in value has averaged about 11% per year since 2009. Most of this growth is due to oyster production, and more efficient production by existing farms. Growth in acreage has been slower than that seen with production, with 1,091 acres and 335 license holders in 2011 (MA DMF Annual Report 2011) and 1352 acres and 398 license holders operating in 2021 (MA DMF Annual Report 2021).

Total MA Shellfish Aquaculture Production - \$Value (primarily oysters & quahogs)

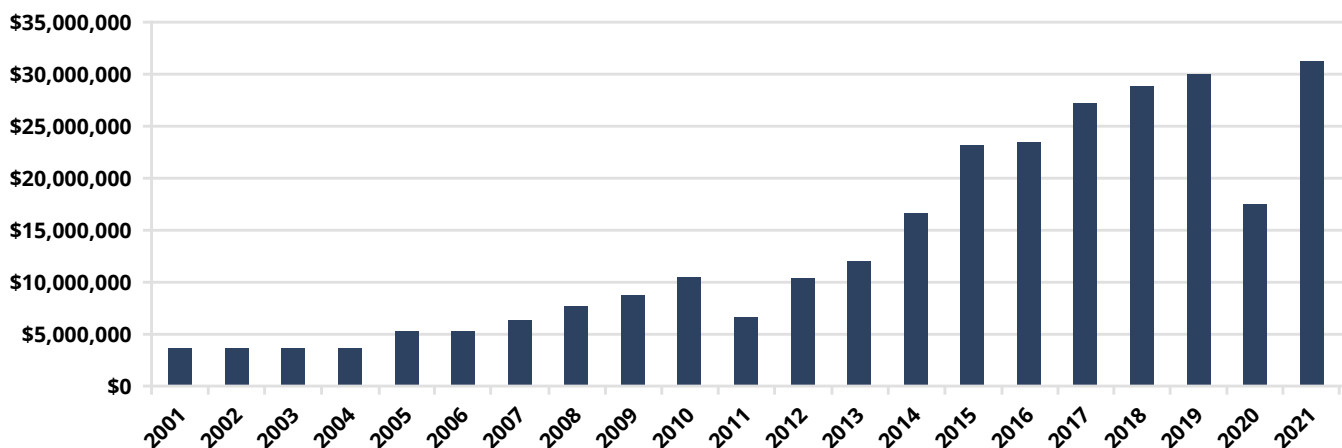


Figure 3: MA shellfish aquaculture production value, data sourced from MA DMF



Figure 4: An intertidal oyster farm, photo CCCE

Aquaculture in MA waters occurs on sites that have been deemed unproductive so wild spat collection is generally limited except for oysters, softshell clams, and blue mussels in certain areas. Most shellfish growers rely on hatchery produced seed to supply their operations. Massachusetts has two commercial hatcheries but many growers also purchase seed from two hatcheries in Maine. Seed production can be a limiting factor for the industry.

A growing area of shellfish aquaculture is propagation of shellfish for enhancement or restoration purposes. In this practice shellfish are released as juveniles or adults at approved sites as part of restoration and enhancement efforts and increasingly in partnership with commercial shellfish producers. Almost all coastal towns in MA have a propagation program of varying techniques and scales, and nonprofits such as The Nature Conservancy have been involved in significant shellfish restoration efforts. Several coastal municipalities have also embarked on pilot studies to examine how propagation of shellfish might help them meet nitrogen-based water quality goals in coastal waters.

The other area of marine aquaculture with growing interest in MA is the production of seaweed either as part of existing shellfish operations or as standalone operations. Current efforts have focused on sugar kelp, *Saccharina latissima*, with four sites active in 2021. Production has been limited, estimated at around 10,000 lbs in 2021 with growers experiencing challenges in sourcing seed string, variable growth, and lack of established markets. Space to site farms has also been limited due to the growing technique utilizing lines in the water and the potential interactions of those lines

with critically endangered right whales in the waters to the east and north of Cape Cod. Kelp is a winter crop, with a season directly overlapping with the presence of right whales, and there is a similar moratorium on pot fisheries during the late winter and spring for the same reasons.

Finfish – Land-based Aquaculture

The aquaculture of finfish in MA is entirely land-based with no current commercial pens in marine waters. There were 12 farms in MA producing finfish in 2018 at the date of the last census, most being traditional flow-through or pond-based production systems for production of trout for stocking and/or consumption. The 2018 census of aquaculture also showed nine farms producing trout, with close to three million fish produced (USDA 2019). However, the largest finfish farm in the state is a recirculating aquaculture system focused on barramundi for human consumption which produces tens of thousands of pounds weekly. A recent spinoff of finfish production has been a line of fertilizer products made from fish waste.

Massachusetts had up to three different facilities producing shrimp, *Litopenaeus vannamei*, at times over the last decade but those have all closed. These farms were smaller indoor commercial operations relying on recirculating or biofloc-type production systems. The shrimp produced were highly marketable, but production was energy intensive and challenging. Shrimp is thought to have much potential but work is needed on production methods, especially in the New England climate.



Figure 5: Barramundi of Great Falls Aquaculture, photo Jessica Wright-Moore

Emerging Issues and Critical Needs

The shellfish aquaculture sector seems to be slowly gaining new entrants but because some communities have or are considering moratoriums on new shellfish leases, the sector may be looking at a general slowdown in growth of leased area. The freshwater land-based sector has retracted in recent decades. While the two sectors are quite different, they have some emerging issues in common.

Massachusetts is one of the most densely populated states in the nation. That fact coupled with the rapidly rising costs of living pose challenges for aquaculture operations. Lack of housing and the cost of housing make it difficult to find, retain, and afford employees. Also, in some coastal communities with high and escalating property values, conflicts can arise over public access to marine waters and tidelands, and over different ideas about how public waters should be used.

Changes to the environment can also pose issues. Massachusetts air temperature has warmed by 3.5 F since the early 1900's (Kunkel et al. 2022) and shown signs of seasonal changes in temperature (Young and Young, 2021), and increased amounts of rainfall (Kunkel et al. 2022). Local waters have warmed rapidly as well, and generally more rapidly than global averages (Rheuban et al. 2016, Pershing et al. 2015). Farming is already a somewhat unpredictable business and relies on environmental conditions. Increased environmental unpredictability will only increase potential challenges.

Key Challenges

- Attracting and retaining farm labor continues to be a challenge especially as cost of living escalates and employees find it difficult to live near to where they work.
- Seed supply: close to 400 shellfish farms in MA rely on two in-state and three out-of-state hatcheries which provide most of the cultured shellfish produced in the state. Problems with any seed supplier can have a ripple effects through the industry.
- A changing climate directly affects food production, and farmers have observed increased frequency and intensity of storms which can disrupt work schedules, damage gear, and cause water quality issues from land runoff.

- Also related to a changing climate, warming waters create challenges such as increased risk of consumption-related illnesses (either due to *Vibrio* sp. or harmful algal blooms), fouling, pathogens and parasites.
- Improving social acceptance of aquaculture within communities and within the seafood market will be critical to allow continued operations and growth.
- Pathogens that can cause disease and/or death in a cultured crop remain a large concern, and breeding animals to be more tolerant or resistant to these diseases and other environmental challenges remains a top priority.
- Most of the MA shellfish aquaculture is focused on growing oysters solely for the raw half-shell market and diversification in alternative species and markets has been slow to mature.
- Changes in water quality classification and standards threaten some important shellfish aquaculture areas.
- Inflation of production costs in labor, utilities, and equipment have rapidly outpaced any slow growth in market value for aquaculture products.

Key Opportunities

- The area of genetic research has advanced rapidly over the last few decades and with it, new tools to help select brood animals for particular desired traits in aquaculture. Further melding of this research technology with industry usage will help improve production.
- Periods of market weakness such as the early phases of the COVID-19 pandemic allowed for alternative market exploration that could help further market diversification for resilience.
- The [MA Climate Change Assessment](#) represents an opportunity for more comprehensive understanding of the hazards the industry faces and how they may be addressed.
- Private industry and environmental interests are bringing new attention to shellfish production that offer collaborative opportunities that can enhance water quality and habitat restoration.
- The Massachusetts Aquaculture Association has provided a statewide forum for shellfish

aquaculture information exchange and advocacy for the industry.

- The [Massachusetts Shellfish Initiative](#) released a strategic plan that includes many objectives that would benefit shellfish aquaculture in the state.
- Research funding from various agencies for aquaculture research continues to increase and should help guide further innovation for increased productivity, growth, and seafood safety.

Important Tools and Other Resources

- The [Massachusetts Aquaculture Permitting](#) site provides a step-by-step guide and overview of the shellfish aquaculture permitting process.
- The [Massachusetts Shellfish Aquaculture Siting Tool](#) provides a mapping tool to help with the permitting process as well as links to documents on the regulatory framework of aquaculture in the state including by municipality.
- The [Massachusetts Aquaculture Association](#) is the state's primary trade organization for those involved in aquaculture.

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