Aquaculture
Northeast United States
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Prepared for*:*
Northeast Regional Ocean Council (NROC)
www.northeastoceandata.org

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1. INTRODUCTION

Aquaculture in the northeast region is a diverse, vibrant industry with a large potential for growth. Massachusetts is ranked as the seventh largest producer of farmed shellfish in the nation. Oysters and other shellfish are predominant products of the industry, however finfish hatcheries comprise a significant segment of the sector as well, especially in Maine and New Hampshire. This layer depicts current working marine aquaculture facilities in the northeast region, drawing on the best available information from Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut and Eastern Suffolk County, New York aquaculture coordinators and programs. The Northeast Ocean Data Portal working group is continuing to work with aquaculture coordinators in each state to fill current data gaps and improve the accuracy of existing datasets. As such, this dataset should be considered a work in progress. The data user is encouraged to read this and the metadata of each individual states' data carefully, as geometry, attribute details, and timeliness are not necessarily consistent among datasets used to develop this layer. Details of each state's data source are described in the data processing section.

2. PURPOSE

The purpose of this dataset is to assist in ocean planning activities in the Northeast by filling a spatial data gap through the depiction of region-wide aquaculture activities.

3. SOURCES AND AUTHORITIES

- Maine Department of Marine Resources Aquaculture Lease Records
- New Hampshire Department of Environmental Services Coastal Resources Program
- New Hampshire Department of Environmental Services Shellfish Program
- New Hampshire Fish and Game Department
- Massachusetts Division of Marine Fisheries
- Connecticut Department of Agriculture Bureau of Aquaculture and Laboratory Services
- Connecticut Department of Energy and Environmental Protection
- Connecticut SeaGrant
- Suffolk County (NY) Department of Economic Development and Planning
- Rhode Island Coastal Resources Management Council
- Rhode Island Department of Environmental Management Division of Fish and Wildlife, Marine Fisheries Section
- Northeastern Massachusetts Aquaculture Center (NEMAC) at Cat Cove Marine Laboratory, Salem State University

4. DATABASE DESIGN AND CONTENT

Native storage format: ArcGIS File Geodatabase – simple feature class

Feature Types:

Shellfish: Aquaculture polygons which include oysters, clams (hard and soft), scallops and mussels

Finfish: Finfish aquaculture polygons which include Atlantic salmon, steelhead trout, summer flounder, black sea bass, cobia, gilthead sea bream, European sea bass, white sea bass, and California yellowtail

Seaweed: Aquaculture polygons in which seaweed is cultivated

Multi-trophic or other: Includes polygon aquaculture facilities that specialize in multiple species and/or multiple trophic levels, or facilities that cultivate sea urchins. This also includes sites whose primary species are unknown

CT Shellfish Beds - Recreational: Natural shellfish beds which can be harvested recreationally

CT Shellfish Beds – State Managed: Natural shellfish beds which are leased, owned or managed by the state

CT Shellfish Beds – Town Managed: Natural shellfish beds which are leased, owned or managed through the local shellfish commission

Data Dictionary:

Line	Name	Definition	Type	Size
1	OBJECTID	Uniquely identifies a feature	OBJECTID	*
2	Shape	Geometric representation of the feature	geometry	*
3	siteID	Unique alphanumeric code assigned to each site by the each state	text	32
4	siteName	Name of aquaculture site, or leaseholder, if no site name exists	text	64
5	allSpecies	Species cultivated at each site as listed from original data source	text	128
6	genSpecies	A generalized description of the species at each site	text	64
7	location	Water body or other general geographic landmark describing the location of the site	text	64
8	state	State in which the site is located	text	16
9	dataAccuracy	Description of the certainty of the site's precise location, attribute information, and timeliness	text	100
10	status	Description of whether the site is currently active, if known	text	16
11	duration	Description of the timeframe under which the lease is operational, if known	text	32
12	Shape_Leng	Length of polygon in spherical coordinates	double	*
13	Shape_Area	Area of polygon in spherical coordinates	double	*

Feature Class Name: Aquaculture

Total Number of Unique Features: 2630

Dataset Status: In Progress

5. SPATIAL REPRESENTATION

Geometry Type: vector polygon
Reference System: GCS_North_American_1983
Horizontal Datum: North American Datum 1983
Ellipsoid: Geodetic Reference System 1980

XY Resolution: XY Scale is. 000000001
Tolerance: 0.000000008983153

Geographic extent: -74.00 to -65.00, 37.00 to 46.00

IS0 19115 Topic Category: environment, oceans, farming, economy

Place Names: Place Names:

Atlantic Ocean, Bagaduce River, Baker Cove, Barnstable Harbor, Beattie Pond, Beebe Cove, Black Island, Blue Hill Bay, Bourne Cove, Branford, Branford Harbor, Bridgeport, Buzzards Bay, Cape Cod Bay, Captain Harbor, Casco Bay, Clinton Harbor, Cobscook Bay, Cockenoe Harbor, Connecticut, Cotuit, Cove Harbor, Damariscotta River, Duck Island Roads, Duxbury Bay, East River, Eastern Bay, Easton Bay, Fairfield, Farm River Gut, Fence Creek, Fishers Island Sound, Flanders Bay, Frenchman Bay, Great Peconic Bay, Greenwich Point, Guilford Harbor, Gulf of Maine, Hammonasset State Park, Hampton Harbor, Harbor Pond, Hog Bay, Horseshoe Shoals, Indian Neck, Ipswich River, Johns River, Johnsons Point, Jordan Cove, Jordan River, Katama Bay, Kelsey Island, Kingston Bay, Little Narragansett Bay, Little Peconic Bay, Little Pleasant Bay, Little River, Long Cove, Long Island Sound, Machias Bay, Madison, Maine, Massachusetts, Meduncook River, Menemsha Pond, Menunketsuck River, Mill River, Mount Desert Narrows, Mystic Harbor, Napeague Bay, Narragansett Bay, Nasketucket Bay, Nauset Bay, Neck River, New Hampshire, New Haven Harbor, New Meadows River, Niantic River, Ninigret Pond, Norwalk Harbor, Old Saybrook, Oyster River, Palmer Cove, Patchogue River, Pawcatuck River, Penobscot Bay, Pinkham Bay, Piscataqua River, Plum Island Sound, Point Judith Pond, Popponesset Bay, Portsmouth, Potter Pond, Provincetown Harbor, Quinnipiac River, Rhode Island, Rocky Neck State Park, Salt Pond Bay, Scarborough River, Seapit River, Sheepscot River, Sheffield Island Harbor, Shelter Island Sound, Sherwood Millpond, Sixpenny Island, Southold Bay, Southport, St. George River, Stamford Harbor, Thimble Islands, Toothacker Bay, Town Cove, Uncas Point, Wareham River, Wellfleet River, Weskeag River, West River, Westcott Cove, Winnapaug Pond

Recommended Cartographic Properties:
(Using ArcGIS ArcMap nomenclature)

Simple fill symbol: 2.0 outline of the same color (RGB)
Shellfish: 157-94-209
Finfish: 61-59-54
Seaweed: 56-168-0
Multi-tropic or other: 230-0-168
10% hatched fill symbol: 0.1 outline of the same color (RGB)
CT Shellfish Beds - Recreational: 0-132-168
Simple fill symbol: no outline, 50% transparency (RGB)

CT Shellfish Beds – Town Managed: 137-
90-68 CT Shellfish Beds – State Managed:
230-152-0

Scale range for optimal visualization: 5,000 – 50,000

6. DATA PROCESSING

A description of each states' datasets and the subsequent processing are described below.

Maine – Maine's aquaculture dataset contained 256 polygon features depicting the geographic locations of active aquaculture lease sites along the coast of Maine. The dataset was produced by Maine Department of Marine Resources (MEDMR) by creating polygons from lease coordinate descriptions and combining them with lease information from MEDMR records. The file did not include Limited Purpose Licenses (LPAs) that are current for only the calendar year in which they are issued. LPAs have a maximum size of 400 square feet around a single center point. They are limited in gear type and species cultivated. The dataset also contained four status categories: Active, Expired, Pending and Terminated. Only the Active and Pending lease areas were included in the depicted regional dataset. This subset included 159 features. It is accurate as of September 11, 2018, but may change as leases are added and others expire or are terminated.

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Information about Maine Aquaculture can be found here:
http://www.maine.gov/dmr/aquaculture/leases/decisions/index.html

New Hampshire – New Hampshire's aquaculture dataset contained 38 polygon features. The NH Department of Environmental Services (NHDES) has compiled all existing geographic information on the boundaries of aquaculture sites in New Hampshire waters. The coverage contains the boundaries of aquaculture sites that were licensed in 2015 and is accurate as of February 28, 2019. Sites that were pending application approval were not included in this layer. Additional licenses may be approved later in the year. RPS added a field to this dataset describing the general location of each site.

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Massachusetts – The 404 Massachusetts aquaculture sites depict the majority of aquaculture license sites permitted as recently as 2013 and the species the license holders are permitted to grow. Massachusetts aquaculture data is currently undergoing review by the Massachusetts Division of Marine Fisheries (MA DMF) and individual municipalities. Finalized site locations and additional attribute information will be added to this dataset when it becomes available.

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Rhode Island – Data on Rhode Island aquaculture sites comes from the Rhode Island Department of Environmental Management Division of Fish and Wildlife, Marine Fisheries Section. The Rhode Island Department of Environmental Management (RIDEM) provided a shapefile of these polygon features, with information on site ID, location, and status. This data is accurate as of July 20, 2018. Species information was provided and included in the dataset, but is undergoing QA/QC at RIDEM. Note: Data on Rhode Island aquaculture sites is not available for download at this time.

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Connecticut – Data on Connecticut aquaculture was derived from two datasets provided by the State of Connecticut Department of Agriculture/Bureau of Aquaculture and the State of Connecticut Department of Environmental Protection. One dataset contains the location of natural shellfish beds. Natural beds managed by the state, town or used for recreational harvesting were selected from this dataset, resulting in 1855 polygons. The number of beds in use at any given time is subject to change. The second dataset contains 46 polygons representing the approximate geographical location of permitted "Certificate for Aquaculture

Operation" gear sites in the Connecticut coastal waters of Long Island Sound via the State of Connecticut Application for Joint Programmatic General Permit for Aquaculture Department of the Army General Permit. These datasets are up to date as of January 15, 2016. For more information on CT Aquaculture and Shellfish, see the [CT Aquaculture Mapping Atlas](#).

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 New York – Data on aquaculture sites in New York State were available for Eastern Suffolk County only. Suffolk County aquaculture data were derived from three feature classes found in the Suffolk County Aquaculture Lease Program (SCALP) geodatabase, provided by the Suffolk County Department of Economic Development and Planning. Using an inventory of current leases found on the Suffolk County website, we selected sites which are currently being leased from the Grants, 10_Acre_Areas, and TMAUA feature classes, modifying the attribute information for each feature based on information from the aforementioned inventory, and merging the datasets into one shapefile. The TMAUA (Temporary Marine Area Use Assignment) features (sites A-10, A-11, and A-27), which are circular, off-bottom plots, were originally represented as point features in the database, with the point referring to the center of each feature. These features were further modified from their original point geometry by applying a buffer to each point location, so that each resulting circular polygon has the area specified in acres in the inventory. These data are accurate as of November 9, 2015. The number of leases that are currently being leased by the County are subject to increases/decreases over time.

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  Federal Waters - Two blue mussel aquaculture sites have been permitted in offshore federal waters in the northeast. Sites will be located in the Gulf of Maine off of Cape Ann and within Horseshoe Shoals in Nantucket Sound. Site coordinates were plotted based on developer notes provided by the developer, based at the Northeastern

Massachusetts Aquaculture Center (NEMAC) at Cat Cove Marine Laboratory, Salem State University. The Northeast Data Portal Working Group will work to verify the coordinates once the sites are active.

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Processing environment: ArcGIS 10.3.1, Windows 7 Professional, Intel Core i7 CPU

	Process Steps Description
1	Available shapefiles were obtained from each state and loaded into ArcGIS, and if necessary, projected into GCS North American 1983 using the PROJECT tool.
2	The regional aquaculture layer was produced using the MERGE tool to merge the source datasets
3	Attributes were edited in the editing environment to reflect information that was consistent among the datasets and to generalize existing information, including species.

7. QUALITY PROCESS

Attribute Accuracy: Original content was acquired from authoritative sources. Discrepancies in attribute information among the datasets result in incomplete information in some fields. Consult the attribute table of the feature class which describes the accuracy of each feature. Rhode Island species attribution is currently undergoing quality assurance and quality control processes by RIDEM Marine Fisheries. Information in these fields was assumed, and may be out of date or incomplete.

Logical Consistency: None

Completeness: Limited Purpose Licenses (LPA's) were not included in the Maine dataset. Pending permit applications were not included in the New Hampshire dataset. New York State data were available for Suffolk County only.

Positional Accuracy: It is not expected that all lease areas, or portions of lease areas will be in use at all times, particularly in Connecticut. The positional accuracy of the offshore blue mussel sites and Massachusetts sites are pending verification. Variations in digitization methods may affect positional accuracy of some features. Consult the attribute table of the feature class which describes the accuracy of each feature.

Timeliness: Based on best available information as of March 4, 2016. Data may change as aquaculture leases expire or are terminated, or as new leases are added.

Use restrictions: Data is presented as is. Users are responsible for understanding the metadata prior to use.

Distribution Liability: All parties receiving these data must be informed of these caveats and limitations.