FNPS Form 10-900-b
(Nov. 1999) Utah MS Word Format

OMB No. 1024-0018

United States Department of the Interior
National Park Service

64501019

National Register of Historic Places Multiple Property Documentation Form

This form is for use in documenting multiple property groups relating to one or several historic contexts. See instructions in Guidelines for Completing National Register Forms (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. For additional space use continuation sheets (Form 10-900a). Type all entries.

__X__ New Submission ___ Amended Submission

A. Name of Multiple Property Listing

Eastern Rig Dragger Fishing Vessel Shipwrecks in the Stellwagen Bank National Marine Sanctuary

B. Associated Historic Contexts

(Name each associated historic context, identifying them, geographical area, and chronological period for each.)

Transition from Sail to Internal Combustion Engine Powered Fishing Vessels in New England 1900-1930

Mechanization in New England Fisheries 1920-1950

Post World War II Competition in New England Fisheries 1950-1980

C. Form Prepared by

name/title Deborah Marx and Matthew Lawrence, Maritime Archaeologists

organization NOAA/Stellwagen Bank National Marine Sanctuary date 24 November 2008

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D. Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for the listing of related properties consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in 36 CFR Part 60 and the Secretary of the Interior's Standards for Planning and Evaluation.

___See continuation sheet

Signature of certifying official

Dec. 3, 2008
Date

NOAA/National Oceanic and Atmospheric Administration
State or Federal agency and bureau

I, hereby, certify that this multiple property documentation form has been approved by the National Register as a basis for evaluating related properties for listing in the National Register.

for Erika K Martin Seibert

Signature of the Keeper of the National Register

Jan 16, 2009
Date

Table of Contents for Written Narrative

Provide the following information on continuation sheets. Cite the letter and the title before each section of the narrative. Assign page numbers according to the instructions for continuation sheets in How to Complete the Multiple Property Documentation Form (National Register Bulletin 16B). Fill in page numbers for each section in the space below.

E. STATEMENT OF HISTORIC CONTEXTS

Fishing has been one of the principal activities of people living in Northeastern North America since the retreat of the Laurentide ice sheets at the end of the last Ice Age. During the roughly 12,000 years of this region's human habitation prior to the arrival of Europeans, Native American's gathered abundant shellfish, finfish, and marine mammals with spears, hooks, and weirs in both near shore and offshore environments. Native American's utilized the region's marine resources in a seasonal pattern, harvesting food when it was abundant and limiting the quantity gathered to what was readily consumable by local populations. North America's marine resources were forever changed by the settlement of Europeans in the region in the 1600s. Instead of harvesting the area's marine resources for subsistence consumption, Europeans saw the region's bounty of the sea as a commodity to be sold on a world market. Europe's awareness of the North American fishery extended back to the 16th century, when Basque and English fishermen began following codfish and whales from their traditional fishing grounds off Northern Europe to the Newfoundland Banks off North America. These fishermen were following in the footsteps of the Viking peoples who established short-lived colonies in North America around 1000 C.E. and more successful settlements in Iceland and Greenland based upon fishing and farming. European knowledge of the North American continent spread south from the Newfoundland Banks to the coastal waters of the Gulf of Maine as fishermen began visiting the waters off North America on a regular seasonal basis. Reduced fish stocks in European waters likely led fishermen to incur additional risks by sailing across the stormy North Atlantic. In addition, European Catholics' demand for fish resulted in a growing market for cod. Catholic doctrine allowed parishioners to consume fish, a "cold meat" on Fridays and during Lent, when "hot meat" from land mammals could not be eaten because of the libidinous urges it was thought to inspire.

Cod was the fish of choice because of its durability. Cod has a low fat content that when the fish was salted and dried, made a highly portable foodstuff. Salt cod almost never spoiled and the inexpensive, highly portable, protein packed food not only graced the tables of Catholic Europe but was traded into Africa and was stocked for long sailing voyages to the Far East. European knowledge of Northeastern North America developed as fishing outposts were first established in the Canadian Maritimes. These outposts served as productions centers for a long distance trading network moving commodities harvested from New World marine production centers, such as the Newfoundland Banks, to Old World consumption centers, such as England and Spain. Trans-Atlantic commerce was founded upon the harvest of North America's marine resources and the shipment of salt cod to European consumers. By the middle of the sixteenth century nearly sixty percent of the salt cod eaten in Europe was caught off Northeastern North America. Following upon the established routes pioneered by earlier fishermen, Bartholomew Gosnold led a party of English colonists on the first colonizing voyage across the Atlantic to New England in 1602. While the colony he attempted to establish on

Cuttyhunk Island failed, his most lasting contribution to the region was naming Cape Cod after the quantities of that fish found in its surrounding waters (Bolster 2008:30; Kurlansky 1997:51; McFarland 1911:31-32).

Early accounts of New England describe the region's abundant marine resources, focusing primarily on the "sacred" codfish and great whales, but also recognizing the vast numbers of pollock, hake, haddock, and salmon found off Northeastern North America. These animals were by no means unfamiliar to the European fishermen and explorer who sailed west as the geology and biology of what marine ecologists and oceanographers consider as the Northeast Shelf large marine ecosystem is very similar to the ecosystems on the eastern side of the North Atlantic. The Northeast Shelf large marine ecosystem extends west-southwest from Newfoundland to Cape Cod encompassing widely ranging seafloor topography. Comprised of shallow sandy banks, rocky ledges, muddy basins, and deep channels, the Northeast Shelf large marine ecosystem encompasses the most important fishing grounds off Northeastern North America. In particular, the submerged banks located between Nantucket and Newfoundland result in nutrient upwelling that form the basis for tremendously rich food webs. These banks stretch a distance of 1,000 miles, with varying widths from 50 to 250 miles, and overall encompass 70,000 square miles. The most well known offshore banks are Georges Bank, Browns Bank, Amaral Bank, and the Grand Banks. In addition to the offshore banks, the Gulf of Maine and its inshore banks also supported tremendous quantities of marine life due to the very high primary productivity of the coastal waters. The focus for much of New England's inshore fishing effort has been the 17,000 square-mile area that encompasses the coasts of Massachusetts, New Hampshire, and Maine and is delimited on eastern side by a line drawn from Cape Cod to Cape Sable. Scattered throughout the Gulf of Maine are sand banks and elevated gravel or rock ledges which are the ideal habitat for marine fishes. Best known of these areas are Stellwagen Bank, Scantum Basin, Ipswich Bay, and Jeffreys Ledge (Bolster 2008:19; Matthews 1927:2,8).

Earlier European fishermen and explorers laid the groundwork for the Pilgrims landing on Cape Cod and subsequent colonization of Plymouth, Massachusetts in 1620. While New England's hinterlands had not been extensively explored, the coast had been accurately mapped by Captain John Smith before their arrival. Initially, colonial fishermen exploited the anadromus fish stocks in local rivers in a subsistence pattern similar to their Native American neighbors. However, the arrival of more colonists and the establishment of settlements around Massachusetts Bay, with the explicit purpose of engaging in fishing for cod, led fisherman further afield. Ultimately, the English Civil War reduced the number of English fishermen in North American waters and allowed colonial fishermen to take the place of their European counterparts on the North Atlantic banks (McCusker and Menard 1985:99). Likewise, fewer fish were sold onto the market thereby increasing the price of cod. Higher prices spurred colonial merchants to make the investment in fishing infrastructure (fishing gear, fish

processing, and shipping) required for the business of cod fishing. Cod soon became the cornerstone of New England's economy spurring on shipbuilding and fishing infrastructure construction in Massachusetts ports such as Salem, Marblehead, New Bedford, Provincetown, Plymouth, Boston, and Gloucester. Coincident with the fishery's growth, colonial fishermen and shipwrights began building larger vessels suitable for longer voyages. The first colonial fishermen prosecuted their trade with ship's boats such as shallops and pinnaces. As local shipwrights began to build craft specifically for fishing, two-masted ketches predominated of around 30 tons burden. Hull and rig development from these early vessel types led to the regionally specific Chebacco boat and the adoption of fore and aft rigged sails that became the sloops and schooners that came to dominate the fisheries and in the Atlantic coasting trade. These more substantial vessels further cemented the close ties between New England fishermen and the economic trade between the American Colonies and the Caribbean colonies through the seasonal fishing and trading patterns that developed between these areas. Dried fish, along with livestock, timber, and whale products, became the chief exports of the Massachusetts colonies. In the decade prior to the American Revolution dried fish accounted for 35% of the average annual value of all New England exports and was the single most valuable export commodity. Primarily exported to Southern Europe and the West Indies Dried fish was also the fourth most valuable export from all of British North America (Vickers 1994:144-148; McFarland 1911:77,309-311; Vickers and Walsh 2005; McCusker and Menard 1985:108).

By the beginning of the seventeenth century, English colonists in North America had developed an extensive trading network encompassing continental Europe, Africa and the West Indies with New England salt cod as the basis for exchange for slaves, manufactured goods, and molasses. The growth of commercial trade led to the expansion of market fisheries around New England. Fishing became an economic mainstay and provided the backbone for the development of other industries such as agriculture and manufacturing. By the beginning of the eighteenth century, New Englanders had built up an industry around fishing, exporting ten million pounds of cured fish per year. New England fishing vessel sailed between the waters of Cape Ann and Cape Cod as well as to the shores of Maine, Nova Scotia, and Newfoundland. The fishing industry not only provided a valuable commodity for the international market, but was also a training ground for future merchant mariners, naval seamen, and shipwrights. Over ten thousand New Englanders found employment in the fishing industry at sea and on shore. The large numbers of men engaged in the same business lead to fishery's value and influence in commerce, legislation, and international affairs at the outbreak of the Revolutionary War. Of all the New England colonies, Massachusetts had the greatest fishing effort with twenty towns engaged in the cod fishery.

It is at this time that the port of Gloucester, Massachusetts became a fisheries hub. Its protected harbor and proximity to the underwater banks offshore made the city an ideal

location for supporting all aspects of fishing from shipbuilding to fish processing and final shipment. The shipbuilding industry arose to supply ships, brigantines, and sloops for Boston merchants and townspeople but before long these same vessels were adapted for the coasting trade and fishing. In 1713, the first schooner was reportedly built in Gloucester. Schooners' fore and aft sails more effectively utilized the wind for voyages along the Eastern Seaboard as compared to a square rigged vessel. The design was particularly well suited to fishing because of fewer number of sailors needed to man it. The schooner eventually became the pre-dominate vessel type employed in the New England fisheries until the first decades of the twentieth century.

Between 1775 and 1815, New Englanders experienced several periods of reduced maritime opportunity as conflict predominated on the seas. Merchant trade conditions fluctuated widely during this period leading to an unsettled atmosphere where attention was diverted from the sea to the growth of the fledgling country's agricultural production and westward expansion. The blockade of New England's ports during the Revolutionary War and War of 1812 disrupted and even suspended normal fishing operations with fewer men remaining in the fisheries. Many New England fishermen left the water and became soldiers during the conflicts while some ship owners turned their fishing schooners into privateers. The state of the fishery was so low that for a short period of time the Federal government provided allowances to help jumpstart and rebuild the fleet and dockside facilities. With the return of peaceful relations after the War of 1812, American fishermen slowly recovered and returned to sea in even greater numbers. Despite competition from other fisheries such as mackerel, cod still retained the distinction of being the principle food fish caught from New England waters through the period of the Civil War. From 1818 till 1866, the annual average vessel tonnage employed in the cod fishery doubled from its average during the years 1789-1818. An example of the sheer magnitude of the codfishery is its peak year, 1859. In 1859, New England's cod fishery consisted of over 2,500 vessels, totaling 129,000 tons, and manned with over 18,000 seamen. Nearly every community on the water was involved in the fishery (McFarland 1911:169-171).

In 1846, a railroad line connected Gloucester and Boston increasing up the lines of communication and transportation between cities. The railroad opened up the markets of Boston and more importantly New York and Philadelphia to fresh Gloucester fish. These new markets caused a rapid rise in the number of vessels and men associated with the fishing industry. As Massachusetts' trade network expanded in the mid-nineteenth century by supplying increasing quantities of fresh fish to regional markets while maintaining its preserved fish markets, New England's fishing craft developed to exploit the incredibly rich fishing grounds on the Georges and Newfoundland Banks. Increasingly speedy schooners raced the short fishing season to secure as many trips to the fishing banks as possible. Racing to the fishing grounds ultimately led to the heroic fishermen's races out of Gloucester that pitted American schooners against Canadian schooners for bragging rights and national prestige.

This focus on speed under sail led to construction of glorious vessels capable of carrying mountains of sail and the creation of a complex mythology surrounding the Massachusetts fishing fleets.

Groundfishing technology remained relatively unchanged for the first three hundred years of European fishing activity on the North American fishing grounds. Until the mid 1800s offshore groundfishing was done with handlines from the decks of small ketches, sloops, and schooners. Handlines consisted of a single tarred cotton line weighted with a 2 ½ pound to 3 ½ pound lead sinker and having multiple baited hooks at its end. Fishermen "jigged" their line in a series of short movements causing the bait to move through the water several feet above the seafloor. The motion simulated the natural prey of groundfish and the bait (whether it was shellfish, small fish, or dismembered seabirds) provided an enticing morsel. Once a fisherman had a bite, the line was then hauled onboard, the fish removed, and the hooks re-baited and dropped to the seafloor. Each fisherman could operate two or three handlines putting approximately four to six hooks into the water. Handlining was very labor intensive, but proved entirely satisfactory for catching fish from the Middle Ages to the mid-nineteenth century. In the following years, innovative fishermen spread their fishing effort over a larger area by using dories, small one or two-man rowed boats ranging from 12 to 14 feet long that could be stacked on the deck of a schooner. Dory handlining substantially increased catches allowing fishermen to fill their dories three to four times in a day, but dory fishing placed individual fishermen in greater danger due to separation from their mother ship in fog and bad weather.

Seeking greater catches with less effort, dory fishermen developed another technique in the 1870s known as tub trawling to put more hooks in the water. Also called bottom longlining, each tub trawl consisted of a quarter mile long ground-line with gangings, shorter pieces of line with baited hooks, attached every five feet. The groundlines and gangings were coiled in to half of a barrel or "tub," which might contain between 200 to 500 hooks. When deployed, one end of the line was anchored to the bottom while a buoy on the other end allowed its retrieval. Each dory carried from four to six tubs and one or two fishermen. To deploy the gear, one fisherman would uncoil and deploy the ground line and gangings while the other rowed the dory. A single schooner could carry between 10 and 16 dories, resulting in 10,000 to 32,000 hooks set out at one time. The tub trawl would be set and then hauled by hand, baited and set out again three or four times a day. At day's end, the dories would row or sail back to the schooner where the fish would be pitch-forked aboard and then the dory and its fishermen were hoisted on deck.

The extremely laborious process of baiting thousands of hooks and the cost of the bait led the owner of the Boston-based schooner *Sylph* to experiment with the English method of beam trawling in 1865. European fishermen had developed beam trawling to catch groundfish in a more cost effective manner. A large conical or bag shaped net, held open by a beam, caught

anything that crossed its path with no need for bait or individual hooks. The *Sylph*'s owners were fishermen of Irish origin who contracted Dennison J. Lawlor of East Boston to build the schooner. Measuring 55.6 feet between perpendiculars, the *Sylph* was different from its contemporaries as it had a considerable amount of drag to its keel. Reportedly, the schooner was fast and sea worthy, but its beam trawl was deemed a failure. After a year of using a beam trawl, *Sylph*'s owners were unable to turn a profit because the schooner was designed for the fast commute needed to and from the fishing grounds and unable to handle the new gear effectively (Chapelle 1973:107-109; Edwards 1987:51).

The next serious attempt at beam trawling occurred several decades later through a joint effort by Benjamin Low, a Gloucester wharf owner, and Captain Alfred Bradford. English-born Bradford had tried beam trawling from his schooner, but found his vessel unequal to the task. He returned to England to study the fishing technique and returned home with an English crew. Enlisting Benjamin Low's finances, the partners had the Arthur D. Story shipyard of Essex, Massachusetts build a copy of an English trawling ketch using a model built by Charles O. Story and plans by the U. S. Fish Commission. The 91-foot long ketch-rigged *Resolute* sailed from the shipyard in October 1891. It had a plumb stem overhung by a 39-foot long pole bowsprit and a flush deck. A steam engine and boiler were located below decks to power the trawl winch. The *Resolute* looked nothing like the fishing schooners usually produced by the Essex yards. Tests with the *Resolute* in Ipswich Bay and Georges Bank resulted in damage to the schooner's nets and a low market price for the catch. The vessel's owner re-rigged the *Resolute* as a schooner after five months and four unsuccessful trips and switched to dory fishing. Beam trawling never reached widespread use in New England waters because of region's rocky terrain; however, fishermen successfully used beam trawls in the waters surrounding Cape Cod. Auxiliary sloop fishermen used beam trawls to catch flounder along the cape's smooth shallow sandy bottom and by 1904 the U. S. Bureau of Fisheries reported that 65 beam trawlers were operating out of Cape Cod ports with an annual catch totaling 1.5 million pounds of flounder worth $48,169 (Edwards 1987:51; Story 1995:137; Thomas 2002:36-39).

The *Resolute*'s experiment with beam trawling in 1891 paved the way for the adoption of the otter trawl, which was better suited to New England's uneven and rocky seafloor. Instead of a beam holding open the net, otter trawls used two kite-like structures on either side of the net called otter boards or doors. As the fishing vessel towed its net, hydrodynamic pressure pushed the doors outwards stretching open the net. The foot rope, which ran along the bottom of the net, was outfitted with wooden or rubber disc-shaped rollers of varying size to lift the net off the seabed and over obstacles. American fishermen were slow to adopt the otter trawl. The first use of otter trawl gear dates to the 1860s; however the technology's developers are variously attributed to an Englishman named Hearden or Irish offshore fishermen. The English North Sea fleet began utilizing the otter trawl in the 1880s. Ultimately, the efficacy and ease of

use of the otter trawl led to its wide spread adoption in Europe around 1900. Within the first decades of the twentieth century otter trawling revolutionized American fishing vessel design, propulsion, and deck equipment, transforming the schooner fishing fleet into engine-driven trawlers (Wood 1926:11; Dunne 1994:319).

Transition from Sail to Internal Combustion Engine Powered Fishing Vessels in New England 1900-1930

During the last half of the nineteenth century, fishermen began returning to the near shore Massachusetts Bay fishing grounds to harvest a wider variety of fresh fish including haddock, halibut, and flounder. Fishermen never abandoned these inshore grounds, but railroad connections and fresh fish markets spurred a resurgence of effort in waters closer to shore. Fishing schooners made day or overnight trips to Stellwagen Bank, bringing the fish back to port before it spoiled. However, America's northeast fishing fleet remained a predominantly offshore fleet, voyaging hundreds of miles to the Canadian Banks and Georges Bank. Fishing ports began to specialize in the commodity they intended to market. Boston cemented its position as a predominantly fresh fish market, while Gloucester maintained its focus on the salted fish trade. Fishing schooners of all sizes were built in large established yards as well as in fishermen's backyards. The Gloucester market drove the development of fishing schooner construction. The most well known town for building fishing schooners was Essex, Massachusetts where more than 4,000 wooden vessels were built from the mid 1600's until the collapse of the industry in the mid 20th century. Shipbuilding in Essex encompassed most of the lives of everyone in the town from the yards to all of the ancillary industries. Vessels built at the town's sixteen shipyards (the main yards were run by the Story, Burnham, and Boyd families) included all types of sizes and styles including coastal, passenger, trading, and yachts, but Essex's specialty was the fishing schooner. The greatest market for these vessels came from the fishermen of the neighboring town of Gloucester. Gloucester looked primarily to Essex because of the towns' close proximity and Essex's reputation for quality workmanship at a competitive price. The several hundred year relationship between the Gloucester fishermen and the Essex shipbuilders kept Essex busy as technological changes began to change the style of fishing vessels at the beginning of the twentieth century (Story 1995:78).

Technological changes in propulsion, fishing gear, and vessel design dramatically changed the New England fishery during the first decades of the twentieth century. Following the development of the first four cylinder four-stroke gasoline engine by Wilhelm Maybach in 1890, gasoline engines became a viable power source as manufacturers increased horsepower and portability. Innovative fishermen saw the internal combustion engine as a way to increase their productivity by diminishing the impact of weather on their enterprise. The marriage of internal combustion engine to schooner resulted in a new variety of vessel, the auxiliary schooner. Gloucester shipbuilder John Bishop launched the first fishing schooner with an internal

combustion engine in March 1900. Built for Captain Solomon Jacobs, the *Helen Miller Gould* measured 117 feet long with a breadth of 25.4 feet. Sensing the import of its arrival, an estimated crowd of 3,000 spectators turned out for the schooner's launching. When launched, *Helen Miller Gould* carried a 35-horsepower Globe gasoline engine; shortly thereafter a 150-horsepower Globe gasoline engine was installed that drove the schooner at 8 knots. On 12 April 1900, the *Helen Miller Gould* departed Gloucester in search of mackerel. It made several very profitable mackerel seining trips during 1900 and its stock and share price set new records. The following year began just as well, but misfortune struck in October 1901 when a gasoline leak caught fire. Fears that the fuel tanks would explode prevented any fire fighting attempts by the crew. The *Helen Miller Gould* only lasted eighteen months and the flammability of gasoline introduced a new danger to the fishermen lives but, the schooner was a money maker and its success affirmed the advantages of an internal combustion engine. *Victor*, the second schooner with a gasoline engine, was launch in March 1901 by the Tarr and James shipyard in Essex. *Victor* was smaller than the *Helen Miller Gould*, measuring 95.5 feet long and 25.4 feet, but seine fishermen began to realize the benefits of having an engine when encircling a school of fish during calm weather. The use of internal combustion engines as auxiliary power was adopted by the New England fishing industry with little change to vessel design. Shipbuilders continued building traditional fishing schooners, adding engine supports and a shaft log for the future installation of an engine. In the Essex yards, engine specialists from Gloucester visited the shipyard to bore the shaft log, install the shaft strut, drive shaft, stern bearing and propeller. At the same time, already operating schooners were retrofitted with engines by placing the propeller and shaft off center alongside the stern post or between two stern posts with blocking above and below the shaft aperture. As gasoline engines improved and diesel engines became available more and more schooners underwent the transition to auxiliary vessels (Chapelle 1973:221-223; Story 1995:149-150; Thomas 2002:85-87).

The internal combustion engine was not immediately adopted by all fishermen; many were not comfortable with the new technology while others had no interest in paying for propulsion when the wind was free. Historian Howard Chapelle described the transition from sailing schooner to auxiliary schooner in his book *The American Fishing Schooners 1825-1935*.

> The true sailing qualities of the auxiliary schooners, fitted with engines when launched, could not be ascertained due to the drag of the propeller. The early installations were often faulty. Some had inadequate engine beds resulting in misalignment and failures in the thrust bearings and stuffing boxes. There were also gasoline fires and explosions, causing loss of some vessel property and of life. Nevertheless, the advantages of auxiliary power were obvious. From 1901 on, the number of engines installed steadily increased. For a time, the unreliability of the gasoline

> engine installments delayed the development of all power fishing vessels. Steam fishing vessels were tried in the 1880s and '90s, but were found to be uneconomical in the existing North Atlantic fisheries. The gradual conversion of the bulk of the fishing schooners to auxiliaries eventually led to the increasing suppression of sail, with the engine becoming paramount propulsion by 1925. The complete suppression of sail followed the introduction of the heavy oil engines and the appearance of the diesel trawlers and seiners after 1930, though a "riding sail" was utilized by some vessels into the 1930s (Chapelle 1973:223).

The transition of the New England fishing fleet from sail to engine power was not a wholly linear evolution. In 1901 and 1902 following upon the successes of the *Helen M. Gould*, Essex shipbuilders constructed several fishing vessels that embodied important aspects of future fishing vessel design, but did not lead to directly to the vessels of later decades. In March 1901, the A. D. Story yard launched a solely gasoline-powered fishing vessel for the cod and mackerel fishery off Kennebunk, Maine. Measuring 60 feet long and 28.62 gross tons, the *Dorcas* carried a crew of eight and was likely used in the inshore fishery. Later that year, A. D. Story began construction on a large steam powered, wooden-hulled, mackerel seiner for Captain Solomon Jacobs as a replacement for the *Helen M. Gould*. While not the first steam mackerel seiner (vessels for this task were built as early at 1885), the *Alice M. Jacobs* had several unique design characteristics that were echoed in later fishing vessels. Fishing schooner historian, Gordon W. Thomas, characterized the *Alice M. Jacobs* as an "ocean-going tug" with a plumb bow and elliptical stern, as opposed to the clipper bow and fine lines of a schooner. In addition to its 300 horsepower steam engine, the steamer carried two masts used primarily for steadying the vessel or "laying to." At over 141 feet long and 24 feet in breadth, the steamer was considerably larger than the schooners of that time, but its hull shape was evocative of the future when solely internal combustion engine-powered vessels would drive sail out of the fisheries (Story 1995:158; Thomas 2002:113-115).

Coincident with the introduction of gasoline engines to the hook fishing fleet, fishermen sought out improvement in fishing gear technology to catch groundfish. Following in the footsteps of Captain Alfred Bradford and the *Resolute*, New England fishermen again looked to Great Britain and found the otter trawl. In 1904 a group of American investors, comprised of Boston fish dealers and bankers, purchased designs for a modern steel trawler hull and rights to the patented British otter trawl. They also imported otter trawl gear and even sent an American captain, H. Dexter Malone, to observe British trawlers in action before going forward with construction. Organized as the Bay State Fishing Company, the syndicate contracted the Fore River Shipbuilding Company to build the first U. S. steel steam trawler. Launched in Quincy, Massachusetts in 1905, the steam trawler towed its first net in December 1905. Whereas internal combustion engines were relatively new to the marine world, steam power was well

understood and had been refined to an art over the previous century. The *Spray* quickly proved its technology profitable leading to the construction of fifty-five more steam trawlers between 1906 and 1920. However, steam trawlers were expensive to build and operate and only the port of Boston developed a fleet. Individual or family fishermen in New England could not raise the capital to build and use steam trawlers. For example, the cost to purchase an otter trawl and associated gear was $3,000.00 and most steam trawlers used two alternately, for a total of $6,000 in gear or ten times that value of all the tub trawls carried by a schooner. Steam trawlers also spent more time and money repairing their gear in comparison to dory fishermen. Traditional dory fishermen also did not possess the skills required to operate a steam trawler; therefore, crewmembers were needed to be familiar with deck machinery, boilers, and steam engines (German 1982:104-106). Captain H. Dexter Malone, who returned to the schooner fleet after serving as the steam trawler *Spray*'s first captain, described what her perceived as the disadvantages of steam trawlers and otter trawling.

> A schooner of the fast sailing type which is now characteristic of the fishing fleet can beat the *Spray* in from the South Channel by four hours, with a fair wind. A schooner and its dories can cover more ground than can be covered by the steam trawler. . . I am convinced that month for month a schooner can bring in more fish than a steam trawler and the condition of the fish brought in by a net are not to be compared with those landed by a dorymen on a trawl (German 1982:104).

However, Captain Malone also realized one highly profitable aspect of steam trawling, that fishing could take place in poor weather with a lesser degree of danger to the crew as compared to dory trawling. In rain or shine, steam trawlers were capable of catching tremendous quantities of fish even if they were not of the quality caught by hook and line fishermen. For example, the trawler *Long Island* caught 300,000 pounds of haddock, cod, and flounder during a 13-day cruise. Catches of that magnitude stunned hook and line fishermen. Using nets with a mesh size of 1 ¼ inches, steam trawlers swept the seafloor catching adult and juvenile fish. In fact, forty percent of the catch in the months between June and December was juvenile fish. Concerned hook and line fishermen prevailed upon the Bureau of Fisheries to investigate the alarming quantity of bycatch in 1912, but no action was taken to assuage their concerns that steam trawlers were destroying the future of the fishery (Edwards 1987:52-53).

Following in the footsteps of the steel otter trawlers built in Quincy, Essex shipbuilders began building otter trawlers. Lacking the more sophisticated steel fabrication infrastructure found in Quincy, the Essex yards worked in the medium they were most familiar, wood. While the cost of these wooden vessels was less than their steel counterparts, the cost of steam machinery

and the complexity of its operation made these wooden trawlers only affordable for corporate fishing operations. Gorton-Pew Vessels Co contracted for two of these vessels in 1916 and took delivery of the *Walrus* and *Seal* in 1917. Built by different yards, the nearly identical wooden trawlers initiated construction efforts on several wooden steam trawlers by the Essex yards. Advancements in engine technology set the stage for the marriage of diesel engine to otter trawl within a year of the *Seal*'s launch. The Essex yard of J. F. James and Son made the wooden steam trawlers obsolete with the launch of the diesel powered trawler *Pioneer* in May 1918. Measuring 140 feet 9 inches over all, with a beam of 23 feet and a 12-foot 4 inch depth of hold, *Pioneer* was the first diesel powered trawler launched on Cape Ann. Smaller in overall dimensions than the *Walrus* and *Seal*, but similar in hull design, the *Pioneer* embodied the efficiency of diesel propulsion and the efficacy of the otter trawl in one package (Story 1995:169-171).

In comparison to the gasoline engines used in the auxiliary schooners beginning with the *Helen M. Gould*, diesel engines offered advantages that led fishermen to embrace these power plants. Developed in Germany in the 1890s, diesel engines utilized high compression and its resulting heat to combust its fuel, while gasoline engines used an electric spark to induce combustion. Diesel engines developed greater torque at low rpms as compared to gasoline engines, a feature particularly helpful for dragging a heavy net over the seafloor. Diesel fuel was much safer to store in large quantities due to its lower volatility. Unlike gasoline which caused catastrophic fires on many of the early auxiliary schooners, diesel has a higher flash point than gasoline making it less likely for spilled diesel fuel to explode. Overall the diesel engine was safer, more efficient, and therefore more economical making it a good fit with the New England fishing fleet. Lastly a diesel engine would take up 40 to 50 percent less space and weight than a comparable gas engine making it very suitable in wooden vessels. The diesel engine made otter trawling accessible to the average fisherman because it was economically feasible to own and operate a small diesel vessel without a large capital investment.

Shortly after the *Pioneer* went into service, Captain Dan Mullins of New Bedford, Massachusetts ordered a vessel that repackaged the fishing gear and propulsion technology of the *Pioneer* into a smaller, more economical hull that revolutionized fishing. Named *Mary* when launched late in 1919, this new variety of vessel was the first eastern rig dragger. Built by Wilbur A. and J. D. Morse of Thomaston, Maine, the *Mary* was described by contemporaries as a "schooner dragger," as it was the offspring of the schooner building tradition and closely resembled more traditional schooners in its hull design. Measuring 81 feet long and having 54 tons burthen, the *Mary* had a bowsprit and was initially rigged with a full suite of sails, but its hull was beamier than a traditional schooner and a small pilothouse enclosed the wheel at the stern. Within a short while, Mullins reduced the vessel's sailing rig to its gaff foresail and trysail when the mainsail got in the way of hauling the net. In addition to

the dragger's 60 horsepower crude oil (diesel) engine, two revolutionary aspects of the vessel were its gallows frames and trawl winch. The steam trawlers of the 1900s utilized gallows frames to support the trawl doors and steam winches to facilitate deployment and recovery of the trawl net. However, these critical aspects of otter trawling had not migrated to smaller vessels. Somewhat different than the steam winches used on steam trawlers, the *Mary*'s winch had a wooden frame was more similar in construction to contemporary schooner anchor windlasses. Designed by the Hathaway Winch Company (provider of most trawl winches in the following decades) to operate off the vessel's engine via a chain and sprocket connection, *Mary*'s winch ran fore and aft and utilized two gypsy heads to haul in the manila towing cables. A winch man at both gypsy heads wrapped the *Mary*'s 2.5 inch towing cables around the drums to recover the net. Mullins, who had previous experience with gas powered vessels, invested $22,000 in the *Mary*'s construction somewhat speculatively and hoped that the combination of technologies would be profitable.

The *Mary*'s engine, gallows frames, and winch quickly proved to have design flaws that resulted in breakdowns; however, Captain Mullins persevered and began landing successful catches of flounder that made others take notice. His large landings provided capital for beefing up the gallows frames which took most of the strain while trawling. He also worked with Hathaway to develop a cast iron exhaust pipe that resisted the corrosive effects of the diesel exhaust and became the standard for future draggers. Most importantly, Mullins used his experience with the winch to design a double-drum trawl winch capable of utilizing wire towing cables. It also had a metal frame and was much more capable of withstanding the forces generated when a trawl net hung on a seafloor obstruction. Installed in the fall of 1920, the new winch set the stage for record flounder landings the following year from Georges Bank (*Atlantic Fisherman* February 1926).

Following in the footsteps of Captain Mullins, Captain Herbert W. Nickerson initiated plans for a schooner dragger of his own in the spring of 1921. Captain Nickerson sought out famed naval architect Thomas F. McManus to design the hull of his vessel. Departing from the more graceful schooner bow and overhanging stern found on the knockabout schooners he was so famous for designing, McManus drew up a workmanlike hull more reminiscent of the large wooden steam trawlers, but scaled to an overall length of 78.5 feet. With a plumb bow, straight sheer, and truncated stern, McManus set the hull style for future purpose-built eastern rig draggers with the *Blanche Ring*. McManus completed his plans on 24 May 1921 and turned them over to shipbuilder Donald M. Waddell of Rockport, Massachusetts. Built for approximately $22,000, Captain Nickerson sought to reduce operating costs by dramatically reducing the number of crew and kind of crew necessary to operate. Due to unionized labor costs associated with the steam engineers and associated crew, the steam trawling fleet found itself unable to earn enough from catching fish in the early 1920s to meet operating costs. Therefore, enterprising fishermen looked to the large diesel-powered trawlers that were still

operating as a model to emulate. Nickerson anticipated that a week's catch of 12,000 pounds would cover the *Blanche Ring*'s operating costs and yield a profit.

Waddell's yard laid the vessel's keel in July with an anticipated launch date of late September. Measuring 20 feet in beam with a depth of hold at the main hatch of 9 feet, the *Blanch Ring* had a capacity of 80,000 pounds. Equipped with a two-cylinder Bolinder crude oil engine, the *Blanche Ring* could cruise at 9 knots. One particular aspect of the engine found to be of great interest by those who took its maiden voyage was its ability to quickly reverse the engine. This feature greatly facilitated docking and controllability when towing a net. Like the *Mary*, the *Blanche Ring* was equipped with a trawl winch provided by the Hathaway Machinery Company. In addition, Waddell added a single cylinder gasoline engine and generator to provide power for electric lights and a small bilge pump. When built, the *Blanche Ring* lacked the stern wheelhouse that would characterize later eastern rig draggers. Rigged as a knockabout two-masted schooner with a jib, foresail, and mainsail, a wheel house would likely have gotten in the way of the mainsail that was still expected to provide some motive power (*Fishing Gazette,* December 1921 and January 1922; *Atlantic Coast Fisherman*, September 1921; Dunne 1994:319-322).

While the *Mary* and *Blanche Ring* were purpose-built, fishermen throughout the 1920s converted their schooners to auxiliary schooners and added otter trawl gear to fish for groundfish as an eastern rig dragger. This process involved a reduction in the schooner's rig to bare poles with stay sails and the truncation of the bowsprit to a nub. In most cases a deckhouse was built around the helm to provide shelter for the wheelman. The installation of the deck winch and gallows frames necessitated structural strengthening to withstand the forces generated by towing and recovering a fish-laden trawl net. These changes define the difference between an auxiliary fishing schooner and an eastern rig dragger. Early purpose-built eastern rig draggers were simply sailing vessel hulls broadened and strengthened in their aft quarters to accommodate an engine and winch; however, naval architects and shipbuilders began to design hulls specifically suited to dragging. The end of purely sail powered fishing vessel construction came with the launch of the *L. A. Dunton* in 1921 from the A. D. Story shipyard. The two-masted semi-knockabout schooner was the last large sized fishing schooner to enter service without auxiliary power, although it was built with an engine bed and shaft log to accommodate power at a later time. Two years after its launch it was outfitted with an auxiliary diesel engine. The *L. A. Dunton*'s design, with its round bow, shorter bowsprit, long cutaway forefoot, and long stern overhang, was the epitome of a New England fishing vessel built during the twentieth century's first two decades, but the *L. A. Dunton*'s highly refined sailing design would soon become anachronistic. The subsequent decades of the twentieth century would see the predomination of a new vessel paradigm (D'Estang and German 1993).

In addition to the adaptation of auxiliary schooners to otter trawling, surplus First World War submarine chasers entered New England's fishing fleet after the conflict's end in 1918. Known as the splinter fleet, 440 sub chasers were built for the war effort. These 110-foot long wooden-hulled gas engine powered vessels were ideally suited for the fishing industry because of their speed, powerful engines, and 1000 mile operating range. Few modifications were needed to accommodate otter trawling. After a few years of service, fishermen typically replaced the gasoline engine with a diesel engine and upgraded the navigation and fish finding equipment to optimize the vessel's efficiency. While, these vessels had a hull design distinct from the schooner building tradition, they are also considered to be eastern rig draggers. Subsequent design of the purpose-built eastern rig dragger hull incorporated aspects of the submarine chaser's hull as well as electronics and net tending equipment.

Mechanization in New England Fisheries 1920-1950

Eastern rig draggers are a transitional vessel bridging the change from traditional fishing schooner to the modern stern trawler. Historian Morry Edwards characterized eastern rig draggers as, "a compromise between the greyhound speed of the fishing schooner and the slow brute strength of the harbor tug" (Edwards 1987:49). The design evolved in shipyards of New England in response to technological advancements and economic realities. The historic eastern rig dragger is categorized as a wooden-hulled engine-powered fishing vessel that deployed, towed, and recovered its otter trawl net or dredge over the starboard or port side. Eastern rig draggers were also used in other fisheries such as sword fishing or purse seining; however, the design of the vessel was dictated by the transition to solely internal combustion engine power and the deployment bottom fishing gear. Reflecting its schooner ancestors, eastern rig draggers have an aft positioned wheelhouse. The wheelhouse contained the helm, associated electronic and navigation equipment, as well as the captain's bunk. Entry into the wheelhouse could be made from the deck through side stairways or from below via a hatched passageway. The wheelhouse sat on the engine room trunk, which on some draggers was built of steel after fishermen noticed that engine heat excessively dried and shrank in the wood. The wheelhouse structure itself was also changed to steel in larger draggers.

Below decks, eastern rig draggers were divided into thirds by bulkheads with the crew's quarters, galley, and mess in the forecastle accessed with a standup companionway, the fish hold sat amidships, and aftermost compartment held the engine, generators, fuel tanks, batteries, compressors, and the engineer's quarters. Once the fish were hauled aboard they were dropped into the fish holds though hatches or openings in the main deck. Men in the hold shoveled fish into iced compartment on either side of the vessel. Many eastern rig draggers used poured concrete as ballast. The concrete helped to insulate the fish hold making it cooler in temperature and easier to clean. The position of the concrete ballast

amidships helped the vessel maintain its trim and overall stability under changing loads, fishing net retrieval, and rough sea conditions.

Early eastern rig draggers, particularly those converted from an auxiliary schooner, could be described as having a schooner or ketch rig, depending upon the length of its fore or main masts. Ultimately, single masted vessels predominated after Gloucester fleet owner Lawrence McEwen developed a system of hoisting blocks attached to wire ropes running from the foremast to the aft gallows in 1950. On some vessels, a small mizzen mast was often preserved to help launch the dory from the pilothouse roof in an emergency. The early draggers had stubby bowsprits which were soon discarded with the elimination of the forestaysail and jib. At the dragger's bow, a covered forecastle called a whaleback, raised the foredeck adding protection for the crew against sweeping seas in bad weather. At the stern, larger draggers had rounded transoms for protection and strength during docking or in a following sea. Smaller vessels had squared transoms, to provide more deck space, and more waterline bearing to allow large diesel engines to be fitted below decks. The square transom was also cheaper to build because fewer frame timbers were needed.

The raised area of the open deck just in-front of the wheelhouse trunk was called the break. Its location was positioned above the bulkhead separating the engine room and the fish hold. The heavy drum winches were placed there supported by the bulkhead. Power was supplied to the winch through a chain connected to the engine or shaft connection. Other pieces of fishing gear peculiar to an eastern rig dragger included gallows frames, which were positioned in pairs along the side of the vessel. The gallows frames were metal u-shaped supports which helped carry the weight of the doors and ease the deployment and recovery of nets. Larger draggers carried two sets of trawl gear and twin sets of gallows on each side to facilitate switching of gear based upon stock abundance and market strength. A dragger with two sets was considered double rigged. In general, draggers with a single set of gallows frames had them mounted along its starboard side so that if the vessel encountered another vessel head on it could turn to starboard, as the nautical rules of the road required, without fouling its net. The open deck forward of the break at amidships was where the nets were stored as well as set out and hauled in.

An eastern rig dragger's hull was mainly constructed from white oak. A typical Albert Condon designed 78-foot long vessel had dimension and fastenings as follows. The keel was 10 inch sided and 19.5 inch molded with all scarfs keyed or locked. The scarf surfaces were covered with a coast of heavy lead and oil paint and fastened with no less than six 5/8th inch galvanized iron screw bolts with washers under the nuts. Two 7/8th inch galvanized screw bolts, with washers and nuts, passed though both layers of the keel at every scarf and elsewhere spaced no father apart then every second frame. The 4-inch sided oak futtocks were double sawn and molded 5 inches at the deck, 6.5 inches at the turn of the bilge, and 8 inches at the keel.

Futtocks were held together with ½ inch diameter screw bolts or wedged locust of white oak treenails resulting in frames with sided dimensions of 8 inches. Frames were spaced 18 inches apart. Both the stempost and sternpost were made of oak with the stem 10 inches sided and molded and the sternpost 16 inches sided and molded.

Once the concept of the eastern rig dragger took hold in New England the slow evolution of the vessel type began to further adjust and refine its characteristics. The shipbuilder's goal was to build "a relatively inexpensive sea tractor that would achieve some compromise between steaming speed and towing efficiency." Eastern rig draggers were ruggedly built with a deep draft and round bottom with various bow and stern designs and "represented a deliberate union of native construction skills with the design evolution of our own highly successful sailing fishing boats and powered yachts." Dragger design was plain and practical and built to do a job (Edwards 1987:50; Prybot 1988:15-22).

The transition to the eastern rig dragger and the predomination of the otter trawl was supported by the growth of fresh fish processing infrastructure and vessel maintenance facilities. Boston's fish pier was the second largest wholesale market following New York's Fulton fish market during the early twentieth century. The Boston wholesale fresh fish business and distribution network primarily focused on the Massachusetts' communities, but it also supplied Connecticut, New York, and Pennsylvania. Other important New England distribution centers included Gloucester, MA, Portland, ME, and Providence, RI. In 1921, the first filleting machine came into service in New England, diminishing the time and effort needed to move a fish from boat to market. Filleting eased the housewife's preparation efforts and also produced processing waste that was ground up into fish meal for livestock and poultry feed. At the same time, Clarence Birdseye developed a method of quick freezing which preserved the fresh fish flavor. Filleting and freezing merged making frozen fish fillets a highly transportable and consumer friendly product, which eventually morphed into the ubiquitous fish stick. Even Gloucester began to shift away from its strength, salt cod, to fresh or frozen haddock, cod, and scrod (a small cod) fillets. Frozen filets spurred a new marketing strategy focused on convenience and availability to even the most landlocked states. The development of frozen fish sticks and filets, pioneered by Gloucester's Gordon-Pew Fisheries Co. Ltd., marks the beginning of a trend that distanced consumers from the animal origins of their food products (Matthews 1927:22).

The efficiency of the fishing fleet markedly increased as a result of the technological developments embodied by the eastern rig dragger, and like the concerns voiced as the steam otter trawlers came on line, many were worried about the capacity of fish stocks to sustain the levels being harvested. In addition to the dragger's efficiency, automated filleting and flash freezing removed bottlenecks in the fish supply network that had previously limited the number of fish that could be sold. The combination of these technologies spurred fishermen to catch

increasingly larger amounts of fish. Eastern rig draggers were far less affected by weather conditions than their predecessors and could cover larger areas to make up for diminishing catches that signaled the beginning of habitat destruction and over fishing. A scientific study by Harvard University in 1930 showed that 37 million haddock were landed in Boston with another 70 to 90 million baby haddock being discarded dead at sea because the net's small mesh size prevented the escape of juveniles. Unfortunately, minimum trawl mesh size regulations were not enacted until 1953. The rise in popularity of fish, especially haddock and Acadian redfish, led to signs of fish stock dysfunction and population collapse as unregulated fishing occurred throughout New England's inshore fishing grounds. Shipyards began producing larger eastern rig draggers with bigger engines to allow fishing fleets to move offshore and locate larger stocks. Fish stocks received a small reprieve during the Great Depression as consumers had less money for fish causing the fleet to contract.

From the 1930s through the 1950s, the most common vessel constructed throughout New England for fishing was the eastern rig dragger. Naval architects continued to refine its overall hull design, while diesel propulsion systems, deck machinery, navigation, and fish-finding instruments kept pace with advancing technology. A June 1943 article in *Atlantic Fishermen* tallied approximately 27 draggers over 50 feet long being built or on order along the New England coast. Vessel costs were relative to size, smaller draggers in the 50 to 75-foot range were affordable for individual fishermen, while vessels around 100 feet in length often required more sophisticated financing for construction costs. Another economical aspect of the eastern rig dragger was its ability to adapt its fishing style to changing catch opportunities. Vessel owners could change their gear type depending on the season to maximize profits. For example, many eastern rig draggers would stop dragging and start swordfishing in the summer by adding a temporary bow pulpit and mast lookout. Another common transformation was the shift from bottom trawling to purse seining.

The most prolific areas of eastern rig dragger construction in New England were Essex County, Massachusetts and mid-coast Maine. Facilities for the vessel's construction ranged from well established shipyards with specially trained labor to fishermen's backyards. Historical records indicate that over 500 wooden eastern rig draggers were built or converted from schooners in New England between 1919 and 1984 (Edwards 1987:63).

Essex, Massachusetts shipyards successfully transitioned from schooners to eastern rig draggers with the help of its skilled craftsmen who embraced the need for a new style of fishing vessel. The change from predominately auxiliary schooner construction to eastern rig dragger construction took place in Essex between 1924 and 1932. Initially, the auxiliary schooner hull remained mostly the same while the rigging was further reduced by shortening the spars and removing the bowsprit. Additional changes included a raised aft rail, or monkey rail, which continued forward of the break of the deck and a whale back for protection at the bow.

Leading the conversion from schooners to draggers were Gloucester's Portuguese and Italian immigrants. Portuguese immigrants began settling in Gloucester during the 1870s and by the 1890s, the Portuguese community solidified its community status with the construction of their own church, Our Lady of Good Voyage. Italian immigrants (particularly from Sicily) settled in the area at the beginning of the twentieth century. Both groups took up fishing as their main source of income. Initially these new immigrants operated small vessels fishing the local waters or served as crew aboard a schooner, but after saving up enough money they contracted for a dragger of their own. Continued immigration from these countries and the development of redfish, or ocean perch market (a fish once considered undesirable for eating) allowed Essex shipbuilder Dana Story to profit from the new demand for the dragger. In total, the Essex shipyards built nineteen schooners which were later converted to eastern rig draggers and sixty-two eastern rig draggers.

The efforts of the Essex shipbuilders pale in comparison to those of Harvey F. Gamage of South Bristol, Maine who was the single largest builder of eastern rig draggers. His shipyard built almost 100 eastern rig draggers, most destined for the New England fisheries. Harvey F. Gamage's biographers generally relate that his name became synonymous with the word dragger and that fishermen felt he built the best boat your money could buy. In 1924, Harvey F. Gamage opened his business on the former site of A. and M. Gamage Company which operated from 1845 until 1902. Harvey F. Gamage worked his way up from being a carpenter under his father and then an apprentice at yacht builders Hodgdon Brothers in East Boothbay, Maine. After starting his yard he had a hard time staying afloat until the beginning of World War II when government orders for wooden minesweepers came in. These war time contracts supplied valuable income until Harvey F. Gamage successfully marketed his yard to fishermen in the 1950s. He saw that the aging New England fishing fleet needed new vessels that were technologically up to date and strongly built. An 1961 article by H. L. Peace Publications on Harvey F. Gamage explained the allure of the Gamage dragger.

> Since WW II, the bulk of hull replacements in the New England fleet have come off the Gamage ways-evidence of the faith the fishermen place in these rugged vessels. Heavily-timbered and thick-planked, these boats of ample freeboard are capable of riding out the very worst that New England's treacherous weather can hurl at them. With a competent skipper to find fish, this ability to stay on the grounds combined with a long life expectancy makes for a hull that pays off in dollars and sense.

In May 1957, the *Maine Coast Fisherman* newspaper attributed Harvey F. Gamage's success to three key aspects. "Harvey Gamage sells fishing vessels, first, because he builds them faster than anyone in the business, secondly, he builds a good boat and at a good price,

thirdly, he makes a firm contract to build a certain boat at the certain price, and sticks by his contract." The article further explained that in a time when building a steel vessel was plausible, the wooden vessel's lower price and longevity (with care) made it the fisherman's choice. Fisherman also thought that a wooden vessel was drier and more comfortable and was not so likely to quickly sink if it foundered in a storm.

Harvey F. Gamage's yard produced four eastern rig dragger hulls per year and his vessels set the standard for New England draggers. While not mass produced, many of the vessels were of similar design making the shipbuilding process simple and straight forward. An 80-foot vessel cost $100,000 and up just for the hull, a price that fishermen were willing to pay because of the quality and craftsmanship. After adding in the cost of the engine, electronics, and fishing gear the vessel price could reach near $450,000. The typical construction of an 80-foot vessel used large quantities of oak for its 9-inch sided keel, 3-inch sided double sawn frames on 18-inch centers (with 12 inches between frames), deck beams, and 2-inch outer hull planks. The futtocks were fastened together with galvanized bolts and the planking secured to the frames with galvanized nails 5 by 3/8 inches. The working deck and outer hull were protected from wear and tear by pine sheathing 2.5 inches thick and steel sheathing covered the hull where the fishing gear scraped the side. The vessel's power plant, typically a large diesel engine for propulsion and a smaller diesel engine for electrical generation and emergency propulsion, were produced by a variety of manufacturers including Enterprise, Cooper-Bessemer, Atlas, Fairbanks-Morse, Caterpillar, Detroit, or Cummins. A typical navigation and electronics package found in an eastern rig dragger of the 1950s included a compass, radiotelephone, radio direction finder, and a depth sounder. Additional options that could be specified by a customer included bilge and wash down pumps, batteries, fish hoist, trawl winch, fire fighting equipment, galley stove, radiator, life saving equipment, fuel and water tanks, sink, and ice refrigerator (H. L. Peace Publications 1961).

Another prominent builder of eastern rig draggers was the yard of Newbert and Wallace of Thomaston, Maine. Over three decades after World War II, Leroy Wallace and Herbert Newbert built 91 commercial fishing vessels, the majority being of the eastern rig dragger type. Newbert and Wallace used plans drawn by naval architect Albert E. Condon to construct quality vessels at reasonable prices. Albert Condon was a boat builder and draftsman who worked with various yards in Thomaston, Maine until 1938 when he began designing vessels on his own. His eastern rig draggers dominated in New Bedford fleet until his death in 1963. Other well known eastern rig dragger designers include Walter McInnis, Dwight S. Simpson, Geerd Hendel, Williams Hand Jr., and John Gilbert. Initially, hull design came from a yard's in-house builder's model, but the superior designs offered by the professional naval architects led to partnerships where the naval architect was hired to draw up plans for a specific vessel or a class of vessels based on the vessel's length (Snediker 2003:33-34).

The Massachusetts' ports of Boston, Gloucester, Provincetown, and New Bedford had the greatest numbers of eastern rig draggers. During the first decade of the twentieth century, Boston's fish landings came primarily from the schooner fleet, but the large steel-hulled steam trawlers that fished primarily on Georges Bank and the Great South Channel east of Nantucket were making rapid inroads. As steam trawler catches increased, infrastructure followed. In 1914, the Boston Fish Pier was built in South Boston to accommodate the infrastructure needed for the fresh and frozen fish processing and distribution. Nearly all of the fish landed in Boston was subsequently sold through the New England Fish Exchange. In 1916, forty dealers at the exchange split into two competing companies, the Bay State Fishing Company and the Boston Fish Pier Company. Possessing sufficient capital and infrastructure both companies purchased steel otter trawlers and set about expanding the market for fresh fish. World War I saw the U. S. Navy charter these trawlers for minesweeping and mine laying; however, the companies still made considerable profits from the charter fees.

The 1941 Gloucester Master Mariner Association Yearbook opined that the growth of the U. S. Navy and Coast Guard at the start of the Second World War was a boon to New England's small boat fleet. Military purchases removed a number of large fishing vessels from the offshore banks allowing smaller family fishermen in the ports of Boston, Gloucester, New Bedford, and Provincetown to flourish. In the months before the Japanese attack of Pearl Harbor, military requisition staff sought out potential candidates for conversion into minesweepers and coast patrol boats. The largest North Atlantic steam and diesel trawlers were well suited to conversion due to their seaworthiness, large engines, and broad sterns. In the first months of the war, the Federal government bought twenty-three vessels on the east coast for a sum of $3,500,000. In many cases the government paid more than the replacement cost of an individual vessel making it very profitable for vessel owners to dispose of the large trawlers for wartime use. The reduction in fishing effort and landings meant that the remaining smaller vessels faired much better with higher prices paid for fish and less internal competition. The fleet reduction lured many fishing vessels to remain in New England during the winter months as opposed to their previous practice of fishing off the Mid-Atlantic in the winter. In particular, Gloucester's eastern rig dragger fishing fleet increased its landings by targeting inshore Acadian Redfish (Gloucester Master Mariner's Association Year Book 1941).

Gloucester was slower to embrace the eastern rig dragger in comparison to New Bedford due to its focus on the Grand Bank's schooner fishery. By the beginning of the 1930s; however, lower cost foreign competitors reduced Gloucester's share of the salt cod industry at the same time halibut catches declined. Ultimately, the city's fishery resurgence by the end of the decade was based upon the adoption of the eastern rig dragger, redfish, and the Midwestern palate. Known as Ocean Perch or Rosefish, Acadian Redfish (*Sebastes marinus*) were initially considered a "trash fish" by Gulf of Maine fishermen who only landed a small number of their total catch to dress up retail store displays. The Bureau of Fisheries (an ancestor organization

of the National Marine Fisheries Service) first separately recorded landings of Acadian Redfish in 1928 signifying its change to a commercial species. At this time, Acadian Redfish gained popularity in the Midwest where the fish's small white fillet had the same texture and taste as fresh water perch. Beginning in 1933, an enterprising Gloucester fish processor began filleting the fish and freezing it for the American housewife. Marketed as sea perch, it became a favorite in Chicago. Gloucester fishermen built new vessels or increased the horsepower of those already built to pursue this new market and by 1943 Gloucester surpassed Boston in volume of landings and became the number one producer of fish in New England. Gloucester's eastern rig draggers were ideally suited to fish the inshore fishing grounds, such as Stellwagen Bank, where redfish were plentiful. In 1939, 57% of all of the redfish were landed and processed in Gloucester (Boston handled 38% of the catch and Portland, ME 5%). Up until 1945, 90% of the entire redfish catch came from the Gulf of Maine. Landings of redfish in Gloucester were huge with 91 million pounds in 1942, 84 million pounds in 1943, 92 million pounds in 1944, 102 million pounds in 1945, and 130 million pounds in 1946. Stellwagen Bank accounted for 8.8% of the entire redfish landings in Gloucester in 1943 and 6.7% of the landings in 1946. Redfish growly slowly and mature late making them an easy target for overfishing. Gloucester possessed the shore side infrastructure to quickly process (fillet and quick freeze) and ship redfish while Boston could not accommodate the influx of redfish at its docks. Boston's trawlers were also designed to target larger species and were not well suited for inshore work where the main redfish habitats flourished. By 1946 the Gulf of Maine banks had been depleted and fleets moved further offshore to Nova Scotia in search of larger redfish stocks (*Atlantic Fisherman* April 1940; Cox 2001:28-30; Perlmutter 1947:7-9).

Post World War II Competition in New England Fisheries 1950-1980

The outbreak of World War II interrupted normal fishing activities and removed a significant portion of the fishing workforce, but also generated new opportunities as wartime demands for protein increased and the Great Depression ended. In particular, larger fishing vessels lost men to military service, thus favoring smaller inshore fishing vessels that required fewer crew. Similar to the sell off of surplus naval vessels into the fishing fleets after the First World War, surplus submarine chasers from World War II were converted for use in the New England fishing fleet as eastern rig draggers. During the war years, 438 110-foot long sub chasers were built by American shipyards and little modification to their plywood hulls and two diesel engines was required to enter the fishing fleet at war's end. Additional technological advancements also increased the efficiency of New England's fisheries. The small diameter (6-inch) rollers on the bottom of the otter trawl nets were replaced with "rockhoppers", large diameter (>12-inch) discs attached to the bottom of the trawl net, that were capable of rolling over large rocks and rough seafloor without catching or damaging the net. "Tickle chains" were also added to the net's foot rope to prevent fish from slipping under the net. However, the most significant advancements came from electronics for navigation and fish finding.

Sonar development for anti-submarine warfare changed the simple depth sounder into a sensitive tool for locating fish in the water column. Likewise, the development of LORAN, a radio-based navigation system resulted from Allied aviation research. LORAN allowed fishermen to return to a specific spot on the ocean with a high degree of accuracy and greatly facilitated the fisherman's ability to return to a successful fishing ground or to avoid net hangs.

Eastern rig draggers changed the nature of the fishing industry forever. In 1954 Harvard University Professor Donald J. White wrote, "No longer is the fisherman an isolated hero venturing in his dory from a mother ship into a hostile ocean with doubtful gear, at the mercy of the elements, and in some question of returning alive." White continues with his assessment of the industries changes:

> Modern trawlers and draggers boast countless improvements over early models. Diesel power had displaced coal-burning engines, opening up more space for fish storage and crew and eliminating firemen as crew members. Mechanical refrigeration supplements ice in up to date aluminum, cork, or stainless steel storage rooms. The trawlers acquired radios in the twenties; today nearly all trawlers And draggers have radio-telephones. They have loran for direction finding and the fathometer for undersea sounding. . . . These instruments remove much of the danger and guesswork from fishing operations and keep the ship in constant touch with marketing conditions on land (White 1954).

Increasing world demand for new protein sources after World War II led to foreign flagged fishing vessels entering into the fishing grounds traditionally exploited only by North American fishermen. Fleets of German, Spanish, Polish, and Russian vessels fished the offshore banks and inshore waters between 1960 and 1976. In 1970 for example, an estimated 900 foreign flagged vessels fished in New England waters. During that time, Massachusetts's catch was cut in half from 500 million to 250 million pounds annually. U. S. fishermen saw what they had traditionally considered as their fish being harvested by massively subsidized foreign factory ships, which were tremendously efficient and powerful. Not only were local fishermen unable to compete with the efficiency of the factory fishing vessels, but they feared that New England groundfish would be completely destroyed by the rapacious foreign fleets.

In 1976, the United States Government passed the Magnuson-Stevens Fishery Conservation and Management Act which designated up to 200 miles offshore of the United States coast as territorial waters for an extended fishing zone where foreign vessels could not fish. The legislation also created a national program for the conservation and management of the fishery resources of the United States to prevent overfishing, to rebuild overfished stocks, to insure

conservation, to facilitate long-term protection of essential fish habitats, and to realize the full potential of the Nation's fishery resources. The elimination of foreign fleets jumpstarted the industry and caused a boom of all industries related to fishing. Fishing communities were revitalized and government loans and low financing spurred a shipbuilding boom that replaced the eastern rig draggers with modern steel stern draggers able to better monopolize the fish stocks. Ultimately, the Magnuson-Stevens Fishery Conservation and Management Act did not solve the problem of over fishing. After a number of good years following the disbarment of the foreign fleets in the 1980s, commercial fishing has suffered from over capitalization due to the attractive financing offered by the government. Commercial fishing and its supporting industries have slowly been declining because of the reduction of fish stocks and further government efforts to restrict fishing to protect those ailing stocks (Georgianna 2000:6).

The end of the eastern rig dragger's rein came in the 1960s when trawling methods changed from handling the net from the side to off the stern. This new vessel design, developed in the Pacific, was called western rig with the pilot house being moved forward and a net reel placed at the stern to facilitate fishing. Stern trawling was far safer and more efficient because vessels did not have to stop and face into the wind to recover the net, as side trawlers did (while side trawlers were stopped they were at risk of being damaged by strong winds and seas). Stern trawlers were more versatile and could fish in all types of weather. A small amount of wooden western rig stern trawlers were built but it was not until steel hulls became a mainstay in the 1970s that stern trawlers truly replaced the eastern rig dragger. In response to the many apparent advantages offered by a stern trawler, eastern rig dragger captain John Gerard pointed out a perceived fault, "On an eastern-rig, the captain can look out and see all the men on deck, on the other [western rig], you can only look where you're going" (*New Bedford Standard Times* 25 September 2007).

In 1994 Congress authorized thirty million dollars for the buyback of fishing vessels under the Inter-Jurisdictional Fisheries Act, Section 308 D as amended in 1986. The legislation's goal was to help fisheries conservation efforts and provide financial help to fisherman affected by the low stock numbers. NOAA's National Marine Fisheries Service took the lead and created the Fisheries Capacity Reduction Initiative, which sought to buy vessels and ground fish permits from their owners for a fair price. The vessels would then be destroyed or permanently removed from the industry. Between 1994 and 1998 seventy-eight vessels were purchased under this program. The buy back targeted older vessels, such as eastern rig draggers, which were not considered to be financially viable assets to the fleet (Snediker 2003).

Today, approximately 15 out of the over 500 eastern rig draggers built are still actively fishing or afloat. These vessels are slowly disappearing as they sink or are scrapped. In nearly all cases the fishing permits associated with the remaining eastern rig draggers are more valuable than the vessels themselves. Currently, the *Evelina M. Goulart* and the *Roann* are the only

eastern rig draggers held in museum collections. The 83-foot long *Evelina M. Goulart* was built by Arthur D. Story in Essex, Massachusetts in 1927 as an auxiliary schooner. It was later converted into an eastern rig dragger for groundfishing. The Essex Shipbuilding Museum acquired the *Evelina M. Goulart* in 1990 and it is on display unrestored in a covered shed near to where it was launched. Unfortunately, the *Evelina M. Goulart* has been stripped of its masts, deckhouse, fishing gear, winches, engine, and machinery. Many of its hull planks are sprung and the vessel looks to be suffering from rot as it was raised from the seafloor after sinking. Unlike the *Evelina M. Goulart*, the *Roann* has been completely rebuilt at Mystic Seaport so that is may become a floating classroom for the interpretation of New England's fishing heritage. The 60-foot long eastern rig dragger was designed by Albert Condon and built in 1944 by Newbert and Wallace. It fished out of Vineyard Haven, Massachusetts and Point Judith, Rhode Island before Mystic Seaport acquired it in 1997. Mystic Seaport has submitted *Roann*'s National Historic Landmark nomination and its listing is pending.

F. ASSOCIATED PROPERTY TYPES

Name of Property Type

Eastern rig dragger fishing vessel shipwrecks in the Stellwagen Bank National Marine Sanctuary

Description

Eastern rig dragger fishing vessel shipwrecks in the Stellwagen Bank National Marine Sanctuary (SBNMS) are categorized as internal combustion engine-powered wooden-hulled fishing vessels that deployed trawl nets or dredges over the vessel's side and were built and operated primarily in New England waters (see section E for a more extensive physical description of the vessel type). The vessel must have sunk in the Stellwagen Bank National Marine Sanctuary. Eastern rig draggers include vessels originally built as schooners or U. S. Navy submarine chasers that were later modified to tow a net or shellfish dredge from the vessel's side and have the physical characteristics described below. The vessel must have been constructed prior to 1958 to qualify as a historical resource as defined by the National Register of Historic Places. The main physical characteristics of the property type are its ability to deploy and recover a trawl net or shellfish dredge from the vessel's side, associated winches and machinery gear to deploy, tow, and recover the fishing gear, an enclosed wheelhouse at the vessel's stern, and crew's quarters contained below deck in the forecastle. The position, arrangement and variety of certain fishing gear machinery and components indicate whether the fishing gear was deployed from the vessel's side while the location of wheelhouse equipment and cultural artifacts indicate the location of wheelhouse and forecastle living space.

To date, four eastern rig dragger shipwrecks have been located and investigated in the Stellwagen Bank National Marine Sanctuary. All sites have been imaged with side scan sonar and been video documented with vary degrees of completeness with a remotely operated vehicle (ROV). Each consists of a wooden hull with diagnostic features such as deck machinery, engine machinery, fishing gear, and cultural artifacts. Site preservation varies, some vessels are almost completely intact sitting upright on the seafloor, while others consist of lower hull remains and durable machinery features such as the vessel's engine and trawl winch. The average size of the shipwreck sites vary from 50 to 80 feet long and 20 to 30 feet wide.

Review of historic vessel loss locations yielded the following list of 45 eastern rig draggers that are possibly sunk within the boundaries of the Stellwagen Bank National Marine Sanctuary:

Name	Year Built	Length (ft)	Breadth (ft)	Year Lost
Captain Drum	1875	77.4	15.4	1952
Holy Name	1893	81.4	16.1	1960
Olympia	1900	98.5	16	1964
Jean and Patricia	1906	78.7	19.0	1953
Ruth and Margaret	1914	102.5	23.2	1948
Ethel S. Huff	1916	42.6	14	1945
J. B. Junior	1917	60	16.7	1953
Alden	1917	104.3	15	1957
Gertrude Parker	1917	93.3	21.6	1946
Joffre	1918	105	25.2	1947
Nyoda	1918	71.8	17.3	1954
Pauline M. Boland	1925	75.8	18.8	1930
Barbara C.	1925	49	15.5	1951
Helen M.	1926	81.2	20.5	1957
Olivia Brown	1927	84.3	21.5	1953
Jackie B.	1929	77.9	17.6	1963
Lassgehn	1930	51	12.2	1951
Rose and Lucy	1930	81.8	18.0	1964
Rose Marie	1930	80	18	1971
Nina	1933	61.6	16.2	1952
Mary Alice	1941	47.7	14	1952
Heroic	1941	91.6	21.2	1969
Leah F	1942	88.5	23.6	1949
Positive	1942	91.5	21.3	1954
Villanova	1942	75.4	20.0	1964
St. Christopher	1944	90.3	21.4	1946
Nancy F	1944	68.6	16.4	1951
Cigar Joe	1944	73	18.7	1963
Captain Scrod	1944	78	18.2	1983
Mary and Josephine	1944	66.2	17.4	1984
Vita Maria	1945	89.2	20.6	1982
Maria Rosa	1946	64.7	18.1	1990
Salvator(e) and Grace	1947	73	18	1966
Lilo	1948	47	14.2	1980
Nyanza	1948	56.2	15.5	1990
Madonna Della Catena	1950	74		1984
Edna G.	1950	51.4	16.8	1988
Sea Fox	1953			2001

Maria Sicilia	1956	62.6	18.3	1982
Racketeer	1956	58.8	18.8	1989
Diana & Mark	1959	61.8	18.6	1989
Frances D.	1960	64.9	18	1982
North Star	1967	55	17.4	2003
North Sea		71	17	1980
Our Lady of the Rosary		57		1982

Significance

The eastern rig dragger fishing vessel shipwrecks in the Stellwagen Bank National Marine Sanctuary are significant to American history and are eligible at the state level for the National Register of Historic Places based upon Criteria D; the shipwreck sites are likely to yield information important to history. The shipwrecks are significant specifically to the New England states of Maine and Massachusetts based upon archaeological information that can be collected about the vessels and the people who built, used, and in some cases died when these vessels sank.

The level of structural integrity of an individual site will dictate the overall research goals and expected outcomes, since some vessels are entirely intact while others only consist of machinery structures and lower hull timbers. In general, eastern rig draggers shipwrecks provide a physical record of the technological development of New England's fishing industry between 1920 and 1950. Investigation of the archaeological sites will likely yield information on regional vessel adaptation through mechanization to meet the needs of a changing fishery responding to decreasing fish stocks and increasing demand for fish throughout the United States. Most importantly, archaeological site investigations will shed light on representatives of a vanishing vessel type that contributed to the United States' economic and industrial growth and environmental changes during the 20th century.

Current and future research programs will develop information important to history through linking eastern rig dragger fishing vessel shipwrecks to their historical context (see section E). Research themes that will yield this information include shipboard life, vessel design and adaptation, the mechanization of fishing, and the wrecking event.

Shipboard life

Future site investigations can provide information about the lives of fishermen who operated eastern rig draggers. Little documentation of the crew's cabin spaces and their day to day life onboard exists in the historical record, making archaeological investigation a significant way to yield insight into fishing as a livelihood. Archaeological information derived from a single

shipwreck might show differences and/or similarities in the crew's background, ideology, economic status, and life-ways through documentation of personal items such as eating utensils and family mementos. Personal artifacts found on several eastern rig dragger shipwrecks may yield information that illuminates differences and/or similarities between geographic locales based on the vessel's home port, such as Gloucester or Provincetown, or the crew's cultural affiliation, such as Portuguese or Italian. In many cases, several generations of a single family were engaged in fishing on eastern rig draggers resulting in strong ties to the sea and to particular vessels. While the men where physically engaged in fishing the women of the household managed the family and the business on shore making resulting in a family's full immersion in the fishing business. Since many eastern rig draggers were operated by close knit family units, archaeological site information may reveal multi-generational use patterns that add great depth to the story of New England's fishery.

Vessel Design and Adaptation

Like many vernacular watercraft, little information exists in archival collections that document the variety eastern rig dragger design and construction. In particular, archaeological research is expected to elucidate the modification of schooners to become eastern rig draggers. Archaeological information can more fully describe the overall transition of New England's fishing vessels from schooner to stern dragger as embodied in the eastern rig dragger. Understanding the changes in vessel design would allow historians and archaeologist to better understand the development of New England fishing industry and its usage of the underwater landscape. The period between 1920 and 1950 represents a dramatic shift away from the wind powered schooner that predominated in the New England fisheries for over one hundred years to a paradigm of engine powered vessels less controlled by the natural environment. The introduction of the otter trawl to New England revolutionized fishing practices and the packaging of this technology into the small and more cost effective eastern rig dragger exponentially increased its impact. The first eastern rig draggers represent a hybrid vessel that incorporated the advancing technology into older hull forms. Ever frugal, New England fishermen adapted their already built vessels to otter trawl technology and as opportunity arose purchased vessels that had been specifically designed for the new technology.

Purpose built eastern rig draggers constituted a compromise between speed, cargo capacity, seaworthiness, and towing power. The archaeological record will yield specific construction details and materials information that can provide information on the shipbuilder's techniques used in the largest shipyards around Essex, MA, Thomaston, ME, or South Bristol, ME. Likewise, the great diversity of shipyards building eastern rig draggers likely resulted in different yards employing varying styles of hull construction based on the materials and craftsmen available in the region. Analysis of the archaeological remains of several eastern rig draggers may yield information that shows distinct construction styles of originating from

shipyards in New England and throughout the Atlantic coast of North America. Not only will regional differences become apparent by looking at the remains of several vessels, but analysis of a larger collection of vessels may reveal ways in which naval architects and shipbuilder varied hull designs in small ways to suit customer demands and budgets. The twentieth century is remarkable for the speed of change brought about by increasing communication. Development of the eastern rig dragger's hull form took place on a rapid time scale in comparison to previous changes to New England's fishing vessels. The archaeological record is the only place this rapid development is fully described.

Mechanization of Fishing

New England's fishing industry has been a cultural identity and economic force since the early decades of European colonization. In particular, the glorious grand banks schooner inspired an American mythology that emphasized the resourcefulness and self assurance of the American male that is also personified by the myth of the American cowboy. As the American fishermen and fishing schooner reached its zenith at the beginning of the twentieth century, technological advances in the form of diesel engines and otter trawling remade the fishery. The mechanization of New England fisheries, exemplified in the form of the eastern rig dragger, resulted in the greatest change in fishing technique since Europeans arrived on the North America continent. The eastern rig dragger played a critical role in demonstrating the efficiency and efficacy of the diesel engine and otter trawl, so much so that that fish populations declined precipitously. Eastern rig dragger fishermen utilized the vessel's efficiency and efficacy to target new fish species that had not previously been pursued. Prior to 1940, species like the Acadian Redfish existed in huge numbers and the tremendously large catches of these fish landed during the war years and beyond by eastern rig draggers supplied the nation with a food source that revolutionized how American's purchased fish. The massive quantities of redfish and other species caught by eastern rig draggers led to the further industrialization of the fish processing industry creating factory-style food handling for a food that had previously been handled by home makers and fishmongers on a decentralized basis.

Archaeological information derived from the early diesel engines, trawl winches, deck gear, and trawl nets found on eastern rig dragger shipwrecks will show the technical evolution that made the vessels so profitable. The mechanization of fishing changed the relationship of fishermen to their tools. Fishermen had to become more mechanically adept; capable of fixing winches and diesel engines rather than mending sails and serving rigging. Details such as a trawl winch's location on deck or its manufacturer can provide information on a vessel's age, overall dimensions, home port, and how the crew interacted with the machinery. Information on the target species, amount that could be caught during a single trawl, or the average size of the fish caught can be determined by documenting the trawl nets design which includes mesh size, otter door size, and footrope composition. As the populations of Massachusetts' key fish

species such as cod or redfish declined trawl net characteristics changed in an effort to increase catches or as a result of fishery management regulations designed to preserve the fisheries for future generations. Archaeological investigation of this aspect can provide context for the current environmental problems facing fishermen and fishery managers.

Wrecking Event

Events surrounding the sinking of an eastern rig dragger, in many cases, can only be examined through an analysis of its archaeological remains. Information extracted through the archaeological investigation of the shipwreck site can identify the cause of the vessel's demise and the crew's activities onboard just prior to and during the sinking event. In general, little or no detailed information exists in the historical record about the wrecking event. Local newspaper articles covering eastern rig dragger sinkings focused on who was onboard and the physical condition of the crew as a result of their traumatic ordeal. Analysis of the wrecking event may yield information about deficiencies in the design and operation of eastern rig draggers that may have contributed to the vessel's demise. Variables such as a vessel's design or age, its engine's type and age, the amount of knowledge crew members had in operating new technology, or the variety of otter trawl gear deployed at the time of the loss can lend greater depth to the story of the New England fishing industry and its constituent fishermen.

No eastern rig dragger fishing vessel has been determined eligible or is listed on the National Register of Historic Places, although a National Historic Landmark nomination is pending for the *Roann* in the collection of Mystic Seaport. Six eastern rig draggers have been located by recreational divers and fishermen in Massachusetts' waters outside the Stellwagen Bank National Marine Sanctuary. None of these sites have been the subject of an archaeological investigation to record the site and assess its potential eligibility for the National Register of Historic Places. Aside from Mystic Seaport in Connecticut, the Essex Shipbuilding Museum in Massachusetts has the only other eastern rig dragger in a museum collection. These organizations have recognized the role played by eastern rig draggers in the evolution of fishing vessel design, fishing gear technology and use, as well as the economic and social functions eastern rig draggers played in New England's coastal communities from the beginning of the twentieth century to present day.

Registration Requirements

In order for a shipwreck to be eligible for listing as part of this multiple property submission under criteria D at the state level, there must be physical evidence that the shipwreck is an eastern rig dragger located within the boundaries of the Stellwagen Bank National Marine Sanctuary. The property must potentially yield information on the development of the engine-

powered fishing vessel and the mechanization of New England's fishing industry. Key registration requirements are that the property must have sufficient structural integrity to visually convey the historic function and design of an eastern rig dragger. Information that may be yielded from the property must contribute to a greater understand of shipboard life, vessel design and adaptation, the mechanization of fishing, and the wrecking event.

Evidence of its location should consist of a side scan sonar image at minimum. To be considered eligible for individual listing, the archaeological site must have sufficient integrity for archaeologists to determine that the shipwreck is an eastern rig dragger through documentation of diagnostic features that indicate its use or function. Historically reported vessel losses may be used in tandem with archaeological information to ascertain the site's age. Sites may be eligible even if disturbed by natural forces or human interactions as long as enough archaeological integrity remains to have the potential to yield useful information.

Artifacts will not be considered individually eligible or as contributing to the significance of a multiple property submission unless they can be associated with a specific shipwreck. If such artifacts have the potential to yield information because of their own characteristics apart from any associated with a wreck, they may be considered as significant objects, as opposed to a site.

Threats

Eastern rig dragger shipwrecks have been located in depths ranging from 200 feet to 500 feet. The character of the physical remains present at a shipwreck sites results from the wrecking process and subsequent impacts from natural and anthropogenic forces. The wrecking process for eastern rig draggers lost in the sanctuary includes three separate causal factors that influence site preservation. Fire was a leading cause of vessel destruction. Oftentimes, the fire burned for several hours, consuming much of the vessel's structure before it sank. Burned vessels enter the archaeological record with less material remains and are therefore more readily impacted by environmental and anthropogenic forces. Other eastern rig draggers sank due to collision with another vessel or an unknown object. Collision typically fragmented the vessel, compromising its structure and therefore increasing the impacts of post-depositional forces. Some eastern rig draggers entered the sanctuary's archaeological record as a result of foundering. Foundering likely resulted from a storm event or a mechanical failure. In either case, the eastern rig dragger's strongly-built wooden hull remains largely intact and therefore its structure will most likely withstand post-depositional forces to a greater degree.

All materials submerged in the marine environment undergo degradation based upon environmental factors and the material's composition. Largely constructed of wood, eastern rig

draggers are digested by marine organisms and bacterial decomposition. Iron fastening and machinery corrode and loose tensile strength. In both cases the archaeological site's degradation reaches a plateau where the degradation process slows. Material buried in the sediment is the best preserved as it is surrounded in an anoxic environment that preserves both organic and inorganic material. The cold water, limited currents, and depth in the sanctuary's muddy basins mean that natural forces are a slow, inexorable threat, but one that does not diminish the site's archaeological integrity.

The biggest threat to SBNMS's historic shipwrecks is from commercial and recreational fishing activities. Negative impacts to eastern rig dragger site's can be directly correlated with their location in areas subject to gillnet fishing, bottom trawling, and hook and line bottom fishing. Bottom trawling has the greatest negative impact potential. Single impacts from trawl gear may crush or disarticulate wooden structure and remove artifacts from the site. Repeated trawl gear impacts can completely destroy the fragile wooden structure of a shipwreck. Trawl nets may also become entangled in the wreck structure, impeding public access and archaeological research. Gillnet fishing also negatively impacts shipwreck structure through the deployment and recovery of the net. Gillnet fishermen intentionally set their gear on shipwreck structure. While the net itself weighs very little, weighted lines and anchors destroy artifacts and structure. Gillnetting's greatest negative impact results when the fishermen recovers the gear and finds it snagged on the wreck. Gillnetters can exert tremendous pull on their gear in an attempt to break the snag free, leading to destruction of shipwreck structure. Oftentimes gillnet fishermen cannot recover their net; it remains entangled in the wreck continuing to fish and impeding access.

Current Protection

The sanctuary's mandate to protect and manage historical resources arises from various federal regulations and laws as follows:

- Antiquities Act of 1906
- Historic Sites Act of 1935
- Archaeological and Historic Preservation Act of 1960
- National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. § 470 et seq.)
- Department of Transportation Act of 1966 (section 4(f))
- Presidential Order 11593 of 1971
- National Environmental Policy Act (NEPA) (Section 101(b)(4))
- National Marine Sanctuaries Act (NMSA) of 1972 (16 U.S.C. § 1432 et seq.)
- Archaeological Resource Protection Act of 1979 (ARPA) (16 U.S.C. § 470aa et seq.)
- Stellwagen Bank National Marine Sanctuary Regulations of 1992 (15 C.F.R § Subpart N)

The NMSA mandates that all National Marines Sanctuaries manage maritime heritage resources in a fashion that protects the resources while facilitating uses compatible with resource protection. Office of National Marine Sanctuaries regulations require the sanctuary to comply with all laws and regulations of the Federal Archaeology Program, such as the National Historic Preservation Act (NHPA) and Archaeological Resource Protection Act (ARPA). These regulations require the sanctuary to develop a heritage resource inventory and management program, oversee federal activities that may affect historic and cultural resources, and nominate potentially eligible sites to the National Register of Historic Places.

Stellwagen Bank National Marine Sanctuary seeks to comply with Section 110 of the National Historic Preservation Act by nominating archaeological sites to the National Register of Historic Places. Currently, four shipwrecks at three separate locations within the sanctuary are listed on the National Register of Historic Places. Although the National Register of Historic Places was originally designed to recognize historic properties on State-held lands, the Keeper of the Register has determined that NOAA's Office of National Marine Sanctuaries may participate in the program because the sanctuary has jurisdiction and control over historic properties on the sanctuary's seafloor as set forth by Congress during the sanctuary's designation. In addition to complying with section 110 of the NHPA, the sanctuary is required by Section 106 of the same act to take into account sanctuary actions that may impact historic properties and to allow the Advisory Council on Historic Preservation an opportunity to comment on sanctuary actions.

Current Stellwagen Bank National Marine Sanctuary regulations prohibit moving, removing or injuring, or attempting to move, remove or injure a sanctuary historical resource except as an incidental result of traditional fishing operations. These regulations also prohibit drilling into, dredging or otherwise altering the seabed of the sanctuary; or constructing, placing or abandoning any structure, material or other matter on the seabed of the sanctuary, except as an incidental result of an anchoring vessel, traditional fishing operations; or the installation of navigational aids. Lastly sanctuary regulations prohibit possessing within the sanctuary (regardless of where taken, moved or removed from), except as necessary for valid law enforcement purposes, any historic resource.

G. GEOGRAPHICAL DATA

Stellwagen Bank National Marine Sanctuary

Stellwagen Bank National Marine Sanctuary (SBNMS), managed by NOAA's Office of National Marine Sanctuaries, is located at the mouth of Massachusetts Bay, 25 miles east of Boston, 3 nautical miles southeast of Cape Ann, and 3 nautical miles north of Cape Cod, Massachusetts. Congress designated the 842-square mile (638 square nautical miles) area encompassing Stellwagen Bank and Basin, Tillies Bank and Basin, and the southern portion of Jeffreys Ledge a National Marine Sanctuary in 1992. The sanctuary lies wholly in federal waters and does not overlap with the state waters of the commonwealth of Massachusetts. The sanctuary's most prominent feature is Stellwagen Bank, a glacially deposited sandbank created by the retreating Laurentide Ice Sheet that covered much of New England during the last period of glaciation. SBNMS lies astride the maritime routes connecting the historic ports of Provincetown, Plymouth, Boston, Salem, and Gloucester to the Atlantic Ocean. Given the nearly four centuries of European and Euro-American waterborne transportation across sanctuary waters, archaeologists have found a rich collection of maritime heritage resources resting on the sanctuary's seafloor in the form of historic shipwrecks. The most well known shipwrecks are the paddle wheel steamship *Portland* lost with all hands in 1898, the collided coal schooners *Frank A. Palmer* and *Louise B. Crary,* and the coal schooner *Paul Palmer.* All three of these shipwreck sites are listed individually on the National Register of Historic Places.

The sanctuary has diverse bottom topography and composition. Its most prominent submerged feature is the kidney-shaped plateau, Stellwagen Bank. Stellwagen Bank is a shallow, sand and gravel covered geologic feature curving in a southeast to northwest direction for 19 miles. It is roughly 6 miles across at its widest point at the southern end. The surface of Stellwagen Bank, which is the shallowest portion of the sanctuary at 65 feet, is mostly sand and gravel while coarser sand and gravel flank the eastern edge of the bank. The sanctuary also includes all of Tillies Bank (situated to the northeast of Stellwagen Bank) and southern portions of Jeffreys Ledge (situated to the north). Directly north of Stellwagen Bank is Gloucester Basin where the seafloor consists of fine mud and the depths drops to over 500 feet.

The Sanctuary boundary is marked by the following coordinates, which indicate the northeast, southeast, southwest, west-northwest, and north-northwest points: 42 45'59.83" N x 70 13'01.77" W (NE); 42 05'35.51" N x 70 02'08.14" W (SE); 42 07'44.89" N x 70 28'15.44" W (SW); 42 32'53.52" N x 70 35'52.38" W (WNW); and 42 39'04.08" N x 70 30'11.29" W (NNW).

H. SUMMARY OF IDENTIFICATION AND EVALUATION METHODS

The multiple property listing has been developed based upon historical and archaeological research on eastern rig draggers in the Stellwagen Bank National Marine Sanctuary between 2003 and 2008. The shipwrecks were discovered through side scan sonar surveys. Sanctuary maritime archaeologists used an EdgeTech DF-1000 dual frequency side scan sonar as their primary search tool. The digital DF-1000 operates simultaneously at both low (100 kHz) and high (384 kHz) frequencies. Sonar data was displayed and recorded using Triton Imaging's Isis sonar acquisition software. Geographic positioning for the surveys was accomplished utilizing a differential global positioning system (DGPS).

Survey locations were chosen based upon the location of reported vessel losses, fishing hangs, and multibeam anomalies. Reported vessel losses were locations where a vessel was reported as sunk. These locations were identified with specific geographic coordinates in the form of Latitude/Longitude, LORAN TD's, or descriptive ranges and bearings. Primary and secondary source material compiled from newspapers, archives, and books were entered into the sanctuary's historic vessel loss database, which was then queried to extract the records of reported vessel loss. Most of the reported vessel losses in Massachusetts Bay provide imprecise positions. A common reported vessel loss may reference a very rough bearing and a distance (for example, 10 miles southeast of Gloucester, Massachusetts). This variety of reported loss was less useful for informing the survey area selection process, but it was valuable for determining the possible identity of a located shipwreck.

Fishing hangs were locations identified by fishermen where fishing gear (primarily trawl gear) became entangled with an object on the seafloor. The source of the entanglement may be a geologic formation or cultural in origin. Oftentimes, a fishing hang had the name of a shipwreck associated with it; fishermen often attributed hangs to fishing vessels that had sunk in the vicinity. Multibeam anomalies were features on the USGS Sun-illuminated Sea Floor Topographic Map of Stellwagen Bank National Marine Sanctuary that were visually identified on the map by sanctuary staff. Previous remote sensing surveys of these multibeam anomalies revealed the anomalies to be shipwrecks, geologic features, or false anomalies created by multibeam data errors.

Subsequent remotely operated vehicle (ROV) investigations of potential eastern rig draggers, conducted in partnership with the National Undersea Research Center at the University of Connecticut (NURC-UConn), yielded still and video imagery used to document, date, and ultimately identify shipwreck sites. All ROV investigations utilized the NURC-UConn ROV *Hela* and the University of Connecticut's (UConn) Research Vessel *Connecticut*. *Hela* was a Deep Ocean Engineering Phantom IIIS2 ROV heavily modified by Deep Ocean Exploration and Research and Cyvect. The vehicle carried a lighting system comprised of two 200-watt HMI

light and one 50 watt halogen light, all oriented forward. The vehicle's main imaging tool was a 3-CCD Tritech Aries color video camera on a forward-looking pan-and-tilt bracket. Scaling lasers mounted twenty centimeters apart bracketed the Aries camera. The parallel lasers allowed the archaeologists to measure artifacts and structures. A single-CCD color video camera was mounted to face downward providing plan view imagery of structures underneath the ROV. *Hela* also carried an Insite Pacific Scorpio 3-mega pixel digital still camera and strobe that was oriented either forward facing or downward facing. Each of the ROV's video cameras recorded its digital data onto Sony DVCAM tapes. The ROV's complement of positioning sensors consisted of a depth sensor, analog compass, sector scanning sonar, and ultrashort baseline tracking system.

ROV investigations focused on the exploration, comprehensive documentation, and characterization of the eastern rig dragger shipwrecks with the following objectives in mind:

1) Vessel construction and design
   -Project data was used to determine how the ship's hull was built, its overall shape, and the location/design of its wheelhouse/cabin to determine the vessel's age and identity.
   - A close examination was made of visible propulsion components and associated machinery to help determine age and identity.
2) Fishing/deck gear design and use
   -The style of fishing gear (including deck winches) was documented to determine vessel type and date of loss.
   -The location of fishing gear (absent, stowed, or deployed) was recorded to determine the vessel's activities at the time of its loss and if the deployed gear contributed to its wrecking.
3) Wrecking event
   -Information about the condition of the ship's hull, fishing gear, and artifactual material was recorded to illuminate the wrecking event. Information about the wrecking event can indicate the vessel's identity.
4) Material culture
   -The presence, location, and type of artifacts were documented to answer questions about the vessel's identity, when it sank, and life onboard

An additional objective was the documentation of anthropogenic impacts to the sites from activities such as commercial fishing. The information was used to determine which activities have damaged the site as well as which activities possess the greatest future threat to the site. Identified threats will inform the creation of management strategies to best protect the historic resources.

I. MAJOR BIBLIOGRAPHIC REFERENCES

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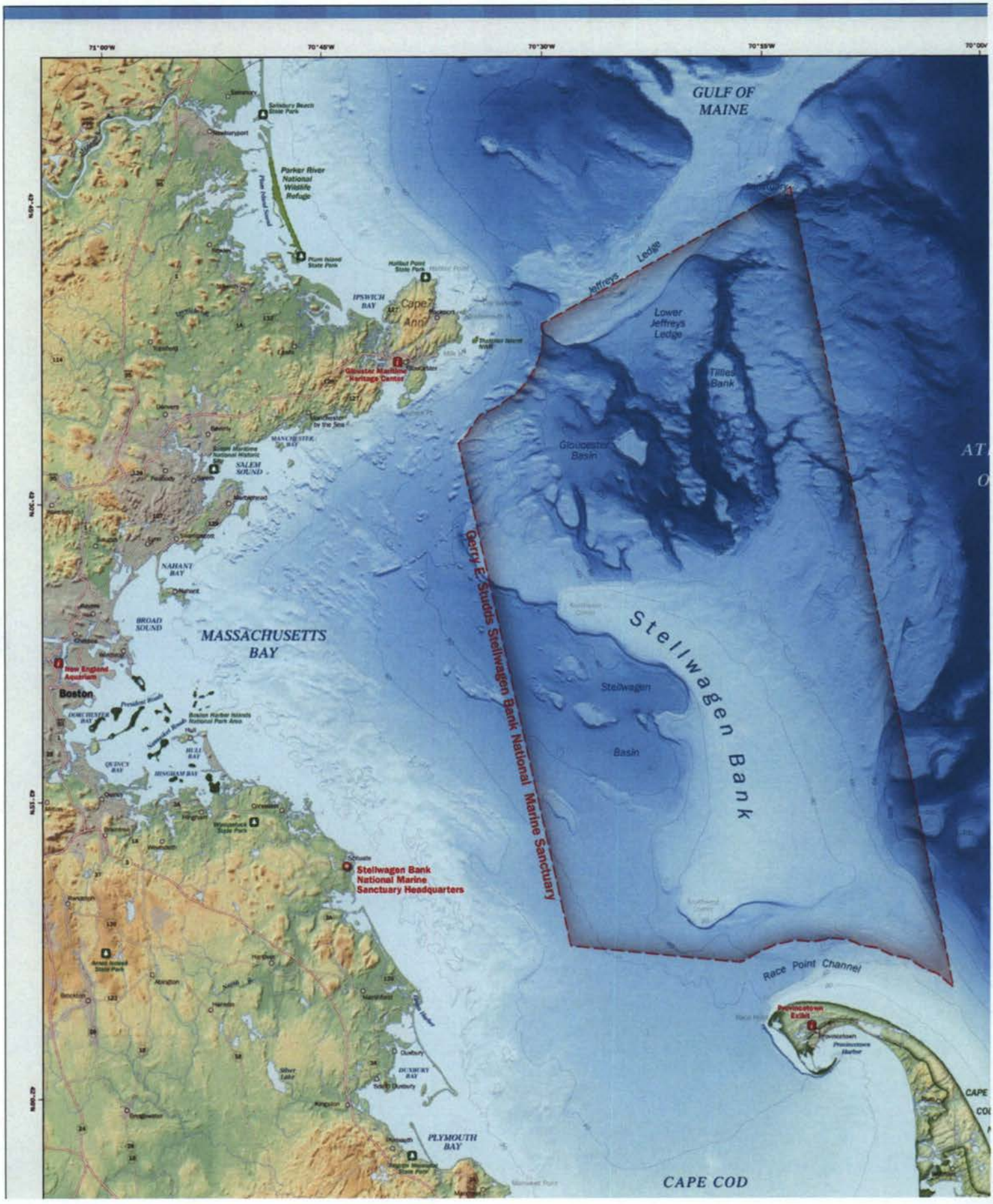
GULF OF MAINE
Parker River National Wildlife Refuge
IPSWICH BAY
Cape Ann
Gloucester Maritime Heritage Center
Jeffreys Ledge
Lower Jeffreys Ledge
Tillies Bank
Gloucester Basin
SALEM SOUND
NAHANT BAY
BROAD SOUND
MASSACHUSETTS BAY
New England Aquarium
Boston
Gerry E. Studds Stellwagen Bank National Marine Sanctuary
Stellwagen Bank
Stellwagen Basin
Stellwagen Bank National Marine Sanctuary Headquarters
Race Point Channel
Provincetown Exhibit
PLYMOUTH BAY
CAPE COD
71°00'W
70°45'W
70°30'W
70°15'W

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Sanctuary System
Stellwagen Bank National Marine Sanctuary
175 Edward Foster Rd.
Scituate, MA 02066
(781) 545-8026 FAX: (781) 545-8036

National Register of Historic Places
National Park Service
1201 Eye St., NW 8th Floor (MS 2280)
Washington, DC 20005

To Whom It May Concern, 21 July 2008

Please find enclosed the multiple property National Register of Historic Places nomination for eastern rig dragger fishing vessel shipwrecks in the Stellwagen Bank National Marine Sanctuary and an individual site nomination for the shipwreck and remains of the eastern rig dragger fishing vessel *Joffre*. The *Joffre* and future site nominations related to this multiple property nomination reside solely in federal waters off the coast of Massachusetts in a National Marine Sanctuary managed by the National Oceanic and Atmospheric Administration (NOAA). The historic shipwreck sites are under the jurisdiction of NOAA and are protected by regulations which prohibit the disturbance, salvage, or removal of historical resources. In addition to the nomination package, NOAA is providing you with information clarifying the agency's authority to nominate properties in the Stellwagen Bank National Marine Sanctuary.

The National Historic Preservation Act mandated that federal agencies establish programs to ensure that "properties under the jurisdiction or control of [such] agenc[ies] are identified, evaluated, and nominated to the National Register," as appropriate. 16 U.S.C. § 470h-2 (a)(2)(A). The National Marine Sanctuaries Act (NMSA) gives NOAA jurisdiction and management responsibility and authority over "discrete area[s] of the marine environment" designated as national marine sanctuaries. 16 U.S.C. § 1433 (a). The duties placed on NOAA by the NMSA include the protection and management of submerged cultural and historical resources. 16 U.S.C. § 1431 et seq. The authority of NOAA to nominate sites in the Stellwagen Bank National Marine Sanctuary to the National Register is further affirmed by the successful listing of the steamship *Portland*, schooners *Frank A. Palmer* and *Louise B. Crary*, and schooner *Paul Palmer* to the National Register of Historic Places in 2005-2007.

Therefore, we ask that you include the multiple property nomination for eastern rig dragger fishing vessels in the Stellwagen Bank National Marine Sanctuary and the shipwreck and remains of the *Joffre* to the National Register in recognition of its importance to the history of this nation. We believe that it is NOAA's duty to put forth nominations for properties under our jurisdiction and hope that you recognize this nomination as an attempt to meet our own mandate under the NHPA. 16 U.S.C. § 470h-2 (a)(2)(A). Thank you for your attention to this important issue. Please do not hesitate to contact me at 781-545-8026 if you have any questions.

Sincerely,

Craig MacDonald
Superintendant

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Sanctuary System
Stellwagen Bank National Marine Sanctuary
175 Edward Foster Rd.
Scituate, MA 02066
(781) 545-8026 FAX: (781) 545-8036

National Register of Historic Places
National Park Service
1201 Eye St., NW 8th Floor (MS 2280)
Washington, DC 20005

To Whom It May Concern,

25 November 2008

Please find enclosed the multiple property National Register of Historic Places nomination for eastern rig dragger fishing vessel shipwrecks of the Stellwagen Bank National Marine Sanctuary and an individual site nomination for the shipwreck and remains of the eastern rig dragger fishing vessel *Joffre*. The *Joffre* and future site nominations related to this multiple property nomination reside solely in federal waters off the coast of Massachusetts in a National Marine Sanctuary managed by the National Oceanic and Atmospheric Administration (NOAA). The historic shipwreck sites are under the jurisdiction of NOAA and are protected by regulations which prohibit the disturbance, salvage, or removal of historical resources. In addition to the nomination package, NOAA is providing you with information clarifying the agency's authority to nominate properties in the Stellwagen Bank National Marine Sanctuary.

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Therefore, we ask that you include the multiple property nomination for eastern rig dragger fishing vessels of the Stellwagen Bank National Marine Sanctuary and the shipwreck and remains of the *Joffre* to the National Register in recognition of its importance to the history of this nation. We believe that it is NOAA's duty to put forth nominations for properties under our jurisdiction and hope that you recognize this nomination as an attempt to meet our own mandate under the NHPA. 16 U.S.C. § 470h-2 (a)(2)(A). Thank you for your attention to this important issue. Please do not hesitate to contact me at 781-545-8026 if you have any questions.

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