The Evolution of New Bedford Fishing Gear: Otter Trawling

Written by Justin Demetri

In the course of about 100 years New Bedford has transformed itself from a fading whaling port with a virtually insignificant fishing fleet, to the nation's most valuable fishing port. Being close to rich fishing grounds and scallop beds is only one factor, the other being a continuous stream of new innovations and adoption of new technologies. Without a long history as a fishing port, New Bedford fishermen were not saddled with cultural and technological traditions that might have held back the evolution of the industry. The early 20th century saw New Bedford fishermen quickly adapt to new ways of fishing or in the case of sea scallops, adopt a new industry altogether.

Beam Trawling

The method of beam trawling has been used in parts of Europe for centuries. This type of trawling utilizes a large timber or "beam" to open a funnel shaped net which is dragged along the ocean floor. The beam is connected to the headline, at the top of the net mouth and at either end has large trawl heads that act like the runners on a sled. As fish enter the net, they tire and fall back to the "cod end." At the end of the tow the net is hauled to the surface and the cod end is brought on deck. The catch is released on deck by untying the knot in the cod end.

The English fishing fleet quickly adopted steam power in the 19th century for their trawlers out of famous fishing ports like Brixham, Grimsby and Hull. This type of fishing however was slow to arrive in the Western Atlantic, and once here it took even longer to be adopted. There were early attempts to bring beam trawling to American waters, and although they were not successful, they certainly were harbingers of what was to come in the ensuing decades.

A little-known but early attempt at beam trawling was undertaken in the 1860's by the McManus family of Boston. They rigged the SYLPH, a small deep draft schooner with a beam trawl, in imitation of a design known as a Skerries Wherry in their native Ireland. While this method was well established in their homeland, they had difficulties beam trawling in New England waters. Although the small craft could tow the trawl under sail alone, they could only fish on sandy bottom, otherwise they would tear the net or break the beam on hard bottom. There was little or no interest among fish buyers in the various flounder species that they caught and so the early technology was abandoned.

The next stage in beam trawling came in 1891 with the RESOLUTE of Gloucester. The vessel was designed like an English trawler and carried a ketch-rig, with a capacity of 100,000 pounds of fish. She carried a steam winch below deck for hoisting the sails and hauling in the net. However she relied only on sail power, whereas most of the English vessels of her type were steam driven by that time. RESOLUTE made four trips between November 1891 and February 1892, none of them considered successful. On her third trip the net was torn and the beam broken. Her English Captain and crew realized that the

local industry was not equipped to maintain vessels like this. In England, supplies were brought to the vessels by steamer. Meanwhile, what fish she did catch was of poor quality, often crushed or scaled after being dragged in the net. Her owners decided that RESOLUTE was too lightly built for beam trawling and converted her into a dory trawler for cod and halibut. Eventually she would be re-rigged as a schooner.

Although RESOLUTE was unsuccessful as a beam trawler, within a few years of her first trip there were small vessels out of Provincetown that began using beam trawls on the sandy bottom around Cape Cod. These vessels became known as "flounder draggers" due to the action of dragging the net along the bottom. These early draggers were the fist glimpse of what fishing would become in the 20th century. By 1905 small gasoline engines of around 10 hp were being used by the flounder draggers to improve their earning power. By 1908 the ports of Cape Cod were home to 126 flounder draggers. The increase of flounder landings increased the demand for fish that was previously of little value.

The first flounder dragger out of New Bedford was Captain Dan Mullins' EDNA J. MORSE, a small sloop that he rigged for beam-trawling. Captain Mullins employed the beam trawl in the winter flounder fishery and proved in short order that dragging was the way of the future. It did not take long for other New Bedford fishermen to notice his success and soon others began dragging with beam trawls. The flounder draggers were a start, but it would take a different type of gear, one that did not use a beam to open the net, to radically change the fishing industry.

Arrival of Otter Trawling

Like beam trawling, otter trawling arrived in America from England, where it was invented in 1860. The principle is essentially the same, but instead of the beam, this rig uses a pair of wooden otter boards or "doors" that act like underwater kites to hold the net open. In 1905 the SPRAY was launched as America's first steam trawler. At 105 feet long and 283 gross tons, the SPRAY was built of steel along the lines of the English fleet of otter trawlers. Her patented equipment, including the deck mounted steam winch, was brought over from England on a lease. But much like the earlier attempts at beam trawling, otter trawling did not look promising early on. However the SPRAY would eventually prove profitable, and by 1911, three more steam trawlers would be launched; the beginning of the Boston beam-trawler fleets. Even though these vessels fished with an otter trawl, they would always be known as beam trawlers locally.

Steam trawlers were expensive to build and to operate, rendering them beyond the means of anyone save large fishing corporations. But in the summer of 1910, New Bedford fishermen would discover that the otter trawl itself was not out of their reach. It was at that time that some of the fleet went to Montauk, New York to fish for fluke (summer flounder). The New Bedford fleet discovered that between 30-40 of the Long Island fishing vessels were already using otter trawls. Many of these Long Island fishermen were of Scandinavian origin, and it is assumed that these men brought otter trawling from their home countries.

One of the advantages of using an otter trawl instead of a beam trawl was the fact that it was easier to handle the gear and stow it on deck. This factor was one of the reasons for the development of the otter trawl in the first place. New Bedford fishermen like Captain Dan Mullins realized very quickly that otter trawling was more practical and efficient, especially on the small, 30-50 foot sloops that made up the fleet.

New Bedford's early dragger fleet with their small gasoline engines and primitive power winches would fish on shallow grounds (under 90 feet deep) using nets with a sweep ranging between 50 and 75 feet. These small drag nets were held open with wooden doors that weighed 150 pounds. This was still very early in the history of otter trawling and as time went on vessels, engines and especially the gear itself, would improve greatly.

Dragging Basics

The basic components of otter trawling – dragging – have remained the same: A large, wide funnel shaped net is towed behind a fishing vessel along the bottom using the doors to keep the mouth open. The headrope at the top of the net mouth is lined with floats. The footrope consists of chain or “rollers” (originally wood or metal) depending upon the nature of the fishing ground. Both of these lines are connected to the top and bottom of the doors on either side of the net using chain bridles. As the vessel moves through the water the doors act like kites, the water pressure pushing the net wide open. The length of the net itself acts like the tail of the kite, keeping the entire trawl stabilized. Originally, trawl nets were typically made of tarred cotton twine or another natural fiber. The early nets were towed from the vessel using manila rope, which was eventually replaced with wire cable.

Improvements to the Otter Trawl: V-D Trawl

Otter trawling, or dragging as it was better known, was taking over the local fleets in the 1920's and with it came a wave of improvements. In 1925 the V-D trawl arrived from Europe. It was invented by two Frenchmen named Vigneron and Dahl after watching an early attempt at pair trawling (two vessels towing one net). This system improved the way the net was connected to the doors. In the V-D system, ground cables are used to create some distance between the trawl doors and the net. The cables that connect the trawl to the fishing vessel, called warps, are attached to metal brackets on the trawl door using a Burrows link. From the trawl doors, chains lead to a “stopper” and “Kelley eye” which are connected to the ground cable from the net. At the wings of the net there were two sticks held vertically known as “dhanlenos” that the headrope and footrope attached to via a bridle. The dhanlenos (named for an English tightrope walker) helped ensure that the net was being properly set out. By having the doors far ahead of the actual net, they stir up a mud cloud as they drag the bottom. The mud cloud corrals fish toward the mouth of the net.

The N-E Trawl

In the 1930's experiments conducted by Ralph Symonds and Bay State Fishing Company's John Malcolm led to a further refinement in dragging known as the N-E trawl. Not all groundfish stay on the bottom and these men attempted to increase the area of the net's mouth to catch these mid-water fish. In the original otter trawl and the V-D system, the floats along the headrope were not enough to open the net wider. The use of *dhanlenos* on the V-D trawls kept the wings of the net tied down. In the improved N-E trawl system, *dhanlenos* were removed and long cable leaders were used instead to connect head and footrope. This change allowed the net to stretch out to is natural shape, the headrope now floating higher, with an overhang to trap any fish that attempt to swim over the net. Within a short time of its introduction, the N-E trawl had replaced the V-D trawl in the New England fleet.

Further Improvements: Doors, Rollers, and Chafing Gear

Over time new technology and materials further refined the otter trawl into what it has become today. It was not just the net itself that improved, but every part of trawling gear would be refined. The otter boards or "doors" were originally large rectangular devices made of oak and strapped with iron. They could weigh between 150 and 2000 pounds depending upon the vessel. The doors could become damaged as they bounced off rocks on the hard bottom and so would need reconditioning at times. The wooden doors were replaced with steel doors of the same shape, but even they could be damaged and bent. Today the doors are steel but many are now hydro-dynamically designed to better travel through the water and allow a skipper to more accurately trim the net.

Chafing Gear

When New Bedford's fleet consisted mostly of flounder draggers, the nets were towed on sandy or muddy bottom, with the use of a sweep chain along the footrope. However groundfish mostly live on or around hard bottom, which requires some form of roller gear to get the net to fish on the rocks and "humps." Without some form of roller gear, nets can bounce over the bottom, missing the fish, or can snag, causing a "hang up." With most of Georges Bank and the Great South Channel considered hard bottom, roller gear is essential for getting the net over the rocks.

Originally, rollers were made from hardwood of about 18" in diameter with a 2" hole in the middle to accommodate the roller wire. The rollers would be attached to an 8' cable with smaller wooden "spacers" and chain in between. Several 8' segments would go along the footrope, depending upon how large the net was. Since these wooden rollers and spacers could be easily damaged while towing, keeping them in manageable segments allowed a crew to replace them as needed. Besides being prone to damage, wooden rollers also tended to float during the first few tows of the day. By the 1960's iron bound rollers, with steel straps along the outside were common.

In the mid-1960's former New Bedford fisherman Walter Bruce created a small business

that quickly became an innovator in the field of trawl wire. It was Bruce who first began making roller gear from old rubber tires. These “donuts” or “cookies” were a very important development for the fishing fleet. They are more durable than the wooden rollers and allowed for improvements for both roller sweeps for groundfish and flat sweeps for flounder.

In the 1970's F&B Rubberized Inc. continued where Walter Bruce left off, creating many new products for trawl and scallop gear from old rubber tires. For the very hard bottom that was once off limits to dragging, they developed large roller gear that look like vehicle tires called “rockhoppers.” The rockhopper discs, some up to 36” in diameter, can also be pressed together on a steel tube to make one large roller. The roller gear made by F&B is still considered the best and longest lasting equipment available today.

Roller gear helps the net tow over the hard bottom, but the cod end, especially in the days of natural fiber could tear up if not protected. Some form of chafing gear was needed for when the fish-filled net makes contact with the bottom. Cow hides treated with bluestone (copper sulfate) were used as chafing gear by both the draggers and the larger beam trawlers into the early 1960's. Cowhide chaffers were also used by many draggers as temporary hatch covers during fishing operations. They provided an effective seal so no warm air could escape. Eventually the hides were replaced with chafing gear called chaffing whiskers, made up of a mat of polypropylene or polyethylene rope strands that protected the cod end.