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Reprinted by the Sound School
Adult Education Program
December 2007

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The University of Connecticut Sea Grant Marine Advisory Program is Information transfer activity of the Connecticut Sea Grant Marine Advisory Program implemented through the Cooperative Extension Service.

This report was developed with funds provided by the office of Sea Grant, National Oceanic and Atmospheric Administration, U.S. Department of Commerce

CT-SG-89-02 March 1989

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ABSTRACT

Container relaying has been an approved method in Connecticut for over ten years to cleanse oysters of bacterial contaminants. Oysters are relayed in nylon mesh bags attached to a bottom long line. This method has been modified with equal success to relay hard clams (quahogs) in VEXAR bags. Bag relaying continues to be an effective way for shell fisherman to reduce normal relay losses and utilize a resource that formerly was wasted in many Connecticut Shoreline towns.

KEY WORDS Container relaying, purification of Shellfish, closed shellfish areas Shellfish Management Programs

INTRODUCTION

The relaying of oysters and hard clams (Quahog) from closed areas to certified waters for purification is an important industry procedure in oysters from areas deemed unsafe for direct shell fishing to deeper, cleaner waters has been an accepted industry practice.

Many of these procedures originated when shallow grow-out areas (such as The Beach in West Haven, Connecticut) were closed in 1918 due to pollution. Later, transplants of adult shellfish would be utilized to cleanse them of bacteria in shorter time periods. Such relays relied upon the storm protection of shore features such as islands in the western section of Long Island Sound. These areas suitable for relays were quickly leased, and the remaining potential sites were closed to commercial shell fishing.

However, losses do occur in the relay process, which varies from site to site. These losses occur through predation, breakage in the harvesting process, and poor retrieval procedures. In Connecticut, it is estimated that up to 40% of the relayed stock can be lost to the industry as a result to the above factors, especially for short relays of less than 180 days. The shellfish industry has expanded rapidly (leasing has increased 90% in state waters) in eastern Connecticut where environmental conditions make open water relay recovery difficult, if not impossible. A new relay method was developed in 1978 incorporating large mesh bags on a long line to cleanse clams and oysters (Visel, 1978). Initial results of this relay system reduced losses to less than 10%.

BAG RELAY STUDIES

To our knowledge, the first bag relay occurred on August 7, 1978. After receiving permission from the State Department of Health Services (DOHS) and the local Madison Shellfish Commission, 15 bushels of oysters were relayed in mesh bags in 10 feet of water off the shore of Madison, Connecticut. They were relayed using a bottom trawl similar to a lobster trawl by Tom's Rocks near Webster Point Madison.

METHODS

In the 1978 Madison relay, oysters were loosely packed (1/2 bushel) in one-bushel capacity nylon mesh bags. Mesh bags were cut from a rectangular sheet of nylon two-inch mesh number 21 thread seine webbing. The sheet of webbing was then folded in half and laced along one side and the bottom edge, creating a bag approximately 40 inches across and 40 inches deep.

To complete the bag, a nylon drawstring was passed through the top meshes, creating a continuous loop when tied end to end. Mesh relay bags were attached to a lobster trawl line utilizing this drawstring. The long-line consisted of 5/16-inch polypropylene lobster pot rope. Bights (loops) of line six inches in diameter were placed approximately every 10 feet with a single overhand knot. Two trawls 150 feet long, each containing 15 realy bags, were used with lobster pot buoys at each end to mark recovery. No additional weight other than the oysters themselves kept the trawls on the bottom. In setting the trawl, each bag drawstring was drawn tight and tied to the bight of line with half hitches. It took approximately 30 minutes to set each trawl.

PROCEDURES

The procedures utilized in a bag relay are as described by Briarpatch Enterprises, Inc., of Stonington, Connecticut, and can be applied to most bag relay operations.

"Briarpatch Enterprises, Inc., has been bag relaying Mercenaria mercenaria and Crassostrea virginica since August, 1985. The summer of 1986 we redesigned our depurating bag from disposable VEXAR to reusable nylon webbing.

"Our sources of contaminated shellfish vary. We have processed product from Pawcatuck River, Mystic River, Tom's Creek, Neck River, East River, Indian River, and Housatonic River. A sample from each source is provided to the DOHS at the start of the transplanting operation.

"Our depuration lot is divided into four sub lots (A, B, C and D) separated by 500-foot buffer zones and so staked (see Fig.1). Our process begins with identifying a harvestable population of shellfish. We obtain proper town and state permits and officially close sub lot A and obtain a transplant permit in preparation for receiving shellfish.

"The shellfish are removed from closed areas by use of a hydraulic clam dredge or bull rake or oyster dredge. In the case of hard clams, the clams are sorted from the culling table directly into the depurating bags. Capacity of each bag is controlled by use of a bottomless five-gallon bucket as a measure. The bucket is inserted into the mouth of a bag, filled to capacity and then lifted so as to funnel shellfish into the bag.

“Full bags are stacked forward of the work area until harvest operation is suspended. Enroute from the contaminated area to the depuration lot, the full bags are spread out in straight lines on the clear area of the work deck. The bags are tied on polypropylene floating lines at 12-foot intervals and up to 30 bags per string. Upon reaching the lot, the vessel is positioned on a starting point by use of ranges, position is recorded and strings of bagged shellfish are deployed off the stern while the vessel moves slowly forward. Each bag must be handled to evenly distribute the shellfish in the bag as it is dropped. A finishing point position is recorded and procedure is repeated for each string. When several days’ product has been relayed to lot A, the lot is closed, transplant permit cancelled, a transplant permit is obtained for lot B, and the procedure is repeated. Hard clams are relayed on the same day they are removed from the closed area.

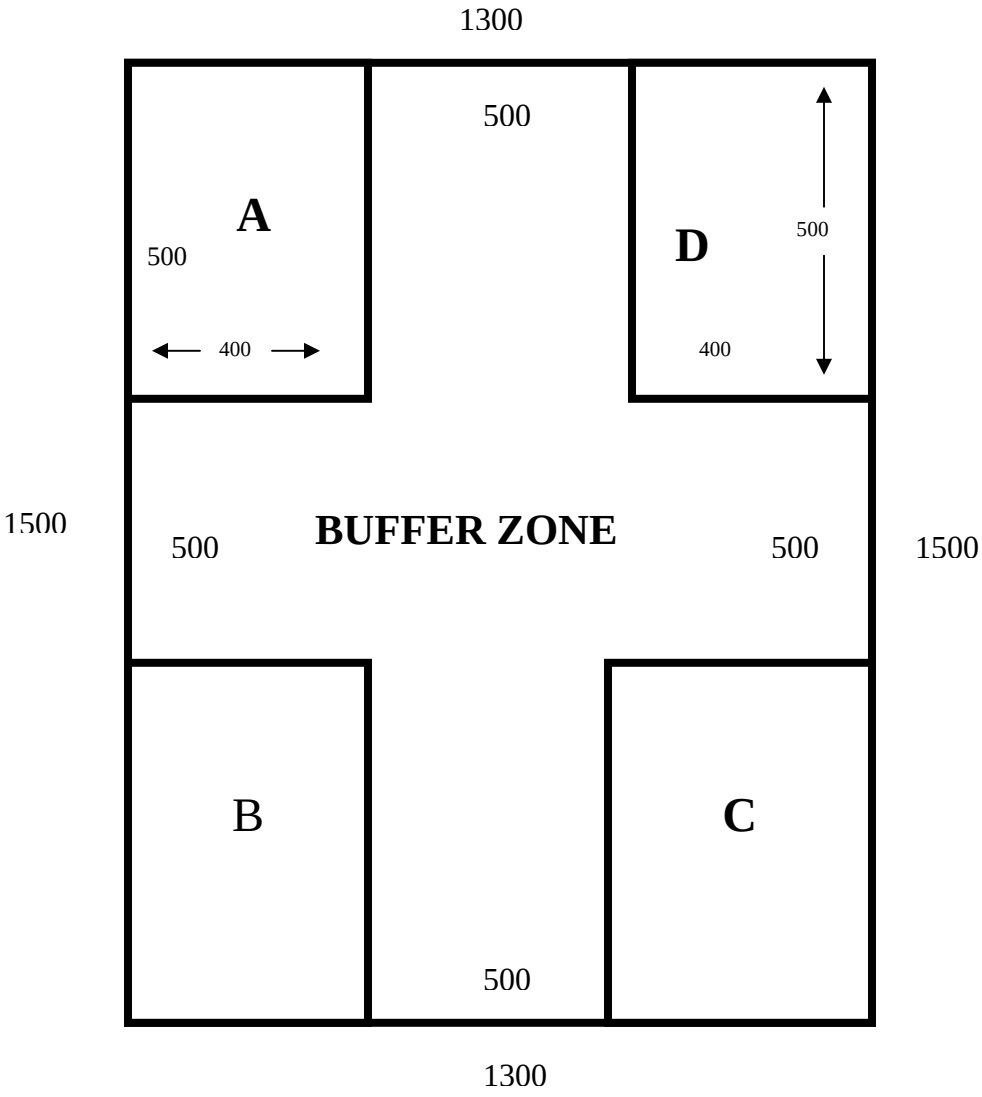
“In the case of oysters, relaying procedures are the same; the difference is in time from harvest to relay. Oysters are usually harvested with hand equipment and in lesser volumes, which do not merit deposition to a depurating lot daily. Therefore, one or two days’ catch may be consolidated before being bagged and relayed.”

“When a lot’s transplant permit is cancelled and the lot is closed, the depurating countdown begins (usually 14 days).”

“Security is achieved through several factors. All strings of bagged shellfish are set blind (without buoys). The 12-foot spacing of bags on the line makes retrieval in 15-to-20 feet of water very difficult without power equipment. The bags of shellfish are heavy enough on the bottom to resist being lifted by the occasional rod and reel drift fisherman who happens to snag one, as evidenced by the broken fishing lines I untangle from my equipment. During periods of activity, the depuration lot is observed by Briarpatch and several other fishermen many times per day.”

“Sampling takes place when sufficient time passes, usually 14 days. Sampling is done in the presence of a disinterested party acting in an official capacity. The sample shellfish are bagged, sealed, marked and refrigerated for transport to the state laboratory. When satisfactory results are reported, the DOHS issues a harvest permit for the appropriate sub lot.

Figure 1 Diagram of Four Depuration Lots
(all measurements in feet)



Note: All corners are buoyed.

“Harvest begins with grapping along the recorded coordinates and hauling several strings of bagged shellfish aboard the vessel. The bags are removed from the line and washed with a high-pressure seawater hose to remove silt or algae from the shellfish. When washing is complete, shellfish are sorted as to shape, size and species, and bagged and tagged for market. Product mortality is assessed for predation, cracked shells and mud clams and recorded in the back of the shellfish logbook. The logbook is also a record of the source and quantity of shellfish harvested and to whom sold.

RESULTS AND DISCUSSION

Some of the questions that had to be addressed with bag relaying was mortalities, condition of the product, the configuration of bag on the bottom, and of course, demonstrable reduction of bacterial contamination. All bag relay programs are permitted and monitored by the Connecticut DOHS under guidelines issued April 26, 1988.

Mortalities differ according to the bottom type. Bag relays realize substantially lower mortalities than open water relays and subsequent recovery. Stewart (1988) found that 1.5 bushel capacity nylon bags with one inch mesh approved by the Connecticut DOHS for hard clams at no time experienced more than one percent mortality in depuration (relay) times of one-to-two-and –a half months. The product was clean, sand free and highly marketable in the restaurant trade.

Underwater observations conducted by Stewart revealed that the “bags flatten out on bottom and the majority of contained hard clams bury in sediment and assume normal siphon feeding/respiration posture. This is assured when bags are filled to 1/3 to ½ capacity. Depuration grounds which allow ebb and flood bottom current achieve thoroughly adequate circulation and no restrictions are obvious.” Gilbert and Follini (1989) reported that bag relay mortalities have been less than five-percent. Half of this is due to starfish predation, the remainder to cracked or damaged shells. Visel (1981) reported that mortalities could vary according to bottom types, with lowest mortalities from hard sand bottoms, four-percent to eight-percent to 20-percent for soft mud bottoms. Underwater observations by Gilbert and Follini (1989) by use of SCUBA equipment have helped refine bag shape to its present stage, which deploys very well on the bottom. Observations of hard clams have shown the clams are able to spread out and actually dig into the bottom. Oysters were observed evenly distributed through the bags in layers not more than two oysters deep.

Bacterial levels are substantially reduced in the bag relaying process. Ten years of data compiled by Malcolm C. Shute, Principal Environmental Sanitarian of the Connecticut DOHS shows this cleansing of the Shellfish. Examples of before and after bacteria examinations are included in Table1 were obtained from Mr Shute.

Table 1. Bacterial Examination of Oyster and Clam Meats
Connecticut State Department of Health
Laboratory Division, Hartford, Connecticut

Date	Location (Source)	Coliform organisms MPN/100 grams	Fecal organisms MPN/100 grams	Standard Plate count per gram	Relay Period
9/9/78	Hammonasset River oysters (moved to):	3500	170	900	8/26/78 9/19/78
9/19/78	BED 101 Relay Result	78	< 18	100	
8/5/85	Tom's Creek Oysters (moved to):	54,000	170	8,600	7/25/85
8/5/85	BED 101 Relay Result	110	< 18	720	8/5/85
4/27/87	Thames River hard clams (moved to):	11,000	490	3,400	4/27/87
5/11/87	BED 4-A Relay Result	< 18	< 18	1,100	5/11/87
5/18/87	Thames River hard clams (moved to):	3,300	1,300	3000	5/18/87
5/31/87	LOT A-2 Relay Result	130	< 18	7,900	5/31/87
6/9/87	Thames River hard clams (moved to):	3,300	78	22,000	6/9/87
6/21/87	LOT A-1 Relay Result	20	< 18	680	6/21/87
4/2/88	Neck River oysters (moved to):	490	330	N.A	4/2/88
5/23/88	BED 413-D Relay result	170	45	500	5/23/88
6/16/88	Gulf Pond oysters (moved to):	490	45	500	5/2/88
6/15/88	BED 413-D Relay Result	4,600	< 18	4,400	6/14/88

Top test indicates source of initial test. The length of the relay period is at the far right. The Relay result test reflects the location of the certified shellfish area period.
None of the relayed shellfish failed to pass the retest after the relay period.

CONCLUSION

Research to date has shown bag relaying to be an effective and economic way for small-scale shell fishermen to cleanse polluted shellfish. The authors feel that for independent baymen, the opportunity to relay with minimum loss can sustain fisheries in areas closed to shell fishing. The limiting factor, of course is suitable water temperatures required for relaying, and therefore relaying must be considered a supplemental or seasonal fishery.

ACKNOWLEDGEMENT

This research was supported by the University of Connecticut Sea Grant Program. The authors wish to thank Mr. Malcolm Shute, Principal Sanitarian of the Department of Health Services, Shellfish Unit, for his comments and assistance in preparing this report.

A special thanks to Margaret Van Patten for the preparation of the figure and table, and to Dolores Chambers and Eleanor Minik for final reviews.

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