A LIMITED STUDY ON THE SANITATION OF FISHING TRAWLER HOLDS

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SUMMARY

The bacterial load on surfaces of wooden fish pens was uniformly in excess of 10^8 per square inch prior to cleaning. Conventional hand scrubbing and rinsing with harbor water failed to reduce the count, whereas the application of a hot jet of detergent followed by rinsing with potable water effected over a 100-fold reduction over most of the hold surfaces. The effect of harbor water versus tap water for rinsing was not studied.

The efficient cleaning of fish-hold compartments and penboards used for holding fish during iced storage at sea is necessary to maintain high quality of product and to prevent the development of bilgy fish. Castell *(1)* and MacCallum *(2)* have shown that this type of spoilage results from the contact of fish with slime-soaked wooden penboards.

This limited study was undertaken to compare two methods for removing slime and reducing the bacterial flora on hold surfaces of a commercial New England trawling vessel.

EXPERIMENTAL METHODS

The first cleaning method studied was that usually employed by local fishermen and consisted of conventional hand scrubbing followed by liberal hosing and flushing with untreated harbor water. The second cleaning method consisted of application of a heated (180 F) chlorinated detergent ("Sanitizer," Casco Chemical Company, Beverly, Mass.) under pressure (280 psi) with a hydraulic jet cleaner (Model B-1250, Sellers Injector Corp., distributed by the Marsh Co., Nashua, New Hampshire) followed by rinsing with potable water[1]. All operations were performed on the same commercial fishing vessel and in the same hold. The second cleaning method was applied 25 days after the first and after the vessel had completed several fishing trips.

Swab samples were taken at 13 locations on fish pen surfaces in the hold immediately after the cargo of fish was unloaded, and again from 13 surfaces adjacent to the former, immediately after cleaning. Swab samples of 1-inch square areas of wooden hold surfaces were taken using stainless steel templates and sterile calcium alginate wool swabs. They were transferred aseptically to 10 ml of 1% Calgon for dissolution. Serial 1:10 dilutions of dissolved swabs were prepared in broth composed of yeast extract (Difco), 0.20%; tryptone (Difco), 0.20%; dextrose, 0.20%; sodium chloride, 0.25%; and distilled water at pH 7.0. Dilutions were plated in duplicate in the above medium containing 1.5% agar, and the plates incubated at 20 C for 5 days.

[1]The use of trade names is to simplify descriptions; no endorsement is implied.

RESULTS AND DISCUSSION

After hand scrubbing, fish storage compartment surfaces, which were heavily coated with slime and debris after the fish had been unloaded, appeared visually clean and free of slime. The data in Table 1 indicate, however, that hand scrubbing with harbor water failed to remove the heavy load of microorganisms even though the surfaces were visually clean. The heavy load of microorganisms on the hand-scrubbed compartments was undoubtedly due to slime entrapped in the grossly pitted surfaces of the wood. The use of untreated harbor water might also be expected to contribute to the bacterial load.

The application of hot detergent with a force of 280 psi reduced the bacterial load over most of the hold surfaces by 100 times. The greatest reduction achieved was 99.89% with only two samples failing to show at least a tenfold reduction in count.

The difficulties in efficiently reducing the bacterial load on wooden surfaces and the resulting effect on quality are evidenced in previous work. MacCallum *(2)* found that all fish stored against heavily contaminated wood surfaces became bilgy within 7 days and that fish de-slimed and then placed in contact with a previously hand-scrubbed penboard developed bilgy odors in 2 days under ice. In contrast, he found fish in contact with steam-sterilized boards, fresh wood, and aluminum sheeting showed no bilgy odors under similar storage periods and recommended the use of aluminum sheeting in fish pen holds. Spencer *(2)* observed that wooden fish boxes coated with a urea-formaldehyde resin were less contaminated and more efficiently cleaned than uncoated boxes. These results and those reported herein clearly indicate that conven-

TABLE 1. EFFECT OF CLEANING METHOD ON TOTAL COUNT PER SQUARE INCH OF HOLD SURFACE

	Hand-scrubbed and rinsed with untreated sea water			Hot jet detergent application followed by rinsing with potable water		
Sample no.	Bacterial count before cleaning	Bacterial count after cleaning	Percent change	Bacterial count before cleaning	Bacterial count after cleaning	Percent change
1	23×10^7	63×10^7	+173.91	125×10^7	14×10^5	−99.89
2	26×10^7	32×10^7	+23.07	29×10^7	13×10^5	−99.55
3	22×10^7	31×10^7	+36.36	88×10^7	52×10^5	−99.41
4	42×10^7	28×10^7	−33.33	67×10^7	29×10^5	−99.57
5	27×10^7	12×10^7	−55.56	32×10^7	71×10^6	−77.81
6	34×10^7	39×10^7	+14.70	35×10^7	23×10^6	−93.43
7	42×10^7	35×10^7	−16.69	25×10^7	26×10^5	−98.96
8	21×10^7	39×10^7	+85.71	192×10^7	8×10^7	−95.84
9	30×10^7	34×10^7	+13.33	40×10^7	16×10^5	−99.60
10	9×10^7	22×10^7	+144.49	48×10^7	11×10^5	−99.77
11	45×10^7	38×10^7	−15.56	61×10^7	18×10^5	−99.70
12	13×10^7	7×10^7	−53.86	22×10^7	29×10^7	+3.18
13	26×10^7	8×10^7	−69.24	85×10^7	17×10^5	−99.80
Mean	28×10^7	30×10^7		65×10^7	37×10^6	

tional hand scrubbing of porous wooden surfaces with untreated harbor water fails to remove the bacterial population satisfactorily. The application of hot pressurized detergent was found far more efficient in reducing bacterial numbers on porous wooden pen surfaces. The use of aluminum sheeting or the application of presently available plastics such as polyphenols, polyurethane, and urea-formaldehyde resins to wooden fish pen surfaces to render them impervious to bacteria and to facilitate efficient reduction of the bacterial load would appear to offer considerable advantage in the sanitation of fish pen holds.

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