

SHALLOWER STORAGE PENS IMPROVE FISH QUALITY

By Joseph F. Puncochar* and Samuel R. Pottinger**

ABSTRACT

Fish and ice were packed in a storage pen of a fishing vessel. The pressure at the bottom was measured for piles of different heights and after varying periods of settling. The pressures recorded reached 446 pounds per square foot for a pile 52 inches high which had been settling for 3 days. Shallower packing would reduce the pressure and lead to the landing of fish of better quality.

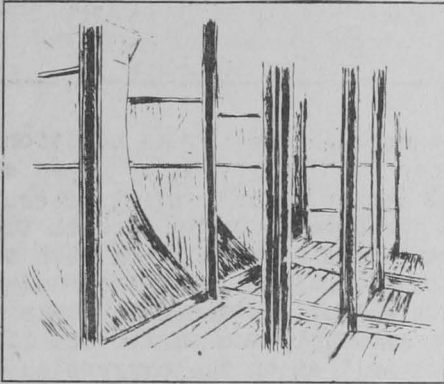


FIGURE 1 - HOLD WITHOUT PEN BOARDS

In the holds of most fishing vessels (Figure 1) there are a series of slotted vertical posts into which pen boards, approximately $4\frac{1}{2}$ feet long by 6 to 10 inches wide, can be inserted, as desired, to provide pens for storage of the catch. As the fish are stowed with crushed ice, each pen is generally subdivided, especially on the larger vessels, by the additional insertion of horizontal boards to give two or more compartments, one above the other, which vary in height from 4 to 5 feet.

To measure the pressure to which the fish are subjected at various depths, a slightly inflated rubber bladder, which had airtight connections through copper tubing to a manometer, was placed at the bottom of the pen. Then fish (haddock) and ice were placed in the pen (Figure 2) to a depth of 24 inches

Observations of fish landed at Boston showed that, when other factors were equal, those fish which had been held aboard the vessels in the lower layers of deeply-packed pens were considerably inferior in quality to the fish that had been in the upper layers or in shallow pens.

The reason for this difference is shown by measurements which demonstrate how the pressure on the lower fish increases with the depth of the pile and also with the passage of time, during which the ice melts and the fish pack down more tightly.

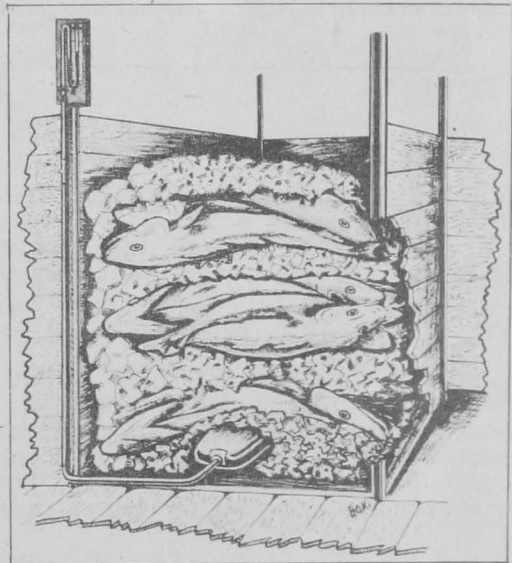


FIGURE 2 - PRESSURE RECORDING DEVICE

*Bacteriologist, Fishery Technological Laboratory, Boston, Mass.

**Chemist, Fishery Technological Laboratory, College Park, Md.

Illustrations by Boris O. Knake, Fishery Engineer, Fishery Technological Laboratory, Boston, Mass.

The authors and illustrator are members of the staff of the Division of Commercial Fisheries.

in the manner described by Knake (1946). When the apparatus reached constant temperature, the manometer showed that the pressure on the bladder was 86 pounds per square foot.

Each day thereafter the pile was built up to a higher level with more fish and ice, and the new pressure reading was recorded. These readings are shown in Table 1. By the fifth day, the height of the pile had reached 60 inches, and the pressure reading was 346 pounds per square foot.

Table 1 - Pressure on Fish at Various Depths in Fish Pens

Days in pen Number	Depth of fish and ice in pen Inches	Pressure Lbs. per sq. ft.
0	24	86
1	32	144
2	48	216
3	50	245
4	56	317
5	60	346

To show how the pressure varied with time at a constant depth, an additional experiment was carried out. The bladder was placed at the bottom of a pen and covered with ice and fish as before to a depth of 52 inches. The initial pressure at constant temperature was found to be 389 pounds per square foot. On each succeeding day any decrease in the height of the pile was made up with fresh fish and ice, and the pressure again determined. By the third day, the pressure reading for the 52-inch pile had risen to 446 pounds per square foot, as shown in Table 2. The decreases in height that had to be made up were evidently due to the settling of the pile and, perhaps, compression of the fish, as well as to the expression of their body juices and melting of the ice.

Table 2 - Pressure on Fish at Constant Depth of 52 Inches

Days in pen Number	Depth of fish and ice in pen Inches	Pressure Lbs. per sq. ft.
0	52	389
1	52	389
2	52	432
3	52	446

Upon examination of the fish stored in the deep pen, it was found that those from the lower part were badly crushed and were considerably inferior to those that had been stored in shallower pens. In similar experiments, Ellison (1934) demonstrated that fish lose 10 to 12 percent in weight during storage in deep pens.

From these experiments it is obvious that, to reduce the bruising of fish aboard many of the larger vessels, shallower pens should be used. In fish pens about 30 inches deep, or approximately one-half the present depth, the pressure exerted on the bottom layer of fish would be reduced to 144 pounds, or less, per square foot, and the fish would lose less weight, have fewer bruises, and be of generally better quality when landed.

LITERATURE CITED

ELLISON, W. A., JR.

1934. Prevention of spoilage at sea. Part 2, The Hold. Fishing Gazette. April. Vol. 51, No. 4, pp. 17-19.

KNAKE, B. O.

1946. Icing fish at sea. Fishery Leaflet 189. U. S. Fish and Wildlife Service, Chicago 54, Ill.