

# FRESH FISH SHIPMENTS IN THE BCF INSULATED, LEAKPROOF CONTAINER

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The Bureau of Commercial Fisheries' leakproof, insulated, shipping container can be used to expand the markets for fresh fish to inland cities not now reached--provided reliable transportation can be found. This article describes tests made using the conventional nonrefrigerated trucking system to transport containers of fish to retail stores in three cities for 10 weeks. In general, the results were encouraging despite delays caused by trucking strikes in one city.

The March 1968 issue of COMMERCIAL FISHERIES REVIEW (CFR) contained a report describing the development of an insulated, leakproof, container at the Bureau of Commercial Fisheries Technological Laboratory (Gloucester, Massachusetts). It explained the need for a container suitable for extended shipment of chilled fishery products via air, rail, refrigerated or nonrefrigerated truck. It presented the details of the container, which we believe meets the need.

Now we give the results of an extended series of shipping tests in which we shipped fresh fish via conventional nonrefrigerated trucks.

Nonrefrigerated trucks provide service to almost every section of the country. The truckers will handle small lots (one or more packages) and, within 3 days, can reach cities within a 700-mile radius of Gloucester. These companies pick up at the shipper's plant, transfer to one or more truck lines as needed, and deliver directly to retailers or distributors. However, unknown factors in this service are: (1) time that might be needed to reach various cities, (2) type of handling the container might receive and effect these factors might have on quality, and (3) the long-term, week-to-week, reliability of the service.

Therefore, we set up a series of test shipments that would provide us with information on (1) the time trucks needed to reach 3

selected cities, (2) condition of product and container on arrival, and (3) overall reliability of the service.

## Procedure

### Selection of Cities

One criterion used in selecting cities was distance. We wanted to have the shipments sent to 3 locations within a radius of about 700 miles from Gloucester. Another very important criterion was that there be a retail outlet in the city in which we knew, from previous contacts<sup>1/</sup>, that people would be willing to help us record the necessary data each week for a total of 10 weekly shipments. Combining the 2 requirements resulted in selecting Burlington, Vermont, 175 miles from Gloucester; Syracuse, New York, 355 miles away; and Pittsburgh, Pennsylvania, 635 miles away.

### Packing

Each Friday afternoon, fish that had been caught 2 to 4 days before were obtained from processors in Gloucester. Each shipment consisted of two or three 25-pound-size fillet tins. One was filled with haddock fillets; the other or others with whiting, ocean perch, or pollock, depending on availability. The tins were held over the weekend in a chill room at 33° F., then packed in the shipping containers on Monday morning. The containers and method of assembly were essentially those described in CFR. (Figure 1 shows a container being prepared for shipment.)

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Selection would have been very difficult without help from BCF Division of Marketing.





Fig. 1 - Preparing BCF insulated, leakproof, container for shipment.

For the first 5 shipments, refrigeration was provided by ice frozen in polyethylene bottles, each containing about 2 pounds of ice. The bottles were placed under, beside, and on top of the fillet tins to provide 24 pounds of ice for the Burlington shipments and 30 pounds each for the Syracuse and Pittsburgh shipments. For the last 5 shipments, a slab of absorbent urea-formaldehyde foam was placed under the fillet tins, and 10 to 15 pounds of the bottled ice were replaced with an equal weight of loose flake ice. As the ice melted, the water was absorbed by the urea-formaldehyde foam, so no free water accumulated in the container.

### Shipping the Fish

Each Monday, for 10 weeks, the filled containers were picked up at the laboratory by

a local intercity truck and taken to Boston where the containers were transferred to interstate truck lines. On arrival, the containers usually were transferred again, either a smaller truck of the interstate trucker, to a truck of a separate company specializing in city deliveries. Then the containers were delivered to the final destination.

### Recording Information

On delivery of the containers, the recipient noted the date and time of arrival, condition of container, condition of product based on its odor and appearance, temperature of product, temperature of outside air, pounds of ice remaining, and whether any free liquid was present. The information was then mailed to the laboratory for summarizing. The findings are presented in table and discussed below.

### Results of Shipping Tests

#### Burlington

On the whole, the shipments to Burlington were the most successful, particularly in punctuality; the slowest shipment was only 1½ hours later than the fastest. Although the average of all product temperatures was 37° F., the products packed with bottled ice averaged 37° F., and those packed with some flake ice averaged 33° F.

#### Syracuse

Deliveries in Syracuse were considered more erratic than in Burlington. Of the 5 shipments, 5 arrived in about 1 day, but others arrived in 3 days. The quality of

Summary of Data Recorded During Intercity Shipping Tests

Destination	Shipping <sup>1/</sup> Time		Condition of Container	Condition of Product	Product <sup>2/</sup> Temperature		Outside Air <sup>3/</sup> Temperature		Ice Used Per 24 Hours		Amount of Liquid
	Ave.	Range			Ave.	Range	Ave.	Range	Ave.	Range	
Burlington, Vt.	25.5	25.0 to 26.5	Good to Very Good	Good to Very Good	35.0	32.0 to 39.0	52.0	30.0 to 67.0	5.2	3.0 to 6.8	Trace
Syracuse, N.Y.	45.5	23.0 to 77.0	Good	Good to Excellent	33.8	32.0 to 38.0	63.2	40.0 to 84.0	4.2	1.7 to 6.6	None
Pittsburgh, Pa.	70.25	50.0 to 75.0 <sup>4/</sup>	Very Good	Fair to Good	36.9	35.0 to 40.0	42.3	32.0 to 60.0	6.9	6.0 to 7.3	Trace

<sup>1/</sup>Shipping time is elapsed time between loading on truck at Laboratory and unloading at final destination.

<sup>2/</sup>Products were all at 33° F. when packed.

<sup>3/</sup>The outside air temperature in Gloucester at time of packing averaged 59.2° F. and ranged from 43.0 to 75.0° F.

<sup>4/</sup>Three shipments were delayed up to 1 week by various causes. These times are not included.



product, however, was unimpaired; temperatures were satisfactorily low, and sufficient remained to safeguard product for an even longer period. Again, products packed with bottled ice had slightly higher average temperatures-- $34.5^{\circ}$  F.--than those packed with some flake ice, where the temperature of the products averaged  $33.0^{\circ}$  F. The average of all shipments was  $33.8^{\circ}$  F.

### Pittsburgh

Shipments to Pittsburgh were least successful. Two were delayed by strikes until the fish were inedible; in a third, the container was lost in the city and not found until the fish had spoiled. With the successful shipments, however, deliveries were punctual although the temperatures of the fish were a little higher than desirable, they were not excessive, and no significant loss in quality occurred. Differences in temperature also were noted in the Pittsburgh shipments. The products packed with all bottled ice averaged  $38^{\circ}$  F. compared with  $35^{\circ}$  F. for products packed with some flake ice. The overall average temperature was  $36.9^{\circ}$  F.

### General

In all shipments (except those delayed by strikes or lost), the insulation lining the container ensured sufficient ice to keep fish properly chilled for at least another 24 hours beyond time fillets were received. The containers showed no evidence of rough handling: all arrived in good or very good condition, and the fillets showed no significant loss in quality.



Fig. 3 - BCF Technologist prepares to examine shipment after delivery to retail store in Burlington, Vt.

Although delays were encountered in about 10 percent of the shipments, all occurred in one city where conditions were unusual at the time of our tests. In routine shipments, with improved communications between consignor and consignee, delays caused by strikes or other unusual circumstances might be avoided by selecting alternate routes or means of transportation.

### Conclusions

The conventional nonrefrigerated trucking system can be used satisfactorily to ship chilled fish to cities within a 700-mile radius of the processor. The BCF insulated, leak-proof, container is eminently suitable for this use. It protects against loss of quality by preventing excessive increases in temperature during transportation; it prevents damage to other goods in the truck by ensuring that no fish juice or ice water can escape the container.

