

SHIPPING LIVE DUNGENESS CRABS BY AIR TO RETAIL MARKET

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During shipments of live Dungeness crabs from Washington and California to distant retail markets, many crabs in each shipment die; frequently, all die. Reported here is a study made by BCF's Seattle Technological Laboratory to reduce these losses. As a result of this study, live Dungeness crabs can now be shipped by air, with a maximum loss of 5 percent, to any major city in the U.S.

For shipment of live Dungeness crabs to retail markets was begun about 2 years ago by processors in California and Washington. The main outlet for the live crabs was in the Hawaiian Islands, where the shippers found a ready market. However, crabs in the early shipments suffered from high mortality during transit and during holding after arrival. Frequently, the mortality was 100 percent.

In trying to solve this problem, the BCF Technology Laboratory in Seattle, Wash., began a cooperative study with a local shipper to improve the method of shipping.

RECOMMENDATIONS

The successful transportation of live Dungeness crabs by air requires proper handling before shipment, adequate packaging and proper handling after shipment.

A. Handling Before Shipment

The methods presently used by the crab industry are not always conducive to marketing crabs in top-quality condition. The following steps are recommended to ensure that only crabs of highest quality are used for shipments:

On the vessel, carefully remove the crabs from the pots and place them in a live well supplied with fresh, circulating seawater. Keep the injured and weak crabs separate from the uninjured and strong ones.

2. At the shore plant, carefully place the crabs in a live tank equipped to provide fresh, cool, flowing seawater. For best results, store the crabs in the holding tank at a ratio of no more than 2 lbs. of crab per square foot of storage area.

3. Keep the crabs in the holding tank for at least 24 hours prior to shipping. Promptly remove any injured or weak crabs. (During this holding period, the crabs do not need to be fed.)

4. Do not allow the crabs that are to be air shipped live to be held dry--that is, out of the water. (Although holding crabs out of water is common practice in preparing them for cooking, such practice is detrimental because it causes the gills to become dry. This causes the crabs to weaken and die relatively soon.)

B. Packaging for Shipment

Although great importance must be attached to the handling of crabs prior to shipment, even greater importance must be attached to procedures and materials used for packing live crabs. The critical factors are (1) the prevention of injury and (2) the control of temperature and humidity.

1. Prevention of Injury

Injury, which is caused by rough handling and improper packing, kills crabs. Tests have proved that losses are largely eliminated when crabs are properly handled and protected

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against damage. In laboratory experiments, various packing materials were evaluated for their ability to prevent injury. Materials tested included burlap, newsprints, wood shavings, seaweeds, and cellulose blankets. The most effective material was an embossed, crepe-cellulose, fiber blanket called Kimpak.^{1/} This material not only cushioned the crabs from shock but, when moistened, increased humidity in the container. It is easily stored and inexpensive. A half square yard of $\frac{1}{2}$ -inch-thick Kimpak, for example, is enough to pack 50 pounds of crab in a Wet-Lok crab shipper and costs about 35 cents.

Banding claws to reduce injury, using methods developed for lobsters, was also tried. Banding proved awkward, time consuming, and not necessary.

2. Control of Temperature and Humidity

The control of temperature and humidity in packaged live crabs is of paramount importance. In laboratory tests, crabs were kept alive and in good condition for from 1 to 3 days under ideal conditions--at cool temperatures from 35° to 50° F., and at high relative humidities of 80 to 100 percent. When exposed to environments of temperatures above 50° F. and humidities below 70 percent, the crabs survived less than $\frac{1}{2}$ day.

Temperature and humidity during shipment can be controlled by using a suitable shipping container. The container must be insulated, leak-proof, light in weight, easy to handle, and reasonably strong. A strong container helps to protect the live crabs from external sources of damage.

At present, several containers on the market meet most or all the requirements. These containers are variously constructed of foamed polystyrene liners supported by corrugated fiberboard master cartons, or by waxed and resin-impregnated fiberboard insulated with waxed (exterior) double-corrugated fiberboard.

The foamed polystyrene containers are suitable for shipping live crabs and are used extensively for shipping live lobsters. These containers cost 2 or more dollars each in quantity lots. However, a cheaper foamed plastic container, developed by BCF's Gloucester (Mass.) Technology Laboratory, was recently introduced. Good results were obtained when the BCF container was used in shipping live crabs. It costs about \$1.50 each in quantity lots.

Most of our experiments were made using a modified insulated Wet-Lok container (waxed and resin-impregnated fiberboard) designed by us in cooperation with a local paper company. The insulated Wet-Lok has the characteristics necessary for safe shipment of live crabs and is relatively inexpensive. The fiberboard container costs about 90 cents each when bought in quantity.

In addition to adequate packing material and shipping containers, a suitable refrigerant also is needed. One of the best approaches to refrigerating live crabs during shipment is to use gel-ice (sometimes called Zero Pack or Reusable Ice^{1/}). Gel-ice, besides being a good refrigerant, is not liquid at temperatures above the melting point of ice, and it is not toxic. In quantity lots, a 3-pound pack costs about 10 cents a pound.

Based on laboratory and commercial results, BCF's Technology Laboratory at Seafield recommends the following procedures for handling and air shipping live Dungeness crabs:

1. Select an insulated and leakproof container capable of holding about 50 pounds of crab.

2. Place about 12 pounds of frozen gel-ice (the 3-pound pack version) or its equivalent in the bottom of the container.

3. Cover the gel-ice with a single pack of moist material, such as Kimpak, and prechill the container and packing material at 0° or colder, for at least an hour (Figure 1).

4. After carefully prechilling the container, load it with live crabs (Figure 2).

5. Layer the crabs (Figure 3) in the container. Separate the layers with a single pack of moist material, such as Kimpak. Cover the top layer of crabs with a single moist pack. Depending on size and weight of crabs, don't use a pack container with more than 20 to 25 live crabs, or about 50 pounds.

6. Place the top of the container in position (Figure 4), and secure the container at the top with double strapping. Mark container appropriately--for example, "Live Crabs," "Keep in Cool Place," "This Side Up," "Do Not Freeze."

7. Ship the crabs as soon as possible after they are packaged.

^{1/}Trade names mentioned do not imply endorsement but are used only to simplify descriptions.

Notify forwarding agent that live crabs are being shipped so extra care can be given during shipment.

Crabs so packed will survive out of water for 25 to 30 hours at ambient temperatures -- from 65° to 75° F.



Fig. 1 - Modified Wet-Lok crab shipper prepared with gel-ice and Kimpak prior to prechilling.

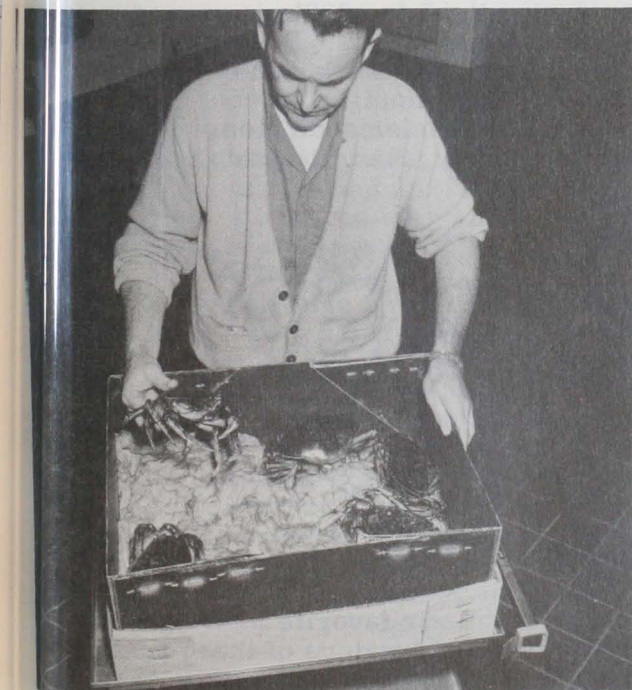


Fig. 2 - Loading live crabs into the shipper.



Fig. 3 - Layering live crabs in the shipper.



Fig. 4 - Placing container top into position prior to strapping.

C. Handling After Shipment

On arrival, the crabs should be examined immediately. Weak crabs should be removed and processed immediately--cooked. The remaining crabs should be placed in a seawater live tank; the water should be circulated at a rate of 10 to 15 gallons per minute and refrigerated at 40° to 50° F. If natural seawater is not available, synthetic seawater can be substituted. (Synthetic seawater salts are available from commercial sources.) If the crabs are displayed in a closed system, such as a lobster-display tank, the water must be filtered. Although glass-wool filters are commonly used in display tanks, we recommend sand filters.

MARKET POTENTIAL

The market for live Dungeness crabs is substantial. Since crabs were introduced to the Hawaiian Islands about 2 years ago, sales have more than doubled. The potential market in the Midwest and East also appears good. Test and commercial shipments of live Dungeness crabs into these areas indicate demand for this type of product would be more than several million pounds a year.

While the Dungeness crab industry is trying to expand its markets through diversification of its product and increased advertising, marketing these crabs alive apparently would fit into the picture readily. If developed in the same manner that the live-lobster industry was, the live-crab industry should be successful.



A DIFFERENCE IN PHILOSOPHY

The introduction of carp into North America during the late 1800's is viewed by many anglers and fishery managers as a mistake of gigantic proportions. During the intervening years, carp and similar species--generally classed as "trash fish"--have been the objects of extensive, expensive, and often futile eradication campaigns. Even small numbers of carp in favorite trout and bass waters evoke demands from anglers to "do something" to get rid of them. In this country, then, the carp is damned, despised, and destroyed.

A brief note in an issue of 'The Progressive Fish Culturist' is of particular interest since it dramatically illustrates the differences in outlook between East and West. In India, a country badly in need of animal protein, fishery workers were having problems--as they seem to have all over the world. Mosquito-fish, the same species so popular in the United States for use in mosquito control programs,

were seriously interfering with the production of one of their favorite food fish. Consequently, a chemical control program was instituted to rid their waters of these pests. The program was successful and soon their waters teemed with the favored species. This species was, of course, carp. ('Outdoor California,' Department of Fish and Game, Sacramento, California.)

