

# FISHERIES DIVERSIFICATION PROGRAM

Productivity and Product Enhancement

Project Summary: FDP 1

2002

## Seawater Spray Holding System Tested



The M.V. Atlantic Challenger

The expansion of the snow crab industry has been one of the fishing industry's most important responses to the cod moratorium. With this relatively new sector comes the seafood industry's core requirement to improve quality at every level. Testing a new onboard crab storage system to improve snow crab quality is at the heart of this project supported by the Fisheries Diversification Program (FDP).

Specifically, when live crab comes over the side, it is stored below in a refrigerated seawater spray compartment instead of being stored in ice. This FDP project examined the new storage system through 14 voyages and provided some comparisons with more traditional storage systems. More information on this and other FDP projects is available through the Department of Fisheries and Aquaculture.

Canada



Government of  
Newfoundland  
and Labrador

## Background

Traditionally, crab is held onboard fishing vessels in ice. This method is effective for a large portion of the crab industry. However, for those on extended fishing trips of four or more days, especially when coupled with warmer summer temperatures, a portion of their catch may arrive at dockside critically weak or dead.

It is vital for the industry to explore any new technology which will allow Newfoundland and Labrador to produce top-quality seafood, resulting in the highest market prices possible.

In 1999, the FDP approved cost-sharing arrangements for the purchase and installation of a refrigerated seawater spray system and a refrigerated chill unit with Captain Ross Petten, owner/operator of the M.V. Atlantic Challenger, a recently constructed 65-foot, steel vessel. Captain Petten had harvested snow crab in experimental fishing areas around the 200-mile limit, and he decided existing holding methods were not sufficient to maximize the liveliness of the crab.

Suppliers of refrigeration and chill systems locally were contacted, as well as various government officials.

It was decided to design a refrigerated spray system that would involve the chilling of seawater by mechanical refrigeration, pumped through a series of nozzles that would allow the release of a low-density, fine spray throughout the vessel hold and onto the live crab stored in porous hard-plastic tote pans.

## Methodology

To create a cool and humid 'natural seawater' environment in the hold, the following methodology was used:

- A seawater pump was used to pump



The reservoir tank holds fresh seawater.

- seawater into an insulated reservoir tank fitted with filters and high and low water level switches to control the operation of the seawater pump;
- The temperature of this water was controlled by a refrigeration system with two corrosion resistant, titanium chilling barrels;
- A booster pump was used to increase the water pressure for spraying;
- Spray nozzles one to two microns in diameter allowed the water to be dispensed as a fine spray or mist;
- Plastic tote holding pans, found throughout the shellfish industry, with extra openings in the sides and bottom, allowed a flow of the refrigerated seawater spray throughout the hold;
- Excess water in the fish hold was removed with the bilge system; and
- A monitor in the wheelhouse gauged the overall temperature in the crab-holding system.

## Analysis

A professional fish grading company was engaged to track the results from the system over the 2000 fishing season and compare the results with others who use the more traditional icing systems. The results from 14 trips are shown in this report. Two voyages of those 14 had a higher percentage of critically weak or dead snow crab because holding temperatures were too low in one case, and a malfunction in the refrigeration system on a second trip caused the water to heat up and not cool down.

Feedback from the processing plant which processed the crab indicated overall quality was comparable to that of vessels exclusively using ice, and yields and pack-outs were relatively the same as other industry averages.

## Results

The results of the refrigerated spray system clearly indicate the requirement for improvements in the mechanical design and also in holding and handling practices.

The results also showed, when two of the worse trips were excluded, the percentage of dead crab was .03% which is slightly better than the .084 % dead crab result from similar-type vessels using a non-refrigerated spray crab holding system. Again, excluding trips on June 04 and July 09, where problems were encountered, the remaining 12 trips had critically weak crab in the range of 1.7% to a high of 6.47%. The percentage of dead crab in the remaining trips ranged from 0% for 11 trips to 0.44% for one trip.

## Recommendations

In order to refine this system, the final report proposes additional testing and modifications for the 2002/03 snow crab harvesting season.

Several incidents were observed where a portion of the crab did not receive enough



Fresh seawater surges through the system.

spray and some, therefore, were critically weak at dockside. The total distribution of seawater to the entire catch was critical to the success of this system.

It appears there was no limit to the amount of seawater sprayed as long as there were no major temperatures changes.

It was recommended the water flow be increased by some 30%, depending on system capacities. Again, in a move to increase the volume of refrigerated spray to the live crab, it was recommended that the number of nozzles and the size of the spray holes be increased.

The spray temperature was adjusted several times over the season in order to find the best settings.

For the final trip (November 15, 2000), the harvester used a water temperature of three degrees Celsius, although it still remains a possibility that lower temperatures could improve holding conditions.

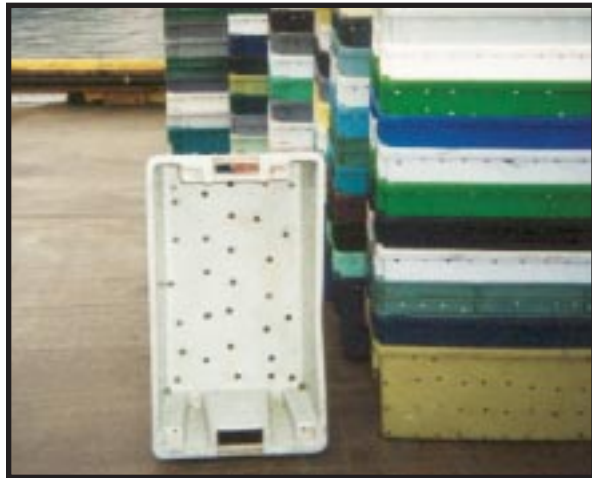
It was observed the holding pan capacity prevented the water from reaching all the crab,

so it was recommended at the end of the 2000 season that the total weight per pan be

reduced from an average of 48 pounds to 38 or 35 pounds.

The very design of the crab holding pans was reviewed in detail and a new design proposed. By the 2001 season, a new pan using grills, as opposed to drilled circular holes (described as more rigid than existing tote pans), further increased the circulation of the spray and resulted in overall improved seafood quality when landing at dockside.

## Dockside Quality Results



Extra holes were drilled for better seawater circulation.

| Trip                  | Lbs.  | Date     | %Dead | %Weak |
|-----------------------|-------|----------|-------|-------|
| 1                     | 26453 | 30/04/00 | 0.44  | 4.59  |
| 2                     | 26169 | 05/05/00 | 0     | 1.77  |
| 3                     | 25663 | 08/05/00 | 0     | 3.52  |
| 4                     | 27181 | 13/05/00 | 0     | 3.96  |
| 5                     | 27690 | 17/05/00 | 0     | 3.41  |
| 6                     | 26500 | 24/05/00 | 0     | 2.7   |
| 7                     | 27192 | 30/05/00 | 0     | 4.06  |
| 8                     | 13021 | 04/06/00 | 0     | 11.97 |
| 9                     | 23323 | 11/06/00 | 0     | 3.82  |
| 10                    | 8475  | 18/06/00 | 0     | 1.39  |
| 11                    | 8702  | 24/06/00 | 0     | 3.3   |
| 12                    | 11990 | 02/07/00 | 0     | 5.47  |
| 13                    | 25797 | 36775    | 18.34 | 69.9  |
| 14                    | 15287 | 14/11/00 | 0     | 6.47  |
| Average               |       |          | 1.65  | 9.87  |
| Avg. Minus Trips 8&13 |       |          | 0.03  | 3.7   |

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The \$10 million Fisheries Diversification Program is part of the \$81.5 million Canada-Newfoundland Agreement Respecting the Economic Development Component of the Canadian Fisheries Adjustment and Restructuring Initiative.