# OBSERVATIONS ON DUNGENESS CRABS SUBJECTED TO WIND STRESS

## INTRODUCTION

Crab fishing with a helicopter rather than a boat was introduced into Oregon early in 1977. The new innovation was met with suspicion and alarm by some. Some boat crabbers and observers claimed that the resource was being damaged because small crabs were being "rained" across the water and beach, that the wind blast from the rotor was harmful, and that crabs returned to the water in the pots were killed. Subsequent observations and experiments failed to verify these claims. It was also claimed that prolonged flight at high speeds would cause delayed mortalities in crabs that were returned to the water. A study was done November 3-December 1 to provide insight into that claim. The results of the study are covered in this report.

## METHODS

The crabs for the study were caught in Yaquina Bay because the small crabs desired were readily available. Three 6-foot diameter crab pots were borrowed from Mr. Bob Mathews of Coos Bay. Mr. Mathews also offered the use of a Hiller 3-place (conventional power) helicopter and a pilot to set and pull one pot prior to the study so we could determine how many crabs could be caught in an overnight fishing period. Mr. Bob Jarvis of Lake Oswego offered the use of his Hughes 5-place helicopter (turbo-jet powered) and two pilots to conduct the flight test. The Hughes helicopter was capable of flying at the speeds we desired for the test, whereas the Hiller ship was somewhat slower.

Our initial plan was to fly two test pots at 100 mph for four minutes. However, only 80 mph could be attained, and that with difficulty. As a result, both test pots were pulled from the water and immediately flown at speeds of 60-80 mph, one for five minutes and the other for seven minutes. Since fewer crabs per pot were caught than anticipated the crabs from both pots were

combined in the holding tanks. Crabs from a third pot were used as a control. These were flown from the fishing site to the laboratory at speeds up to 40 mph, but for only a few seconds. The control crabs were out of the water for about one minute.

The weather was partly sunny and the temperature 55° F during the flight. The test crabs were exteriorly completely dry when landed, and were docile before handling. They were transferred from the pots to the holding tanks in a tub of water to reduce fighting. Even with this precaution a few legs were lost during the transfer.

The crabs were held in 4x4 foot fiberglass tanks supplied with aeration and running sea water from Yaquina Bay. The hardshell and softshell crabs were segregated into separate tanks and fed clams twice weekly. Dead crabs were removed when detected, the shell width measured, and any injuries noted. Upon termination of the study the surviving crabs were measured and shell condition noted. The study was run for 28 days.

## RESULTS

Tables 1 and 2 summarize the results of the study. Three crabs died in each group, but the mortality rate was 4.6% in the control group and 10.3% in the test group. The shell width of the crabs that died was 165, 155 and 153 mm in the control group and 155, 142 and 108 mm in the test group. Five of the six mortalities occurred within the first two weeks. Mortalities were equal for hardshell and softshell crabs. A chi-square test corrected for continuity showed no significant difference in mortality rate between the experimental group of crabs and those in the control group.

One complication interfered with the control group. On day 15 of the study the standpipe in the tank of hardshell crabs was dislodged allowing all the

water to drain out. The crabs were out of water for at least 24 hours and all appeared dead. However, six of the crabs reacted slightly when stimulated. These were returned to the refilled tank, and survived to the end of the study. We assume that all of the crabs in this tank would have survived had the water not drained out.

Table 1. Summary of Wind Stress Test

| | Control | | Test | |
|---|---|---|---|---|
| | Hardshell | Softshell | Hardshell | Softshell |
| No. Crabs | 17 | 48 | 17 | 12 |
| Size Range (mm) | 121-176 | 90-169 | 131-162 | 121-165 |
| Mean Size (mm) | 150.6 | 135.1 | 146.0 | 140.7 |
| No. mortalities | 1 | 2 | 2 | 1 |
| % mortality | 5.9 | 4.2 | 11.8 | 8.3 |
| Total mortality (%) | 4.6 | | 10.3 | |

Table 2. Timing of Mortalities in Wind Stress Test

| | Control | | Test | |
|---|---|---|---|---|
| Week | Hardshell | Softshell | Hardshell | Softshell |
| 1 | 1 | 0 | 1 | 0 |
| 2 | 0 | 2 | 1 | 0 |
| 3 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 1 |

One of the pots originally slated for the control crashed into the ground in transit to the landing site. The pot contained nine crabs, but was not included in the study. However, after 25 minutes out of the water we decided to hold and observe the crabs anyway. One very soft crab was killed on impact,

but only one other died during the study period.

The single pot that was fished overnight for 18 hours prior to the study contained 31 crabs; 15 hardshell and 16 softshell. Only one of the softshell crabs had died after 31 days. None of the hardshell crabs died.

## DISCUSSION

The results of this study are not entirely conslusive. The close mortality rates observed suggests that repetitive tests are necessary to better define whether or not a significant difference exists between crabs that are flown and not flown. Part of the problem lies in the fact that it is difficult to hold live crabs in a confined space for a prolonged period. Cannibalism, fighting, starvation, and overcrowding are a few of the factors that can interfere with this type of study.

However, two points stand out. First, there will probably be small mortalities among crabs that are carefully handled because of their fighting, and second, the mortalities in the test crabs were low indicating that wind stress under the conditions experienced is not overtly harmful.

According to the pilot who flew the helicopter in the study, flying at 80 mph with a crab pot trailing about 100 feet behind and below the craft is not only difficult but dangerous to the flight stability of the helicopter. It is also proportionately more expensive to fly at 80 mph than 40-50 mph. The flight time and speed for this study were well outside the limits that crabs will actually be flown in the fishery. Lesser flight time and speeds should also lessen the stress on the crabs and chance for mortalities.

One factor that has not been observed is the effect of freezing or near freezing temperatures on flown crabs. Observations on this will be made when those conditions are encountered.

The problem of delayed mortalities from wind or temperature stress on flown crabs could be academic if the method of fishing follows the practice of the boat fishery. Most crab pots are fished for two or more days before being pulled. The pots are baited with an amount of bait that will attract crab for about one day. Few crabs will enter the pot the second day and most of the small crabs will probably escape through the escape ports by then. Few small crabs are retained in a pot fished for two or more days.

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