January 2007

BSFRF

Update On Activities and Request for Industry Support.
The Following is a brief update on work that the BSFRF is undertaking currently.

These are all important items which require the attention of industry. BSFRF has broad support from all sectors of Industry, Communities and CDQ groups, all of us dependant on the health and careful management of the crab resources in the Bering Sea.

BSFRF has received significant funding contributions from the National Marine Fisheries Service and North Pacific Research Board.

ALL members of industry will be kept up to date on current BSFRF research efforts regardless of whether those members have contributed or not. HOWEVER, we ask every sector to contribute their fair share toward this important work.

1. **2007-2008 BBRK SURVEY**.

Work continues on designing new trawl survey techniques with the goal of developing a more precise crab stock survey in cooperation with NMFS. The goal is to achieve greater accuracy in area swept measurements and so better measure stock size and recruitment.

Experimental design by BSFRF, NMFS, and ADFG cooperatively.

Funding:

NPRB	250,000
BSFRF	135,000
NMFS	173,500

See attached communication #1 from NRC for background.

2. **OPILIO HANDLING MORTALITY EXPERIMENT**.

Handling mortality is a significant parameter in the current crab models. There is not a lot of good information on handling. The BSFRF Board determined that this is an issue worthy of Industry involvement.

Design Handling Mortality experiment to be conducted in January 2008 follow up 2009. Goal is to gain better understanding of absolute and relative mortality rates of target and bycaught Opilio crabs under different handling and wind chill conditions, Vessels will

carry instrumentation capable of measuring wind speed, wind chill and humidity all major factors into current mortality rate assumptions. Experimental design has begun with the help of WDFW (Washington Department of Fish and Wildlife) staff working with BSFRF.

Proposed Funding:

NMFS Scientific Research Permit; Charter vessel to retain catch for payment.

See attached communications #2 and #3 from Jack Tagart and Steve Hughes

3. **CRAB PLAN TEAM WORKGROUP ON OVERFISHING DEFINITIONS**.

BSFRF continues to monitor CPT work on overfishing definitions. Tagart and Hughes attended November 8 CPT meeting in Seattle and a report, when finalized, will follow.

4. **NMFS CRAB POPULATION MODEL**.

BSFRF continues to monitor the development of the stock assessment model being developed by NMFS. This will be the assessment tool used from now on to measure current and predict future crab stock abundance. This is a critical change in how crab stocks are assessed and TACs set. BSFRF will follow this process carefully.

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COMMUNICATION #1

Hello BSFRF. Given that our BOD meeting will be delayed until later this month, a few updates may be in order.

1. October 25, 2006 Scott and I, with Gary Painter on the telephone, met with Russ Nelson at NMFS to discuss long term research plans between BSFRF and NMFS. I considered this an important meeting. NMFS has determined that they need to make some major changes in their Bering Sea annual survey. This includes establishing a specialized crab only survey that would be conducted annually and a separate ground fish trawl survey that would be conducted with their standard gear every other year rather than every year. NMFS interest in conducting a specialized crab survey would be to do so on a long term basis cooperatively with BSFRF. We agreed that working together cooperatively in the development of a specialized crab survey was now both consistent with NMFS new direction and consistent with the BSFRF goal of developing and promoting the best available science for the research and management of Bering Sea crab stocks. We agreed that completion of the BSFRF planned 2007 survey of the Bristol Bay red king crab stock was a logical step toward development of a long term and standardized crab survey using specialized gear documented to tend the seabed well and to likely achieve a crab catachability coefficient of near 1.0. In my opinion at this point in time, such a specialized crab survey would utilize gear much like we now have but perhaps scaled larger in size to be better suited to available charter vessels. I also see a future survey design to be much like we used in 2005 and that we plan for 2007, both utilizing a much higher sampling density of shorter tows than has been used by NMFS in their standard survey. We should discuss this further at the next BOD meeting but I believe that this is a big step in the right direction and continuing to work on this with Russ and his survey people should be a top priority.

2. Gerard is in town and will be here through November 16, 2006. This week, November 6-10, we are in the final stages of testing the Foundation's Net mind/equipment package for installation of same aboard American Eagle. This work progresses well as Scott has completed all the preliminary tests and he and Gerard are wrapping it up. American Eagle is now scheduled to arrive Seattle this Wednesday evening or Thursday morning. We load test gear on Thursday/Friday and are on schedule for the sea trial/gear tests on Monday-Wednesday November 13-15. NMFS will participate with 4 people and their trawl camera gear. We will work on a daily basis from Dock A at Shilshole in a designated gear test area just north of there.

3. The crab plan team meets in Seattle November 8, 2006. Jack Tagert and I will attend and send you a report soon there after.

So, a busy couple of weeks here with Foundation work. Hope to see you November 29 at the BOD meeting. Best regards, Steve

COMMUNICATION #2

Draft Snow Crab Handling Mortality Experiment: Introduction.

The Bering sea snow crab (*Chionoecetes opilio*) resource is regulated jointly by the State of Alaska and the United States under North Pacific Fishery Management Council Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs (NPFMC, Crab FMP). Stock abundance is assessed annual through trawl surveys and more recently via statistical population modeling (2006 Crab SAFE; Turnock and Rugolo, 2006). Snow crab reach legal size at 79 mm CW but are preferred in the market place at 101 mm CW and larger. Consequently, there is a substantive discard of legal sized crab caught in the directed crab pot fishery. Model estimated abundance and the subsequent total allowable catch are significantly influenced by the estimate of handling mortality for the discarded catch.

Handling mortality is difficult to measure. The crab fishery occurs in late fall through early spring annually. Crab caught in pots are exposed to cold conditions on deck when they are removed from the pots following capture, and suffer various injuries from being dropped or crushed when handled. The NPFMC Crab Plan Teams in the 2006 SAFE citing Warrenchuck and Shirley, 2002a and 2002b note that snow crab appear to be more sensitive [to handling mortality] than either Tanner crabs or red king crabs (where more studies have been conducted) and are reported to have suffered 40% to 100% mortality within 7 days of exposure to severe cold in controlled experiments. Functional relationships that predict snow crab mortality based on exposure to cold estimated handling mortality during the 1998 fishery at 3.6% to 19.6% depending on the relationship applied (Warrenchuck and Shirely, 2002b). More recently, van Tamelen (2005) applied thermal models to estimate snow crab handling during actual and hypothetical fishing seasons; his handling mortality estimates ranged from 0% to 30%.

Handling mortality estimates fixed in the snow crab population models and those used in harvest level calculations range from 25% to 100%. There is a wide discrepancy between the experimentally measured and applied handling mortality rates used in fisheries management. Abundance and allowable harvest estimates are sensitive to the assumed handling mortality rate. Stock assessment scientists argue that the published handling mortality experiments fail to integrate all sources of mortality and they are convinced that mortality is greater than that reported in the literature.

The Bering Sea Fisheries Research Foundation believes that it is essential to attempt to improve empirical observations of handling mortality under actual fishing conditions. Furthermore, as a result of rationalization of the crab fisheries, individual vessels now have more opportunity to adjust their fishing practices to be considerate of measures that may mitigate handling mortality. Therefore we are proposing the following experiments:

1. Instrument a subset of crab fishing vessels to gather realtime deck temperature and windchill data during the fishery.
2. Retain legal and sublegal crabs within the vessel's partitioned holding tanks to measure the differential survival rate following capture over a short time horizon (7-21d). In addition two handling treatments are proposed:
    a. Normal fishing operations handling
    b. Gentle handling, using chutes or handling trays to lessen impacts from dropping and sorting.

Communication #3

November 28, 2006

To: BSFRF BOD

From: Steve

Subject: Handling Mortality Concepts

Our crab handling mortality committee has met several times during the past 2 weeks to discuss the conduct of a study aimed at determining short term crab handling mortalities and methods to minimize future handling mortalities of both marketable and non marketable crab. We have concluded that:

1. The study should be designed to determine and document snow crab short term handling mortality under two conditions referred to as "traditional handling procedures" and "improved handling procedures".
2. Following a statistically based experimental design, the goal of the study would be to determine rates of short/medium term crab mortalities for retained crab and discard crab subject to the two handling techniques under a variety of windchill conditions. Results would document under commercial conditions, "traditional and improved" crab handling mortalities of marketable keepers and non-marketable crab that are normally discarded. Study results would be prepared and reported to the NMFS, NPFMC and ADF@G for future management of Bering Sea snow crab. Improved handling techniques and deck gear would be reported to industry with the goal of future fleet wise usage.

3. The study would be conducted over two field seasons—during Jan-Mar of 2008 and Jan-March of 2009

4. The initial season's research, a pilot study, would involve one commercial crab vessel with 6 crab holding tanks operating for 3 trips over a planned period of 33 days, and one shore side processor

5. The second season's research duration will depend on the pilot study results but could involve two commercial vessels,

each with 6 holding tanks operating for 3 trips each over a planned period of 33 days and one shore side processor.

6. The details of the experimental design are being formulated with the help of a hired statistician

7. Crab trips will be delivered to a shore plant for offload, sorting, data collection and processing of marketable crab. Following data collection, non marketable crab will be loaded in brailers, placed in the vessel's crab tanks and returned to the Bering Sea snow crab grounds.

8. Revenues from the sale of marketable crab will be adequate to cover research costs which precludes the need for NPRB funding.

9. Research would best be conducted under a Letter of Acknowledgment, submitted to the NMFS Regional Director.

BSFRF research should be done cooperatively with NMFS and ADF&G.