

PROJECT OPERATIONAL PLAN FOR THE  
2003 PRIBILOF DISTRICT RED KING CRAB SURVEY



By

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Regional Information Report<sup>1</sup> No. 4K03-61

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December 2003

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**ALASKA DEPARTMENT OF FISH AND GAME  
COMMERCIAL FISHERIES DIVISION  
PROJECT OPERATIONAL PLAN**

**Title:** *Project Operational Plan for the 2003 Pribilof District Red King Crab Survey*

**Yellow Book Project No(s):** *TF-785 (Appendix A)*

**Project Leader:** *Robert K Gish* **PCN:** *11-1857*  
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**Date Submitted:** *June 1, 2003*

**Region:** *Westward*  
**Fishery Unit:** *Bering Sea/Aleutian Islands Crab*  
**Fishery:** *Pribilof District Area Q Red King Crab*  
**Fishery Management Plan:** *Fishery Management Plan for the Commercial King and Tanner Crab Fisheries in the Bering Sea/Aleutian Islands*

**File Name:** *G:\ALLUSE\Skip\2003\Pribilof\PD03POP.doc*

**APPROVALS**

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Headquarters' Receipt:	_____	_____
Headquarters' Recommendation:		
Further Review:	_____	_____
Approval:	_____	_____

## FOREWORD

The Bristol Bay Test Fish Project (BBTF), authorized by the State of Alaska under the Test Fish Program (AS 16.05.050 (15)), funded this project. Initiated in 1990 as the Bering Sea Test Fish Project (BSTF), project research has focused on the population dynamics of and fishing effects on Bristol Bay red king crabs. Triennial surveys of Norton Sound red king crab, Aleutian Islands golden king crab, and St. Matthew Island blue king crab stocks from 1995 through 2000 were also funded under the BSTF program. Operational plans for previous BBTF and BSTF projects are documented in Gish and Byersdorfer (2002), Gish and Pengilly (2003), Gish et al. (2002), Tracy and Pengilly (1996 and 1997), Tracy et al. (1999), Watson and Pengilly (1992, 1993a, 1993b, 1994 and 1996), and Watson et al. (1995). Operational plans for past BSTF projects are itemized in Tracy et al. (1999). Partial funding for performance of this project was provided by NOAA Award NA03NMF4370188. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its sub-agencies. The program budget is itemized in Appendix A.

## ABSTRACT

This report describes the operational plan for the 2003 Pribilof District red king crab *Paralithodes camtschaticus* test fish project: a survey on the distribution and relative abundance of red and blue *P. platypus* king crabs around the Pribilof Islands during the fall fishing season. A description of the objectives, study area, survey design, sampling methods, data analysis and reporting are given. The Alaska Department of Fish and Game (ADF&G) will conduct the survey aboard the chartered *F/V Northern Orion* (a 165-ft. commercial crab-pot fishing vessel) in the Pribilof District of the Bering Sea king crab registration area.

## INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) first opened the Pribilof District red king crab *Paralithodes camtschaticus* fishery in 1993; the fishery continued until 1998 and produced a total harvest of 6.3-million pounds worth \$28.6 million (Bowers et al. 2002). The fishery has been closed since 1999, although the stock has been estimated to be above minimum stock size threshold (MSST) since 1993, and well above maximum sustained yield (MSY) biomass since 1998 as set by the North Pacific Fishery Management Council (NPFMC 2002).

Historically, the Pribilof District king crab fishery was directed on blue king crab *P. platypus*. Annual landings of blue king crab fluctuated widely and the fishery was closed from the 1988/89 season through 1994. The Pribilof District king crab fishery opened as a directed red king crab fishery in 1993 and 1994 and the fishery was opened for both red and blue king crab concurrently during the fall 1995 through 1998 seasons. The Pribilof District has been closed to fishing of both red and blue king crab since 1999. The National Marine Fisheries Service (NMFS) survey results from 1999 indicated the Pribilof District blue king crab stock was below the threshold for a fishery opening and was potentially approaching its MSST definition (Bowers et al. 2002). Survey results since 1999 showed continued declines through 2002, when it was estimated to be below MSST and declared “overfished” (NPFMC 2002). Closure of the Pribilof District red king crab fishery since 1999 has been due to concerns over the potential bycatch of blue king crab during that stock’s period of decline and concerns over the reliability of population estimates for Pribilof Islands red king crab afforded by the NMFS eastern Bering Sea trawl survey.

The blue king crab bycatch concerns are difficult to substantiate, however. There is scant fishery observer data from historic Pribilof District king crab fisheries and no information available on the distribution of either red or blue king crab during the fall fishery except for catch and effort by ADF&G statistical area reported during dockside interviews and on fish tickets. Catch statistics by statistical area only provide information on legal-sized males and statistical areas are too large (approximately 900 nm<sup>2</sup>) to provide needed information on distribution. Nonetheless, a large proportion of the annual harvest of both red and blue king crabs occurred in a single area (statistical area 697500) directly east of St. Paul Island (Morrison and Gish 1994, 1996, 1997a and 1997b, Morrison et al. 1998 and 1999). This suggests that the potential for blue king crab bycatch in a directed red king crab fishery may be significant.

The purpose of this project is to determine the potential for prosecution of a commercial fishery for red king crab in the Pribilof District without the risk of significant bycatch of blue king crab. We are initiating this two-year project designed to determine the distribution and relative abundance of red king crab during the period of a commercial fishery for this species were it to occur. The area we are concentrating on reflects the area of highest concentration of effort observed during the fisheries from 1993 through 1998. Three king crab pot surveys around the Pribilof Islands will address the need for information necessary for the prosecution of a Pribilof District red king crab fishery in the near future. The surveys will occur in September of 2003 and 2004, and in June of 2004. This operational plan addresses the first, September 2003, survey. The September 2003 survey will determine the spatial distribution and relative density (as

measured by catch per pot lift, CPUE) of red and blue king crab in the study area during the time of year that the fishery is normally prosecuted.

## **OBJECTIVES**

Prioritized objectives of the 2003 Pribilof District red king crab test fish project are as follows:

1. Catch approximately 9,150 legal-sized male red king crabs (6.5-inches carapace width or greater) for delivery to Royal Aleutian Seafoods in Dutch Harbor between September 10 and September 30, 2003.
2. Document distribution and relative abundance of red and blue king crabs in the Pribilof District of the Bering Sea, Area Q, during the period a commercial fishery for these crabs would occur.
3. Obtain biological data from all commercially important crab and fish species encountered during the survey and cost-recovery portions of the charter.
4. Map benthic habitat types for both red and blue king crabs around the Pribilof Islands using QTC View methodology.
5. Obtain a sediment sample from each bottom or habitat type using a Van Veen grab. Obtain underwater video of each benthic habitat type in conjunction with each sediment grab sample.
6. Obtain measures of environmental conditions concurrent with catch per pot data over the range of depths fished by deploying three conductivity/temperature/depth (CTD) and two temperature data loggers.
7. Collect stomach samples from 100 red king crabs and 100 blue king crabs from a variety of the habitat types for laboratory analysis.
8. Collect a variety of crabs, fish and other invertebrate species for the fall 2003 observer practicum.

## METHODS

### *Charter Itinerary*

The 30-day cruise will be conducted aboard the chartered vessel *F/V Northern Orion* (a 165-ft. commercial crab-pot-fishing vessel) from approximately September 1 to September 30, 2003 in the Pribilof District of the Bering Sea Management Area Q. The charter will begin and end in Dutch Harbor: the captain, a minimum of 3 crewmembers, and 4 ADF&G staff biologists will be aboard the entire period of the charter.

It is anticipated that the survey part of the charter will be from September 1 to September 21. Cost-recovery fishing will occur toward the end of the charter, the timing of which will be determined by the ADF&G crew leader and the vessel captain. It is anticipated this part of the charter will be from approximately September 22 to September 30.

If sufficient densities of red king crabs are not located initially, cost-recovery fishing will start earlier and it is possible that delivery of crab may be in the middle part of the charter period. In this event, the at-sea research will be conducted after the delivery of cost-recovery crabs if sufficient charter time exists. Sufficient charter time for at-sea research will be determined mutually by the vessel captain and the ADF&G crew leader.

### *Red King Crab Distribution and Relative Abundance Survey*

#### **Survey Area and Design**

The survey area (Figure 1) encompasses the Pribilof Islands and is bounded by 56° 30' N latitude to the south, 57° 30' N latitude to the north, 169° 00' W longitude to the east, and 171° 00' W longitude to the west. The survey area covers approximately 3,600 nm<sup>2</sup> and includes the ADF&G shellfish statistical areas that accounted for 83% to 99% of the total annual Pribilof Islands red king crab harvests for the 1993 through 1998 seasons (Morrison and Gish 1994, 1996, 1997a and 1997b, Morrison et al. 1998 and 1999). In particular, the survey area includes statistical area 695700 (bounded by 57° 00' N latitude, 57° 30' N latitude, 169° 00' W longitude, and 170° 00' W longitude). Statistical area 695700 accounted for the largest portion of the total Pribilof red king crab harvest during 1993-1998 (36%) and of the total Pribilof Islands blue king crab harvest during 1995-1998 (42%). Hence, the survey area includes the area of highest historical fishery production for the red king crab fishery and an area of potentially high blue king crab bycatch. Part of the southwest corner of the study area may not be fished due to depths greater than can be feasibly fished with single-pot gear.

The survey station pattern was designed by first designating stations at the centers and corners of the stations established for the NMFS eastern Bering Sea trawl survey (Stevens et al. 2002) located within the survey area. Additional stations were added to achieve 5-nm spacing between stations for a total of 164 stations. A minimum goal of 142 stations will be fished during each of the September 2003 and September 2004 pot surveys, with lowest priority being placed on the 22 stations in the

southwest corner of the survey area. Dependent upon time, areas to the north and east may be added to the survey.

Each station will consist of 4 pots arrayed in a north-south orientation and each pot will be 0.125 nm apart; the center of each station will be a minimum of 5 nm apart. Each pot will measure 7' x 7' x 34", be fitted with 2.75" stretch mesh on all webbing, and have two opposing tunnel openings measuring 8' x 36".

The target soak time interval for each pot will be 24 to 30 hours. Each pot will be baited with two 2-quart containers of chopped herring. One Pacific cod will be used as hanging bait in two randomly chosen pots per station.

Individual pot locations, set and pull dates and times, and the CPUE of legal-sized male red and blue king crabs will be recorded by the charter vessel captain on the "Pilot House Log" (see Appendix B) for all fishing conducted during the survey. All catch per pot data, with pot location data, will be entered in a computer spreadsheet during the survey and reported to the Kodiak office daily. It is anticipated that a minimum of 656 pots will be sampled during this survey.

### **Survey Catch Sampling**

A minimum of 9 stations (36 pots) will be sampled per day. The number of stations attempted per day will be adjusted to maximize effort during the charter contingent upon existing conditions and constraints. The vessel will be able to transit to the next pot while the contents of each current pot are sampled; that is, there is no requirement for the vessel to stay "on station" while the content of each pot is sampled.

Each red and blue king crab and hair crab *Erimacrus isenbeckii* obtained from survey pots will be sexed and measured for carapace length. Carapace length (CL) will be measured from the posterior margin of the right eye socket to the midpoint of the rear margin of the carapace. Each Tanner crab *Chionoecetes bairdi* and snow crab *C. opilio* will be sexed and measured for carapace width. Carapace width (CW) will be measured as the greatest straight line distance (including spines for legal status determination, excluding spines for biological measurements) across the carapace at a right angle to a line midway between the eyes to the midpoint of the posterior margin of the carapace. The fishery-legal status of male crabs will be determined by the CW including spines relative to minimum legal size (6.5" for red and blue king crab, 3.25" for hair crab, 5.5" for Tanner crab and 3.1" for snow crab). The carapace condition of each crab will be assessed. Each female crab will be examined for reproductive state. If eggs are present the percent clutch fullness, clutch condition, embryo development and color of eggs will be recorded. Loss of limbs and the presence of disease and/or parasites will also be recorded.

### **Benthic Habitat Mapping**

Data on benthic habitat type, or seabed classification, will be obtained during this charter using QTC View methodology (Quester Tangent Corporation 1998). It will consist of acquiring data from the ship's echo sounder, (the first return ping or waveform). This waveform varies according to the characteristic texture of the surficial seafloor sediment (the frequency

distribution of grain sizes) or the immediate subsurface. These waveforms are then classified into groups; the groups correspond to different bottom types. The location of these bottom types are correlated with a dedicated DGPS/WAAS navigation system and using QTC View software to produce a color image of differing bottom types, or benthic habitat.

### **Benthic Habitat Sampling**

A minimum of one benthic sediment sample will be obtained from each bottom type to help ground-truth the echo sounder data return. The sediment samples will be classified according to the percentage of mud, sand, and gravel contained in each sample (Folk 1954). Samples will be obtained using a Van Veen grab.

The distribution and relative abundance of red and blue king crabs in the study area will be assessed as to their correlation with different habitat types.

### **Underwater Video Operation**

Underwater video will be taken in each bottom habitat type to visually document that sediment or substrate type. Every effort will be made to obtain this video from the site sampled by the Van Veen grab.

### **Environmental Data Collection**

Three conductivity/temperature/depth (CTD) and two temperature data loggers will be deployed daily to obtain environmental conditions concurrent with CPUE data. The data loggers will be deployed in a manner that provides coverage over the range of area and depths fished during the charter; no more than one data logger will be deployed at any single station.

Data obtained will be analyzed for evidence of any association between CPUE and the corresponding environmental parameters.

### **Food Habits Sampling**

Stomachs of up to 100 crabs of each red and blue king crab will be collected for future laboratory analysis. These samples will be obtained during normal catch sampling, but will be collected in a manner that covers the range of benthic habitat types encountered.

Methods for analysis of stomach contents will follow those of Jewett and Feder (1982). Contents of each stomach sample will be sorted by taxon in the laboratory and percent wet weight of food and percent of occurrence will be computed separately for red and blue king crab. If distinct benthic habitat types can be identified (see above), percent wet weight and percent of occurrence will also be computed for each species by habitat type.

## **Observer Practicum Collection**

Live red king crabs and other crabs, as well as several fish and invertebrate species will be collected for the observer practicum to be held dockside in Dutch Harbor on October 5.

### ***Cost-Recovery Fishing***

Cost-recovery fishing goals for the 2003 test fish charter are equivalent to the expenses of the September and June charters, tag recovery efforts for the Bristol Bay red king crab injury assessment study and associated training and program costs. The total cost of the FY04 test fish program is approximately \$330,700. The cost-recovery harvest necessary to attain this goal equals approximately 9,150 legal-sized male red king crabs at an estimated average weight of 6.5 pounds and \$5.56 per pound.

Cost-recovery operations will occur at a time to be determined by the vessel captain and the ADF&G crew leader. It is anticipated that this activity will take place toward the end of the charter. If sufficient densities of red king crabs are not located initially, cost-recovery fishing will start earlier and delivery of those crabs may be in the middle of the charter period.

The catch will be monitored at offload by ADF&G staff to ensure accurate accounting of crabs for fish ticket documentation and assure correct payment to the State of Alaska. The offload will be sampled for size distribution and average weight of retained crabs.

### **Cost-Recovery Catch Sampling**

Catch date, location, depth and catch of legal-sized male red king crabs, legal-sized male blue king crabs, sublegal-sized male blue king crabs, and female blue king crabs will be recorded for each cost-recovery pot. Additionally, up to 20 randomly selected cost-recovery pots will be sampled each day to determine legal status, sex, size, and shell age distribution of red and blue king crabs and other commercially important shellfish species. Detailed catch sampling instructions and data forms are provided in "Shipboard Instructions for the 2003 Pribilof District Test Fish Charter (Appendix B).

### ***Data Analysis***

#### **Survey Data**

Distribution of catch of legal-sized male red king crab during the survey will be analyzed relative to five sex-size classes of blue king crab: male blue king crab  $\geq 120$ -mm CL, male blue king crab  $< 120$ -mm CL, mature female blue king crab, immature female blue king crab, and total blue king crab.

Catch per unit effort (CPUE, as measured by number of crabs captured per pot lift) by station will be mapped to compare spatial distribution of legal red king crab with each of the five blue

king crab sex-size classes. Several measures of the spatial association between legal male red king crab and each of the five blue king crab sex-size classes will be investigated for application to the station CPUE data; the appropriateness of these measures will depend on the properties of the catch data collected during the survey. Candidate measures of association are: correlation of station CPUE for legal red king crab with that for each of the five blue king crab sex-size classes; MacArthur-Levin niche overlap (Krebs 1999) of legal red king crab on each of the five blue king crab sex-size classes; MacArthur-Levin niche overlap of each of the five blue king crab sex-size classes on legal red king crab; percent of station co-occurrence for legal red king crab with each of the five blue king crab sex-size classes; and, percent of station co-occurrence for each of the five blue king crab sex-size classes with legal red king crab.

Association of CPUE with depth will be investigated through exploratory graphical methods, the appropriate choice of which will be dependent on the data collected. The likely method will be to prepare box-plots of station CPUE for legal male red king crabs and each of the five blue king crab sex-size classes plotted against bins of depth ranges (e.g., 5 fathom depth ranges). Those results may suggest hypotheses for statistical testing of different responses of CPUE to depth by legal male red king crabs and the five blue king crab sex-size classes.

Dependent upon ability to classify bottom habitat, distribution relative to habitat type will also be analyzed. Classified habitat types will be mapped over the map of the survey data and the maps of red and blue king crab survey distribution. Dependent on results, these data may lend themselves to analysis via computation of niche overlap measures relative to benthic habitat type and exploratory graphical analyses of CPUE response to habitat type as described above.

### **Cost-Recovery Fishing Data**

Additional data on spatial distribution of legal male red king crab, legal male blue king crab, sublegal male blue king crab and female blue king crab collected during cost-recovery fishing will be used to supplement data collected during the survey. Spatial distribution of cost-recovery fishing effort in the Pribilof District and resulting CPUE for legal male red king crab, legal male blue king crab, sublegal male blue king crab and female blue king crab will be mapped over maps of the survey station distribution and CPUE. Measures of spatial association (see above) among legal male red king crab with male blue king crab and female blue king crab will be computed for comparison with the measures of association computed from the survey data.

## SCHEDULES AND PERSONNEL

Month/Day	Personnel	Activity
04/01-08/29	Gish and Pengilly	Project planning, vessel charter procurement, operational plan, shipboard instructions
08/01-08/29	Burt and Shepard	Survey database design and application
09/01-09/30	Gish, Burt, Watson and Byersdorfer	Conduct at-sea survey and cost-recovery fishing
10/01-11/30	Gish	Edit and compile survey data
10/01-11/30	Kochuten and Chisum	Enter survey data electronically
11/01-12/30	Byersdorfer	Prepare biological data summary report

## REPORTS

Month/Year	Author(s)	Report
08/03	Gish and Pengilly	Project operational plan for the 2003 Pribilof District red king crab project
11/03	Gish	Memorandum on distribution and relative abundance of red king crab in the Pribilof District of the Bering Sea
12/03	Byersdorfer	A summary of biological data collected during the 2003 Pribilof District and Bristol Bay red king crab test fish charter cost-recovery fishing
01/05	Gish and Pengilly	Distribution and relative abundance of red king crab in the Pribilof District of the Bering Sea, Area Q

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Table 1. Location of centers of stations, each station consists of four pots arrayed in a North – South orientation.

Primary Station	Latitude		Longitude		Primary Station	Latitude		Longitude	
	Degrees	Minutes	Degrees	Minutes		Degrees	Minutes	Degrees	Minutes
1	56	30.00	169	02.00	38	56	40.00	170	53.25
2	56	30.00	169	11.00	39	56	45.00	169	03.75
3	56	30.00	169	20.00	40	56	45.00	169	12.75
4	56	30.00	169	29.00	41	56	45.00	169	21.75
5	56	30.00	169	38.13	42	56	45.00	169	30.75
6	56	30.00	169	47.25	43	56	45.00	169	40.00
7	56	30.00	169	56.38	44	56	45.00	169	49.25
8	56	30.00	170	05.50	45	56	45.00	169	58.50
9	56	30.00	170	14.75	46	56	45.00	170	07.75
10	56	30.00	170	24.00	47	56	45.00	170	17.00
11	56	30.00	170	33.25	48	56	45.00	170	26.25
12	56	30.00	170	42.50	49	56	45.00	170	35.50
13	56	30.00	170	50.89	50	56	45.00	170	44.75
14	56	30.00	170	59.28	51	56	45.00	170	54.00
15	56	35.00	169	02.50	52	56	50.00	169	04.50
16	56	35.00	169	11.50	53	56	50.00	169	13.50
17	56	35.00	169	20.50	54	56	50.00	169	22.50
18	56	35.00	169	47.88	55	56	50.00	169	31.50
19	56	35.00	169	57.06	56	56	50.00	169	40.75
20	56	35.00	170	06.25	57	56	50.00	169	50.00
21	56	35.00	170	15.50	58	56	50.00	169	59.25
22	56	35.00	170	24.75	59	56	50.00	170	08.50
23	56	35.00	170	34.00	60	56	50.00	170	17.75
24	56	35.00	170	43.25	61	56	50.00	170	27.00
25	56	35.00	170	52.07	62	56	50.00	170	36.25
26	56	40.00	169	03.00	63	56	50.00	170	45.50
27	56	40.00	169	12.00	64	56	50.00	170	54.75
28	56	40.00	169	21.00	65	56	55.00	169	05.25
29	56	40.00	169	30.00	66	56	55.00	169	14.25
30	56	40.00	169	39.25	67	56	55.00	169	23.25
31	56	40.00	169	48.50	68	56	55.00	169	32.25
32	56	40.00	169	57.75	69	56	55.00	169	41.50
33	56	40.00	170	07.00	70	56	55.00	169	50.75
34	56	40.00	170	16.25	71	56	55.00	170	00.00
35	56	40.00	170	25.50	72	56	55.00	170	09.25
36	56	40.00	170	34.75	73	56	55.00	170	18.50
37	56	40.00	170	44.00	74	56	55.00	170	27.75

-Continued-

Table 1. (page 2 of 3)

Primary Station	Latitude		Longitude		Primary Station	Latitude		Longitude	
	Degrees	Minutes	Degrees	Minutes		Degrees	Minutes	Degrees	Minutes
75	56	55.00	170	37.00	117	57	15.00	169	26.06
76	56	55.00	170	46.25	118	57	15.00	169	35.25
77	56	55.00	170	55.50	119	57	15.00	169	44.50
78	57	0.00	169	06.00	120	57	15.00	169	53.75
79	57	0.00	169	15.00	121	57	15.00	170	03.00
80	57	0.00	169	24.00	122	57	15.00	170	12.25
81	57	0.00	169	33.00	123	57	15.00	170	21.69
82	57	0.00	169	42.25	124	57	15.00	170	31.13
83	57	0.00	169	51.50	125	57	15.00	170	40.56
84	57	0.00	170	00.75	126	57	15.00	170	50.00
85	57	0.00	170	10.00	127	57	15.00	170	59.25
86	57	0.00	170	19.25	128	57	20.00	169	08.25
87	57	0.00	170	28.50	129	57	20.00	169	17.50
88	57	0.00	170	37.75	130	57	20.00	169	26.75
89	57	0.00	170	47.00	131	57	20.00	169	36.00
90	57	0.00	170	56.25	132	57	20.00	169	45.25
91	57	5.00	169	06.56	133	57	20.00	169	54.50
92	57	5.00	169	15.62	134	57	20.00	170	03.75
93	57	5.00	169	24.69	135	57	20.00	170	13.00
94	57	5.00	169	33.75	136	57	20.00	170	22.50
95	57	5.00	169	43.00	137	57	20.00	170	32.00
96	57	5.00	169	52.25	138	57	20.00	170	41.50
97	57	5.00	170	01.50	139	57	20.00	170	51.00
98	57	5.00	170	10.75	140	57	25.00	169	09.00
99	57	5.00	170	20.06	141	57	25.00	169	18.25
100	57	5.00	170	29.38	142	57	25.00	169	27.50
101	57	5.00	170	38.69	143	57	25.00	169	36.75
102	57	5.00	170	48.00	144	57	25.00	169	46.00
103	57	5.00	170	57.25	145	57	25.00	169	55.25
104	57	10.00	169	07.12	146	57	25.00	170	04.50
105	57	10.00	169	16.25	147	57	25.00	170	13.75
106	57	10.00	169	25.37	148	57	25.00	170	23.25
107	57	10.00	169	34.50	149	57	25.00	170	32.75
108	57	10.00	169	43.75	150	57	25.00	170	42.25
109	57	10.00	169	53.00	151	57	25.00	170	51.75
110	57	10.00	170	02.25	152	57	30.00	169	00.50
111	57	10.00	170	30.25	153	57	30.00	169	09.75
112	57	10.00	170	39.62	154	57	30.00	169	19.00
113	57	10.00	170	49.00	155	57	30.00	169	28.25
114	57	10.00	170	58.25	156	57	30.00	169	37.50
115	57	15.00	169	07.69	157	57	30.00	169	46.75
116	57	15.00	169	16.87	158	57	30.00	169	56.00

-Continued-

Table 1. (page 3 of 3)

Primary Station	Latitude		Longitude		Primary Station	Latitude		Longitude	
	Degrees	Minutes	Degrees	Minutes		Degrees	Minutes	Degrees	Minutes
159	57	30.00	170	05.25	162	57	30.00	170	33.50
160	57	30.00	170	14.50	163	57	30.00	170	43.00
161	57	30.00	170	24.00	164	57	30.00	170	52.50

  

Secondary Station	Latitude		Longitude		Secondary Station	Latitude		Longitude	
	Degrees	Minutes	Degrees	Minutes		Degrees	Minutes	Degrees	Minutes
165	57	00.00	168	20.04	195	57	30.00	168	23.52
166	57	00.00	168	29.28	196	57	30.00	168	32.76
167	57	00.00	168	38.52	197	57	30.00	168	42.00
168	57	00.00	168	47.76	198	57	30.00	168	51.24
169	57	00.00	168	57.00	199	57	35.00	168	24.30
170	57	05.00	168	20.52	200	57	35.00	168	33.54
171	57	05.00	168	29.76	201	57	35.00	168	42.78
172	57	05.00	168	39.00	202	57	35.00	168	52.02
173	57	05.00	168	48.24	203	57	35.00	169	01.25
174	57	05.00	168	57.50	204	57	35.00	169	10.44
175	57	10.00	168	21.06	205	57	35.00	169	19.75
176	57	10.00	168	30.30	206	57	35.00	169	29.00
177	57	10.00	168	39.54	207	57	35.00	169	38.25
178	57	10.00	168	48.78	208	57	35.00	169	47.50
179	57	10.00	168	58.00	209	57	35.00	169	56.75
180	57	15.00	168	21.54	210	57	35.00	170	06.00
181	57	15.00	168	30.78	211	57	35.00	170	15.25
182	57	15.00	168	40.02	212	57	35.00	168	25.02
183	57	15.00	168	49.26	213	57	40.00	168	34.26
184	57	15.00	168	58.50	214	57	40.00	168	43.50
185	57	20.00	168	22.02	215	57	40.00	168	52.74
186	57	20.00	168	31.26	216	57	40.00	169	02.00
187	57	20.00	168	40.50	217	57	40.00	169	11.25
188	57	20.00	168	49.74	218	57	40.00	169	20.50
189	57	20.00	168	59.00	219	57	40.00	169	29.75
190	57	25.00	168	22.80	220	57	40.00	169	39.00
191	57	25.00	168	32.04	221	57	40.00	169	48.25
192	57	25.00	168	41.28	222	57	40.00	169	57.50
193	57	25.00	168	50.52	223	57	40.00	170	06.75
194	57	25.00	168	59.75	224	57	40.00	170	16.00



## **APPENDIX**

Appendix A. FY04 Yellowbook for the Bering Sea red king crab test fishery.

PROJECT TITLE: Bering Sea Red King Crab Test Fish                      PROJECT NUMBER: TF-785  
 FISHERY UNIT: Bering Sea/Aleutian Islands Crab    REGION: IV  
 COMPONENT: 400110100-Fish. Mgmt. BPS# \_\_\_\_                      LEDGER CODE: 11100741-11147785  
 SUBCOMPONENT: \_\_\_\_\_    LOCATION: Kodiak  
 LEGISLATIVE DIST: 27    PROGRAM ELEMENT: Test Fish-funded project  
 FISHERIES AFFECTED: Pribilof District    SPECIES AFFECTED: Red King Crab  
 USER GROUPS AFFECTED: Red King Crab Fishers, Vessel Owners, and Processing Industry

**PROJECT DESCRIPTION**

Funding for this project will support the state’s expenses for conducting shellfish research projects in the Pribilof District of the Bering Sea king crab management area. The state’s commercial red king crab fisheries in this area produced an exvessel value in excess of \$28.6 million (1993 - 1998). Studies funded under this project provide a better understanding of species biology and the impacts of commercial fishing. Insight toward effective shellfish management policy is a major product of this project. Interim management measures and Alaska Board of Fisheries actions are oftentimes dependent on information obtained from studies funded through the Bering Sea Test Fish Project.

**PROJECT OBJECTIVES**

The Pribilof District red king crab population is assessed to provide information for development of harvest areas and fishery management policy. Data will be collected on all crab captured during the vessel charter. Results of survey activity and cost-recovery fishing will provide information on stock parameters such as natural mortality and fishery harvest rates. Data may also be used to design management strategies to meet the conservation and economic objectives established by the Alaska Board of Fisheries and the North Pacific Fisheries Management Council. These objectives are set forth in the Fishery Management Plan for Bering Sea / Aleutian Islands king and Tanner Crabs as established by the Magnuson-Stevens Fishery Conservation and Management Act.

BUDGET MANAGER: Robert K. Gish, Fishery Biologist III    PCN: 11-1857

BUDGET DETAIL:	FY01	FY02	FY03	FY04
100 PERSONNEL SERVICES	171.4	30.9	37.0	85.8
200 TRAVEL	30.9	23.5	49.9	49.5
300 CONTRACTUAL	231.5	69.8	54.6	163.2
400 COMMODITIES	14.8	6.7	17.4	17.1
500 EQUIPMENT	10.5	0.0	8.5	8.2
700 GRANTS	0.0	0.0	0.0	0.0
<b>PROJECT TOTALS:</b>	<b>459.1</b>	<b>130.9</b>	<b>167.3</b>	<b>323.8</b>

-Continued-

Appendix A. (page 2 of 2)

<b>FUNDING SOURCES</b>	<b>FY01</b>	<b>FY02</b>	<b>FY03</b>	<b>FY04</b>
FEDERAL RECEIPTS	0%	0%	0%	0%
GENERAL FUND	0%	0%	0%	0%
INTERAGENCY RECEIPTS	0%	0%	0%	0%
PROGRAM RECEIPTS	100%	100%	100%	100%
CIP FUNDS	0%	0%	0%	0%
<b>STAFF MONTHS</b>	<b>23.7</b>	<b>2.8</b>	<b>3.8</b>	<b>2.9</b>

PERSONAL SERVICES DATA:

PCN	R	S	LOC	R&S	NAME/TITLE	PREMIUM PAY					COST	
						MM	OT	SEA	HAZSWG	GRV		
1857	A	P	CAA	18 F	R. Gish/FB III	0.0	0	44	0	0	0	10,486
1428	P	P	CAA	16 J	L. Watson/FB II	0.0	0	44	0	0	0	9,486
1409	A	S	BKB	16 A	R. Burt/FB II	0.0	0	44	0	0	0	9,832
1117	A	S	CAA	14 K	S. Byersdorfer/FB I	1.0	30	44	0	0	0	16,674
1409	A	S	BKB	14 B	R. Alinsunurin/FB I	1.0	30	0	0	0	0	10,918
1131	A	S	BKB	14 A	Vacant/FB I	2.0	0	0	0	0	0	17,830
1961	A	S	CAA	14 A	K Spalinger/FB I	0.0	30	0	0	0	0	1,631
1361	P	S	CAA	11 L	T. Dinnocenzo/FWT III	0.0	30	0	0	0	0	1,593
1825	P	S	CAA	11 K	K. Phillips/FWT III	0.0	30	0	0	0	0	1,493
1963	A	S	CAA	11 C	D. Higginbothan/FWT III	0.0	30	0	0	0	0	1,407
5287	P	S	CAA	9 C	D. Parson/FWT III	0.0	30	0	0	0	0	980
1637	P	S	BKB	8 K	T. Chisum/ADC III	0.0	30	0	0	0	0	1,038
1755	A	S	BKB	8 C	S. Kochuten/ADC II	0.0	30	0	0	0	0	1,011
1319	A	S	BKB	8 A	A. Birdsong/ADC I	0.0	30	0	0	0	0	821
<b>PERSONNEL TOTALS</b>						<b>4.0</b>	<b>330</b>	<b>176</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>85,245</b>

PROJECT LINE ITEM DETAIL:

LINE	DESCRIPTION	AMOUNT	COMMENT
72240	Field travel	35.1	travel for charter and tag recoveries
72500	Per Diem/Other costs	14.4	travel per diem, vehicle rental
73000	Charters/Other	163.2	vessel charter, observer testing
74520	Commodities	25.3	research equipment, tags and tag rewards, printing, telephone, freight and storage
<b>TOTAL LINES 200-700:</b>		<b>238.6</b>	
<b>TOTAL PROJECT COST:</b>		<b>323.8</b>	

Appendix B. Shipboard Instructions for the 2003 Pribilof District Red King Crab Test  
Fish Charter.

Alaska Department of Fish and Game  
Westward Region  
211 Mission Road  
Kodiak, Alaska 99615

August 15, 2003

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## GENERAL INFORMATION

The purpose of this manual is to provide instructions and information relating to the 2003 Pribilof District red king crab test fish charter. Refer to it for project objectives and sampling procedures. Expect standard methodologies to remain constant, but be prepared to accept changes to sampling procedures/protocols when circumstances warrant.

The survey will be aboard the charter vessel the F/V *Northern Orion*, a 165-ft. pot-fishing vessel. The vessel and her crew have been contracted to provide service to ADF&G for the 32-day period beginning on August 30 and ending on September 30. Any misunderstandings arising between the vessel and ADF&G crew in regard to the charter service requirements can be resolved by referring to the crew leader.

Following is the list of personnel participating in the year's red king crab test fish charter:

---

ADF&G Crew	Vessel Crew
Skip Gish - biologist crew leader	Jon Greenway - captain
Leslie Watson - biologist	Dave Wilson - engineer
Ryan Burt - biologist	Carl Corsinger - deckhand
Susie Byersdorfer - biologist	Moreno Narte – deckhand/cook

---

### *Safety Briefing*

Prior to commencement of the survey, the captain will provide the ADF&G crew with a shipboard safety orientation, which will at least include pulling the general alarm and the designation of emergency stations. Specific information will be provided for each of the following:

1. General safety orientation: The location of life rafts, fire stations, medical supplies, safety placards, emergency information, and safe/hazardous areas on deck.
2. Shipboard safety drill: Where personnel should be and what to do in emergency situations; the locations of survival suits and EPIRBs. A surprise drill may be held to assess the ability of all crewmembers and ADF&G personnel to don survival suits and assist others to do the same.

The safety and well being of the vessel and ADF&G crew as well as the vessel itself are the primary concern at all times during the charter. Obey the captain in this regard as he is legally responsible for ensuring the safety of all onboard personnel. Do not go on the back deck or anywhere outside alone, especially when seas are rough. When gear is being worked, pay particular attention to buoy lines and trailers, pots and slick decks. ADF&G

personnel will not stack pots, operate hydraulics, or throw buoy lines. Be aware of the crane and hydraulic blocks at all times, particularly when pots are being moved. Retreat to a safe area previously designated by the captain while pots are being set, retrieved, moved, or stacked.

Prior to departure, each ADF&G crewmember should check their survival suit; lubricate or wax the zipper to insure proper functioning. Personal EPIRBs and strobe lights should be tested. Rules concerning EPIRB testing may be obtained from the U. S. Coast Guard in Dutch Harbor (581-3466). Check date on strobe light battery, replace battery if dated or faulty. Tested EPIRBs and strobe lights should be securely fastened to survival suits.

Specific information and/or vessel policies will be provided for each of the following: Storage location for rain gear and boots, galley etiquette, water use policy (showers, laundry, dishes, bathroom), etc.

### ***Email Reporting / Radio Schedule***

A daily status report on charter activities will be transmitted to ADF&G in Kodiak. The crew leader, designated crewmember or the vessel captain will relay this status report. During the directed research leg of the charter the report will contain the total number of pots sampled, and the numbers of legal-sized male red and blue king crabs as outlined on the Email / Radio Log provided in Appendix B.1. During the cost-recovery leg of the charter the report will consist of the daily number of pots pulled and legal-size red king crabs retained. This report will be by internet/Immarsat email or by single side band (SSB) radio.

Email will be our primary means of contact and reporting during this charter. Doug Pengilly (doug\_pengilly@fishgame.state.ak.us) will serve as the primary contact. If Doug Pengilly is not available the report will be sent to Rachel Alinsunurin (rachel\_alinsunurin@fishgame.state.ak.us). The information to be sent by email is listed above.

If email is not possible, a radio schedule will be maintained with the Dutch Harbor office to verify the well being of the vessel and crew, and to transmit the above report via code (Appendix B.2.). This radio contact on SSB 4125 will be at 10:00 AM; if this schedule is missed a second check will occur at 2:30 PM. The ADF&G office call sign is WIM 76 DUTCH HARBOR; call sign for the F/V *Northern Orion* is WTQ 7681. Rachel Alinsunurin will serve as the primary contact for any radio schedule; Savanna Kochuten will be the secondary contact person.

Prior to departure a shore-based contact for the F/V *Northern Orion* will be established, and will be available as an additional contact method. This vessel contact information will be sent to Doug Pengilly (907) 486-1865 and to Rachel Alinsunurin and Savanna Kochuten (907) 581-1239.

### *Miscellaneous Shipboard Rules and Information*

During the charter, task and responsibilities will be delegated amongst the onboard ADF&G crew for the duration of the cruise. Any problems that arise should be channeled through the crew leader. Clean up all work areas used, including the galley table. All data should be kept organized and as dry as possible. Make sure deck paperwork tracks with the pilot house records; every pot will have a unique number that will enable cross-referencing on a pot by pot basis. Although it is the crew leader's responsibility to ensure data integrity, other ADF&G crew will be relied upon for assistance. Be sure to ask the crew leader about any unexpected changes in sample protocols or anything else related to data collecting.

Completed data forms will be edited daily. This practice ensures that the often-important short-term details of the day's event are not overlooked. There will be no compromise with regard to this responsibility. If time permits, the vessel pilot house logs will be entered into a spreadsheet on a daily basis using the laptop computer.

Prior to the vessel's departure from Dutch Harbor to the survey grounds, check off all items on the equipment list (Appendix B.3.) including forms, sampling equipment, and personal gear (e.g., seasick medications). Maintain all sampling equipment by insuring it is cleaned and stored safely inside the vessel at the end of each day (calipers, clipboards, measuring sticks, etc.).

Keep a daily log of sampling activities, hours worked, contingencies, miscellaneous observations, Floy tag recoveries, sampling irregularities, etc. Included in the daily log should also be observations on conditions under which the survey was conducted, such as daily temperature, wind, and sea conditions. Any problems or concerns with survey procedure should also be noted in the daily log. This log would also be appropriate for recording any photographs taken.

Offer assistance to the vessel crew whenever possible. ADF&G personnel are allowed to help out with some of the deck activities that are not inherently dangerous, such as filing bait containers. When time allows, washing dishes, making coffee, cooking and general cleaning should be part of our daily routine. The vessel crew will have a busier schedule than the ADF&G crew; a cooperative effort toward daily chores and maintaining living quarters on the vessel can be a great benefit to everyone's morale.

In general, there will be no home packing of any animals captured during the survey by vessel or ADF&G crewmembers. One major exception to this will be made this year for all crabs sacrificed to obtain stomach samples from red and blue king crabs. Any portion of those crabs that is not consumed onboard may be frozen and retained after the charter. All halibut (dead or alive) are to be placed overboard immediately. It is acceptable, however, to consume cod, groundfish and other mortally injured crabs while at sea. Authorization for the collection of crabs for display or other purposes will be by the crew leader only.

## **Additional Instructions and Reminders**

1. Leave timesheets with Maryjane Rogers in Kodiak or Kathleen Herring in Dutch Harbor; project coding of regular and premium sea pay must be reviewed by the project leader prior to submission of the timesheet (Appendix B.4.).
2. CFEC cards must be aboard the vessel (crew leader's responsibility).
3. Check your survival suit and EPIRB prior to departure.
4. Review survey schedule and charter itinerary.
5. Turn in all receipts for purchases to the crew leader prior to July 31.
6. If there are no forms to record other data you collect, make a form; be inventive.
7. The Pilot House Logs must be completed daily; complete every column in every form as required.
8. Be careful and have fun.

## **SURVEY OBJECTIVES**

Prioritized objectives of the 2003 Pribilof District red king crab test fish charter are as follows:

### ***Cost-Recovery Fishing***

Catch approximately 9,150 red king crabs  $\geq$  6.5-inches carapace width (CW) including spines, for delivery to Royal Aleutian Seafoods in Dutch Harbor on or before September 30, 2003. Sample catches for species composition and size distribution from up to 20 pots per day during cost-recovery fishing. Carapace lengths (widths), shell age, legal status, and other associated data will be taken for all crabs caught in sampled pots.

### ***Distribution and Relative Abundance Survey***

Document distribution and relative abundance of red and blue king crabs during the period a commercial fishery for these crabs would occur in the Pribilof District of the Bering Sea, Area Q. Biological data such as carapace lengths (widths), shell age, legal status, and reproductive status when appropriate will be taken for all crabs caught during the survey.

### ***Benthic Habitat/Bottom Type Mapping***

Map benthic habitat types for both red and blue king crabs around the Pribilof Islands using QTC View methodology. The QTC scans of bottom type will be correlated with catch per pot data to look at habitat preference of the two species.

### ***Benthic Sampling and Underwater Video Observations***

Obtain sediment samples of each bottom type as delineated by QTC View to ground truth and fine tune the system. Sediment samples will be obtained using a Van Veen grab. Obtain underwater video observations of each bottom type to provide visual documentation of habitat types. The use of a drop camera, a mini DV camcorder and 750 ft. of cable will attain these observations.

### ***Environmental Data Collection***

Three conductivity/temperature/depth (CTD) and two temperature data loggers will be deployed in pots on a daily basis in a manner that covers all areas and depths fished during the charter. No station will have more than one data logger. Data will be correlated with catch per pot data.

### ***Food Habits of Red and Blue King Crab***

Collect stomach samples from 100 red king crabs and 100 blue king crabs from a variety of habitat types for laboratory analysis. The food habits of red and blue king crabs will be compared to each other and to the bottom/habitat type from which they were collected.

### ***Observer Practicum Collection***

Collect a total of 80 legal-sized male red king crabs of various shell conditions; also, collect 15 sublegal male and 14 female red king crabs. An additional 9 crabs of various species are to be collected, as well as 5 other invertebrate species and 8 species of fish.

### ***Photographic Documentation***

All aspects of shipboard sampling activities will be documented with a super 8-mm camcorder, and with digital and 35-mm film cameras.

## **METHODS**

### ***Catch Reporting***

The email report will be the daily number of pots pulled, and the number of legal-sized male red and blue king crabs during the survey portion of the charter. Reporting for cost-recovery fishing will cover the number of pots pulled and the number of legal-sized male red king crabs retained. SSB radio report will simply be a welfare check on the status of the vessel and crew.

### *Pilot House Logs*

The charter vessel captain will complete the Pilot House Logs (Appendix B.5., Form 1 and Form 2), for each pot fished during the survey and cost-recovery fishing. Check to ensure that the Pilot House Logs are completely filled out at the end of each day, including the catch per pot for male red and blue king crabs  $\geq 6.5$ -inches CW. All pots fished will be entered sequentially throughout the cruise on the appropriate form. It is the responsibility of the crew leader or the ADF&G crew to insure the completion of this task.

Each pot will be assigned a Sequential Pot Number (SPN) in the order it is set beginning with 1 and continuing throughout the charter. The SPNs are extremely important as they link the pot location, depth fished and soak time to the catch data. Prior to sampling each pot, the ADF&G crew will ask the captain to convey (via the loud hailer) the appropriate SPN and record it on the Survey Data Form (Appendix B.5., Form 3). Sequential numbers for lost pots along with the words "LOST POT" will be recorded on a blank row on the survey form. Likewise, if a retrieved pot is unbaited, the SPN is still recorded and the words "NO BAIT" written on the form.

### *Distribution and Relative Abundance Survey*

The purpose of the red king crab distribution and relative abundance survey is to determine if area(s) of sufficient quantities of red king with minimal or no bycatch of blue king crab exist. If so, there may be the possibility for a commercial fishery for red king crab to occur in the Pribilof District of the Bering Sea Management Area Q.

#### **Survey Design**

The survey design consists of stations (with four pots per station) set approximately 5 nm apart in a grid pattern. All commercially important crab species will be enumerated and sampled for carapace lengths or widths, shell age, legal status, and other associated characteristics. Distribution of legal-sized male red king crabs and all blue king crabs will be documented.

The charter is 30 days in length and will be split into 2 sections: the red king crab survey and cost-recovery fishing. It is anticipated that the survey portion of the charter will last approximately 21 days, including travel to the fishing grounds. Pots will be set 4 to a station, each pot will be 0.125 nm apart and each station will be separated by 5 nm. Each pot will have a target soak period of 24 to 30 hours. The initial survey pattern has 164 stations (656 pots) and encompasses the waters around both St. Paul and St. George Islands. The southwest portion of the area may not be covered or additional stations to the north and east may be added depending upon time.

Pacific cod will be used as hanging bait in 2 pots per station. Pots containing hanging bait will be chosen at random (see Appendix B.6.). Catch data between pots with and without hanging bait will be compared.

### **Survey Catch Sampling**

The contents of each pot fished will be examined for species composition. Red and blue king crabs, hair crabs, Tanner crabs and snow crabs from each pot will be fully enumerated to provide catch per pot by sex and size data. Record all required data on the Crab Survey Data Form and Species Composition Form (Appendix B.5., Form 3 and Form 4). Record all data for each species according to protocols outlined below, and refer to the most recent NMFS species codebook, March 2003, for documenting miscellaneous species.

**Recording Data.** When a pot comes aboard, divide all crabs by species and if possible subdivide by sex. Separate data sheets must be used for each sex of the same species. It is preferable to use separate data sheets for each species, however it is permissible to record separate species of the same sex on the same sheet but they must be delimited by skipping a few lines between each. Before sampling each pot, complete all header information (i. e. station number, date, buoy number, measurer, recorder) and record the SPN (obtained from the captain) on the survey data form. Once sampling has commenced, record the appropriate code for each data category using the choices provided at the bottom of the survey data form. Carapace length (CL) measurements to the nearest millimeter will be taken for all king crabs and hair crabs encountered. The CL is from the posterior margin of the right eye socket to the midpoint of the posterior carapace margin. Carapace width (CW) measurements will be taken to the nearest millimeter for all species of Tanner crabs. CW measurement will consist of the straight-line distance across the carapace in-between the marginal spines at a right angle to a line midway between the eyes to the midpoint of the posterior portion of the carapace. Extra care should be taken to obtain accurate carapace measurements. There is considerable size overlap of sublegal and legal-sized male red king crabs with the same CL; therefore, either a measuring stick or calipers should verify the legal measurement of all king crabs less than 140-mm CL. Legal-sized male red and blue king crabs are  $\geq 6.5$ -inches  $\leq 165.1$ -mm) in carapace width (including the spines). Legal size is  $\geq 3.25$ -inches for hair crabs,  $\geq 5.5$ -inches for Tanner crabs and  $\geq 3.1$ -inches for snow crabs.

**Shell Aging.** Shell age should be determined by examining the ventral side of the coxa (shoulders) of the walking legs (pereiopods) for discoloration and deterioration from scratching and other abrasive action attributable to prolonged contact of the crab's shell with the substrate. Although the following categories were developed for shell-age assessment of red king crabs, each can also be applied to other commercially important crab species encountered during the survey. Record shell age for each crab sampled as follows:

New-shell, pliable (code # 0) – Coxa and ventral surface of exoskeleton are shiny, not scratched or pitted. Legs are easily compressed when pinched since they contain little

meat infill at this time. Exoskeleton is fragile and subject to breakage when handled or dumped from the pot. If carapace is removed, the gills will be translucent to light cream in color. Crabs estimated to have new, pliable exoskeletons for approximately 1 – 3 months.

New-shell (code # 1) – Coxa and ventral surface of exoskeleton are dull. Legs are mostly full of meat; meri are not easily compressed by pinching. If carapace is removed, the gills will be a light cream color.

Old-shell (code # 2) – Distal portion of the ventral coxa is partially or totally covered with brown scratches or dots. Legs are full of meat, meri not easily compressed when pinched. If carapace is removed gill will be tan in color due to fouling by microorganisms. Generally, crabs that have retained their exoskeleton through a molt period (“skipmolt”). May have barnacles and other fouling marine organisms on the carapace.

Very old-shell (code # 3) – Distal portion of ventral coxa densely covered with black scratches or dots. Legs full of meat, meri not easily compressed when pinched. Tips of dactyls are worn, rounded, and black. If carapace is removed, gills will be dark gray or gray-black in color due to fouling by microorganisms. Crabs failing to molt during consecutive growth cycles, sometimes referred to as “double skips.” Frequently covered with barnacles or other fouling organisms.

Other biological characteristics of red king crabs that should be given special attention during sampling include the following:

Embryo color – normally appears purple (code # 2) for uneyed eggs, or tan (code # 1).

Embryo hatching – under the development column, uneyed eggs (code # 1) is the most common.

Diseases – black matt (code # 5), cottage cheese (code # 7) and shell disease (also known as shell rust, code # 8) are the most commonly occurring disease in red king crabs.

### ***Cost-Recovery Fishing***

Cost-recovery fishing goals for the 2003 test fish charter are equivalent to the expenses of the September and June charters, tag recovery efforts for the Bristol Bay red king crab injury assessment study and associated training and program costs. The total cost of the FY04 test fish program is approximately \$330,700. The cost-recovery harvest necessary to attain this goal equals approximately 9,150 legal-sized male red king crabs at an estimated average weight of 6.5 pounds and \$5.56 per pound. We need a minimum of \$220,500 to cover expenses of the September 2003 charter; this goal equals 6,100 crabs with the above parameters.

Cost-recovery operations will occur at a time to be determined by the vessel captain and the ADF&G crew leader. It is anticipated that this portion will take place toward the end of the charter. If sufficient densities of red king crabs are not located initially, cost-recovery fishing will start earlier and delivery of those crabs may be in the middle of the charter period. Fishing data such as catch date, location and depth and CPUE of legal-sized male red king crabs will be recorded for each cost-recovery pot (Appendix B.5., Form 2). The ADF&G crew will maintain a cumulative total of retained red king crabs during cost-recovery fishing (Appendix B.5., Form 5).

### **Random Catch Sampling**

In addition to the data recorded for each cost-recovery pot, up to 20 randomly selected cost-recovery pots (see Appendix B.7.) will be sampled each day to determine legal status, sex, size, egg development and condition, and shell age distribution of red king crabs and other commercially important shellfish species. Record all required data on the Crab Survey Data Form (Appendix B.5., Form 3); record all data for each species according to protocols outlined in the survey catch sampling section above.

### **Offload Sampling**

The catch will be monitored at offload by ADF&G staff to ensure accurate accounting of crabs for fish ticket documentation and assure correct payment to the State of Alaska. The offload will be sampled for size distribution by dockside samplers; average weight of the retained crabs will be obtained by the survey crew.

### **Fish Ticket for Cost-Recovery Delivery**

The crew leader will handle the paperwork of the delivery of crabs to Royal Aleutian Seafoods; this transaction in no way involves the F/V *Northern Orion* or the captain of the F/V *Northern Orion*. A designated crewmember from ADF&G will verify and record the weight of every brailer of cost-recovery crabs offloaded during delivery. Counts of crabs will be made for at least 6 brailers during the delivery and an ADF&G crewmember or a dockside sampler will measure at least 100 crabs for carapace lengths. The crew leader or designee will complete the transaction with the processor. Insure the fish ticket is embossed with the appropriate ADF&G Commercial Fisheries Entry Commission interim use permit card and the required information is completed as follows:

- record the “Vessel Name” as “ADF&G Kodiak Pribilof District Test Fish” (do not write the vessel name on any part of the fish ticket)
- compute the average weight of the crabs and record the appropriate portion of the catch for each statistical area by weight and number of crabs
- weigh the deadloss and record on the fish ticket using the appropriate code
- verify the total poundage and the price agreed upon in the processing contract
- re-check the fish ticket for accuracy before you sign it (remember the state is tax exempt)

Any disagreement with the processor needs to be settled before the fish ticket is signed. Payment of the delivery may be in the form of a check made out to: State of Alaska, 211 Mission Road, Kodiak, AK 99615, or through a prepayment made to the State and submitted to Department of Administration in Juneau (be sure to check with Dave Mitchell at 907-465-4131 prior to accepting a check from the processor).

### **Charter Vessel Payment**

Please ask the captain to send an invoice for the amount agreed to in the charter contract to: ADF&G, 211 Mission Road, Kodiak, AK 99615, ATTN: Skip Gish. Submit this invoice to Dave Mitchell, ADF&G Division of Administration, P.O. Box 25526, Juneau, AK 99802.

## *Ancillary Data Collections*

### **Benthic Habitat/Bottom Type Mapping**

The QTC VIEW consists of proprietary hardware and software. In addition, the system needs a dedicated computer and DGPS, access to an echo sounder and transducer, and a power source protected with an UPS power supply. Refer to the QTC VIEW manual for installation instructions (Quester Tangent Corporation 1998). The system will be installed in Dutch Harbor and ground-truthed on Chelan Bank prior to departure. Data acquisition will occur at all times the vessel is underway and the system data will be downloaded once a day during the charter (Appendix B.5., Form 6).

### **Benthic Sampling and Underwater Video Operations**

A sediment sample will be taken for each bottom/habitat type encountered by the use of a Van Veen grab. Each sample will be emptied into to a one-gallon zip lock type bag, labeled with date, time, latitude and longitude, and placed into the bait freezer. Underwater video of each sample site will be obtained using a drop camera to visually document the habitat type. Both the grab sampler and drop camera will be operated at or near slack tide to ensure successful operation. Date, time, latitude and longitude (Appendix B.5., Form 8) will document each benthic sample and camera deployment.

### **Environmental Data Collection**

The environmental parameters of temperature, conductivity and depth will be recorded throughout the charter in a manner to cover all areas and depths fished. These parameters will be obtained by the use of 3 CTD data loggers and 2 submersible temperature data loggers. Dates and times of data logger deployment will be noted for future reference (Appendix B.5., Form 7).

## **Food Habits of Red and Blue King Crabs**

Stomach will be collected during normal survey sampling procedures from up to 100 red king crabs and 100 blue king crabs. Samples are to be collected in a manner that will cover the range of habitat types encountered during the charter. Collect the stomach with the esophagus and intestine intact; samples will be placed in a whirl-pac bag with enough formaldehyde (5 to 10% solution from buffered formalin) to cover contents. All samples will be noted by species, date, and sequential pot number (Appendix B.5., Form 9).

## **Observer Practicum Collection**

Collect crabs and fishes for the observer practicum. Collection of crabs for the legal tally section include 45 legal-sized male red king crabs, 2 sublegal male red king crabs, 2 female red king crabs and 1 non-target species of crab (blue king crab, hair crab, Tanner crab, snow crab, scaled crab, etc.). Collection of crabs for the biological tally section include 30 legal-sized male red king crabs, 3 sublegal male red king crabs, 1 female red king crab, and 3 non-target species crabs. Collection of species for the bycatch sample section include 5 legal-sized male red king crabs, 10 sublegal male red king crabs, 10 female red king crabs, 5 non-target species crabs, 5 other invertebrate species, 3 Pacific cod, 2 sculpin species and 3 flatfish species. Keep a running tally on the appropriate form (Appendix B.5., Form 10).

## **Photographic Documentation of Research Activities**

Whenever time permits, activities aboard the charter vessel should be documented with photographs and video. All aspects of research activities including the handling and measuring of crabs, clutch size and egg development and various shell ages. Edited video footage provides the best means of documenting the survey operation for future reference. A digital camera, 35mm SLR camera and film, and an 8-mm format camcorder (with blank tapes) have been included in the survey equipment inventory. Note: All photographs should be documented with a short written caption relevant to what is being filmed (i.e., date, time, location and subject).



Appendix B.2. Radio Code Sheet.

**Alaska Department of Fish and Game Radio Code Sheet**  
**Pribilof District King Crab Survey**

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Number	Codes	
0	Whiskey	Charlie
00	Romeo	Quebec
000	Oscar	X-ray
1	Echo	Mike
2	Juliet	Hotel
3	Papa	Victor
4	Yankee	Kilo
5	Golf	Delta
6	Bravo	Tango
7	Foxtrot	Uniform
8	November	Sierra
9	India	Alpha

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## Appendix B.3. Equipment List.

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### Personal Gear:

- survival suits with EPIRBs & strobe attached (4)
- rain gear, boots and gloves (4 pr liners, 5 pr rubber gloves) per person
- earplugs (12 pr)-3 per person
- Stormy Seas jackets (4) \*2 will be brought from Kodiak
- EMT 1 medical jump kit (Dutch Harbor)

### Books and charts:

- books
  - a. Hart - Pacific Fishes of Canada
  - b. Kessler - Alaska's Saltwater Fishes
  - c. Eschmeyer - A Field Guide to Pacific Coast Fishes
  - d. NMFS/AFSC/RACE, - Species Codebook, March 2003
- shipboard instruction manuals (6 copies)
- US Dept. Commerce-ESSA Bathymetric chart
- 2002-2003 ADF&G Commercial Shellfish Fishing Regulations

### Office Supplies:

- write-in-rain notebooks (5)
- write-in-rain 8.5'x11' paper (100 sheets)
- pencils no. 2 (3 doz.) & or mechanical pencils plus extra lead (1 doz.)
- permanent black markers (3)
- paper clips & rubber bands (assorted)
- 10"X13" manila envelopes for data (15)
- calculator w/ extra batteries
- duct tape (1 lg. roll)
- 12" metal ruler
- pencil sharpener
- legal pads (3)
- sticky pads (2)
- 200 sheet ream of printing paper (1)

### Sampling Equipment/Supplies:

- clipboards(4)
- 12" vernier calipers (8) \*4 pr. from Kodiak
- 6.5" measuring sticks (4)
- 5.5" measuring sticks (3)
- 3.25" measuring sticks (3)
- tallywackers (2)
- ratchet and socket set plus 1/2"X 3" lag bolts (2 doz.)
- WD40 (2 cans)
- adjustable leg aluminum measuring tables (1) 4'X8' aluminum sampling table
- sorting baskets (6)
- tube of silicon (1)
- wire cutters
- needle nose pliers(2)
- 1-1/2" pliers (2)
- 1-1/2" channel lock (2)

Electronics:

- Dell Inspiron laptop computer (Kodiak – Data Entry)
  - Compaq laptop computer (Kodiak – QTC)
  - surge protector (1)
  - 25' extension cord
  - Minolta video camera + 4 tapes (Kodiak)
  - Minolta 35mm SLR + 8 rolls 100-400 ASA film (Kodiak)
  - Olympus E-10 digital camera and extra compact flash cards
-

Appendix B.4. Survey Itinerary and Pay Codes.

Date	Activity
9/1	depart Dutch Harbor/travel to grounds
9/2	set survey pot gear
9/3	pull/set survey pots
9/4	pull/set survey pots
9/5	pull/set survey pots
9/6	pull/set survey pots
9/7	pull/set survey pots
9/8	pull/set survey pots
9/9	pull/set survey pots
9/10	pull/set survey pots
9/11	pull/set survey pots
9/12	pull/set survey pots
9/13	pull/set survey pots
9/14	pull/set survey pots
9/15	pull/set survey pots
9/16	pull/set survey pots
9/17	pull/set survey pots
9/18	pull/set survey pots
9/19	pull/set survey pots
9/20	pull/set survey pots
9/21	pull/set survey or cost-recovery pots
9/22	set/pull cost-recovery gear
9/23	set/pull cost-recovery gear
9/24	set/pull cost-recovery gear
9/25	set/pull cost-recovery gear
9/26	set/pull cost-recovery gear
9/27	set/pull cost-recovery gear
9/28	set/pull cost-recovery gear
9/29	travel to Dutch Harbor
9/30	deliver cost-recovery crabs

**Pay Codes**

	Regular Pay	Sea/Hazard Pay
Skip Gish	11349039/11349039	11100741/11147785
Leslie Watson	11349039/11349039	11100741/11147785
Ryan Burt	11349039/11349039	11100741/11147785
Susie Byersdorfer	11100741/11147785	11100741/11147785

## Appendix B.5. Data Forms.

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- Form 1. 2003 Pilot House Logs – Survey Pots.
  - Form 2. 2003 Pilot House Logs - Cost-Recovery Pots.
  - Form 3. ADF&G Crab Survey Data Form.
  - Form 4. Species Composition Form.
  - Form 5. Cost Recovery Daily Tally and Cumulative Catch Record.
  - Form 6. Benthic Habitat / QTC VIEW Log.
  - Form 7. Environmental Data Collection Log.
  - Form 8. Benthic Sampling and Underwater Video Log.
  - Form 9. Stomach Sample Collection Log.
  - Form 10. Observer Practicum Collection Log.
-





Appendix B.5. Form 3.

ADF&G CRAB SURVEY DATA FORM

SPECIES \_\_\_\_\_

VESSEL \_\_\_\_\_

SEX \_\_\_\_\_

STRING NUMBER:

MEASURER \_\_\_\_\_

DATE:

BOUY NUMBER:

RECORDER \_\_\_\_\_

SAMPLE TYPE:  SAMPLE FACTOR:    OF

PAGE \_\_\_\_\_ OF \_\_\_\_\_

SEQUENTIAL POT NUMBER	SPECIES	SEX	SIZE		LEGAL	SHELL	EMBRYOS				OTHER	TAG NUMBER	COMMENTS	
			CRAB (mm)	FISH (cm)			COLOR	DEVEL.	COND.	% CLUTCH				
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
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19														
20														
21														
22														
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24														
25														
26														
27														
28														
29														
30														

**Crab Species**  
 1. L. aegispinus  
 2. P. camtschaticus  
 3. P. platypus  
 4. E. isembekii  
 5. Tanner hybrid  
 6. C. bairdi  
 7. C. opilio  
 8. C. angulatus

9. Cancer magister  
 10. L. couesi  
 11. C. tanneri  
 12. P. multispinus  
 13. P. verill

**Sex**  
 1. Male  
 2. Female

**Legal**  
 1. Sublegal  
 2. Legal

**Live Egg Color**  
 1. Tan  
 2. Purple  
 3. Brown  
 4. Orange  
 5. Purple-brown  
 6. Pink  
 7. Reddish  
 0. Other (note in comments)

**Egg Development**  
 1. Uneyed  
 2. Eyed  
 3. Hatching

**Clutch Condition**  
 1. Dead eggs not apparent  
 2. Dead eggs <20%  
 3. Dead eggs >20%

**Percent Clutch**  
 1. Barren, clean pleopods  
 2. Barren, matted pleopods  
 3. Clutch 1-29% full  
 4. Clutch 30-59% full  
 5. Clutch 60-89% full  
 6. Clutch 90-100% full

**Other**  
 1. Dead  
 2. Nemertean in clutch  
 3. Tubellarians in clutch  
 5. Black mat  
 6. Bitter crab disease

7. Cottage cheese disease  
 8. Shell disease  
 9. Briarosaccus callosus  
 0. Leatherback

Revised: 08/03  
 Source: ADF&G Shellfish Research













### Observer Practicum Collection Log

Station	Requested		Count
	Specimens	Number	
Legal Tally	Legal-sized male red king crabs	45	
	Sublegal male red king crabs	2	
	Female red king crabs	2	
	Non-target species crab	1	
Biological Tally	Legal-sized male red king crabs	30	
	Sublegal male red king crabs	3	
	Female red king crabs	1	
	Non-target species crab	3	
Bycatch Sample	Legal-sized male red king crabs	5	
	Sublegal male red king crabs	10	
	Female red king crabs	10	
	Other crab species	5	
	Other invertebrate species	5	
	Pacific cod	3	
	Sculpin species	2	
Flatfish species	3		

Appendix B.6. Random Sequence for Hanging Bait in Pots.

Random hanging bait sequence by station, by pot; 0 = no hanging bait, 1 = hanging bait.

Station	Pot 1	Pot 2	Pot 3	Pot 4	Station	Pot 1	Pot 2	Pot 3	Pot 4
1	1	0	0	1	38	0	1	0	1
2	0	0	1	1	39	0	1	0	1
3	0	1	0	1	40	0	0	1	1
4	1	0	1	0	41	0	1	0	1
5	1	1	0	0	42	0	1	1	0
6	1	0	1	0	43	1	1	0	0
7	1	0	1	0	44	1	0	1	0
8	1	0	1	0	45	0	1	1	0
9	0	1	1	0	46	0	1	0	1
10	0	1	1	0	47	0	0	1	1
11	0	1	0	1	48	1	1	0	0
12	1	1	0	0	49	1	0	0	1
13	1	0	0	1	50	0	1	0	1
14	0	0	1	1	51	1	0	0	1
15	1	0	0	1	52	0	1	0	1
16	1	0	0	1	53	0	0	1	1
17	0	1	1	0	54	1	0	0	1
18	1	0	1	0	55	0	1	1	0
19	0	0	1	1	56	1	0	1	0
20	1	0	1	0	57	1	0	0	1
21	1	0	0	1	58	1	0	1	0
22	1	1	0	0	59	1	0	1	0
23	0	0	1	1	60	0	1	1	0
24	0	1	1	0	61	1	0	1	0
25	0	1	0	1	62	1	0	0	1
26	0	1	0	1	63	1	1	0	0
27	0	1	0	1	64	1	0	1	0
28	0	1	1	0	65	1	0	0	1
29	1	0	0	1	66	1	0	0	1
30	1	1	0	0	67	0	0	1	1
31	0	1	0	1	68	0	1	1	0
32	1	0	0	1	69	1	0	0	1
33	1	0	0	1	70	0	1	1	0
34	0	1	1	0	71	1	0	0	1
35	0	1	0	1	72	1	0	1	0
36	1	1	0	0	73	0	0	1	1
37	0	1	1	0	74	0	0	1	1

Appendix B.6. (page 2 of 3).

Station	Pot 1	Pot 2	Pot 3	Pot 4	Station	Pot 1	Pot 2	Pot 3	Pot 4
75	0	1	0	1	115	0	0	1	1
76	1	1	0	0	116	1	0	0	1
77	0	0	1	1	117	1	1	0	0
78	1	0	1	0	118	1	0	1	0
79	1	1	0	0	119	0	0	1	1
80	0	1	1	0	120	0	0	1	1
81	0	1	0	1	121	1	0	1	0
82	0	0	1	1	122	1	1	0	0
83	1	0	0	1	123	0	1	0	1
84	0	1	1	0	124	0	0	1	1
85	1	1	0	0	125	1	1	0	0
86	1	0	1	0	126	0	1	0	1
87	0	1	1	0	127	1	0	1	0
88	1	1	0	0	128	1	0	0	1
89	0	0	1	1	129	0	0	1	1
90	0	1	0	1	130	1	0	1	0
91	1	0	1	0	131	1	1	0	0
92	1	1	0	0	132	0	1	0	1
93	1	1	0	0	133	0	1	0	1
94	0	1	0	1	134	1	1	0	0
95	1	1	0	0	135	0	0	1	1
96	0	1	0	1	136	0	1	1	0
97	1	1	0	0	137	1	1	0	0
98	0	1	1	0	138	1	0	0	1
99	1	0	1	0	139	1	0	0	1
100	1	0	1	0	140	1	1	0	0
101	1	1	0	0	141	1	1	0	0
102	1	0	0	1	142	0	0	1	1
103	1	1	0	0	143	0	1	0	1
104	1	1	0	0	144	1	1	0	0
105	0	1	1	0	145	0	0	1	1
106	1	0	0	1	146	1	1	0	0
107	0	0	1	1	147	0	1	0	1
108	0	1	0	1	148	0	1	1	0
109	1	0	1	0	149	0	0	1	1
110	0	0	1	1	150	1	1	0	0
111	0	1	0	1	151	1	0	1	0
112	0	1	0	1	152	0	1	0	1
113	0	1	0	1	153	1	1	0	0
114	1	0	1	0	154	1	0	0	1

Appendix B.6. (page 3 of 3).

Station	Pot 1	Pot 2	Pot 3	Pot 4	Station	Pot 1	Pot 2	Pot 3	Pot 4
155	0	0	1	1	178	1	0	1	0
156	1	0	0	1	179	0	1	1	0
157	0	1	0	1	180	1	0	0	1
158	0	1	0	1	181	0	1	1	0
159	0	1	1	0	182	1	0	0	1
160	0	1	0	1	183	0	0	1	1
161	0	1	0	1	184	1	1	0	0
162	1	1	0	0	185	1	0	1	0
163	1	1	0	0	186	1	1	0	0
164	1	0	0	1	187	0	1	1	0
165	1	0	0	1	188	1	0	1	0
166	1	0	0	1	189	0	0	1	1
167	0	1	0	1	190	1	1	0	0
168	1	0	1	0	191	1	0	0	1
169	1	1	0	0	192	0	0	1	1
170	1	0	1	0	193	0	1	0	1
171	1	0	1	0	194	0	1	1	0
172	1	0	0	1	195	0	1	0	1
173	0	1	0	1	196	0	1	0	1
174	0	1	1	0	197	0	1	1	0
175	0	1	0	1	198	0	1	1	0
176	0	0	1	1	199	0	0	1	1
177	1	0	1	0	200	1	0	1	0

## Appendix B.7. Procedure for Selecting Sample Pots.

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The goal is to obtain a systematic random sample of 20 pots per day during cost-recovery fishing. To do so, you will sample every  $n^{\text{th}}$  pot retrieved that day. To choose which pots to sample find out how many pots will be retrieved from the captain. The  $n^{\text{th}}$  pot will be where  $n = \text{total pots for the day}/20$ . Choose, at random, a number between 1 and  $n$  to start, then sample every  $n^{\text{th}}$  pot retrieved.

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