

**Regional Operational Plan CF.4K.2013.02**

---

---

**Project Operational Plan for the 2013 St. Matthew  
Island Blue King Crab Survey**

by

**Vicki Vanek**

---

---

September 2013

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



## Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the *Système International d'Unités* (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

<b>Weights and measures (metric)</b>		<b>General</b>		<b>Mathematics, statistics</b>	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	$H_A$
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	$e$
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, $\chi^2$ , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient (simple)	r
		corporate suffixes:		covariance	cov
<b>Weights and measures (English)</b>		Company	Co.	degree (angular)	$^\circ$
cubic feet per second	ft <sup>3</sup> /s	Corporation	Corp.	degrees of freedom	df
foot	ft	Incorporated	Inc.	expected value	$E$
gallon	gal	Limited	Ltd.	greater than	>
inch	in	District of Columbia	D.C.	greater than or equal to	$\geq$
mile	mi	et alii (and others)	et al.	harvest per unit effort	HPUE
nautical mile	nmi	et cetera (and so forth)	etc.	less than	<
ounce	oz	exempli gratia	e.g.	less than or equal to	$\leq$
pound	lb	(for example)		logarithm (natural)	ln
quart	qt	Federal Information Code	FIC	logarithm (base 10)	log
yard	yd	id est (that is)	i.e.	logarithm (specify base)	log <sub>2</sub> , etc.
		latitude or longitude	lat or long	minute (angular)	'
<b>Time and temperature</b>		monetary symbols (U.S.)	\$, ¢	not significant	NS
day	d	months (tables and figures): first three letters	Jan, ..., Dec	null hypothesis	$H_0$
degrees Celsius	°C	registered trademark	®	percent	%
degrees Fahrenheit	°F	trademark	™	probability	P
degrees kelvin	K	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	$\alpha$
hour	h	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	$\beta$
minute	min	U.S.C.	United States Code	second (angular)	"
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
<b>Physics and chemistry</b>				standard error	SE
all atomic symbols				variance	
alternating current	AC			population	Var
ampere	A			sample	var
calorie	cal				
direct current	DC				
hertz	Hz				
horsepower	hp				
hydrogen ion activity (negative log of)	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

***REGIONAL OPERATIONAL PLAN CF.4K.2013.02***

**PROJECT OPERATIONAL PLAN FOR THE 2013 ST. MATTHEW  
ISLAND BLUE KING GRAB SURVEY**

by

Vicki Vanek

Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak

Alaska Department of Fish and Game  
Division of Commercial Fisheries  
351 Research Court, Kodiak, Alaska, 99615

September 2013

The preparation of this operational plan is funded in part by a National Oceanic and Atmospheric Administration (NOAA) Cooperative Agreement NA12NMF4370099 (Bering Sea Crab Research XI) and NA13NMF4370198 (Bering Sea Crab Research XII). The views expressed herein are those of the author and do not necessarily reflect the views of NOAA or

The Regional Operational Plan Series was established in 2012 to archive and provide public access to operational plans for fisheries projects of the Divisions of Commercial Fisheries and Sport Fish, as per joint-divisional Operational Planning Policy. Documents in this series are planning documents that may contain raw data, preliminary data analyses and results, and describe operational aspects of fisheries projects that may not actually be implemented. All documents in this series are subject to a technical review process and receive varying degrees of regional, divisional, and biometric approval, but do not generally receive editorial review. Results from the implementation of the operational plan described in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author if you have any questions regarding the information provided in this plan. Regional Operational Plans are available on the Internet at: <http://www.adfg.alaska.gov/sf/publications/>

*Vicki Vanek,  
Alaska Department of Fish and Game, Division of Commercial Fisheries,  
351 Research Court, Kodiak, AK 99615, USA*

*This document should be cited as:*

*Vanek, V. 2013. Project operational plan for the 2013 St. Matthew Island blue king crab survey. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Operational Plan ROP.CF.4K.2013.02, Kodiak.*

The Alaska Department of Fish and Game (ADF&G) administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

**If you believe you have been discriminated against in any program, activity, or facility please write:**

ADF&G ADA Coordinator, P.O. Box 115526, Juneau, AK 99811-5526

U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, MS 2042, Arlington, VA 22203

Office of Equal Opportunity, U.S. Department of the Interior, 1849 C Street NW MS 5230, Washington DC 20240

**The department's ADA Coordinator can be reached via phone at the following numbers:**

(VOICE) 907-465-6077, (Statewide Telecommunication Device for the Deaf) 1-800-478-3648,

(Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

**For information on alternative formats and questions on this publication, please contact:**

ADF&G, Division of Sport Fish, Research and Technical Services, 333 Raspberry Rd, Anchorage AK 99518 (907) 267-2375

**Signature Page**

Project Title: Project Operational Plan for the 2013 St. Matthew Island Blue King Crab Survey

Project leader(s): Vicki Vanek

Division, Region and Area: Commercial Fisheries, Westward Region

Project Nomenclature: TF-785: Bristol Bay Test Fish, 11100741-11147785  
SP-851: Bering Sea Crab Research XII (NA13NMF4370198), 11340607-11340607

Period Covered: September 1, 2013 to 30 April 2014

Field Dates: Approximately September 1 to October 5, 2013

Plan Type: Category I

---

**Approval**

---

Title	Name	Signature	Date
Project leader	Vicki Vanek	<i>Douglas Pengilly (for Vicki Vanek)</i>	6 Sept 2013
Research Coordinator	Douglas Pengilly	<i>Doug's Pengilly</i>	6 Sept 2013



# TABLE OF CONTENTS

	<b>Page</b>
LIST OF TABLES.....	iv
LIST OF FIGURES.....	iv
LIST OF APPENDICES.....	iv
ABSTRACT.....	1
PURPOSE.....	1
OBJECTIVES.....	3
TERMS.....	4
METHODS.....	5
Survey Design.....	5
Catch Sampling.....	7
Tagging Strategy.....	8
Ancillary Collections.....	8
Ocean Bottom Temperature and Ocean Data Collection.....	9
Tagged Crab Recovery.....	9
DATA ANALYSIS.....	9
SCHEDULES AND RESPONSIBILITIES.....	11
DELIVERABLES.....	11
ACKNOWLEDGEMENTS.....	12
REFERENCES CITED.....	12
TABLES AND FIGURES.....	15
APPENDIX A. SHIPBOARD INSTRUCTIONS FOR THE 2013 ST. MATTHEW ISLAND BLUE KING CRAB SURVEY.....	23
APPENDIX B. SURVEY ITINERARY AND LOCATION.....	37
APPENDIX C. SURVEY DATA FORMS AND INSTRUCTIONS.....	47
APPENDIX D. CRAB CODE DESCRIPTIONS.....	73
APPENDIX E. SURVEY EQUIPMENT LIST.....	79

## LIST OF TABLES

<b>Table</b>	<b>Page</b>
1. Summary of blue king crab catches and catch per unit effort (CPUE; average catch per pot lift) from Stratum 1 and 2 during the 1995, 1998, 2001, 2004, 2007, and 2010 triennial St. Matthew Island pot surveys. Data presented is from the 96 stations fished in common in all survey years. <sup>a,b</sup> .....	16
2. Summary of blue king crab catches and catch per unit effort (CPUE; average catch per pot lift) from Stratum 3, in near shore waters, during the 2004, 2007, and 2010 triennial St. Matthew Island pot surveys. Data presented is from the 4 stations fished in common in all survey years. ....	17

## LIST OF FIGURES

<b>Figure</b>	<b>Page</b>
1. Location of the 200 stations established for triennial pot surveys of St. Matthew Island blue king crab by the Alaska Department of Fish and Game. ....	18
2. Primary stations in strata 1 and 2 to be sampled during the 2013 St. Matthew Island pot survey are enclosed by the solid-line polygon (stratum 2 is enclosed in the dashed-line polygon) and secondary stations are enclosed in the dash-dot-line polygon. See Figures 2 and 3 for station layouts in strata 3 and 4, respectively. ....	19
3. Stratum 3 schematic array with bathymetric background for shallow-water stations 301 - 310 to be sampled during the 2013 St. Matthew Island pot survey. Four pots per station will be set in a line perpendicular to shore at 3 fathom (fm) intervals to sample the 11 – 20 fm depth range (i.e. set at seabed depths of 11, 14, 17, and 20 fathoms). Stations 307-310 have been fished in common in 2004, 2007, and 2010; these are the primary stations in stratum 3. ....	20
4. Locations of the 20 4-pot stations in survey Stratum 4 to be sampled during the 2013 St. Matthew Island pot survey. Polygon outlined in bold denotes boundaries of NMFS EBS trawl survey station R-24; pot survey station 409 is located at the geographic center of NMFS EBS trawl survey station R-24. ....	21

## LIST OF APPENDICES

<b>Appendix</b>	<b>Page</b>
A1. Shipboard instructions for the 2013 St. Matthew Island blue king crab survey. ....	24
B1. Itinerary for the 2013 St. Matthew Island blue king crab survey .....	38
B2. Midpoint latitude and longitude coordinates for the 190 stations in Strata 1 and 2 established for triennial pot surveys of St. Matthew Island blue king crab by the Alaska Department of Fish and Game in 1995, 1998, and 2004. ....	39
B3. Latitude and longitude coordinates for stratum 3 stations in shallow waters. On a perpendicular line from shore through these locations, one pot each is set at a depth of 11, 14, 17, and 20 fathoms. ....	44
B4. Midpoint latitude and longitude coordinates for stations in stratum 4. Pot survey station 409 is located at the geographic center of NMFS EBS trawl survey station R-24. ....	45
C1. Survey pilot house log. ....	48
C2. Crab measurement form .....	51
C3. Station catch summary forms. ....	55
C4. Crab subsampling form. ....	58
C5. Species composition form. ....	61
C6. Fish length form. ....	63
C7. Data logger recording form .....	65
C8. Weather observation form .....	67
C9. Tagged crab recovery form. ....	70
D1. Crab code descriptions. ....	74
E1. Survey equipment list .....	80

## ABSTRACT

This report describes the project operational plan for the 2013 St. Matthew Island blue king crab *Paralithodes platypus* triennial pot survey. A description of the objectives, survey area, sampling and tagging methodologies, data analysis, reporting, and tagged crab recovery protocols is given. The survey will be conducted by Alaska Department of Fish and Game (ADF&G) biologists aboard the chartered 34.6-m (113.5-ft) vessel, FV *Sandra Five* during September-October 2013 in the St. Matthew Island Section of the Bering Sea (Area Q). One hundred fifty-six (156) survey stations near St. Matthew, Hall, and Pinnacle Islands are identified to be sampled using rectangular king crab pots during the 35-day survey charter. A relative stock abundance index from the surveyed area will be obtained and compared to indexes from triennial surveys conducted by ADF&G in 1995, 1998, 2001, 2004, 2007, and 2010. A tag recovery program will be implemented for the 2013/14 and subsequent commercial fisheries if prosecuted. Bottom water temperature profiles will be collected at each station. Water temperature, dissolved oxygen and pH will be collected at reference locations continuously for the survey's duration. Bottom topography data will be recorded as the vessel travels.

Key words: blue king crab, *Paralithodes platypus*, St. Matthew Island, Bering Sea, pot survey, distribution, relative abundance, ocean bottom temperature, ocean pH.

## PURPOSE

The Alaska Department of Fish and Game (ADF&G) commercial fishing regulations (5 AAC 34.905 (2) (2)) describe the St. Matthew Island Section for king crab as being within the Northern District of the Bering Sea king crab registration area (Area Q). The St. Matthew Island Section includes the waters north of the latitude of Cape Newenham (58°39' N. latitude) and south of the latitude of Cape Romanzof (61°49' N. latitude) with the Maritime Boundary Agreement Line of 1990 to the west. Commercial fisheries for blue king crab *Paralithodes platypus* in the St. Matthew Island Section occurred from the 1977 through the 1998 seasons, with a peak harvest of 9.5 million pounds landed in the 1983 season (Fitch et al. 2012). The St. Matthew Island blue king crab fishery was declared overfished in 1999 when the stock total mature male biomass was estimated to be below the minimum stock size threshold (MSST) specified in the North Pacific Fishery Management Council (NPFMC) Fishery Management Plan for the Bering Sea/Aleutian Islands King and Tanner Crab (FMP; NPFMC 1998). The fishery remained closed during the 1999 to 2008/09 seasons due to stock levels below the minimum mature male biomass threshold and minimum harvest level specified in the Saint Matthew Island Section blue king crab harvest strategy (5 AAC 34.917).

Results from the 2008 and 2009 National Marine Fisheries Service (NMFS) eastern Bering Sea (EBS) trawl surveys produced estimates of mature male biomass that exceeded MSST for two years in a row (Zheng et al. 2009), prompting NMFS to declare the St. Matthew Island blue king crab stock rebuilt on September 21, 2009 (Donaldson 2009). The Alaska Board of Fisheries removed the minimum total allowable catch (TAC) from the state's Saint Matthew Island Section Blue King Crab Harvest Strategy on September 28, 2009 (Donaldson 2009) and the fishery was reopened for the 2009/10 season with a Total Allowable Catch (TAC) of 1.167 million lb for the combined Individual Fishing Quota (IFQ) and Community Development Quota (CDQ) fisheries (Bowers 2009). However, the harvest for the 2009/10 season (0.461 million lb; Zheng et al. 2010) was substantially below the TAC. The harvest increased to 1.264 million lb in the 2010/11 season, although it did not attain the TAC of 1.600 million lb (Gaeuman 2011). The harvest rose again to 1.881 million lb in the 2011/12 season, but was still below the TAC set for the season (2.539 million lb; Gaeuman 2012). In the most recent 2012/13 season, the TAC was lowered to 1.630 million lb (Fitch 2012) and the season's harvest nearly met this amount at 1.616 million lb (H.B. Fitch, Area Management Biologist, ADF&G, Dutch Harbor; personal communication). The number of vessels

participating in the fishery has increased from 7 when the fishery reopened in the 2009/10 season to 17 in the 2012/13 season (H.B. Fitch, Area Management Biologist, ADF&G, Dutch Harbor; personal communication).

The St. Matthew Island blue king crab stock is inadequately surveyed by the annual National Marine Fisheries Service (NMFS) Eastern Bering Sea (EBS) trawl survey due to the rocky bottom conditions that exist where legal male and mature female crab are at highest densities (Gish et al. 2012). Therefore, abundance estimates of legal males from the trawl survey data can be unreliable and virtually no information on mature females is provided by the trawl survey. To address those problems, ADF&G instituted a triennial pot survey program for St. Matthew Island blue king crab in 1995 to augment the NMFS EBS trawl survey (Blau 1996). In 1995, a standard survey grid composed of 145 stations located between 59°30' and 60°30' N latitude and 172°00' and 174°00' W longitude (stations 1–145; Figure 1) was established based on the historic concentration of fishing effort, and geographic distribution and density of blue king crab observed in annual NMFS EBS trawl survey catches (Watson et al. 1995). The pot surveys continued through 1998, 2001, 2004, 2007, and 2010 (Blau and Watson 1999, Watson and Burt 2002, Watson 2005, Watson 2008, Gish et al. 2012). In 1998, 43 stations were added to the standard survey grid (stations numbered between 146 and 201; Figure 1), which expanded the survey grid to areas north of St. Matthew Island up to 60° 48' N latitude (Blau and Watson 1998). Twelve additional stations were added for the 2004 survey, 2 stations (stations 202 and 203) in the nearshore area south of St. Matthew I. and 10 stations (stations 301–310) in the shallow waters area, 11 to 20 fathom (fm; 20 to 37 m) deep and adjacent to the southern shore of St. Matthew Island (Figure 1; Watson 2004). Additionally, ADF&G performed a special nearshore pot survey for females in cooperation with NMFS in 1999 (Blau 2000).

Results of the ADF&G pot surveys have been crucial to understanding the stock distribution relative to fishery effort, fishery performance, and coverage by the NMFS EBS trawl survey. As well as providing information from commercially and biologically important areas that are not surveyed by the annual NMFS trawl survey, the closer spacing of survey stations for the ADF&G pot survey relative to the NMFS trawl survey allows for detecting changes in spatial processes that accompany changes in stock status (Vining et al. 2001). Moreover, in 2001, the pot survey provided important information on the mature female component of the stock relative to the overfished status that could not be provided by the NMFS EBS trawl survey alone (Watson and Burt 2002). Changes in the catch per unit effort (CPUE, expressed as number of crab per pot lift) of blue king crab during the triennial pot surveys (Tables 1 and 2) suggests that stock abundance declined between the 1998 and 2001 surveys, although not to the degree indicated by the results of the NMFS EBS trawl survey data (Gaeuman 2012), and continued to decline sharply into the 2004 survey (Watson 2008). However, the results of the 2007 and 2010 surveys showed an increase in catch of blue king crab above that which occurred in the 2004 survey, suggesting the stock was rebuilding, although not to the levels of 1995 and 1998.

Analysis of tagged legal male blue king crab survey releases and recoveries in the 1995 and 1998 St. Matthew Island commercial fisheries provided information suggesting significant spatial variation in harvest rates of crab within the survey area (Pengilly and Watson 2004). During the 1995 fishery, legal males tagged and released in the nearshore survey stratum (Stratum 2; Figure 2) were recovered at over 8 times the rate of those tagged and released in the offshore survey stratum (Stratum 1). In the 1998 commercial fishery, tag recovery rates were also dependent upon stratum of release; the recovery rate for legal males tagged in Stratum 2 was 2.7 times higher than for those

tagged in Stratum 1. Tagged crab released during the 2010 survey and recovered in the 2010/11 fishery showed a reversed pattern with legal males released in Stratum 2 recovered at one-third the rate as those released in Stratum 1 (Gish et al. 2012). That was consistent with the southward shift in location of concentrated commercial fishing catch and effort in the 2009/10 and 2010/11 seasons further from St. Matthew Island compared to the historic fisheries prosecuted through the 1998 season in which fishing catch and effort were concentrated near St. Matthew Island in shallower waters (Gish et al. 2012).

Performance of the 2013 triennial St. Matthew Island blue king crab pot survey is necessary for assessing the stock condition relative to rebuilding from an overfished condition and to sustain the time series of data that is needed for incorporation into a multiple-year stock assessment model for this stock (Gaeuman 2012). This operational plan describes the methodology for conducting the 2013 triennial blue king crab survey near St. Matthew Island.

## **OBJECTIVES**

Prioritized objectives for the 2013 St. Matthew Island blue king crab survey are as follows:

1. Obtain a relative stock abundance index (CPUE) and data on the distribution, sex composition, size composition, and reproductive status of blue king crab in the nearshore and offshore waters south and west of St. Matthew Island, including the 96 stations that have been fished in common during all previous St. Matthew Island blue king crab surveys.
2. Obtain data on the density, sex composition, size composition, and reproductive status of blue king crab present in NMFS Eastern Bering Sea trawl survey station R-24.
3. Obtain data on the density, sex composition, size composition, and reproductive status of blue king crab present in the shallow waters from 11-fm to 20-fm (20-m to 37-m) south of St. Matthew Island.
4. Estimate spatial apportionment of fishery mortality, movement of crab between capture during survey and capture during the commercial fishery, and growth by tagging and releasing male blue king crab during the pot survey and collecting tag-recovery information from the 2013/14 St. Matthew blue king crab fishery season and subsequent fishery seasons (if prosecuted).
5. Obtain bottom ocean temperature profiles at all stations fished during the survey and oceanographic parameters (pH, dissolved oxygen, and salinity) within the survey area.
6. Describe the overall species composition in the survey area, with emphasis relative abundance and distribution by sex and size.

# TERMS

## Blue King Crab

- Legal males:  $\geq 140$ -mm (5.5-in) carapace width (CW) outside lateral spines.
  - Legal male recruits: new-shell legal males  $< 134$ -mm carapace length (CL).
  - Legal male postrecruits: new-shell legal males  $\geq 134$ -mm CL and/or all old- or very old-shell legal males.
- Sublegal males:  $< 140$ -mm (5.5-in) CW outside lateral spines.
  - Sublegal prerecruit males: sublegal males  $\leq 105$ -mm CL.
  - Sublegal prerecruit one males: sublegal males  $\geq 105$ -mm CL.
- Mature-sized males: males  $\geq 105$ -mm CL.
- Females, Mature: eggs or empty egg cases on the pleopodal setae or matted condition of the pleopodal setae.
- Females, Immature: no eggs or empty egg cases on the pleopodal setae; pleopodal setae are clean.

## Snow Crab

- Legal males (Industry-preferred): males  $\geq 102$ -mm (4-in) CW outside lateral spines.
- Legal males (Legal by regulation, smaller than Industry-preferred): males  $\geq 79$ -mm (3.1-in), but  $< 102$ -mm CW outside lateral spines.
- Sublegal males: males  $< 79$ -mm CW outside lateral spines.
- Females: Immature and mature as identified by the shape of the abdominal flap (Jadamec et al. 1999).

## Tanner Crab

- Legal males: males  $\geq 112$ -mm (4.4-in) CW outside lateral spines.
- Sublegal males: males  $< 112$ -mm CW outside lateral spines.
- Females: Immature and mature as identified by the shape of the abdominal flap (Jadamec et al. 1999).

## Hair Crab

- Legal males:  $\geq 83$ -mm (3.25-in) CW outside lateral spines.
- Sublegal males:  $< 83$ -mm CW outside lateral spines.
- Females, Mature: eggs or empty egg cases on the pleopodal setae or matted condition of the pleopodal setae.
- Females, Immature: no eggs or empty egg cases on the pleopodal setae; pleopodal setae are clean.

## METHODS

The pot survey will be conducted aboard the FV *Sandra Five*, a 113.5-ft (34.6 m) commercial crab-pot-fishing vessel from approximately September 1 to October 5, 2013. The 35-day charter will begin and end in Dutch Harbor with a captain, engineer, two vessel crewmen, and four ADF&G biologists aboard. Details on methods are provided in the Shipboard Instructions (Appendix A). Approximately two of the 35 days allotted will be necessary for vessel travel to and from the survey grounds (Appendix B1).

Overall methodology follows that described in the 1995, 1998, 2001, 2004, 2007, and 2010 survey operational plans (Watson et al. 1995, Blau and Watson 1998, Watson and Pengilly 2001, Watson 2004, Watson 2007, Gish and Vanek 2010) and documented in respective survey reports (Blau 1996, Blau and Watson 1999, Watson and Burt 2002, Watson 2005, Watson 2008, Gish et al. 2012).

### SURVEY DESIGN

The 2013 survey station grid encompasses the area between 59°30' and 60°48' N latitude and 172°00' and 174°00' W longitude. One hundred fifty-six (156) stations are designated as “primary” stations for the 2013 survey; i.e., they are planned to be sampled during the 2013 survey. An additional 53 stations are designated as “secondary” stations for the 2013 survey; i.e., they may be sampled within the confines of the 35-d survey charter if all primary stations for the 2013 survey are sampled or if conditions encountered during the survey preclude sampling any of the primary stations.

#### **Strata 1 and 2: Standard Offshore and Nearshore Areas**

Two geographic strata with different densities of survey stations are defined: a stratum with higher station density in the nearshore area south of St. Matthew Island (Stratum 2) and a stratum with lower station density (Stratum 1) offshore of Stratum 2 (Figure 2). Stratum 2 was designed to contain the area of highest effort in historic fisheries prior to 1995 (Watson, et al. 1995, Gish et al. 2012) and has produced higher catches of mature females and legal males than Stratum 1 during the previous surveys (Table 1, Gish et al. 2012).

The station layout in both Strata 1 and 2 was established for the 1995 survey and is based on a grid in which stations are spaced by 5 minutes of latitude (5.00 nmi, 9.26 km) north-to-south and 10 minutes of longitude (4.93 nmi, 9.13 km, at the northern most stations and 5.07 nmi, 9.39 km, at the southern-most stations) east-to-west (Watson, et al. 1995). In Stratum 2, the station grid is overlaid with another 5-minutes-latitude by 10-minutes-longitude grid offset from the main grid by 2.5 minutes of latitude north-to-south and 5 minutes of longitude east-to-west (Watson, et al. 1995).

Seventy-four (74) stations in Stratum 1 and each of the 58 stations in Stratum 2 are designated as primary stations that are planned to be sampled during the 2013 survey (Figure 2). The 132 primary stations for the 2013 survey in Strata 1 and 2 include all of the 96 stations within Strata 1 and 2 that were sampled in common during the six triennial St. Matthew Island blue king crab surveys conducted since 1995 (see: Figure 15 *in* Gish et al. 2012). An additional 47 stations in Stratum 1 are designated as secondary stations for the 2013 survey (Figure 2), which may be sampled within the confines of the 35-d survey charter if all primary stations for the 2013 survey are sampled or if conditions encountered during the survey preclude sampling any of the primary stations.

Each station in Strata 1 and 2 will be sampled using four rectangular king crab pots set 0.125 nmi (0.23 km) apart and arrayed north-to-south (or east-to-west if prevailing wind and tide conditions do not allow setting north-to-south). Mid-point station coordinates for the established 200-station survey grid (Strata 1 and 2) are listed in Appendix B2.

### **Stratum 3: Shallow-Waters Area**

The shallow-waters Stratum 3 was first established as a 10-station stratum for the 2004 survey with the intent of monitoring trends in the density and distribution of ovigerous females by sampling from depths  $\leq 20$  fm (37 m) in the area south of and adjacent to St. Matthew Island (Watson 2004). Four of the Stratum 3 stations (stations 307 to 310; Figure 3) are designated as primary stations that are planned to be sampled during the 2013 survey (Figure 3). The four primary stations for the 2013 survey in Stratum 3 include all the stations within Stratum 3 that were sampled in common during the three triennial St. Matthew Island blue king crab surveys conducted since 2004. The remaining six stations in Stratum 3 (stations 301 to 306; Figure 3) are designated as secondary stations for the 2013 survey, which may be sampled within the confines of the 35-d survey charter if all primary stations for the 2013 survey are sampled or if conditions encountered during the survey preclude sampling any of the primary stations.

Each station in Stratum 3 consists of four king crab pots set in a line perpendicular to shore and spaced at 3 fm (5 m) intervals to sample the 11-to-20 fm (20-to-37 m) depth range. The distance between adjacent stations within the four primary stations (stations 301 to 306) and between adjacent stations within the six secondary stations (stations 307 to 310) is 2 nmi (3.7 km; Figure 3). The coordinates for Stratum 3 stations are in Appendix B3.

### **Stratum 4: NMFS Eastern Bering Sea Trawl Survey Station R-24**

Stratum 4 (north of St. Matthew Island and east of Hall Island; Figure 4) is newly-established for the 2013 survey. The boundaries of and the station layout within Stratum 4 were specifically designed to provide data on the distribution and relative density of male blue king crab within NMFS EBS trawl survey station R-24 at a finer scale than is provided by the single haul performed within R-24 by the NMFS EBS trawl survey. Area-swept estimates of abundance of mature-sized and legal-sized male blue king crab from the 2010, 2011, and 2012 NMFS EBS trawl survey data were heavily influenced by unusually large catches of male blue king crab at NMFS EBS trawl survey station R-24 (Chilton et al. 2011a, 2011b; Foy and Armistead 2012). Prior to 2010, highest densities of male blue king crab encountered by the NMFS EBS trawl survey in the vicinity of St. Matthew Island occurred at stations south of St. Matthew Island and NMFS EBS trawl survey station R-24 had little influence on the estimates of St. Matthew blue king crab abundance (e.g., Chilton et al. 2009).

Stratum 4 contains 20 stations (Figure 4). Station layout in Stratum 4 is based on a grid in which stations are spaced 5 nmi (9.26 km) north-to-south and east-to-west and overlaid with another 5-nmi (9.26 km) by 5-nmi (9.26 km) grid offset by 2.5 nmi (4.63 km) north-to-south and east-to-west. Note that station 409 in Stratum 4 (Figure 4) is located at the center of the NMFS EBS survey station R-24, where the tow for the trawl survey is made. All of the 20 stations in Stratum 4 are designated as primary stations that are planned to be sampled during the 2013 survey

Each station in Stratum 4 will be sampled using four rectangular king crab pots set 0.125 nmi (0.23 km) apart and arrayed north-to-south (or east-to-west, if prevailing wind and tide conditions do not allow for a north-to-south orientation). Mid-point station coordinates for the stations in Stratum 4 are in Appendix B4.

### **Gear and Fishing**

Ninety king crab pots measuring 7 ft x 7 ft x 34 in (2.1 m x 2.1 m x 0.9 m) supplied by ADF&G will be used and are the same design as those used in the previous St. Matthew Island surveys. Each pot is webbed with #92 nylon twine with a stretch mesh of 2.5 in (64 mm) and has two opposing 9-in by 36-in (23 cm by 91 cm; inside dimensions) tunnel eye openings set angled up as is standard for blue and red king crab. Each pot will be baited with one gallon of frozen chopped Pacific herring *Clupea pallasii*. The target soak time for each pot is 30 to 36 h. Stations will be retrieved in the sequential order that they are set. Pots within a station, whenever possible, will also be retrieved in the sequential order that they are set.

Fishing parameters, including station number, sequential pot number, set date and time, lift date and time, bottom type (rock, sand, silt, mud or gravel), latitude and longitude, and gear performance, will be reported on the Survey Pilot House Log (Appendix C1).

### **CATCH SAMPLING**

The contents of each pot fished will be enumerated to provide catch per unit effort data for blue king crab, hair crab *Erimacrus isenbeckii*, Tanner crab *Chionoecetes bairdi*, and snow crab *C. opilio*. A determination of legal-sized versus sublegal-sized males, shell condition of males and females, and female reproductive status will be made for each sampled crab. Carapace length (CL) of king and hair crabs will be measured to the nearest mm from the posterior margin of the right eye orbit to the midpoint of the rear margin of the carapace (Wallace et al. 1949) as illustrated in Donaldson and Byersdorfer (2005). Carapace width (CW) of snow and Tanner crabs will be measured to the nearest mm across the carapace at the widest part perpendicular to the medial line, with the tips of the calipers reaching inside the lateral spines as in Jadamec et al. (1999).

Carapace length/width, legal size status, female maturity, shell condition, and female reproductive data will be recorded on the Crab Measurement Form (Appendix C2). Blue king crab catches will be tallied daily by sex and size class as described under Terms (i.e, legal male recruits and postrecruit, sublegal males <105-mm CL, sublegal male prerecruits  $\geq$ 105-mm CL, and females) and recorded on the Station Catch Summary Form (Appendix C3). An explanation of crab codes used in completing all survey forms is given in Appendix D.

***Subsampling of crab.*** Blue king crab will not be subsampled for data recording during this survey.

Subsamples of snow crab may be taken for data recording when successive pots within a station contain a large number of crab. Subsampling of large pot catches may only be done when sampling the full pot contents would either impact crab vitality on deck or the vitality of crab in subsequent pots in the water, or unnecessarily delay overall survey progress. When subsampling, snow crab will first be separated into subcategories by sex. Subsampling will occur at the subcategory group level. If the subcategory group is less than approximately 50 crab, all the

individuals will be measured; if greater, it will be considered for subsampling. A minimum of 25 crab will be measured for each subcategory. The counts of measured, unmeasured, total crab in the pot by sex subcategory will be recorded on the Crab Subsampling Form (Appendix C4). See further details in the instructions for the Crab Subsampling Form.

***Fish and other invertebrates.*** All commercially important species, including Pacific cod *Gadus macrocephalus*, walleye pollock *Theragra chalcogramma*, sablefish *Anoplopoma fimbria*, Pacific halibut *Hippoglossus stenolepis*, Greenland turbot *Reinhardtius hippoglossoides*, yellowfin sole *Limanda aspera*, northern rock sole *Lepidopsetta polyxystra*, and flathead sole *Hippoglossoides elassodon*, northern rockfish *Sebastes polyspinis*, Atka mackerel *Pleurogrammus monopterygius*, arrowtooth flounder *Artheresthes stomias*, and Kamchatka flounder *Artheresthes evermanni*, will be measured and lengths recorded on the Fish Length Form (Appendix C6). All other captured invertebrates and fishes will be identified to species, if possible, and the total number recorded on the Species Composition Form (Appendix C5).

## **TAGGING STRATEGY**

Legal male blue king crab will be tagged in anticipation of their recovery during possible commercial fisheries in the 2013/14 and subsequent seasons. Only legal male blue king crab that are judged to be in healthy condition and have no severe new or old injuries and no parasitic infestations will be tagged. The first 15 legal male blue king crab in each station that are sampled for CL and shell condition that meet the criteria for tagging will be tagged. For example, if 15 eligible crab are sampled in the first pot of a station, those 15 will be tagged, regardless of the number of untagged legal males remaining from that pot or the number of legal males remaining in the next three pots of that station. If less than 15 eligible crab are captured at a station, all will be tagged. Crab will be tagged through the isthmus muscle using Floy® poly ‘spaghetti’ tags as described in Gray (1965).

The tag series letter and unique tag number of each tagged crab will be recorded along with the CL, legal status, and shell condition recorded for the crab on the Crab Measurement Form (Appendix C2). The Floy® tags used in the 2013 survey are identified as follows: florescent pink ‘spaghetti’ tags with white discs, tag series “D”, and unique tag numbers 17,001 to 20,000.

The harvest strategy for the St. Matthew blue king crab commercial fishery in regulation 5 AAC 34.917 specifies a harvest rate on legal males that ranges from 10% to 40% depending on the estimated abundance and size distribution of mature-sized males. If 15 legal males are tagged and released at a station, the probability that at least one of those is recaptured is 0.79 if they are subjected to a 10% harvest rate and >0.99 if they are subjected to a 40% harvest rate; if 15 legal males are tagged, the probability that at least one is recaptured exceeds 0.90 if they are subjected to harvest rates  $\geq 14\%$ .

## **ANCILLARY COLLECTIONS**

All snow crab with signs of bitter crab disease will be retained and frozen, with capture location and date recorded, and sent to National Marine Fisheries Service for testing and use in bitter crab disease research. Ad hoc collections of crab for an invertebrate reference collection may be collected as the appropriate species are encountered.

## **OCEAN BOTTOM TEMPERATURE AND OCEAN DATA COLLECTION**

Bottom temperature (°C) and depth profiles will be obtained during the survey by placing a data logger in one pot at each station fished. Eight Brancker® model TDR-2050/2051 data loggers and one RBR*duo* TD that record temperature and depth, and thirteen RBR Brancker® model XR-420-CTD data loggers that record conductivity (salinity), temperature, and depth will be deployed. Additionally, continuous water temperature reference data will be obtained by the deployment of three RBR model TR-1050 temperature loggers at yet-to-be-determined locations for the duration of the survey. Additionally, pH, dissolved oxygen saturation, temperature, and depth will be recorded by three multi-channel RBR*concerto* loggers deployed within the survey area at yet-to-be-determined locations. Data loggers will be externally marked with a deck identification number (Appendix C7) that will be recorded on the Survey Pilot House Log at the time of deployment.

## **TAGGED CRAB RECOVERY**

All efforts will be made to recover tagged crab and tag-recovery data during the 2013/14 St. Matthew Island blue king crab fisheries and subsequent seasons in the event that the fisheries are prosecuted. A news release will be issued to the Bering Sea crab industry outlining the tagging study by October 1, 2013. Prior to the October 15 regulatory fishery opening date and during vessel tank inspections, ADF&G research staff contact vessel crews and processing facilities to explain the tagged crab recovery effort and attendant tag reward program. All at-sea shellfish observers from the ADF&G mandatory observer program onboard vessels participating in the fishery will be enlisted to monitor catches for tagged crab and a dockside tagged-crab recovery program will be conducted at crab processing locations receiving product from the fishery through cooperation with the ADF&G dockside sampling program.

All recovered, tagged crab will be measured and assessed for shell condition, with complete capture location and depth information to be obtained from vessel captains (Appendix C9).

## **DATA ANALYSIS**

Catch per unit effort (CPUE; number of crab per pot lift) of blue king crab and snow crab captured during the 2013 survey will be summarized for sex-size classes by individual station, by survey strata, and for the overall survey area. Maps with graphic depictions of CPUE by station will be prepared to identify spatial trends in blue king crab and snow crab densities by sex, size, and (for females) reproductive condition. Frequency distributions of size and shell condition of males and size and maturity status of females will be summarized and graphed for blue king crab and snow crab. Reproductive condition data from female blue king crab and snow crab will be summarized. The 2013 survey data on blue king crab and snow crab will be tabulated and compared with that of the previous triennial survey data for comparison of CPUE, spatial distribution, and sex-size composition. Length distributions for captured commercially-important fish species will be summarized.

Ocean bottom temperature and depth data recorded at survey stations will be tabulated and bottom temperature will be plotted as a function of station depth. Spatial trends in temperature and depth in the survey area will be mapped and temperature-depth profiles will be compared

with those obtained in previous triennial surveys. Station CPUE of blue king crab by sex and of snow crab (sexes pooled) will be summarized and graphed as a function of station depth and temperature.

Tag recoveries from the 2013/14 season, if prosecuted, will be summarized overall and by station of release to estimate spatial distribution of fishery mortality relative to preseason distribution. Tag release and recovery data by survey stratum of release, statistical area of release, and depth zone ( $\leq 20$  fm, 21–30 fm, 31–45 fm, and  $\geq 46$  fm; ( $\leq 37$  m, 38–55 m, 57–82 m, and  $\geq 84$  m) of release will be summarized in tabular form or graphically for inspection of trends in: tag recovery rate as a function of release area (survey stratum, statistical area, and depth zone); and release-to-recovery transition between area of release and area of recovery. Spatial variation in tag recovery rates will be statistically evaluated by assuming that the number of tags released at station  $i$  that are recovered during the 2013/14 fishery is a random variable,  $R_i$ , that has a binomial distribution with parameters  $p_i$  and  $N_i$ ; i.e., the probability that  $r_i$  tags are recovered out of the  $N_i$  tags released at station  $i$  is given by,

$$P(R_i = r_i) = p_i^{r_i} (1-p_i)^{(N_i-r_i)}.$$

The recovery rate of tags released at station  $i$  (i.e., the parameter,  $p_i$ ) is assumed to be a function of two unknown parameters,

$$p_i = \varphi_i \theta,$$

where  $\varphi_i$  is the probability that a legal male blue king crab occurring at station  $i$  during the survey is captured during the fishery and  $\theta$  is the probability that a tagged legal male is recovered, given that it is captured during the fishery. Note that  $\varphi_i$  is assumed to be (or, for analytic purposes, allowed to be) dependent on the survey station of initial capture and release, whereas  $\theta$  is assumed to be a constant that does not depend on the station of initial capture and release. Hence it is assumed that: 1) the tag recovery rate,  $p_i$ , is proportional to the harvest rate that the legal crab present at station  $i$  during the survey are subjected to during the subsequent fishery; and 2) the relative difference between  $p_j$  and  $p_k$ ,  $j \neq k$ , is equal to the relative difference between the harvest rates that legal crab present at stations  $j$  and  $k$  during the survey are subjected to during the fishery. Estimates of the individual  $p_i$ 's and of their standard errors will be made according to the standard methods for binomially-distributed random variables. Tests for homogeneity in recovery rates among aggregates of release stations (i.e., for the entire survey area and by survey stratum, statistical area, and depth zone), estimates and standard errors of the overall recovery rates for aggregates of release stations, and tests for differences between the recovery rates for aggregates of release stations will be computed according to the methods of Cox and Snell (1989). Data recorded by vessel captains on the location of tag recovery sites will allow for computation of the minimum distance and of the direction of travel between tag release and recovery sites.

Tag recovery data from the 2014/15 season, if prosecuted, will be summarized and analyzed as described above for the tag recovery data from the 2013/14 season. Additionally, given sufficient recoveries, size and shell condition data recorded at release and recovery will be used to estimate molting probability between the 2013 survey and the 2014/15 fishery season as a function of size (CL) according to a logistic curve (Cox and Snell 1989) and to estimate growth per molt and as a function of size and shell condition.

## SCHEDULES AND RESPONSIBILITIES

Date(s)	Activity	Personnel
1/2013–8/2013	Project planning, vessel charter procurement, operational plan and shipboard instructions	Vanek
3/2013–8/2013	Purchase, prepare, and stage survey gear	Vanek and Westphal
9/2013–10/2013	Conduct at-sea survey	Vanek, Westphal, Litwiniak, and St Amand
9/2013–10/2013	Edit and compile survey data	Vanek and Westphal
10/2013	Pre-season distribution of information/forms on tagging study to vessels, processors, at-sea observers, dockside samplers	Alinsunurin
10/2013–11/2013	Enter survey data electronically	Alinsunurin
10/2013–1/2014	Collect/collate recovered tags and tag-recovery forms; enter tag-recovery data electronically; tag-recovery award distribution	Alinsunurin
12/2013–4/2014	Data summary/analysis; write final survey report	Vanek and Westphal

## DELIVERABLES

A post-survey memo will be written to provide a review of the survey performance, including: 1) the survey itinerary, chartered vessel, vessel crew, and ADF&G crew; 2) successes in, or hindrances to, achieving project objectives; 3) an assessment of the suitability of and satisfaction with the chartered vessel; 4) documentation of deviations from the survey itinerary or survey and sampling protocols provided in this operational plan; and 5) any other items of importance or observations of interest that are not documented on survey forms.

A report detailing the results of the 2013 survey with comparisons to the previous (1995 to 2010) triennial surveys and analyses of tag recoveries during the 2013/14 season (if prosecuted) will be completed and ready for publication in the ADF&G Fishery Data Series (FDS); however, due to confidentiality of data, the report cannot be published until May 31, 2014, the regulatory closure date of the 2013/14 Bering Sea District commercial snow crab fishery.

Month/Year	Deliverables	Author(s)/Presenter(s)
8/2013	Project Operational Plan	Vanek
10/2013	Presentation to industry (in Seattle)	Vanek
10/2013	Memorandum on survey	Vanek
12/2013	Presentation at Interagency meeting	Vanek and Westphal
4/2014	2013 survey report (FDS)	Vanek and Westphal

## ACKNOWLEDGEMENTS

D. Pengilly, regional research supervisor, is recognized and thanked for his continued efforts to maintain project funding, scientific overview, and final editing of this report. Thanks also to R. Shepard, regional analyst, for database structure and management and his help with dataforms. Special thanks to fishery biologists M. Westphal for her efforts preparing for this survey and R. Alinsunurin for her help with survey logistics and overseeing the distribution of tag recovery awards. K. Greer, Westward Region publications specialist generously provided formatting help and prepared the report for final publishing.

## REFERENCES CITED

- Blau, S. F. 1996. The 1995 St. Matthew Island blue king crab survey. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report No. 4K96-27, Kodiak.
- Blau, S. F. 2000. Nearshore blue king crab survey – St. Matthew Island, 1999. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report No. 4K96-27, Kodiak.
- Blau, S. F., and L. J. Watson. 1998. Project operational plan: 1998 St. Matthew Island blue king crab project. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K98-49, Kodiak.
- Blau, S. F., and L. J. Watson. 1999. St. Matthew Island blue king crab survey, 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K00-42, Kodiak.
- Bowers, F. R. 2009. Department of Fish and Game news release 2009/10 Saint Matthew Island Section Blue King Crab Season Opens October 15 Total Allowable Catch Announced at [http://www.cf.adfg.state.ak.us/region4/shellfish/crabs/news\\_rel/2009/nr090930b.pdf](http://www.cf.adfg.state.ak.us/region4/shellfish/crabs/news_rel/2009/nr090930b.pdf) accessed 6/2010.
- Chilton, E.A., C.E. Armistead, and R. Foy. 2009. The 2009 eastern Bering Sea Continental shelf bottom trawl survey: results for commercial crab species. NOAA Technical Memorandum NMFS-AFSC-201. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Kodiak Laboratory, October 2009.
- Chilton, E.A., C.E. Armistead, and R. Foy. 2011a. The 2010 eastern Bering Sea Continental shelf bottom trawl survey: results for commercial crab species. NOAA Technical Memorandum NMFS-AFSC-216. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Kodiak Laboratory, February 2011.
- Chilton, E.A., C.E. Armistead, and R. Foy. 2011b. The 2011 eastern Bering Sea Continental shelf bottom trawl survey: results for commercial crab species. Draft NOAA Technical Memorandum NMFS-AFSC. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Kodiak Laboratory, September 2011.
- Cox, D.R., and E.J. Snell. 1989. Analysis of binary data. Monographs on statistics and applied probability 32. *Second edition*. Chapman & Hall.
- Donaldson, W. 2009. Department of Fish and Game news release Saint Matthew Island Section Blue King Crab at [http://www.cf.adfg.state.ak.us/region4/shellfish/crabs/news\\_rel/2009/nr090928.pdf](http://www.cf.adfg.state.ak.us/region4/shellfish/crabs/news_rel/2009/nr090928.pdf) accessed 6/2010.
- Donaldson, W.E., and S.C. Byersdorfer. 2005. Biological field techniques for lithodid crabs. University of Alaska Sea Grant, AK-SG-05-03, Fairbanks.
- Fitch, H. 2012. Department of Fish and Game news release Saint Matthew Island Section Blue King Crab Season Opens October 15 Total Allowable Catch Announced (issued 10/3/2012) at <http://www.adfg.alaska.gov/static/home/news/pdfs/newsreleases/cf/229915079.pdf> accessed 8/2013.

## REFERENCES CITED (Continued)

- Fitch, H., M. Schwenzfeier, B. Baechler, T. Hartill, M. Salmon, M. Deiman, E. Evans, E. Henry, L. Wald, J. Shaishnikoff, K. Herring, and J. Wilson. 2012. Annual management report for the commercial and subsistence shellfish fisheries of the Aleutian Islands, Bering Sea and the Westward Region's shellfish observer program, 2010/11. Alaska Department of Fish and Game, Fishery Management Report No. 12-22, Anchorage.
- Foy, R.J., and C.E. Armistead. 2012. The 2012 eastern Bering Sea Continental shelf bottom trawl survey: results for commercial crab species. Draft NOAA Technical Memorandum NMFS-AFSC. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Kodiak Laboratory, September 2012.
- Gaeuman, W. 2011. St. Matthew Blue King Crab Stock Assessment in North Pacific Fishery Management Council (NPFMC) 2011. Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions: 2011 BSAI Crab SAFE. North Pacific Fishery Management Council, Anchorage, September 2011.
- Gaeuman, W.B. 2012. 2012. Saint Matthew Island blue king crab stock assessment. [In] North Pacific Fishery Management Council. 2012. Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Region: 2012 Crab SAFE. September 2012. North Pacific Fishery Management Council, Anchorage.
- Gish, R.K. and V.A. Vanek. 2010. Project operational plan for the 2010 St. Matthew Island blue king crab survey. Alaska Department of Fish and Game, Regional Information Report No. 4K10-12, Kodiak.
- Gish, R.K., V.A. Vanek, and D. Pengilly. 2012. Results of the 2010 triennial St. Matthew Island blue king crab pot survey and 2010/11 tagging study. Alaska Department of Fish and Game, Fishery Management Report No. 12-24, Anchorage.
- Gray, G.W., Jr. 1965. Tags for marking red king crabs. *Progr. Fish. -Cult.* 27:221-227.
- Jadamec, L.S., W.E. Donaldson, and P. Cullenberg. 1999. Biological field techniques for Chionoecetes crabs. University of Alaska Sea Grant, AK-SG-99-02, Fairbanks.
- North Pacific Fishery Management Council (NPFMC). 1998. Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs. North Pacific Fishery Management Council, Anchorage.
- Pengilly, D., and L.J. Watson. 2004. Recoveries of tagged blue king crabs *Paralithodes platypus* in St. Matthew Island commercial fisheries, 1995 – 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K-04-2, Kodiak.
- Vining, I., S.F. Blau, and D. Pengilly. 2001. Evaluating changes in spatial distribution of blue king crab near St. Matthew Island. Pages 327-346 in G.H. Kruse, N. Bez, A. Booth, M.W. Dorn, R.N. Lipscius, D. Pelletier, C. Roy, S.J. Smith, and D. Witherell (eds.). *Spatial processes and management of marine populations*, University of Alaska Sea Grant College Program, AK-SG-01-02, Fairbanks.
- Wallace, M.M., C.J. Pertuit, and A.R. Hvatum. 1949. Contribution to the biology of the king crab (*Paralithodes camtschatica*) Tilesius. U.S. Department of the Interior, Fish and Wildlife Service, Fishery Leaflet No. 340.
- Watson, L.J. 2004. Project operational plan for the 2004 triennial St. Matthew Island blue king crab survey. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K-04-26, Kodiak.
- Watson, L.J. 2005. The 2004 triennial St. Matthew Island blue king crab survey and comparisons to the 1995, 1998, and 2001 surveys. Alaska Department of Fish and Game, Divisions of Sport Fish and Commercial Fisheries, Fishery Management Report No. 05-22, Anchorage.
- Watson, L.J. 2007. Project operational plan for the 2007 St. Matthew Island blue king crab survey. Alaska Department of Fish and Game, Regional Information Report No. 4K07-8, Kodiak.
- Watson, L.J. 2008. The 2007 triennial St. Matthew Island blue king crab survey and comparisons to historic surveys. Alaska Department of Fish and Game, Fishery Management Report No. 08-41, Anchorage.

## REFERENCES CITED (Continued)

- Watson, L.J., and R. Burt. 2002. The 2001 St. Matthew Island blue king crab survey and comparisons to the 1995 and 1998 surveys. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K02-37, Kodiak.
- Watson, L.J., and D. Pengilly. 2001. Project operational plan for the 2001 St. Matthew Island blue king crab tagging survey. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K-01-41, Kodiak.
- Watson, L.J., D. Pengilly, and S.C. Byersdorfer. 1995. Project operational plan for the 1995 St. Matthew Is. blue king crab tagging survey. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report No. 4K-95-48, Kodiak
- Zheng, J., R. Foy, and D. Barnard. 2009. St. Matthew Blue King Crab Stock Assessment in Fall 2009 in North Pacific Fishery Management Council (NPFMC) 2009. Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions: 2009 BSAI Crab SAFE. North Pacific Fishery Management Council, Anchorage, September 2009.
- Zheng, J., R. Foy, and D. Barnard. 2010. St. Matthew Blue King Crab Stock Assessment in Spring 2010 in North Pacific Fishery Management Council (NPFMC) 2010. Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions: 2010 BSAI Crab SAFE. North Pacific Fishery Management Council, Anchorage, May 2010.

## **TABLES AND FIGURES**

Table 1.–Summary of blue king crab catches and catch per unit effort (CPUE; average catch per pot lift) from Stratum 1 and 2 during the 1995, 1998, 2001, 2004, 2007, and 2010 triennial St. Matthew Island pot surveys. Data presented is from the 96 stations fished in common in all survey years.<sup>a,b</sup>

Strata/Survey Year	Legal Males		Sublegal Males		Females	
	Number	CPUE	Number	CPUE	Number	CPUE
Stratum 1 (65 stations, 260 pots)						
1995	1,124	4.3	1,034	4.0	27	0.1
1998	1,988	7.7	1,179	4.5	128	0.5
2001	1,097	4.2	617	2.4	34	0.1
2004	166	0.6	48	0.2	3	<0.1
2007	880	3.4	1,101	4.2	41	0.2
2010	899	3.5	1,182	4.5	26	0.1
Stratum 2 (31 stations, 124 pots)						
1995	1,364	11.0	1,544	12.5	1,518	12.2
1998	1,205	9.7	885	7.1	1,909	15.4
2001	959	7.7	744	6.0	343	2.8
2004	274	2.2	211	1.7	114	0.9
2007	973	7.8	598	4.8	341	2.8
2010	1,007	8.1	1,098	8.9	864	7.0
Strata Combined (96 stations, 384 pots)						
1995	2,488	6.5	2,578	6.7	1,545	4.0
1998	3,193	8.3	2,064	5.4	2,037	5.3
2001	2,056	5.4	1,361	3.5	377	1.0
2004	440	1.2	259	0.7	117	0.3
2007	1,853	4.8	1,699	4.4	382	1.0
2010	1,906	5.0	2,280	5.9	890	2.3

<sup>a</sup> Stratum 1 stations: 1-3, 6-8, 15-17, 28-29, 36-37, 45-46, 54-55, 63-64, 72-95, 98-105, 110-116, and 122 -128. Stratum 2 stations: 4-5, 9-11, 18-21, 30-35, 47-53, 65-71, 147, and 149.

<sup>b</sup> The representational percentage of the 96 in-common stations in relation to the total number of stations fished in each survey declined from 70% of the stations in 1995 and 1998, to 61 % in 2001, and to about 55% of the 2004 and 2007 stations. In 2010, this increased slightly to 60% of the stations, similar to 2001. Average soak times for pots from all stations were similar in the first four surveys, ranging from 34 hours in 1995 to 39 hours in 2004, as compared to the average soak time of 49 hours in 2007 (Watson 2008). In 2010, the average soak time was 32 hours (Gish et al. 2012).

Table 2.—Summary of blue king crab catches and catch per unit effort (CPUE; average catch per pot lift) from Stratum 3, in near shore waters, during the 2004, 2007, and 2010 triennial St. Matthew Island pot surveys. Data presented is from the 4 stations fished in common in all survey years.

Year	Stations	Pots	Mature Males		Sublegal Males		Females	
			Number	CPUE	Number	CPUE	Number	CPUE
2004	4	16	3	0.2	0	0	25	1.6
2007	4	15	21	1.4	32	2.1	617	41.1
2010	4	16	26	1.6	53	3.3	811	50.7

<sup>a</sup> Stations are 307-310.

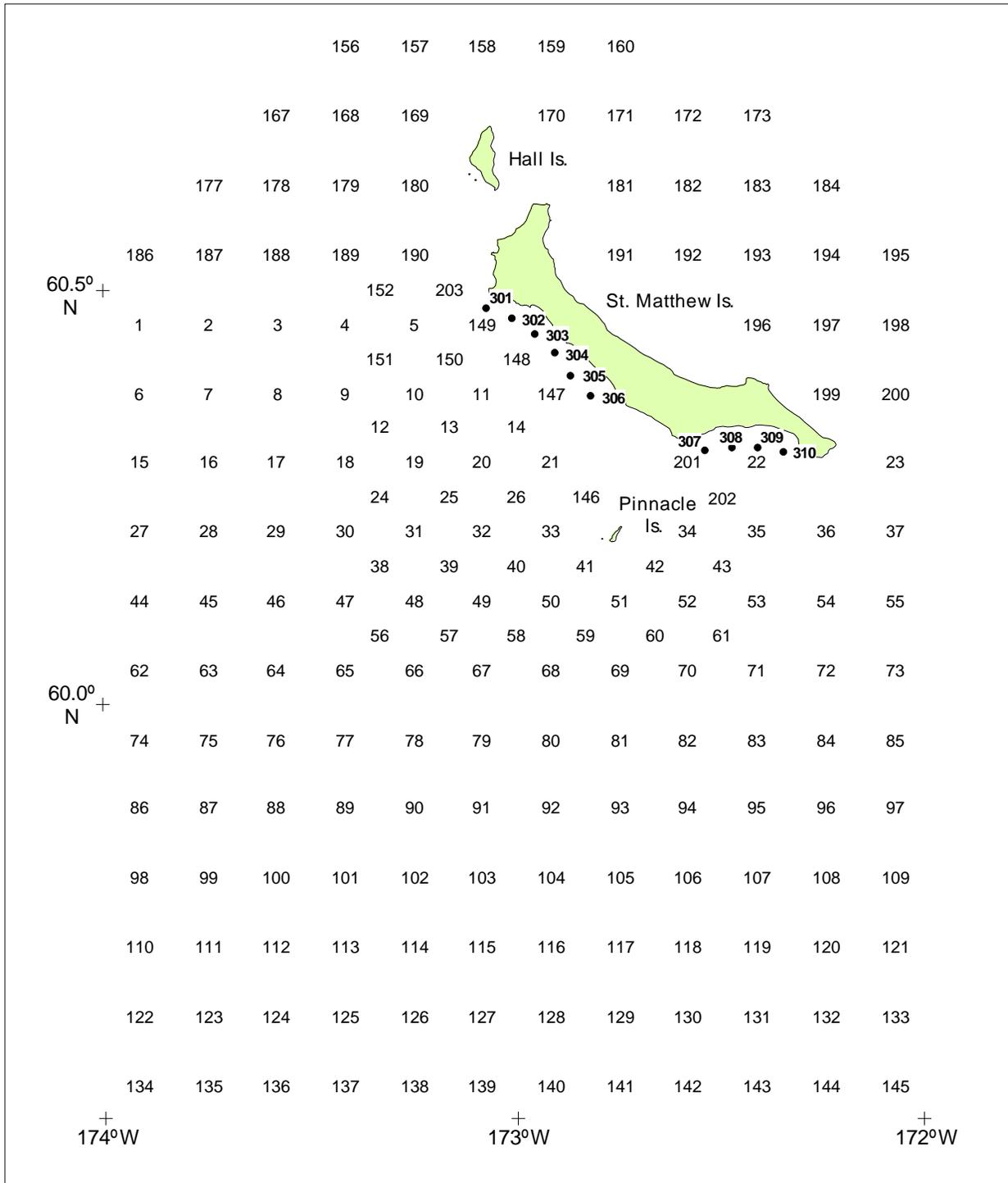
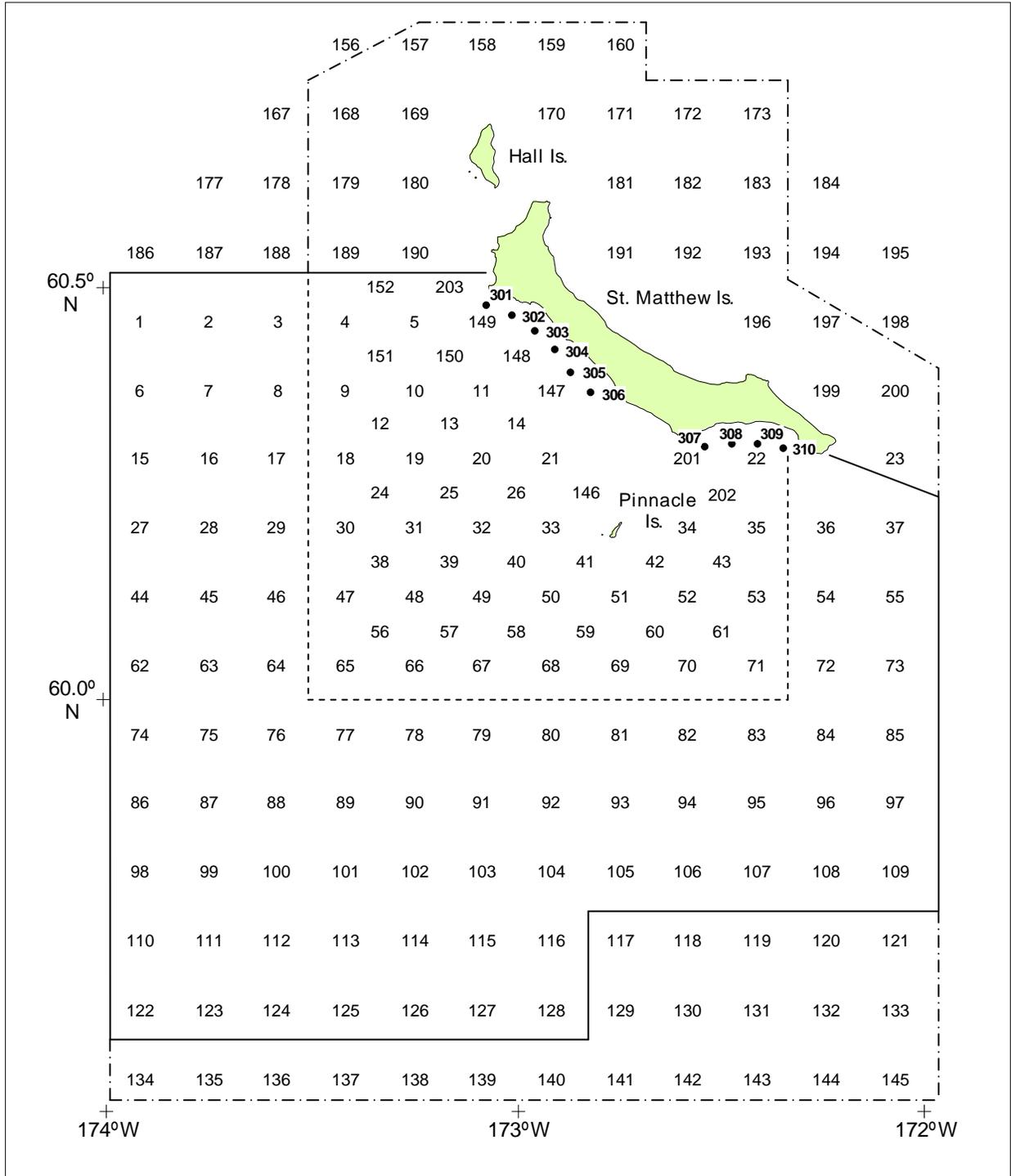


Figure 1.—Location of the 200 stations established for triennial pot surveys of St. Matthew Island blue king crab by the Alaska Department of Fish and Game.



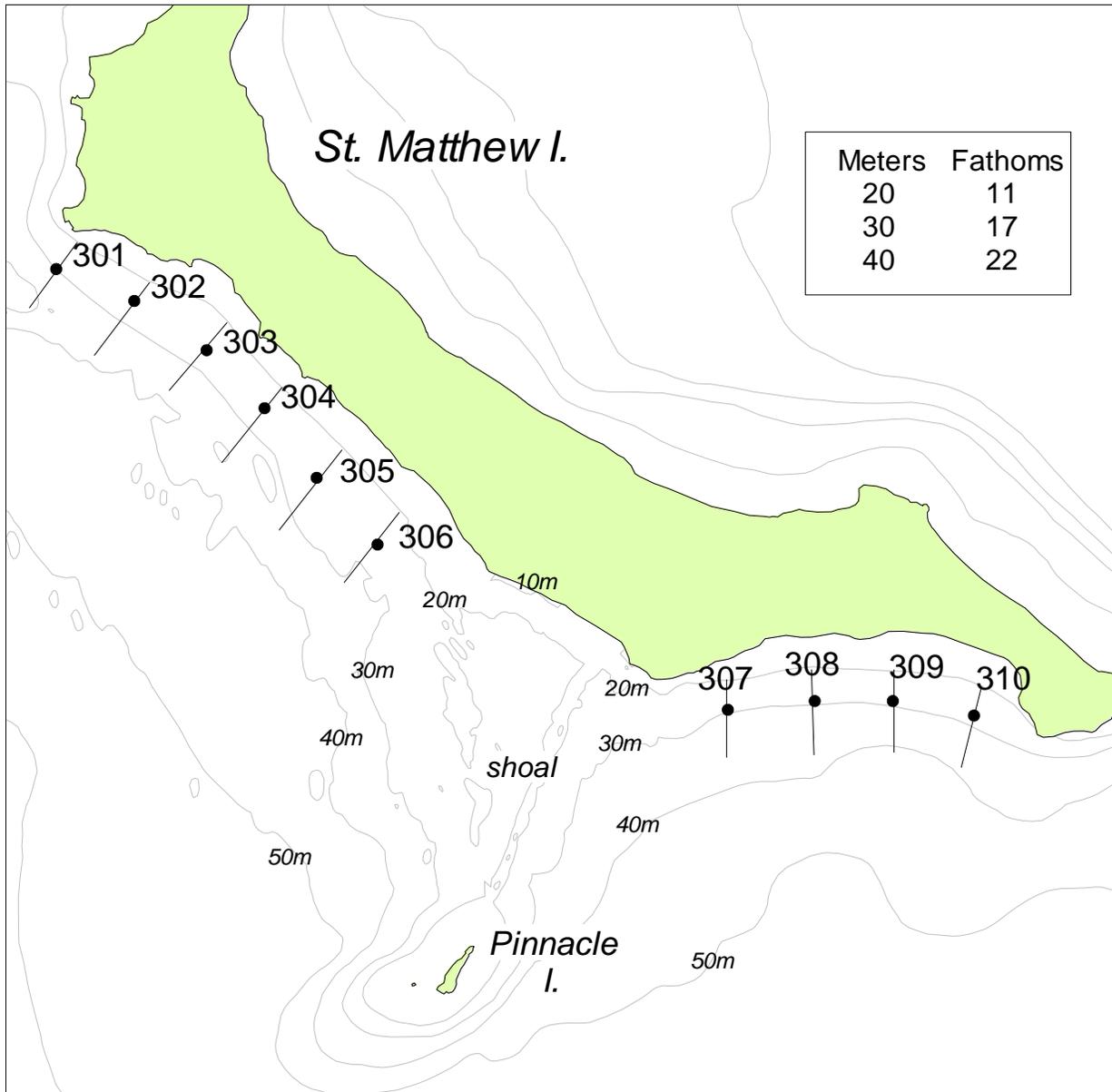


Figure 3.—Stratum 3 schematic array with bathymetric background for shallow-water stations 301 - 310 to be sampled during the 2013 St. Matthew Island pot survey. Four pots per station will be set in a line perpendicular to shore at 3 fathom (fm) intervals to sample the 11 – 20 fm depth range (i.e. set at seabed depths of 11, 14, 17, and 20 fathoms). Stations 307-310 have been fished in common in 2004, 2007, and 2010; these are the primary stations in stratum 3.

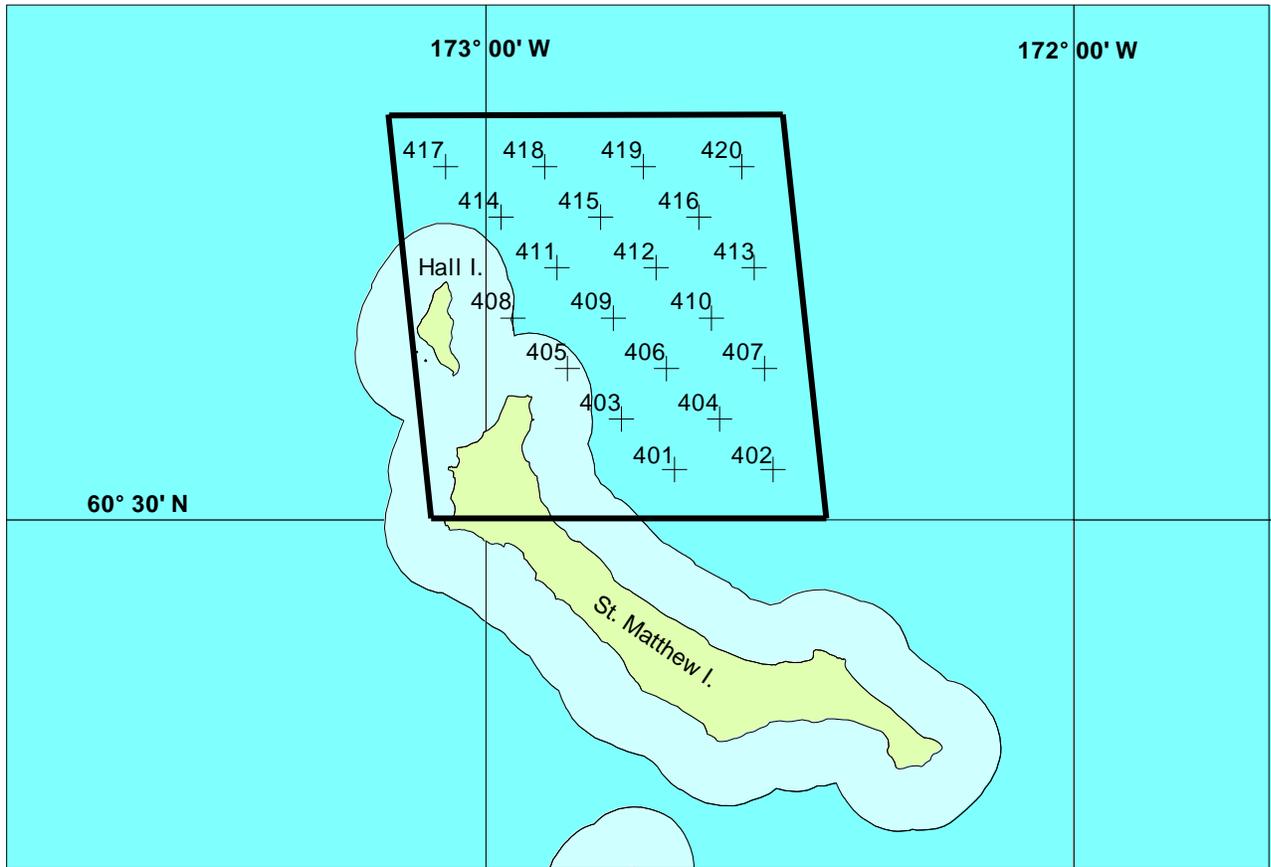


Figure 4.—Locations of the 20 4-pot stations in survey Stratum 4 to be sampled during the 2013 St. Matthew Island pot survey. Polygon outlined in bold denotes boundaries of NMFS EBS trawl survey station R-24; pot survey station 409 is located at the geographic center of NMFS EBS trawl survey station R-24.



**APPENDIX A. SHIPBOARD INSTRUCTIONS FOR THE 2013 ST.  
MATTHEW ISLAND BLUE KING CRAB SURVEY**

**TABLE OF CONTENTS**

	<u>Page</u>
GENERAL INFORMATION FOR ADF&G CREW .....	29
Vessel Safety Briefing .....	30
Immersion Suits .....	30
Shipboard Rules and Reminders .....	31
Timesheets, Payroll Codes, Etc. ....	32
SURVEY AND SAMPLING PROTOCOLS .....	33
Catch Sampling .....	33
Crabs .....	33
Other Species .....	34
Tagging Strategy .....	34
Tagged Crab Recovery .....	34
Oceanographic Data Collection .....	35
Photographic Documentation of Research Activities .....	35
Photographs of Blue King Crab Shell and Clutch Conditions, and Diseases or Parasites .....	36
INSTRUCTIONS TO THE CAPTAIN .....	38
Survey Overview .....	38
Setting and Retrieving Gear .....	38
Status Reports and Email Schedules .....	39

---

-continued-

## GENERAL INFORMATION

The purpose of this manual is to provide instructions and information related to the 2013 St. Matthew Island triennial pot survey. Refer to this document for detailed sampling instructions, form completion or information not covered in the operational plan. Expect standard methodologies to be consistent, and be prepared to accept changes to sampling procedures and protocols when warranted.

By State of Alaska Statute (Sec. 16.05.815(c)):

ALL SURVEY DATA ON BLUE KING CRAB ARE CONFIDENTIAL until the regulatory closure of the 2013/14 St. Matthew Island blue king crab commercial fishery, February 1, 2014.

ALL SURVEY DATA ON TANNER CRAB ARE CONFIDENTIAL until the regulatory closure of the 2013/14 Bering Sea District Tanner crab commercial fishery, March 31, 2014.

ALL SURVEY DATA ON SNOW CRAB ARE CONFIDENTIAL until the regulatory closure of the 2013/14 Bering Sea District snow crab commercial fishery, May 31, 2014.

**Maintaining confidentiality applies to and is required by all vessel and ADF&G personnel.**

The 2013 survey will be conducted aboard the chartered FV *Sandra Five*, a 113.5-ft (34.6 m) crab-pot-fishing vessel. The charter will be approximately 35 days in length, beginning on approximately September 1 and ending on approximately October 5, 2013.

The following personnel are participating in the 2013 king crab charter:

ADF&G Crew	Vessel Crew
Vicki Vanek - cruise leader	Joe Morris - captain
Miranda Westphal - research crew	Tim Seyster - engineer
Corey Litwiniak - research crew	Shonn Wheeler - deck boss
Loren St. Amand - research crew	Bryan Therien - crewman

The cruise leader is responsible for resolving any misunderstandings arising between the vessel crew and ADF&G biologists in regard to the charter service requirements; also, the cruise leader will be responsible for resolving any conflicts that may arise among the ADF&G crew.

Insubordination to the cruise leader or the vessel captain will result in immediate suspension from at-sea duties, and may result in the immediate return of that individual to port.

---

-continued-

### ***Vessel Safety Briefing***

Prior to the commencement of the survey, the captain will provide the ADF&G crew with a shipboard safety orientation to include the following:

1. General safety orientation: the location and operation of EPIRBs, life rafts, life rings, immersion suits, fire stations, medical kits, and safe/hazardous areas on deck.
2. Designation of emergency stations, operation of any assigned equipment, including sounding of the general alarm.
3. Instructions for making a distress call.
4. What to do in the event of a person overboard.
5. What to do in the event of a fire or flooding.
6. What to do if an ‘abandon ship’ order is issued.

Prior to the vessel’s departure from Dutch Harbor, the captain, vessel crew and ADF&G crew will conduct an abandon ship, man overboard, and a fire fighting drill (in the presence of USCG personnel if possible).

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 maneuver, bait, or unbait pots, operate hydraulics, or throw buoy lines. Be aware of the crane and hydraulic blocks at all times, particularly when pots are being moved. Do not stand under crane or boom arms at any time. Retreat to a safe area previously designated by the captain or deck boss while pots are being set, retrieved, moved, or stacked.

### ***Immersion Suits***

Prior to vessel departure, it is the individual’s responsibility to ensure that his/her immersion suit is ready for at-sea use. You should be able to put your survival suit on within 60 seconds. Practice before getting onboard. Supplied suits must be free of damage and have waxed, operable zippers and a safety whistle attached. Ensure that you know how to activate the EPIRB before attaching it to your suit. Ensure that new batteries have been installed in the supplied ACR FireFly3 strobe light and that you know how to turn it on before attaching it to your suit. Be sure you know how to use the supplied electronic signaling torch before attaching it to your suit. Store your suit where you can easily get to it, away from heat registers and in a clean location.

All EPIRBs, strobes, and electronic signaling torches will be returned to the Dutch Harbor office at the end of the survey for use on other BS/AI research surveys.

---

-continued-

### *Shipboard Rules and Reminders*

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.

Prior to survey vessel departure, several of you will inventory and pack all necessary items on the equipment list (Appendix E1) to ensure that we have everything we need to conduct the survey. During the charter, tasks and responsibilities will be delegated among the onboard ADF&G crew for the duration of the cruise. Any problems that arise should be channeled through the cruise leader. Expect that you will be learning and executing all basic tasks whenever so directed by the cruise leader. The rule of the deck is that no one goes off-deck until sampling and clean-up are completed for the day.

Whenever possible, the cruise leader will explain why we are doing something in a particular way, but your willing cooperation in executing tasks that you don't want to do or that you don't understand is mandatory. If you are unsure about what is being asked of you, ask the cruise leader. Some of the tasks are: 1) measuring crab and fish; 2) identifying other captured species; 3) recording crab, species composition, fish measurements, and subsampling data; 4) daily data editing of all survey forms, 5) tallying daily crab counts, 6) computer entry of key data, 7) operating temperature data loggers and managing their deployment; and 8) clean-up of deck sampling area and gear.

Completed data forms will be edited daily and cross-checked for accuracy. This practice ensures that the often-important short-term details of the day's events are not overlooked. Make sure deck paperwork tracks with the pilot house logs; every pot will have a unique number that will enable cross-referencing on a pot-by-pot basis. All spaces containing data need to be filled in with the appropriate code number, so that there are no ditto marks, arrows, or lines traveling down a data column to indicate the code number is the same as in an above space. Forms will be filed and kept in a safe, dry place inside the house. Although it is the cruise leader's responsibility to ensure data integrity, other ADF&G crew will be relied upon for assistance and it is expected that all at-sea staff will do their very best to aid in this effort. Be sure to ask the cruise leader about any unexpected changes in sampling protocols or anything else related to data collection when clarification is needed.

All work areas used, including galley and pilothouse tables will be cleaned up immediately after use. All sampling equipment will be cleaned and stored safely inside the vessel at the end of each day (calipers, clipboards, measuring sticks, etc.). Books and other references will be available for use by all staff. They will be kept dry and clean, and stowed in an accessible location away from vessel crew working areas.

Keep a daily log of sampling activities and irregularities, miscellaneous observations, hours worked, photographs taken, and other survey-related items that are not detailed on a sampling form. 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 that occur with survey/sampling procedures and suggestions for improving future surveys should also be noted in your daily log.

---

-continued-

Seabird and marine mammal observations will be tabulated by one person, and that information will be forwarded to the appropriate federal agency.

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 filling bait containers. When time allows, offers to help the vessel crew wash dishes, make coffee, help with meal preparation, and general help with cleaning is greatly appreciated. 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.

There will be no home packing or unauthorized retention of any animals captured during the survey by vessel or ADF&G crewmembers. All halibut (dead or alive) are to be placed overboard immediately. Sport fishing is allowed if a person has a valid 2013 fishing license. Subsistence and personal-use fishing is strictly prohibited. Collection of crabs and other animals will be allowed only as specifically directed by the cruise leader.

***Timesheets, Payroll Codes, Etc.***

Time sheets for pay periods ending August 31, Sept 15, and Sept 30 will be filled out in TEARS, printed and signed by the cruise leader, and sent to Tonya Wood in the Kodiak office prior to survey departure. Ensure that your prepared timesheets are correctly coded; use the following codes for regular time and sea pay as listed below.

---

Name	PCN	REGULAR	SEAPAY CODE
Vanek, Vicki	1857	11340607 - 11340607	11100741 - 11147785
Westphal, Miranda	1428	11340607 - 11340607	11100741 - 11147785
Litwiniak, Corey	1469	11100741 - 11147785	11100741 - 11147785
St. Amand, Loren	1906	11100741 - 11147785	11100741 - 11147785

---

---

-continued-

## SURVEY AND SAMPLING PROTOCOLS

This section contains sampling and data recording information that has not already been addressed in the overall operational plan. To eliminate repetition of sampling and data recording instructions, refer to the specific form and code descriptions contained in Appendices B (itinerary and location), C (forms and instructions), D (crab code descriptions), and E (survey equipment list).

### *Catch Sampling*

#### **Crabs**

Catch sampling is done on a priority basis to allow complete enumeration, sampling or subsampling, and documentation of blue king crab captured in survey pots.

Carapace length (CL) measurements to the nearest millimeter will be taken for all king and hair crabs encountered. Carapace width (CW) measurements not including the spines will be taken to the nearest millimeter for snow crab and Tanner crab. In other words, measurements ending in .1 to .4 will be rounded down, and measurements ending in .5 to .9 will be rounded up. Extra care should be taken to obtain accurate measurements.

If a sampled crab is unmeasurable (mangled, molted in the pot, etc.), that crab will be recorded on the Crab Measurement Form and biological characteristics that can be assessed will be documented. Note in comments your best estimate of what the CL measurement would have been if the unmeasurable crab had been whole (or the range of the likely possibilities).

Legal size status for blue king crab and other commercially important king crabs captured in survey pots must be determined and recorded.

Minimum legal sizes are as follows:

Species	Minimum Legal Size
Blue king crab <i>Paralithodes platypus</i>	5.5" CW, outside lateral spines
Snow crab <i>Chionoecetes opilio</i>	3.1" CW, outside lateral spines
Tanner crab <i>C. bairdi</i>	4.4" CW, outside lateral spines
Hair crab <i>Erimacrus isenbeckii</i>	3.25" CW, outside lateral spines

There is considerable size (CL) overlap of sublegal and legal-sized male blue king crab; in the previous 6 surveys, the smallest legal male measured was 111-mm CL and the largest sublegal measured was 146-mm CL. Therefore, either a measuring stick or calipers should be used to verify the legal measurement of all male king crab in the 110-mm to 150-mm CL range.

‘Riders’ are defined as crab that come up on, but not in, a sampled pot. During catch sampling, riders will not be counted, sampled, or recorded on survey forms. Crab that fall back into the sea from the interior of the pot will not be counted, either.

---

-continued-

However, observations on crab loss from survey pots will be noted and if pot doors are not secured to prevent routine loss of pot contents, that pot will be repaired such that crab are not routinely lost in successive pot lifts.

When a pot is hauled and emptied, sand fleas in the bait jars instead of remains of bait will be noted and recorded by a designated person.

### **Other Species**

All fishes and skates will be identified to the lowest taxonomic level possible, enumerated, and for select fishes, measured from each survey pot. For each pot, no species will be recorded more than once on the Species Composition Form, i.e., the total count by species will be recorded.

### ***Tagging Strategy***

Legal male blue king crab will be tagged in anticipation of their recovery during possible 2013/14 and subsequent commercial fisheries. A maximum of 15 legal male blue king crab will be tagged and released at each station. Each crab will be healthy, with no severe new or old injuries or parasitic infestations. The first 15 legal crab caught in each station that meet the tagging criteria will be tagged. If the maximum goal is captured in the first pot of a station, those crab will be tagged, regardless of the number available in the remaining three pots of that station. Crab will be tagged through the isthmus muscle using Floy® poly ‘spaghetti’ tags as described in Gray (1965). The tags are fluorescent pink, with white discs and are marked with the series letter ‘D’ followed by a 5-digit number (17,001 – 20,000). The tag series letter and unique tag number of each tagged crab will be recorded along with the CL, legal status, and shell condition recorded for the crab on the Crab Measurement Form (Appendix C2).

### ***Tagged Crab Recovery***

In the event previously tagged blue king crab are captured during the survey, record all required information (size, shell condition, location, and reproductive data) on the Tagged Crab Recovery Form (Appendix C9). The 1995 tags are yellow with orange discs; the 1998 and 2001 tags are fluorescent pink with fluorescent green discs; the 2010 and 2013 tags are fluorescent pink with white discs. Sample tagged crab as soon as possible, then release them with the tag intact as close to the capture location as possible. If the vessel moves off-station by more than 0.5 nmi before release, record the release location in the comments section of the Tagged Crab Recovery Form.

During the commercial fisheries, at-sea observers and dockside samplers will be asked to perform almost all of the tag recoveries from vessels, either while fishing or during offloading at the processing plants. The Dutch Harbor research staff will distribute the tag rewards.

---

-continued-

### **Oceanographic Data Collection**

Bottom water temperature and depth data will be collected at each station by the use of 13 conductivity (salinity)/temperature/depth (CTD; RBR Brancker® model XR-420-CTD) and 9 temperature/depth (TDR; 8 RBR Brancker® model TDR-2050/2051 and 1 RBR*duo*) data loggers. Loggers will be deployed with one logger at each station, in the second or third pot of the 4-pot string set at the station.

Loggers will be secured inside the pots by a carabiner and two door hooks with rubbers or with three door hooks with rubbers in a manner that restricts movement during deployment. The logger should not be positioned next to a crossbar in the pot to prevent potential damage from the logger hitting against the bar during deployment. Each logger has an identification number visible and readable from outside the crab pot. Check after every deployment for any problems in position, legibility of logger number, or other performance issues. Record lost or damaged loggers.

Reference pots will be set for the length of the survey to obtain continuous water temperatures by the deployment of 3 RBR model TR-1050 temperature loggers. Dissolved oxygen, pH, temperature, and depth profiles will be collected using 3 multi-channel RBR*concerto* loggers deployed throughout the survey area under the cruise leader's direction.

### **Photographic Documentation of Research Activities**

Whenever time permits, all aspects of research activities including the handling and measuring of crab, aboard the charter vessel should be documented with photographs or video. There will be at least one waterproof ADF&G camera available for anyone to use to take photos. A GoPro video camera will be used on deck periodically to record general survey activities. Video footage provides an excellent means of documenting the survey operation for future reference. Note: Photographs should be documented with a short written caption relevant to what is being filmed (i.e., date, time, location and subject).

Images should remain on the memory card with the camera if the provided ADF&G camera is used or transferred to the survey laptop and/or DVD if a personal camera is used.

Copies of all photos and videos must be given to the cruise leader before departure from the boat or other arrangements agreed upon with the cruise leader. This includes photos and videos taken on personal cameras. Policies on photos taken whether on one of the ADF&G cameras or a personal camera will be provided. (Ask the cruise leader if you have any questions on ADF&G policies regarding photos.) ADF&G cameras and/or DVDs of images should be returned to Vicki Vanek.

In addition, no photos or videos may be posted on public spaces, without approval from the ADF&G cruise leader. This includes those taken by the vessel crew, who are considered agents of the state during this charter.

---

-continued-

## **Photographs of Blue King Crab Shell and Clutch Conditions, and Diseases or Parasites**

**Objective:** To take photographs of: 1) shell conditions in blue king crab (*Paralithodes platypus*), 2) clutch conditions in blue king crab, and 3) crab diseases and parasites.

### **Shipboard Instructions:**

For every crab to be photographed:

1. Document crab sample and collection information on the dry erase board or on a paper card:
  - Species (i.e., BKC)
  - Date (i.e., 8/6/10)
  - Sex (i.e., F)
  - Survey code and sequential pot number (i.e., SM10-58)
  - Subject of photograph (one of the below):
    - i. Shell condition code (i.e., SC=2)
    - ii. clutch condition code
    - iii. name of disease or parasite
2. Photograph this information immediately prior to the photographs of the crab this information applies to. It will be your first photo in the series you take of that crab. This will allow us to match the information with the crab images by consecutive photo number (and avoids the need for separate written documentation).

**BE SURE THAT IT IS LEGIBLE ON THE PHOTO.**

Anytime you switch to taking photos of another crab, remember to first photo the new crab's information. It also helps to take a photo of something completely different (for example, deck, seas, sky etc.) between different crab. This will be used to identify the following photos on the digital card as belonging to that crab. If you go back to take more photos of a crab you photographed earlier (after photographing other crab), take another photo of the crab identifying information adding "part 2" to the information, as your first photo in the second series of photos, even though it was taken earlier.

3. Arrange the crab for photographs in a well-lit area. Preferably, photographs should be taken with a light-colored or white backdrop. Watch for glare.

---

-continued-

For blue king crab shell condition photos:

Blue king crab will be selected based on two criteria: 1) those that are representative of a given shell condition description (1 = SOFT; 2 = NEW; 3 = OLD; 4 = VERY OLD; 5 = VERY, VERY OLD; 9 = NEW, PLIABLE; 0 = PREMOLT and MOLTING. Full descriptions are in Appendix D1.) and 2) those that may be difficult to determine the shell condition code for as the crab may display characteristics of more than one shell condition description. You will be taking photos of two views each for the dorsal (top) and ventral (bottom) sides: one that includes the entire crab and one that is a close-up of the carapace margin area.

For each sampled crab, please take at least five images:

Photo 1 – Text label that shows information on the crab sample and collection location.  
(see above)

Photo 2 – Dorsal view of the entire crab.

Photo 3 – Close-up of the dorsal view that includes the lateral carapace margin area of the crab.

Photo 4 – Ventral view of the entire crab.

Photo 5 – Close-up of the ventral view that includes the lateral carapace margin area of the crab.

The intent of the close-up images are to clearly display the carapace margin, coxa to merus segments, and sternites in order to assess wear of spines, grasping marks, coloration, and scratches. Provided these five images are taken sequentially for each crab, there is no need to include text in the photographs of the crab themselves (Photos 2 – 5).

For blue king crab clutch conditions:

Photograph blue king crab with good representations of clutch conditions that are needed for the observer manual.

For crab diseases or parasites:

Photograph any diseases or parasites seen on any crab species, as chosen during the survey. Take as many views as necessary, including at least one of entire crab and close-ups at varying distances. Try to take at least one that is very close-up to show distinguishing signs, such as the raised profile from normal shell profile line as in pepper disease.

General information on photos taken:

Images should remain on the memory card with the camera if the provided ADF&G camera is used or transferred to DVD if a different camera is used. Please return the ADF&G cameras and/or DVDs of images to Vicki Vanek.

Policies on photos taken whether on one of the ADF&G cameras or a personal camera will be provided.

---

-continued-

## INSTRUCTIONS TO THE CAPTAIN

### *Survey Overview*

The 2013 survey station grid is within the area between 59°30' and 60°48' N latitude and 172°00 and 174°00' W longitude. Stations in Stratum 1, 2, and 4 will be sampled using 4 king crab pots spaced 0.125 nmi apart and arrayed north-to-south. Stratum 3 shallow-water stations are 2 nmi apart and will consist of 4 pots set in a line perpendicular to shore and spaced at 3-fm intervals to sample the 11-fm to 20-fm depth range (one pot each at 11, 14, 17, and 20 fathoms). The target soak time for each pot within a station is 30 - 36 hours. To achieve the target soak time, stations will be set in 'blocks' of 6 to 9 stations. Mid-point station coordinates for the 2013 survey are listed in Appendix B3 and will be provided in electronic format to be uploaded to the vessel's computer.

Ninety identical king crab pots measuring 7-ft x 7-ft x 34-in supplied by ADF&G will be used. Each pot is webbed with #92 nylon twine with a stretch mesh of 2.5 in and has two opposing 9-in x 36-in (inside dimensions) tunnel eye openings. Each pot will be baited with one gallon of frozen chopped Pacific herring. No hanging bait will be used.

One hundred fifty-six (156) stations are designated as "primary" stations for the 2013 survey and an additional 53 stations are designated as "secondary" stations. Adequate time to fish both primary and secondary stations is expected; however, inclement weather or other factors may occasionally hamper survey progress. The primary stations are the stations definitely planned to be sampled. If all designated survey stations are sampled, additional stations from areas to the west and east of St. Matthew and Hall Islands may be sampled. (See Figures 2-4.)

### *Setting and Retrieving Gear*

The Survey Pilot House Log will be used to report all required data for each pot when setting or retrieving gear (Appendix C1). Unique, sequential pot numbers (SPN) will be assigned for each pot in successive stations beginning with the numeral 1. Record the latitude and longitude to the nearest one-hundredth of a minute; this information must be recorded at the time each pot is set, not at the time it is pulled. Pilot house logs must be accurately completed each day. Please use pencils to record all data.

Prior to gear deployment, a temperature logger will be secured in the second or third pot at each station fished. Each logger will be externally marked to correspond with a three-digit ID number; please make sure the crew tells you which logger ID number is put in that pot. If a logger is placed in a pot other than the second one, the crew must identify and report which pot contains the unit. Each logger will be secured inside the top of the pot during baiting by attaching 3 sets of door rubbers to the unit and hooking it to the pot mesh so that the unit doesn't hit the pot frame.

A Weather Observation Form will be completed daily at the beginning and ending of setting and retrieving of gear (4 observations per station). If weather observations are made at non-station locations, leave the station number blank and complete the rest of the form as directed (Appendix C9).

---

-continued-

As each pot comes aboard, you will need to tell the ADF&G deck crew what the sequential pot number (SPN) is for that pot.

- ✓ If a pot is lost prior to retrieval, set without bait, or did not fish properly, note that on the Pilot House Log, and inform the ADF&G deck crew. Do not erase the sequential pot number of any lost pot or pot that had a poor performance.
- ✓ If the 4-pot string is pulled in reverse order from the order in which the string was set, please notify the ADF&G deck crew of the proper SPN and that the string is being pulled in reverse order.

### *Status reports and Email Schedules*

The ADF&G cruise leader will use the vessel's onboard email system to convey a daily status report on charter activities information to Doug Pengilly in the Kodiak office; when daily reports are not feasible, a minimum of three status reports each week will be sent. Reports will contain information such as the area where the vessel is currently working (e.g., geographic description or block of survey stations), planned destination for the next day (e.g., survey stations), any major unusual findings and the status or well being of the vessel and crew (e.g., "All OK"); the report may also contain the total number of pots sampled and the numbers of blue king crab by station.

An inReach® satellite communicator using the Iridium satellite network will be on at all times and will register the vessel's location by coordinates once every 2 hours. This will allow the vessel's current location (within 2 hours) and a history of the vessel's movements to be tracked from any onland location via the internet at the inReach® website.

Use of the ship's satellite telephone will only be used for emergencies. ADF&G crew will only be allowed to use either means of the vessel's communications for personal use except as authorized by the cruise leader.



## **APPENDIX B. SURVEY ITINERARY AND LOCATION**

Appendix B1.–Itinerary for the 2013 St. Matthew Island blue king crab survey.

---

Charter Day	Activity
1	Gear work, load survey gear
2	Depart Dutch Harbor
3	Travel to survey area
4	Set first block of stations, set reference pots
5-32	Set 6-9 stations each day, Pick stations set previous day
33	Pick stations set previous day, retrieve reference data pots
34	Travel to Dutch Harbor
35	Arrive Dutch Harbor and offload survey gear

Appendix B2.—Midpoint latitude and longitude coordinates for the 190 stations in Strata 1 and 2 established for triennial pot surveys of St. Matthew Island blue king crab by the Alaska Department of Fish and Game in 1995, 1998, and 2004.

Station	Stratum	N Latitude		W Longitude	
		Degrees	Minutes	Degrees	Minutes
1	1	60	27.50	173	55.00
2	1	60	27.50	173	45.00
3	1	60	27.50	173	35.00
4	2	60	27.50	173	25.00
5	2	60	27.50	173	15.00
6	1	60	22.50	173	55.00
7	1	60	22.50	173	45.00
8	1	60	22.50	173	35.00
9	2	60	22.50	173	25.00
10	2	60	22.50	173	15.00
11	2	60	22.50	173	5.00
12	2	60	20.00	173	20.00
13	2	60	20.00	173	10.00
14	2	60	20.00	173	0.00
15	1	60	17.50	173	55.00
16	1	60	17.50	173	45.00
17	1	60	17.50	173	35.00
18	2	60	17.50	173	25.00
19	2	60	17.50	173	15.00
20	2	60	17.50	173	5.00
21	2	60	17.50	172	55.00
22	2	60	17.50	172	25.00
23	1	60	17.50	172	5.00
24	2	60	15.00	173	20.00
25	2	60	15.00	173	10.00
26	2	60	15.00	173	0.00
27	1	60	12.50	173	55.00
28	1	60	12.50	173	45.00
29	1	60	12.50	173	35.00
30	2	60	12.50	173	25.00
31	2	60	12.50	173	15.00
32	2	60	12.50	173	5.00
33	2	60	12.50	172	55.00
34	2	60	12.50	172	35.00
35	2	60	12.50	172	25.00
36	1	60	12.50	172	15.00
37	1	60	12.50	172	5.00
38	2	60	10.00	173	20.00
39	2	60	10.00	173	10.00
40	2	60	10.00	173	0.00
41	2	60	10.00	172	50.00
42	2	60	10.00	172	40.00
43	2	60	10.00	172	30.00

-continued-

Station	Stratum	N Latitude		W Longitude	
		Degrees	Minutes	Degrees	Minutes
44	1	60	7.50	173	55.00
45	1	60	7.50	173	45.00
46	1	60	7.50	173	35.00
47	2	60	7.50	173	25.00
48	2	60	7.50	173	15.00
49	2	60	7.50	173	5.00
50	2	60	7.50	172	55.00
51	2	60	7.50	172	45.00
52	2	60	7.50	172	35.00
53	2	60	7.50	172	25.00
54	1	60	7.50	172	15.00
55	1	60	7.50	172	5.00
56	2	60	5.00	173	20.00
57	2	60	5.00	173	10.00
58	2	60	5.00	173	0.00
59	2	60	5.00	172	50.00
60	2	60	5.00	172	40.00
61	2	60	5.00	172	30.00
62	1	60	2.50	173	55.00
63	1	60	2.50	173	45.00
64	1	60	2.50	173	35.00
65	2	60	2.50	173	25.00
66	2	60	2.50	173	15.00
67	2	60	2.50	173	5.00
68	2	60	2.50	172	55.00
69	2	60	2.50	172	45.00
70	2	60	2.50	172	35.00
71	2	60	2.50	172	25.00
72	1	60	2.50	172	15.00
73	1	60	2.50	172	5.00
74	1	59	57.50	173	55.00
75	1	59	57.50	173	45.00
76	1	59	57.50	173	35.00
77	1	59	57.50	173	25.00
78	1	59	57.50	173	15.00
79	1	59	57.50	173	5.00
80	1	59	57.50	172	55.00
81	1	59	57.50	172	45.00
82	1	59	57.50	172	35.00
83	1	59	57.50	172	25.00
84	1	59	57.50	172	15.00
85	1	59	57.50	172	5.00
86	1	59	52.50	173	55.00
87	1	59	52.50	173	45.00
88	1	59	52.50	173	35.00

-continued-

Station	Stratum	N Latitude		W Longitude	
		Degrees	Minutes	Degrees	Minutes
89	1	59	52.50	173	25.00
90	1	59	52.50	173	15.00
91	1	59	52.50	173	5.00
92	1	59	52.50	172	55.00
93	1	59	52.50	172	45.00
94	1	59	52.50	172	35.00
95	1	59	52.50	172	25.00
96	1	59	52.50	172	15.00
97	1	59	52.50	172	5.00
98	1	59	47.50	173	55.00
99	1	59	47.50	173	45.00
100	1	59	47.50	173	35.00
101	1	59	47.50	173	25.00
102	1	59	47.50	173	15.00
103	1	59	47.50	173	5.00
104	1	59	47.50	172	55.00
105	1	59	47.50	172	45.00
106	1	59	47.50	172	35.00
107	1	59	47.50	172	25.00
108	1	59	47.50	172	15.00
109	1	59	47.50	172	5.00
110	1	59	42.50	173	55.00
111	1	59	42.50	173	45.00
112	1	59	42.50	173	35.00
113	1	59	42.50	173	25.00
114	1	59	42.50	173	15.00
115	1	59	42.50	173	5.00
116	1	59	42.50	172	55.00
117	1	59	42.50	172	45.00
118	1	59	42.50	172	35.00
119	1	59	42.50	172	25.00
120	1	59	42.50	172	15.00
121	1	59	42.50	172	5.00
122	1	59	37.50	173	55.00
123	1	59	37.50	173	45.00
124	1	59	37.50	173	35.00
125	1	59	37.50	173	25.00
126	1	59	37.50	173	15.00
127	1	59	37.50	173	5.00
128	1	59	37.50	172	55.00
129	1	59	37.50	172	45.00
130	1	59	37.50	172	35.00
131	1	59	37.50	172	25.00
132	1	59	37.50	172	15.00
133	1	59	37.50	172	5.00

-continued-

Station	Stratum	N Latitude		W Longitude	
		Degrees	Minutes	Degrees	Minutes
134	1	59	32.50	173	55.00
135	1	59	32.50	173	45.00
136	1	59	32.50	173	35.00
137	1	59	32.50	173	25.00
138	1	59	32.50	173	15.00
139	1	59	32.50	173	5.00
140	1	59	32.50	172	55.00
141	1	59	32.50	172	45.00
142	1	59	32.50	172	35.00
143	1	59	32.50	172	25.00
144	1	59	32.50	172	15.00
145	1	59	32.50	172	5.00
146	2	60	15.00	172	50.00
147	2	60	22.50	172	55.00
148	2	60	25.00	173	0.00
149	2	60	27.50	173	5.00
150	2	60	25.00	173	10.00
151	2	60	25.00	173	20.00
152	2	60	30.00	173	20.00
156	1	60	47.50	173	25.00
157	1	60	47.50	173	15.00
158	1	60	47.50	173	5.00
159	1	60	47.50	172	55.00
160	1	60	47.50	172	45.00
167	1	60	42.50	173	35.00
168	1	60	42.50	173	25.00
169	1	60	42.50	173	15.00
170	1	60	42.50	172	55.00
171	1	60	42.50	172	45.00
172	1	60	42.50	172	35.00
173	1	60	42.50	172	25.00
177	1	60	37.50	173	45.00
178	1	60	37.50	173	35.00
179	1	60	37.50	173	25.00
180	1	60	37.50	173	15.00
181	1	60	37.50	172	45.00
182	1	60	37.50	172	35.00
183	1	60	37.50	172	25.00
184	1	60	37.50	172	15.00
186	1	60	32.50	173	55.00
187	1	60	32.50	173	45.00
188	1	60	32.50	173	35.00
189	1	60	32.50	173	25.00
190	1	60	32.50	173	15.00
191	1	60	32.50	172	45.00

-continued-

---

Station	Stratum	N Latitude		W Longitude	
		Degrees	Minutes	Degrees	Minutes
192	1	60	32.50	172	35.00
193	1	60	32.50	172	25.00
194	1	60	32.50	172	15.00
195	1	60	32.50	172	5.00
196	1	60	27.50	172	25.00
197	1	60	27.50	172	15.00
198	1	60	27.50	172	5.00
199	1	60	22.50	172	15.00
200	1	60	22.50	172	5.00
201	2	60	17.50	172	35.00
202	2	60	15.00	172	30.00
203	2	60	30.00	173	10.00

---

Appendix B3.—Latitude and longitude coordinates for stratum 3 stations in shallow waters. On a perpendicular line from shore through these locations, one pot each is set at a depth of 11, 14, 17, and 20 fathoms.

Station	Stratum	N Latitude		W Longitude	
		Degrees	Minutes	Degrees	Minutes
301	3	60	28.67	173	4.38
302	3	60	27.92	173	0.68
303	3	60	26.77	172	57.26
304	3	60	25.42	172	54.53
305	3	60	23.79	172	52.06
306	3	60	22.23	172	49.19
307	3	60	18.37	172	32.63
308	3	60	18.57	172	28.53
309	3	60	18.57	172	24.83
310	3	60	18.23	172	21.00

Appendix B4.—Midpoint latitude and longitude coordinates for stations in stratum 4. Pot survey station 409 is located at the geographic center of NMFS EBS trawl survey station R-24.

Station	Stratum	N Latitude		W Longitude	
		Degrees	Minutes	Degrees	Minutes
401	4	60	32.50	172	40.76
402	4	60	32.50	172	30.71
403	4	60	35.00	172	46.19
404	4	60	35.00	172	36.16
405	4	60	37.50	172	51.69
406	4	60	37.50	172	41.59
407	4	60	37.50	172	31.57
408	4	60	40.00	172	57.25
409	4	60	40.00	172	47.00
410	4	60	40.00	172	37.00
411	4	60	42.50	172	52.75
412	4	60	42.50	172	42.64
413	4	60	42.50	172	32.63
414	4	60	45.01	172	58.46
415	4	60	45.01	172	48.30
416	4	60	45.01	172	38.27
417	4	60	47.51	173	4.12
418	4	60	47.51	172	54.01
419	4	60	47.51	172	43.93
420	4	60	47.51	172	33.89



## **APPENDIX C. SURVEY DATA FORMS AND INSTRUCTIONS**

Appendix C1.-Survey pilot house log.

**Survey Pilot House Log**

Vessel Name: \_\_\_\_\_

Survey Code: \_\_\_\_\_

ADF&G Number: \_\_\_\_\_

Captain Name: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_

SPN	STATION NUMBER	BUOY ID	SET GEAR		DEPTH (fathoms)	BOTTOM TYPE (see below)	LOCATION		LOGGER ID	LIFT GEAR		GEAR PERF. (see below)
			DATE (mm - dd - yy)	TIME (0000-2359)			LATITUDE (N) (dd° mm.mm)	LONGITUDE (ddd° mm.mm) E or W		DATE (mm - dd - yy)	TIME (0000-2359)	
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												

**BOTTOM TYPE:**  
 1 = rock    4 = mud  
 2 = sand    5 = gravel  
 3 = silt

**GEAR PERFORMANCE:**  
 blank = good    41 = pot door bent or not tied  
 40 = lost pot    42 = pot not baited  
 43 = pot landed upside down  
 44 = hole in pot

## INSTRUCTIONS FOR SURVEY PILOT HOUSE LOG

This form is used to record fishing parameters for every pot that is set during the survey. It is the definitive table in the survey database and must be accurately completed each day gear is set or pulled.

**Vessel Name:** F/V Sandra Five

**Captain's Name:** Joe Morris

**Survey Code:** SM13

**ADF&G Number:** 70770

**Page \_\_\_ of \_\_\_ :** The pages of this form will be numbered sequentially as they are generated over the course of the survey. When the last page is numbered, that number will be written in the 2<sup>nd</sup> blank on all the pages. For example: A total of 47 Pilot House Log pages were used during the survey. 'Page 1 of 47' would be on the first page, and 'Page 47 of 47' would be on the last page.

**Sequential Pot Number (SPN):** As pots are set, the captain will number them beginning at '1' and then number each successive pot sequentially over the course of the survey. Sequential pot numbers are unique and **will not** be reused if a pot is lost.

**Station Number:** The captain will record the station number for each sequential pot set. For our survey, there will be one station number per 4-pot string.

If a station is resampled, the numeral 2 will precede the new station number in a 4-digit format. For example: station 6 has been reset and will be documented as station 2006. Similarly, station 141 has been reset and is identified as station 2141.

**Buoy ID:** The ID and/or letters marked on the trailer buoy of the pot buoy set-up will be recorded.

### Set Gear

**Date:** The captain will record the date the gear is set, in mm-dd-yy format.

**Time:** The captain will record the time the gear is set, in local Alaska time and in 24-hour format (0000 – 2359). '0000' is midnight and denotes the beginning of the next day.

**Depth:** The captain will record depth in whole fathoms, or to the tenth of a fathom if electronically displayed.

---

-continued-

**Bottom Type:** Enter one of five bottom type codes as listed at the bottom of the form.

- 1 = rock
- 2 = sand
- 3 = silt
- 4 = mud
- 5 = gravel

**Location** – As the gear is set, the captain will record:

**Latitude (N)** in degrees and decimal minutes - dd° mm.mm, and

**Longitude (E or W)** in degrees and decimal minutes - ddd° mm.mm.

All pots in this survey will be set in west longitude; circle the letter ‘W’ on each Pilot House Log page.

Latitude and longitude may be recorded in either of two ways, e.g., 52°15.77’ or as a string of numbers with symbols and decimal points omitted ‘521577’.

**Logger ID:** The temperature data logger ID number will be recorded in the same row as the sequential pot number in which it was deployed.

#### **Lift Gear**

**Date:** The captain will record the date the gear is pulled, in mm-dd-yy format.

**Time:** The captain will record the time the gear is pulled, in local Alaska time and in 24-hour format (0000 – 2359). ‘0000’ is midnight and denotes the beginning of the next day.

**Gear Performance:** Gear performance will be assessed for every pot pulled. Codes to be used are at the bottom of the form.

- Blank = good
- 40 = lost pot
- 41 = pot door bent or not tied
- 42 = pot not baited
- 43 = pot landed upside down
- 44 = hole in webbing

Appendix C2.-Crab measurement form.

**Crab Measurement Form**

Sample Date (mm-dd-yy): \_\_\_\_\_ Survey Code: \_\_\_\_\_ Recorder: \_\_\_\_\_  
 Station: \_\_\_\_\_ Pot Start Time: \_\_\_\_\_ Measurer(s): \_\_\_\_\_  
 SPN: \_\_\_\_\_ Buoy ID: \_\_\_\_\_ Pot End Time: \_\_\_\_\_ Logger ID: \_\_\_\_\_  
 Page \_\_\_\_\_ of \_\_\_\_\_ (record times as 0000-2359) Tag Series: \_\_\_\_\_

SPECIES	SEX	CARAPACE SIZE (mm)	CHELA HEIGHT (mm)	LEGAL SIZE	SHELL CONDITION	MATURITY	EGGS				CONDITION	PARASITES	TAG NUMBER	COMMENTS
							CLUTCH FULLNESS	EGG DEVELOPMENT	CLUTCH CONDITION	EGG COLOR				
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														

<b>SPECIES CODES:</b> 1 = golden king 2 = red king 3 = blue king 4 = hair crab 5 = DO NOT USE 6 = <i>C. bairdi</i> 7 = <i>C. opilio</i> 8 = <i>C. angulatus</i> 9 = Dungeness 10 = <i>L. coeui</i> 11 = <i>C. tanneri</i> 12 = <i>P. multispina</i> 13 = <i>P. vernii</i> 41 = hybrid, <i>C. bairdi</i> 42 = hybrid, <i>C. opilio</i>	<b>SEX:</b> 0 = unknown 1 = male 2 = female 3 = hermaphrodite  <b>LEGAL SIZE:</b> 0 = sublegal 1 = legal, retained 2 = legal, not retained	<b>SHELL CONDITION:</b> 0 = premolt / molting 1 = soft 9 = new, pliable 2 = new 3 = old 4 = very old 5 = very, very old	<b>EGGS</b> <b>CLUTCH FULLNESS:</b> 0 = no eggs 1 = trace to 1/8 full 2 = 1/4 full 3 = 1/2 full 4 = 3/4 full 5 = 100% full  <b>EGG DEVELOPMENT:</b> 1 = uneyed eggs 2 = eyed eggs 3 = hatching  <b>CLUTCH CONDITION:</b> 1 = no dead eggs 2 = dead eggs < 20% 3 = dead eggs > 20% 4 = barren / clean setae 5 = barren / matted setae 6 = barren / no setae  <b>EGG COLOR:</b> 0 = other 1 = cream 2 = tan 3 = yellow 4 = orange 5 = dark orange 6 = pink 7 = reddish 8 = purple 9 = purple-brown 10 = brown 11 = brownish-black	<b>PARASITES:</b> blank = not examined 0 = none 1 = <i>B. callosus</i> 2 = nemertean worms 3 = bitter crab 4 = other 5 = black mat 6 = torch 7 = cottage cheese 8 = turbellarian worms 9 = pepper crab 10 = snailfish eggs 12 = leatherback
--	---	--	---	--

IN THE BERING SEA DISTRICT:  
 Legal *C. bairdi*: Both eyes completely red AND Two angular V-shaped notches in margin of upper lip (epistome) forming M shape.  
 Legal *C. opilio*: Does not have ALL of the above characteristics.

-continued-

### INSTRUCTIONS FOR CRAB MEASUREMENT FORM

This form is used to record selected crab species from sampled pots. At least one form will be filled out for every sequential pot number set. If a pot contains zero crab, make a large null symbol ‘Ø’ on the center of the form. If multiple sexes or species are sampled on the form, a blank line will separate those changes. Enter the Survey Code and fill in Station Number, Sequential Pot Number, and Buoy ID fields as directed in the *Survey Pilot House Log* instructions.

Header:

**Sample Date:** Record the date that the pot was sampled, in mm-dd-yy format.

**Recorder:** Write the initials of the person recording the data.

**Measurer(s):** Write the initials of the person(s) measuring crab.

**Logger ID:** The number of the logger if there is one present in the pot.

**Tag Series:** The FLOY tag series number on this survey is “D”.

**Page \_\_\_ of \_\_\_ :** The pages of this form will be numbered sequentially within each SPN sampled. When the last page of an SPN is completed, that number will be written in the 2<sup>nd</sup> blank on all the pages. For example: A total of 4 crab measurement pages were used to record data for an SPN. ‘Page 1 of 4’ would be on the first page, and ‘Page 4 of 4’ would be on the last page.

Data:

NOTE: The column headings for species code, sex, and legal size are in grey. If there is a number recorded in the grey box at the bottom of the column heading, this means that every crab entry on the entire page is the same code number.
--

**Species Code:** Record the species code of the sampled crab from the list at the bottom of the form.

**Sex:** Record the sex of the crab as noted at the bottom of the form.

**Carapace Size (mm):** Record the carapace length of king and hair crabs in mm CL. For Tanner, snow, and Dungeness crabs, record the carapace width in mm CW.

**Chela Height (mm):** N/A – Not recorded during this survey.

---

-continued-

**Legal Size:** Record the legal size/retention status code of male crab only; record code ‘0’ for sublegal males and code ‘2’ for all legal males sampled during the survey.

**Shell Condition:** Record the shell condition of each crab sampled as noted at the bottom of the form.

**Female Maturity:** The maturity status of each crab sampled.

**Eggs** – When mature female crab are sampled, the following data fields will be completed using the codes listed at the bottom of the form.

**Clutch Fullness:** Ranges as fractional percentage from no eggs (0%) to 100% full.

**Egg Development:** Eggs will be eyed, uneyed, or hatching.

**Clutch Condition:** Presence of dead eggs OR presence of clean or matted setae.

**Egg Color:** Egg color will be the closest match to colors displayed in the standard color chart.

**Condition:** Condition of the crab during/after gear retrieval. The crab is uninjured (*blank*), newly-injured, dead, or previously dead. If there is a fresh injury, note in the comments what the injury is.

**Parasite(s):** Record all codes that apply to the sampled crab. This field will be *blank* if a crab was not examined for parasites. If crab is examined, and no parasites or signs of disease are seen, be sure to record a *zero*. Multiple parasites can be recorded, separated by commas (e.g., 1, 10). If you find a parasite or disease seen not listed, use the code for “other” (i.e. 4), and describe and take photos.

- Blank = Not examined
- 0 = Examined, no parasites or signs of disease seen
- 1 = *Briarosaccus callosis* (a rhizocephalan parasitic barnacle)
- 2 = Nemertean worms
- 3 = Bitter crab
- 4 = OTHER (describe and take photos)
- 5 = Black mat
- 6 = Torch (also known as Shell Disease; caused by various chitonoclastic bacteria (CCB))
- 7 = Cottage cheese
- 8 = Turbellarian worms
- 9 = Pepper crab
- 10 = Snailfish eggs
- 12 = Leatherback

---

-continued-

**Tag Number:** The five digit number on the FLOY tag. If a crab is tagged with a FLOY tag, record the 5 digit number on the tag (for this survey, numbers are 17,001 – 20,000).

**Comments:** Note items specific to the sampled crab (e.g., what a fresh injury was, if severely injured, extensive bleeding, poor overall condition), and other observations not captured in required form fields. Describe parasite or disease lesions. Note if photos taken. If the size (CL) of the crab is unusually small or large, note that the size is right. For king crab, do the same for sublegal or legal status, when the size (CL) of the crab is unusual for the crab's legal size or is at either end of the range of CL measurements where both legal and sublegal status occur.

SEE APPENDIX D FOR DETAILED DESCRIPTIONS OF CRAB CODES.



SNOW CRAB

**Station Catch Summary Form**

2013 St. Matthew Island Blue King Crab Survey

PG \_\_\_\_\_ OF \_\_\_\_\_

FV

\*\*\*At-sea use only - no database entry\*\*\*

RECORDER \_\_\_\_\_

STATION	SEQUENTIAL POT NUMBER	SUBLEGAL MALES	LEGAL MALES			FEMALES			COMMENTS
		<79-mm CW	79-101 mm CW	≥102-mm CW	Total	Immature	Mature	Total	
STATION	TOTALS								
STATION	TOTALS								
STATION	TOTALS								
STATION	TOTALS								
STATION	TOTALS								

-continued-

## INSTRUCTIONS FOR STATION CATCH SUMMARY FORM

**\*\*\*At-sea use only – no entry into main database\*\*\***

This form documents the daily catch record for male and female blue king crab by station and sequential pot number. An identical form will be used to summarize the daily catch record for male and female snow crab. This form is used to prepare catch information for daily e-mail transmissions to ADF&G offices, and in the preparation of the post-survey cruise memo. The cruise leader or the assistant cruise leader is solely responsible for completing this form. If subsampling of the catch has occurred, record the total counts recorded on the *Crab Subsampling Form* (see next page).

Fill in Station Number, Sequential Pot Number, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form.

Record the catch at each SPN for the categories listed below. Record the total catch by subgroup for each station sampled.

### Blue King Crab

#### *Legal Males*

- Recruit: new-shell crab <134-mm CL.
  - Postrecruit: new-shell crab ≥134-mm CL.
  - Postrecruit: old- or very old-shell crab of legal size.
- Total number of legal males.

#### *Sublegal Males*

- Sublegals <105-mm CL.
  - Sublegals ≥105-mm CL.
- Total number of sublegal males.

#### *Females*

- Mature
  - Immature
- Total number of females.

### Snow Crab

#### *Legal Males*

- ≥ 79-mm (3.1-in) CW.
  - ≥ 102-mm (3.1-in) CW.
- Total number of legal males.

#### *Sublegal Males*

- < 79-mm (3.1-in) CW.
- Total number of sublegal males.

#### *Females*

- Immature
  - Mature
- Total number of females.

### Crab Subsampling Form

Sample Date (mm-dd-yy): \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_

Survey Code: \_\_\_\_\_

Recorder: \_\_\_\_\_

Station Number: \_\_\_\_\_

Measurer(s): \_\_\_\_\_

SPN: \_\_\_\_\_ Bouy ID: \_\_\_\_\_

Logger ID: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_

	SUBSAMPLING CATEGORY				NUMBER			COMMENTS
	SPECIES CODE	SEX	LEGAL SIZE	FEMALE MATURITY	MALE SIZE	NOT MEASURED	MEASURED	
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

58

**SPECIES CODES**  
 1 = golden king  
 2 = red king  
 3 = blue king  
 4 = hair crab  
 5 = DO NOT USE  
 6 = *C. bairdi*  
 7 = *C. opilio*  
 8 = *C. angulatus*  
 9 = Dungeness  
 10 = *L. couesi*  
 11 = *C. tanneri*  
 12 = *P. multispina*  
 13 = *P. verilli*  
 41 = hybrid, legal *C. bairdi*  
 42 = hybrid, legal *C. opilio*

**SEX**  
 0 = unknown  
 1 = male  
 2 = female  
 3 = hermaphrodite  
 99 = not seperated by sex

**LEGAL SIZE**  
 0 = sublegal  
 1 = legal, retained  
 2 = legal, not retained  
 99 = males not separated by legality

**FEMALE MATURITY**  
 0 = unknown  
 1 = immature  
 2 = mature  
 3 = mature, primiparous  
 4 = mature, multiparous  
 99 = females not separated by maturity

**MALE SIZE CATEGORY**  
 0 = unknown  
 1 = CL/CW < minimum defined for "Prerecruit-2"  
 2 = CL/CW range defined for "Prerecruit-2"  
 3 = CL/CW ≥ minimum defined for "Prerecruit-1"  
 4 = CL/CW < minimum defined for size at maturity  
 5 = CL/CW ≥ minimum defined for size at maturity  
 6 = CL/CW range and shell condition defined for "Recruit"  
 7 = CL/CW range and shell condition defined for "Post-recruit"  
 8 = CL/CW < defined for "exploited legal males"  
 9 = CL/CW ≥ defined for "exploited legal males"  
 Note: 1-3 are defined only for sublegal male king crab  
 6-7 are defined only for legal male king crab  
 8-9 are defined only for legal male snow and Tanner crab and their hybrids

**IN BERING SEA DISTRICT:**  
 Legal *C. bairdi*:  
 Both eyes completely red AND  
 Two angular V-shaped notches in margin of upper lip (epistome) forming M shape  
 Legal *C. opilio*:  
 Does not have all of the above characteristics

**INSTRUCTIONS FOR CRAB SUBSAMPLING FORM**

***The cruise leader will determine when part of a pot's catch is to be subsampled.***

***Blue King Crab***

Blue king crab will NOT be subsampled on this survey.

***Snow Crab***

Snow crab may be subsampled for high catches of snow crab at some stations.

This form is used to record the total number of crab that have been subsampled at each pot by separate sex and size categories determined prior to conducting the survey. Measuring of crab will not commence until crab counts for each subsampling category have been made and recorded.

Enter the **Sample Date, Survey Code, Station Number, Sequential Pot Number, Buoy ID** fields, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form.

**SUBSAMPLING CATEGORIES:**

Record the **Species Code, Sex, Legal Size, and Female Maturity** columns as directed in the *Crab Measurement Form* instructions and as at the bottom of the form.

The additional code of “99” will be used when the crab were not separated by sex, legality, or female maturity. This will mean the crab count for that line will be a mix of that particular characteristic (e.g. if a crab species was separated by sex, but then males were not separated by legal status, the code “99” under legal size would mean the numbers on that line were a mix of legal and sublegal males).

**Male Size Category:** In the 2013 St. Matthew Island survey, we will not be subsampling snow crab to this level, so leave this column blank.

---

-continued-

NUMBER OF CRAB:

**Number Not Measured (i.e. crab counted and released to the sea):** Tally the number of unmeasured crab by the identified sex, legal size, female maturity, and male size categories recorded on the same line.

**Number Measured (i.e. subsample of crab that were measured):** Tally the number of crab measured by the identified sex, legal size, female maturity, and male size categories recorded on the same line.

**NOTE:** Measure crab from each subcategory in multiples of 25, recording and filling up one entire *Crab Measurement Form* for each 25 measured. If there is less than 25 in a subcategory, measure all the crab and do not subsample that subcategory.

**Total Number:** Add the number of measured and unmeasured crab and record the total number of crab caught by identified sex and size categories.

**Comments:** Anything related to the sampling or subsampling of sex and size categories will be noted.

Enter the Sample Date, Survey Code, Vessel Name, Sequential Pot Number, Station Number, Buoy ID fields, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form. Record the Species Code, Sex, and Female Maturity columns as directed in the *Crab Measurement Form* instructions.

Appendix C5.-Species composition form.

**Species Composition Form**

Sample Date (mm-dd-yy): \_\_\_\_\_ Survey Code: \_\_\_\_\_ Vessel Name: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_ Recorder: \_\_\_\_\_

	SPN	STATION	BUOY ID	SPECIES CODE	TOTAL NUMBER	SPECIES NAME	COMMENTS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

FREQUENTLY ENCOUNTERED SPECIES (Bering Sea & Aleutians in general):

- |   |  |
|---|--|
| 471 = Alaska skate                                  | 69060 = Aleutian hermit crab                 |
| 472 = Aleutian skate                                | 69090 = Alaskan hermit crab                  |
| 10115 = Greenland turbot (or Greenland halibut)     | 71500 = snail unident.                       |
| 10120 = Pacific halibut                             | 71820 = Pribilof neptune (or Pribilof whelk) |
| 10210 = yellowfin sole                              | 72500 = hairy triton (or Oregon triton)      |
| 20510 = sablefish (or black cod)                    | 72743 = angled buccinum (or angular whelk)   |
| 21220 = Pacific grenadier                           | 72752 = silky buccinum (or ladder whelk)     |
| 21347 = yellow Irish lord                           | 78403 = giant octopus                        |
| 21720 = Pacific cod                                 | 83000 = brittle star unident.                |
| 21921 = Atka mackerel                               | 83320 = notched brittlestar                  |
| 40011 = hydroid unident.                            | 81742 = purple-orange sea star               |
| 40500 = jellyfish unident.                          | 82510 = green sea urchin                     |
| 68577 = Artic lyre crab (or circumboreal toad crab) | 91000 = sponge unident.                      |
| 68578 = Pacific lyre crab                           |  |

Alaska Department of Fish and Game - Shellfish Research - Fish Length Form (Rev. Aug 13, 2013)

-continued-

### INSTRUCTIONS FOR THE SPECIES COMPOSITION FORM

This form is used to record total numbers of all identified species from sampled pots, except for the species documented on the *Crab Measurement Form*, the *Crab Subsampling Form*, or the *Fish Length Form*.

If there are no species other than the measured crab in the pot, make a null symbol ‘Ø’ in the Species Name column for that SPN. Leave a blank line between pots.

Enter the Sample Date, Survey Code, Vessel Name, Sequential Pot Number, Station Number, Bouy ID, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form.

**Species Name:** Write the common name, or if unavailable, the scientific name of each animal caught.

**Species Code:** Except as noted below, record the 5-digit NMFS RACE code of each identified animal. Commonly-encountered species are listed at the bottom of the form; refer to the supplied 2013 NMFS Species Code Book for additional codes. If an animal cannot be identified to species at the time of sampling, note the genus or family name and write the corresponding code on the form. When photographs or specimens are taken for later positive identification, note that in the Comments section (below).

**Total Number:** By species or taxon, record the total number of animals caught in each pot.

**Comments:** Anything related to individual species listed on the form (photograph taken, specimen collected, preliminary identification, etc.).

Appendix C6.-Fish length form.

**Fish Length Form**

Sample Date (mm-dd-yy): \_\_\_\_\_

Vessel Name: \_\_\_\_\_

Survey Code: \_\_\_\_\_

Recorder: \_\_\_\_\_

Page: \_\_\_\_\_ of \_\_\_\_\_

Measurer(s): \_\_\_\_\_

SPN	STATION	BUOY ID	SPECIES CODE	FISH LENGTH (cm)	SPECIES NAME	COMMENTS
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

FISH TO MEASURE:

- |                             |                             |                               |
|-----------------------------|-----------------------------|-------------------------------|
| 10285 = Alaska plaice       | 10112 = Kamchatka flounder  | 10200 = rex sole              |
| 10110 = arrowtooth flounder | 21910 = lingcod             | 30050 = roughyeye rockfish    |
| 21921 = Atka mackerel       | 30420 = northern rockfish   | 20510 = sablefish             |
| 30330 = black rockfish      | 10261 = northern rock sole  | 10250 = sand sole             |
| 30400 = bocaccio            | 21720 = Pacific cod         | 30560 = sharpchin rockfish    |
| 10270 = butter sole         | 10120 = Pacific halibut     | 30020 = shortspine thornyhead |
| 30151 = dark rockfish       | 21110 = Pacific herring     | 10262 = southern rock sole    |
| 30150 = dusky rockfish      | 30060 = Pacific ocean perch | 10220 = starry flounder       |
| 10170 = English sole        | 21710 = Pacific tomcod      | 21740 = walleye pollock       |
| 10130 = flathead sioe       | 30475 = redbanded rockfish  | 30470 = yelloweye rockfish    |
| 10115 = greenland turbot    | 30430 = redstripe rockfish  | 10210 = yellowfin sole        |

Alaska Department of Fish and Game - Shellfish Research - Fish Length Form (Rev. Aug 13, 2013)

-continued-

### INSTRUCTIONS FOR FISH LENGTH FORM

This form is used to record the measurements of commercially-important or other selected fish species from sampled pots.

If there are no fish species measured from the pot, make a null symbol 'Ø' in the Species Name column for that SPN. Leave a blank line between pots.

Enter the Sample Date, Survey Code, Vessel Name, Sequential Pot Number, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the data recorder's name and the name(s) of those who measured the fish.

**Species Code:** Record the 5-digit NMFS RACE code of each measured fish. Fish species to be measured are listed and coded at the bottom of the form; refer to the supplied 2013 NMFS Species Code Book for additional codes.

**Fish Length (cm):** Record the total length or the fork length of the fish, in centimeters.

Fork length (FL) – Distance from the anteriormost point on the head to the innermost part of the fork of the tail fin.

Total length (TL) – the greatest length of a fish from the anteriormost point on the head to the tip of the tail.

**Species Name:** Write the common name, or if unavailable, the scientific name of each animal caught.

**Comments:** Anything related to the individual fish measured. If the fish was preserved or collected for identification, document that action in the Comments section.

### Data Logger Recording Form

Sample Date (mm-dd-yy): \_\_\_\_\_

Vessel Name: Sandra Five

Survey Code: SM13

Page \_\_\_\_\_ of \_\_\_\_\_

Recorder: \_\_\_\_\_

	LOGGER ID	MODEL	DATA MEASURED	SERIAL NUMBER	COMMENTS
1					
2	219	XR-420-CTD	CTD	9643	
3	221	XR-420-CTD	CTD	9616	
4	223	TDR-2050	TD	11880	
5	224	TDR-2050	TD	11818	
6	225	TDR-2050	TD	11808	
7	226	TR-1050	T	12570	
8	227	TR-1050	T	12569	
9	228	TR-1050	T	12176	
10	229	TDR-2050	TD	11884	
11	230	TDR-2050	TD	11885	
12	231	TDR-2050	TD	11886	
13	232	XR-420-CTD	CTD	13166	
14	233	XR-420-CTD	CTD	13167	
15	234	XR-420-CTD	CTD	13168	
16	238	XR-420-CTD	CTD	13235	
17	240	TDR-2050	TD	23905	
18	241	TDR-2050	TD	23904	
19	242	XR-420-CTD	CTD	17415	
20	243	XR-420-CTD	CTD	17416	
21	244	XR-420-CTD	CTD	17417	
22	245	XR-420-CTD	CTD	17418	
23	246	XR-420-CTD	CTD	17419	
24	247	XR-420-CTD	CTD	17420	
25	248	XR-420-CTD	CTD	17421	
26	249	RBR <i>duo</i>	TD	50530	
27	250	RBR <i>concerto</i>	pH O T D	TBD	
28	251	RBR <i>concerto</i>	pH O T D	TBD	
29	252	RBR <i>concerto</i>	pH O T D	TBD	
30					

DATA MEASURED	
C = Conductivity (salinity)	O = Dissolved Oxygen
D = Depth	pH = pH
T = Temperature	

### INSTRUCTIONS FOR DATA LOGGER FORM

For the 2013 St. Matthew survey, these are the loggers that will be used on the survey.

During this survey, the loggers measuring CTD (conductivity, temperature, and depth) and TD (temperature and depth) will be deployed in the second or third pot at the survey stations. Loggers will be secured within a pot during the first two days of setting, and generally will stay in the same pot for the entire survey.

Data loggers measuring T (temperature) and pH-DO-T-D (pH, dissolved oxygen, temperature, and depth) will be deployed in reference pots away from the stations to obtain continuous data for the length of the survey. These can also be used as backups to measure temperature at survey stations.

This form is generally used to identify the unique logger ID number of the units that are deployed in survey pots, and will be used to record summarized comments about the loggers and logger deployment during the survey.

Details will be noted in a field notebook throughout the survey.

If more than one page of the form is used, enter the Sample Date (i.e. the date that the form was filled out), Vessel Name, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form.

If additional loggers are used, record all items as detailed above.

**Comments:** Anything related to the performance, deployment, and especially ‘not retrieved’ if a pot containing a logger is lost during the survey.

### Weather Observation Form

Vessel Name: \_\_\_\_\_ Survey Code: \_\_\_\_\_ Page \_\_\_\_\_ of \_\_\_\_\_

STATION NUMBER	DATE (mm/dd/yy)	TIME (0000-2359)	CLOUD COVER	WIND		SWELL	BAROMETER (millibars)	COMMENTS
				SPEED	DIRECTION			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

**CLOUD COVER:**  
 1 = Clear  
 2 = 1/8 obscured  
 3 = 1/4 obscured  
 4 = 3/8 obscured  
 5 = 1/2 obscured  
 6 = 5/8 obscured  
 7 = 3/4 obscured  
 8 = 7/8 obscured  
 9 = Completely overcast

**WIND SPEED:**  
 0 = Calm  
 1 = Light Air  
 2 = Light Breeze  
 3 = Gentle Breeze  
 4 = Moderate Breeze  
 5 = Fresh Breeze  
 6 = Strong Breeze  
 7 = Near Gale  
 8 = Gale  
 9 = Strong (or Severe) Gale  
 10 = Storm  
 11 = Violent Storm  
 12 = Hurricane

**SWELL:**  
 1 = 0 .. 2 feet  
 2 = 2 .. 4 feet  
 3 = 4 .. 6 feet  
 4 = 6 .. 8 feet  
 5 = 8 .. 10 feet  
 6 = 10 .. 12 feet  
 7 = 12 .. 14 feet  
 8 = 14 .. 16 feet  
 9 = more than 16 feet

## INSTRUCTIONS FOR WEATHER OBSERVATION FORM

This form is used to document daily weather observations at stations fished during the charter, and will be completed at the time each station is set and picked (2 observations per station). If an observation is made at non-station locations, leave the station number blank.

Enter the Vessel Name, Survey Code, Page Number, Station Number, Date, and Time as directed in the *Survey Pilot House Log* instructions. Record the appropriate *code* numbers for cloud cover, wind speed (see next page) and direction, swell, and barometer reading. In the Comments section, note any other information pertinent to the weather observation.

---

### Wind Speed Codes

Wind speed is a measure of wind velocity in knots and uses the Beaufort scale.

#### **0 = Calm**

Sea surface smooth and mirror-like. Wind speed approximately 0-1 knots (0-1 mph).

#### **1 = Light Air**

Ripples with the appearance of scales are formed, but without foam crests. Wind speed approximately 1-3 knots (1-3 mph).

#### **2 = Light Breeze**

Small wavelets, still short, but more pronounced. Crests have a glassy appearance and do not break. Wind speed approximately 4-6 knots (4-7 mph).

#### **3 = Gentle Breeze**

Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses. Wind speed approximately 7-10 knots (8-12 mph).

#### **4 = Moderate Breeze**

Small (1-4 ft) waves becoming larger; fairly frequent white horses. Wind speed approximately 11-16 knots (13-18 mph).

#### **5 = Fresh Breeze**

Moderate (4-8 ft) waves taking a more pronounced long form; many white horses are formed. Chance of some spray. Wind speed approximately 17-21 knots (19-24 mph).

#### **6 = Strong Breeze**

Large (8-13 ft) waves begin to form; the white foam crests are more extensive everywhere. Probably some spray. Wind speed approximately 22-27 knots (25-31 mph).

---

-continued-

**7 = Near Gale**

Moderately high (13-20 ft) waves and white foam from breaking waves begins to be blown in streaks along the direction of the wind. Wind speed approximately 28-33 knots (32-38 mph).

**8 = Gale**

Moderately high (13-20 ft) waves of greater length; edges of crests begin to break into spindrift. The foam is blown in well-marked streaks along the direction of the wind. Wind speed approximately 34-40 knots (39-46 mph).

**9 = Strong (or Severe) Gale**

High (20 ft) waves. Dense streaks of foam along the direction of the wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility. Wind speed approximately 41-47 knots (57-54 mph).

**10 = Storm**

Very high (20-30 ft) waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole the surface of the sea takes on a white appearance. The 'tumbling' of the sea becomes heavy and shock-like. Visibility affected. Wind speed approximately 48-55 knots (55-63 mph).

**11 = Violent Storm**

Exceptionally high (30-45 ft) waves (small and medium-size ships might be for a time lost to view behind the waves). The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected. Wind speed approximately 56-63 knots (64-72 mph).

**12 = Hurricane**

The air is filled with foam and spray, waves over 45 ft. Sea completely white with driving spray; visibility very seriously affected. Wind speed approximately 64-71 knots (73-83 mph).

Appendix C9.-Tagged crab recovery form.

**Tagged Crab Recovery Form**

Vessel Name: \_\_\_\_\_ Processor Name: \_\_\_\_\_ Sampler Name: \_\_\_\_\_ Obs ID<sup>a</sup>: \_\_\_\_\_ Packet Number<sup>a</sup>: \_\_\_\_\_  
 Fishery Code: \_\_\_\_\_ Species Code: \_\_\_\_\_ ADF&G Number: \_\_\_\_\_ Sampler Type<sup>b</sup>: \_\_\_\_\_ Sample Date (mm-dd-yy): \_\_\_\_\_

C R A B N U M B E R	CAPTURE DATE (mm-dd-yy)	TAG		D I S P O	CARAPACE SIZE (mm)	SEX	L E G I Z E	S H E L L	F E A T	EGGS						C O N D	PARASITE	LOCATION		DEPTH (fathoms)	STAT AREA
		S E R I E S	N U M B E R							C L U T C H	F U L L	D E V E L	C L O N D	C O L O R	L A T I T U D E (N) (dd°mm.mm)			L O N G I T U D E E or W			
1																					
2																					
3																					
4																					
5																					

<b>TAG DISPOSITION:</b> 1 = tag removed from crab 2 = tag left on crab and released	<b>SHELL AGE:</b> 1 = soft 2 = new, pliable 3 = old 4 = very old	<b>FEMALE MATURITY:</b> 0 = unknown 1 = immature 2 = mature 3 = mature - primiparous 4 = mature - multiparous	<b>CLUTCH FULLNESS:</b> 0 = no eggs 1 = trace to 1/8 full 2 = 1/4 full 3 = 1/2 full 4 = 3/4 full 5 = 100% full	<b>EGG DEVELOPMENT:</b> 1 = uneyed eggs 2 = eyed eggs 3 = hatching	<b>EGGS:</b> <b>CLUTCH CONDITION:</b> 1 = no dead eggs 2 = dead eggs < 20% 3 = dead eggs > 20% 4 = barren / clean setae 5 = barren / matted setae 6 = barren / no setae	<b>EGG COLOR:</b> 0 = other 1 = cream 2 = tan 3 = yellow 4 = orange 5 = dark orange 6 = pink 7 = reddish 8 = purple 9 = purple-brown 10 = brown 11 = brownish-black	<b>CONDITION:</b> blank = uninjured 1 = fresh injury 2 = dead 3 = previously dead	<b>PARASITE(S):</b> blank = none 1 = B. callosus 2 = nemertean worms 3 = bitter crab 4 = other 5 = black mat 6 = loach 7 = cottage cheese 8 = turbellarian worms 9 = pepper crab 10 = snailfish eggs 12 = leatherback
---	--	--	--	---	--	---	---	---

CRAB NUMBER	TAG OR TAGGED CRAB RECEIVED FROM: (name, address, city, state, zip)	LOCATION INFORMATION RECEIVED FROM: (name, address, city, state, zip)	COMMENTS
1			
	REWARD: ISSUED   NOT ISSUED	REWARD: ISSUED   NOT ISSUED	REWARD: ISSUED   NOT ISSUED
2			
	REWARD: ISSUED   NOT ISSUED	REWARD: ISSUED   NOT ISSUED	REWARD: ISSUED   NOT ISSUED
3			
	REWARD: ISSUED   NOT ISSUED	REWARD: ISSUED   NOT ISSUED	REWARD: ISSUED   NOT ISSUED
4			
	REWARD: ISSUED   NOT ISSUED	REWARD: ISSUED   NOT ISSUED	REWARD: ISSUED   NOT ISSUED
5			
	REWARD: ISSUED   NOT ISSUED	REWARD: ISSUED   NOT ISSUED	REWARD: ISSUED   NOT ISSUED

a Observer and fish ticket administrator use only  
 b 1 = observer: catcher only vessel; 2 = observer: catcher processor; 3 = observer: floating processor; 4 = dockside sampler

-continued-

### **Instructions for Tagged Crab Recovery Form**

This form is used to record when a tagged crab is caught. This may be a crab tagged previously on the 2013 St. Matthew survey, in previous years, by another research group, or be another species with a tag.

**Vessel Name:** Name of vessel that caught the tagged crab. This will be FV *Sandra Five* if caught during this survey.

**Fishery Code:** N/A for this survey – leave blank. (A code used to identify a specific fishery)

**Processor Name:** N/A for this survey – leave blank.

**Species Code:** See Crab Species Code List (Appendix D1). Use the RACE code.

For blue king crab, this is 69323.

**Sampler Name:** Use this for the Recorder's name.

**ADF&G Number:** N/A for this survey – leave blank.

**Sampler Type:** N/A for this survey – leave blank.

**Obs. ID:** N/A for this survey – leave blank.

**Sample Date:** Date crab was measured. In this survey, date captured and returned to sea.

**Packet Number:** N/A for this survey – leave blank.

**Capture Date:** Mm-dd-yy tagged crab was recaptured. (Not the tagging date.)

**Tag Series:** Tag series letter preceding tag number, printed on both tag string and tab.

**Tag Number:** Record the tag number with leading zeros, excluding the series letter.

**Tag Dispo:** Tag disposition (codes also on form)

1 = tag removed from crab (DO NOT DO THIS)

2 = tag left on crab and crab released

**Carapace Size:** Record standard carapace measurement used for species of crab in mm.

**Sex:** Code that represents the sex of the crab (codes also on form).

0 = unknown

1 = male

2 = female

3 = hermaphrodite

**Legal Size:** Codes on form. A code that represents the legal size status of male crab only. Leave blank if a female.

**Shell Condition:** Codes on form.

---

-continued-

**Female Maturity:** Codes on form.

**Clutch Fullness:** Codes on form. Code represents the fractional amount of eggs present in relationship to abdomen size.

**Egg Development:** Codes on form. Code represents the observed stage of egg maturity.

**Clutch Condition:** Codes on form. Code represents the general overall condition of the eggs and setae.

**Egg Color:** Codes on form. Code that represents the observed color of the eggs. Use color chart.

**Condition:** Codes on form. Code that represents the observed condition and health of the animal as related to gear retrieval. Ignore old injuries unless otherwise directed.

**Parasite(s):** Codes on form. Code(s) that represent any observed parasite and/or disease. Differentiate each parasite and/or disease by a comma. The code for “other” is to be used to note the presence of a parasite or disease not on this list. If used, describe, photograph and retain the entire crab for further analysis.

NOTE: These codes are the same as for the *Crab Measurement Form*, with one exception. There is no zero listed. Put in a zero if the crab was examined and no parasites or disease found, as on the crab measurement form. Blank will mean crab not examined for parasites or disease.

**Latitude (N):** Latitude of the pot in which the tagged crab was caught in degrees and decimal minutes (dd°mm.mm).

**Longitude:** Longitude of the pot in which the tagged crab was caught; in degrees and decimal minutes (ddd°mm.mm). Circle E or W to indicate the appropriate hemisphere.

**Depth:** Depth of pot in which the tagged crab was caught, in whole fathoms.

**Statistical Area:** Six-digit number used to identify the commercial fishing statistical area where the crab was caught. See the ADF&G statistical area map.

**Tag or Tagged Crab Received From:** N/A for this survey – leave blank.

**Location Information Received From:** N/A for this survey – leave blank.

**Comments:** During this survey, use this space to write in the SPN (Sequential Pot Number) the tagged crab was recaptured in (e.g. “SPN=124”). Also record anything unusual related to the tag on the crab. If you run out of room, use empty space on the same line to record notes.

NOTE: See Appendix D for further details on the meaning of crab codes.

## **APPENDIX D. CRAB CODE DESCRIPTIONS**

**Crab Measurement Form Codes**

**SPECIES CODES:**

- 1 = golden king
- 2 = red king
- 3 = blue king
- 4 = hair crab
- 5 = **DO NOT USE**
- 6 = *C. bairdi*
- 7 = *C. opilio*
- 8 = *C. angulatus*
- 9 = Dungeness
- 10 = *L. couesi*
- 11 = *C. tanneri*
- 12 = *P. multispina*
- 13 = *P. verilli*
- 41 = hybrid, *C. bairdi*
- 42 = hybrid, *C. opilio*

**SEX:**

- 0 = unknown
- 1 = male
- 2 = female
- 3 = hermaphrodite

**LEGAL SIZE:**

- 0 = sublegal
- 1 = legal, retained
- 2 = legal, not retained

**SHELL CONDITION:**

- 0 = premolt / molting
- 1 = soft
- 9 = new, pliable
- 2 = new
- 3 = old
- 4 = very old
- 5 = very, very old

**FEMALE MATURITY:**

- 0 = unknown
- 1 = immature
- 2 = mature
- 3 = mature - primiparous
- 4 = mature - multiparous

**CLUTCH FULLNESS:**

- 0 = no eggs
- 1 = trace to 1/8 full
- 2 = 1/4 full
- 3 = 1/2 full
- 4 = 3/4 full
- 5 = 100% full

**EGG DEVELOPMENT:**

- 1 = uneyed eggs
- 2 = eyed eggs
- 3 = hatching

**CLUTCH CONDITION:**

- 1 = no dead eggs
- 2 = dead eggs < 20%
- 3 = dead eggs > 20%
- 4 = barren / clean setae
- 5 = barren / matted setae
- 6 = barren / no setae

**EGG COLOR:**

- 0 = other
- 1 = cream
- 2 = tan
- 3 = yellow
- 4 = orange
- 5 = dark orange
- 6 = pink
- 7 = reddish
- 8 = purple
- 9 = purple-brown
- 10 = brown
- 11 = brownish-black

**CONDITION:**

- blank = uninjured
- 1 = fresh injury
- 2 = dead
- 3 = previously dead

**PARASITE(S):**

- blank = not examined
- 0 = none
- 1 = *B. callosus*
- 2 = nemertean worms
- 3 = bitter crab
- 4 = other
- 5 = black mat
- 6 = torch
- 7 = cottage cheese
- 8 = turbellarian worms
- 9 = pepper crab
- 10 = snailfish eggs
- 12 = leatherback

**IN THE BERING SEA DISTRICT:**

Legal *C. bairdi*: Both eyes completely red AND Two angular V-shaped notches in margin of upper lip (epistome) forming M shape

Legal *C. opilio*: Does not have all of the above characteristics

Many of the biological descriptions for king crabs are illustrated in Donaldson and Byersdorfer (2005) and in Jademec et al. (1999).

**Crab Species Codes.** Shorthand species codes (or deck codes) are recorded in on-deck survey forms.

Code	Common Name	RACE Code	Scientific Name
1	golden king crab	69310	<i>Lithodes aequispinus</i>
2	red king crab	69322	<i>Paralithodes camtschaticus</i>
3	blue king crab	69323	<i>Paralithodes platypus</i>
4	hair crab	69400	<i>Erimacrus isenbeckii</i>
5	DO NOT USE		
6	Tanner crab	68560	<i>Chionoecetes bairdi</i>
7	snow crab	68580	<i>Chionoecetes opilio</i>
8	triangle Tanner crab	68570	<i>Chionoecetes angulatus</i>
9	Dungeness crab	68020	<i>Cancer magister</i>
10	scarlet king crab	69300	<i>Lithodes couesi</i>
11	grooved Tanner crab	68550	<i>Chionoecetes tanneri</i>
12	<i>Paralomis multispina</i>	69335	<i>Paralomis multispina</i>
13	<i>Paralomis verrilli</i>	69331	<i>Paralomis verrilli</i>
41	Hybrid, legal <i>C. bairdi</i>	n/a	<i>Chionoecetes bairdi</i> and <i>C. opilio</i> hybrid
42	Hybrid, legal <i>C. opilio</i>	n/a	<i>Chionoecetes bairdi</i> and <i>C. opilio</i> hybrid

**IN THE BERING SEA DISTRICT:**

Legal *C. bairdi*: Both eyes completely red AND

Two angular V-shaped notches in margin of upper lip (epistome) forming M shape

Legal *C. opilio*: Does not have all of the above characteristics

**Legal Size.** Describes the size and fate of male crabs.

0 = Sublegal. Crab is too small to retain under any conditions.

1 = Legal, retained. A legal-sized crab that has been retained for market or study.

2 = Legal, not retained. A legal-sized crab that has been returned to the sea.

-continued-

**Shell Condition.** Shell condition codes are used to reflect the approximate time since a crab has last molted. Scratching on the ventral surface of the coxa, legs and carapace, shell color, epifaunal growth, and spine and dactyl wearing are all indicators of elapsed time since last molt.

**0** = Premolt and molting. Crab is preparing to molt, exoskeleton is beginning to decalcify and soften.

**1** = Soft. Crab has recently molted, exoskeleton is very soft, flaccid, and shapeless when out of the water. Exoskeleton texture is similar to wet leather or skin.

**9** = New, pliable. Exoskeleton is firm yet flexible, few or no scratches, pits, or epibionts present. Ventral surface of the coxa is shiny, spines and dactyls are sharp.

**2** = New. Coxa and ventral surface of the exoskeleton are dull, ranging from no-to-slight discoloration and no-to-limited scratching. Spines and dactyls may be slightly worn. Merus not easily compressed by pinching and will crack if bent. Adult female Tanner crab rarely have grasping marks on the merus.

**3** = Old. Characteristic exoskeleton is darker in coloration, and has significant scratching, wear, and abrasions. Carapace and chela are hard and cannot be indented by thumb pressure. Dactyls are worn and dull at the tips. Spines are worn or rounded. Barnacles and other epibionts are usually present. Adult female Tanner crab that have been mated a second time usually show grasping marks on the merus.

**4** = Very old. Distal portion of ventral coxa densely covered with dark scratching. Tips of dactyls are well worn, rounded, and dark. Carapace is frequently covered with epibionts to a greater extent than old-shell crab. Adult female Tanner crab that have been mated more than two times frequently have multiple grasping marks on the merus.

**5** = Very, very old ('graveyard'). Exoskeleton characterized by being soft and spongy because of decay. Spines and dactyls are heavily worn and often worn through to muscle. Epibionts are always present and the shell appears brown to black dorsally and ventrally. Crab of this shell age are usually listless upon capture.

**Female Maturity.** Maturity describes the relative reproductive stage of the animal. *See Terms in main section of operational plan for immature and mature definitions for king crab and Chionoecetes crab as used in this survey.*

**0** = Unknown. The maturity of the crab was not determined.

**1** = Immature. Juvenile animal too young to reproduce.

**2** = Mature. Adult animal old enough to reproduce.

**3** = Mature, primiparous. New-shell adult female crab, without grasping marks, developing or having previously developed a single clutch. *Used only for Chionoecetes crab.*

**4** = Mature, multiparous. Old, very old, or very, very old shell adult female crab, with one or more grasping marks, that has developed at least two clutches. *Used only for Chionoecetes crab.*

**Eggs.** Descriptions of the egg clutch or pleopodal setae.

**Clutch Fullness.** Describes the fractional amount of eggs present in relationship to the size of the abdomen; fullness is recorded as a visual estimation of the size of the clutch relative to an idealized full clutch (100%).

**0** = No eggs present.

**1** = Trace to 1/8<sup>th</sup> full. From 1 egg up to 1/8 of a full clutch; eggs not visible when the abdomen is closed.

**2** = 1/4 full. Up to 1/4 (13% - 25%) of a full clutch; eggs not visible when the abdomen is closed.

**3** = 1/2 full. Up to 1/2 (26% - 50%) of a full clutch; eggs just visible when the abdomen is closed.

**4** = 3/4 full. Up to 3/4 (51% - 75%) of a full clutch; eggs are visible when the abdomen is closed.

**5** = Full. A completely full clutch (76% - 100%); thickness of the egg mass is greatly pronounced.

**Egg Development.** Describes the observed stage of egg maturity. Eye slits or eye spots are visible as the egg develops. If empty egg cases are visible among viable eggs within the clutch, the eggs are in the hatching state. *For golden king crab, newly-hatched zoeae may be visible to the naked eye.*

**1** = Uneyed. Unfertilized or early development stage eggs with no visible eye spots.

**2** = Eyed. Eye spots and/or prezoaeae visible in eggs.

**3** = Hatching. Eggs are clearly in a visible state of hatching; empty egg cases are present.

**Clutch Condition.** Describes the general overall condition of the clutch, setae, and eggs observed during the examination of mature female crab.

**1** = No dead eggs. Eggs are present but none are visibly dead.

**2** = Dead eggs (< 20%). Less than 20% of the visible eggs are dead; dead eggs appear opaque or off-color from the remainder of the clutch.

**3** = Dead eggs (> 20%). More than 20% of the visible eggs are dead.

**4** = Barren, clean setae. No visible eggs, pleopodal setae are clean, shiny, light in color and very fine.

**5** = Barren, matted setae. No visible eggs, pleopodal setae are dirty in appearance and often have dead and/or empty egg cases attached.

**6** = No visible setae on pleopods.

**Egg Color.** Use the *standard color chart* illustrations to match egg color.

**0** = other; describe.

**4** = orange

**8** = purple

**1** = cream

**5** = dark orange

**9** = purple-brown

**2** = tan

**6** = pink

**10** = brown

**3** = yellow

**7** = reddish

**11** = brownish-black

---

-continued-

**Condition.** Describes the apparent health and condition of the animal.

**blank** = Uninjured. No visible fresh injuries.

**1** = Fresh injury. The animal has been injured during/after gear retrieval.

**2** = Dead. The animal died during/after gear retrieval.

**3** = Previously dead. The animal died prior to gear retrieval.

**Parasites and Diseases.** Common parasites and diseases that have been visually observed during the course of routine field work and examination are listed below.

**blank** = animal not examined

**0** = None. Animal was examined; no parasite or disease observed.

**1** = *Briarosaccus callosus* externae or scars from previous externae present within abdominal flap.

**2** = Nemertean worms present in egg clutch.

**3** = Bitter crab. Crab afflicted with bitter crab syndrome (pertains to Tanner and snow crab).

NOTE: These are only those crab that show the visual signs of bitter crab. Crab will be sent to NMFS for confirmation. A small percentage of crab showing visual signs consistent with bitter crab syndrome, may not actually have bitter crab (e.g. milky looking hemolymph may have other causes) and some crab with bitter crab syndrome will not have yet developed the signs seen visually.

**4** = Other. Note the presence of a parasite or disease not described in this list.

**5** = Black mat. Crab afflicted with black mat syndrome.

**6** = Torch. Chitinoclastic bacteria presence evident on crab shell. (Also known as CCB)

**7** = Cottage cheese. Crab afflicted with ‘cottage cheese’ disease.

**8** = Turbellarian worms present in egg clutch.

**9** = Pepper crab. Crab afflicted with pepper crab disease.

**10** = Snailfish eggs. Snailfish eggs present under the carapace within the branchial chamber.

**12** = Leatherback. A crab with a leathery or rubbery carapace, regardless of shell condition.

## **APPENDIX E. SURVEY EQUIPMENT LIST**

### **EQUIPMENT PROVIDED FOR EACH ADF&G CREWMEMBER**

Immersion suit with EPIRB, strobe, and rescue laser flare  
Rain gear, boots, gloves (6 pairs liners and 6 pairs rubber per person)  
SOSpenders (approved Type V for use as a Type II) or vest Type V (one per person)  
LED headlamps for use on deck, and headlamp or flashlight for emergency use

### **DECK AND SAMPLING EQUIPMENT**

1. One 4'x8' aluminum sorting table with 6 stands
2. (12) thin, 3" hex head bolts and appropriate sized socket wrench for table assembly
3. (4) regular size clipboards (plastic or non-gunked up regular)
4. (5) covered clipboards (aluminum or plastic)
5. waterproof watch (1); timer (1)
6. (6) pair non-digital calipers, large size with millimeter scale: (3) electronic calipers
7. Measuring sticks: (4) 5.5" for blue king; (4) 3.1" for snow crab.
8. (3) tape measures (cm) for fish measurements
9. (6) onion sacks for holding crab, fish in tanks
10. (1) fish measuring board
11. (2) can WD-40
12. (4) dump totes
13. fish baskets: (15 orange round and 5 yellow rectangular)
14. (4) plastic Rubbermaid dishpans
15. Assorted plastic bags: (2 doz.) gallon and (100) quart zip-locks; (2 doz.) 25 gal. clear thick mil
16. (10) rolls electric tape
17. (1) liter of 100% formalin, with mixing jar
18. (1) gallon alcohol
19. (20) specimen jars
20. (1) dissecting kit
21. (12) Victorinox knives
22. (2) plastic toolbox for crab sampling equipment
23. (2) magnifying glasses, including (1) 4-inch diameter

### **TAGGING EQUIPMENT**

1. FLOY spaghetti tags – 3000 tags:  
Fluorescent pink with white disks, "D" series, numbered "17,001 – 20,000"
2. Tagging rods
3. I bolts (to attach tagging rods to table)
4. Needles: curved
5. Blue insulation box (to hold needles on deck)
6. Sandpaper (to sharpen needles)
7. Wooden paint stirrers (to hold open crab tail and expose isthmus muscle)

---

-continued-

## **CRAB POT GEAR**

ADFG Pots (90)

Shots – for 90 pots and extras

ADFG marked Bouys – for 90 pots and extras

## **FISHING/POT REFURBISHING SUPPLIES**

1. (2) 5-lb rolls #30 biodegradable cotton twine
2. (7) 5-lb rolls #96 tarred seine twine
3. (5) 5-lb rolls #84 tarred seine twine
4. (12) 5-lb rolls 5-mm orange poly twine
5. (1) 600-ft roll #32 groundline, for door ties
6. (50) metal door hooks
7. (50) door rubbers
8. (4) net mending needles, assorted sizes
9. (2) hand-held propane torches
10. (2) propane cylinders

## **FORMS**

1. 60 Survey Pilot House Log forms
2. 4,000 Crab Measurement Forms (rite-in-rain)
3. 80 Station Catch Summary Forms (2 sets, one for blue king crab, 1 for snow crab)  
\*\*\*non-data entry\*\*\*
4. 30 Crab Subsampling Forms (rite-in-rain)
5. 300 Species Composition Forms (350 rite-in-rain; 50 regular paper)
6. 250 Fish Length Forms (rite-in-rain paper)
7. 2 Temperature Logger ID Forms (rite-in-rain paper)
8. 10 Tagged Crab Recovery Forms (rite-in-rain paper)
9. 20 Weather Observation Forms
10. 10 sheets specimen labels (rite-in-rain paper)

## **CHARTS AND BOOKS**

1. NOAA Charts: St. Matthew Island and Bering Sea
2. ADFG Groundfish/Shellfish Statistical Area Chart 3 – Bering Sea (showing NMFS Areas)
3. 2013 NMFS Species Codebook (2)
4. 2012-2014 Commercial King and Tanner Crab Fishing Regulations (2)
5. Checklist of Alaskan Crabs, B.G. Stevens 2002 (1)
6. Review of the Family Lithodidae, Zaklan 2002 (1)
7. Biological Field Techniques for Chionoecetes Crabs, Jadamec et al. 1999 (2)
8. Biological Field Techniques for Lithodid Crabs, Donaldson and Byersdorfer 2005 (2)
9. Alaska Saltwater Fishes and Other Sea Life, Kessler 1985 (2)
10. Guide to the Identification of some common eastern Bering Sea Snails, MacIntosh 1976 (2)
11. Common fish and inverts near Pribilof Islands - Byersdorfer 2004 (1)
12. Common fish and inverts near St. Matthew Island - Byersdorfer 2005 (1)

---

-continued-

Field Guide to the Benthic Marine Invertebrates of Alaska's shelf and upper slope, Roger N. Clark, 2006 version, CD only

13. Names of Decapod Crustaceans AFS #17, Williams et al. 1989 (1)
14. Names of Mollusks 2<sup>nd</sup> edition AFS #26, Turgeon et al. 1998 (1)
15. Fishes of Alaska, Mecklenburg et al. 2002 (1)
16. Guide to northeast Pacific Flatfishes, Kramer et al. 1995 (1)
17. Guide to northeast Pacific Rockfishes - 2003 edition, Kramer & O'Connell 1986 (1)
18. A Field Guide to Alaskan Corals, Wing and Barnard 2003 Draft (2)
19. Guide to Marine Mammals of Alaska – 3<sup>rd</sup> edition, Wynne 2007 (1)
20. Field Guide to Sharks, Skates, and Ratfish of Alaska, Stevenson et.al. 2007
21. Field Guide to Common Fishes and Invertebrates of Alaska, Byersdorfer and Watson 2010
22. Under Alaskan Seas, Barr and Barr 1983 (1)
23. A Field Guide to the Birds of North America, National Geographic – 4<sup>th</sup> edition 2002 (1)
24. Field Guide to the Night Sky, National Audubon Society, Chartrand 1991
25. Laminated color chart, ADF&G Shellfish Research 2006 (2)
26. Pacific Coast Crabs and Shrimps, Jensen 1995 (1)
27. Diseases of Wild and Cultured Shellfish in Alaska, Meyers and Burton 2009 (1)
28. Pacific Coast Fishes, Eschmeyer et al. 1983 (1)
29. Pacific Fishes of Canada, Hart 1973 (1)
30. Brittle Stars, Lambert and Austin 2007 (1)
31. Sea Stars, Lambert 2000 (1)
32. Sea Cucumbers, Lambert 1997 (1)
33. Field Guide to Squids and Octopods, Jorgensen 2009 (1)
34. Shell Condition for Chionoecetes Crabs Example Photographs
35. Trifold Pamphlet: Marine Mammals of the Eastern North Pacific 3<sup>rd</sup> ed., Sea Grant 2010
36. Laminated Sheet: North Pacific Albatrosses Identification, USFWS et.al.
37. A Field Guide to Sea Stars of the Pacific Northwest, McDaniel 2011
38. Knots & Splices, 2<sup>nd</sup> ed., Day and Jarman 2006

#### **OFFICE SUPPLIES**

1. (2) cruise leader notebooks (V.Vanek)
2. Cruise leader ADF&G collecting permit (V.Vanek)
3. (1) small 3-ring binder for completed Pilot House Log forms
4. (1) small 3-ring binder for completed Station Catch Summary Forms
5. Rite in Rain notebooks (5)
6. (2) calculators
7. (20) mechanical pencils
8. Pkg. 'No. 2' regular pencils
9. (5) ink pens
10. Permanent markers
11. (100) sheets plain paper
12. (50) sheets Rite-in-the-Rain paper
13. 3-ring hole punch

---

-continued-

Ass't. rubber bands (including large, for clipboards)

14. (1) roll Scotch tape; (2) rolls duct tape
15. Ass't. paper and binder clips
16. (15) envelopes (data form filing)
17. plastic file tote/lid (1) with hanging folders (15)

### **MISCELLANEOUS SUPPLIES**

Paper towels (16 rolls)

Small hair dryer

LED waterproof flashlights (3)

Chargers for rechargeable batteries (AA, AAA) (2)

Rechargeable batteries (4 AA, 16 AAA)

Extra regular batteries, AAA, AA (for head lamps, flashlights)

SOSpenders recharge kit (2)

pairs earplugs (40)

medical kit

25-ft extension cord (1)

### **COMPUTERS**

1. laptop, with case and laptop power cords (3)
2. mouse and mouse pad, if desired (3)
4. external keyboard, if desired (3)
5. external number pad, if desired (3)
5. Burnable DVD's (12)
6. extension power cord (2)
6. Buss bar (2)

### **CAMERAS**

Waterproof Panasonic Lumix DMC-TS3/4 (3)

camera battery chargers(3)

extra batteries (3)

memory cards (9)

GoPro video cameras (3)

Extra batteries (3), battery chargers (3)

Underwater housing (3)

Accessories: roll bar mounts (6), tripod mounts(2), desiccant packages, zipties

### **OLEX**

1. Olex computer box
  2. Attachment for direct wire to DC; cord/attachment for AC
  3. Monitor with marine mount and base
  4. Keyboard and small wireless mouse
  5. Six 2" C-clamps
- 

-continued-

**DATA LOGGERS**

Loggers (RBR Global):

<u>Conductivity/Temp/Depth (13)</u>		<u>Temperature/Depth (9)</u>		<u>Temperature (3)</u>	
<u>Model</u>	<u>Serial #</u>	<u>Model</u>	<u>Serial #</u>	<u>Model</u>	<u>Serial #</u>
XR-420-CTD	9616	TDR-2050	11808	TR-1050	12176
XR-420-CTD	9643	TDR-2050	11818	TR-1050	12569
XR-420-CTD	13166	TDR-2050	11880	TR-1050	12570
XR-420-CTD	13167	TDR-2050	11884		
XR-420-CTD	13168	TDR-2050	11885		
XR-420-CTD	13235	TDR-2050	11886		
XR-420-CTD	17415	TDR-2050	23904		
XR-420-CTD	17416	TDR-2050	23905		
XR-420-CTD	17417	RBR <i>duo</i>	50530	<u>pH/DO/Temp/Depth (3)</u>	
XR-420-CTD	17418			RBR <i>concerto</i>	TBD
XR-420-CTD	17419			RBR <i>concerto</i>	TBD
XR-420-CTD	17420			RBR <i>concerto</i>	TBD
XR-420-CTD	17421				

1. RBR Submersible Data Logger User’s Manual – newest edition
2. RBR software CD versions 5.21 and 6.13; and Ruskin software version 1.6.0
3. RS232 cable, and maintenance kit (lube, ‘O’-rings)
4. Hydraulic hose sleeves and steel attachment hardware (shackles, bolts, carabineers)
5. door hooks and rubbers for securing probes inside pots
6. 3-volt 123A lithium camera batteries:

XR-420-CTD requires 4; TDR-2050 requires 2; TR-1050-CTD requires 2;

RBR*duo* requires 8; RBR*concerto* requires 8

(Note: New batteries put in at start of survey.)

**MICROSCOPE**

dissecting microscope

light source box

---