

**Regional Information Report No. 4K10-12**

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**Project Operational Plan for the 2010 St. Matthew  
Island Blue King Crab Survey**

by

**Robert K. Gish**

and

**Vicki A. Vanek**

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December 2010

Alaska Department of Fish and Game

Division of Commercial Fisheries



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<b>Weights and measures (metric)</b>		<b>General</b>		<b>Measures (fisheries)</b>	
centimeter	cm	Alaska Administrative Code	AAC	fork length	FL
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	mid-eye-to-fork	MEF
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	mid-eye-to-tail-fork	METF
hectare	ha	at	@	standard length	SL
kilogram	kg	compass directions:		total length	TL
kilometer	km	east	E		
liter	L	north	N	<b>Mathematics, statistics</b>	
meter	m	south	S	<i>all standard mathematical signs, symbols and abbreviations</i>	
milliliter	mL	west	W	alternate hypothesis	H <sub>A</sub>
millimeter	mm	copyright	©	base of natural logarithm	<i>e</i>
		corporate suffixes:		catch per unit effort	CPUE
<b>Weights and measures (English)</b>		Company	Co.	coefficient of variation	CV
cubic feet per second	ft <sup>3</sup> /s	Corporation	Corp.	common test statistics	(F, t, $\chi^2$ , etc.)
foot	ft	Incorporated	Inc.	confidence interval	CI
gallon	gal	Limited	Ltd.	correlation coefficient (multiple)	R
inch	in	District of Columbia	D.C.	correlation coefficient (simple)	r
mile	mi	et alii (and others)	et al.	covariance	cov
nautical mile	nmi	et cetera (and so forth)	etc.	degree (angular)	°
ounce	oz	exempli gratia		degrees of freedom	df
pound	lb	(for example)	e.g.	expected value	<i>E</i>
quart	qt	Federal Information Code	FIC	greater than	>
yard	yd	id est (that is)	i.e.	greater than or equal to	≥
		latitude or longitude	lat. or long.	harvest per unit effort	HPUE
<b>Time and temperature</b>		monetary symbols		less than	<
day	d	(U.S.)	\$, ¢	less than or equal to	≤
degrees Celsius	°C	months (tables and figures): first three letters	Jan, ..., Dec	logarithm (natural)	ln
degrees Fahrenheit	°F	registered trademark	®	logarithm (base 10)	log
degrees kelvin	K	trademark	™	logarithm (specify base)	log <sub>2</sub> , etc.
hour	h	United States (adjective)	U.S.	minute (angular)	'
minute	min	United States of America (noun)	USA	not significant	NS
second	s	U.S.C.	United States Code	null hypothesis	H <sub>0</sub>
		U.S. state	use two-letter abbreviations (e.g., AK, WA)	percent	%
<b>Physics and chemistry</b>				probability	P
all atomic symbols				probability of a type I error (rejection of the null hypothesis when true)	α
alternating current	AC			probability of a type II error (acceptance of the null hypothesis when false)	β
ampere	A			second (angular)	"
calorie	cal			standard deviation	SD
direct current	DC			standard error	SE
hertz	Hz			variance	
horsepower	hp			population	Var
hydrogen ion activity (negative log of)	pH			sample	var
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

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## ABSTRACT

This report describes the project operational plan for the 2010 St. Matthew Island blue king crab *Paralithodes platypus* triennial 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 33.5-m (110-ft) vessel, F/V *North American* during July-August 2010 in the St. Matthew Island Section of the Bering Sea (Area Q). One hundred and forty-one primary stations and up to 24 secondary stations near St. Matthew, Hall, and Pinnacle Islands will be sampled using a series of four-pot stations during the 30-day survey. 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, and 2007. A tag recovery program will be implemented for the 2010/11 and subsequent commercial fisheries, if prosecuted. Bottom water temperature profiles will be collected across the depth range of fished pots. Benthic habitat data obtained using a seabed classification system will be collected continuously for the duration of the survey. Collection of live ovigerous female blue king crabs will be made in support of studies conducted by National Marine Fisheries Service (NMFS) in Kodiak and for the Alutiiq Pride Shellfish Hatchery/Seward Marine Center, University of Alaska Fairbanks in Seward.

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

## INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) commercial fishing regulations describe the St. Matthew Island Section for blue king crabs *Paralithodes platypus* as being within the Northern District of the Bering Sea king crab registration area (Area Q). This section includes the waters north of the latitude of Cape Newenham (58°39' N lat) and south of the latitude of Cape Romanzof (61°49' N lat) with the Maritime Boundary Agreement Line of 1990 to the west (ADF&G 2008). Commercial fisheries for blue king crabs 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. 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 1999/2000 to 2008/2009 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 24, 2009 (Mecum 2009<sup>1</sup>). The Alaska Board of Fisheries (BOF), meeting via teleconference on Monday September 28, 2009, removed the minimum total allowable catch (TAC) from the state's Saint Matthew Island Section Blue King Crab Harvest Strategy by emergency regulation (Donaldson 2009). The BOF (2010) changed the harvest strategy regulation at the meeting in March of 2010. The fishery was reopened for the 2009/10 season with a TAC for Individual Fishing Quota (IFQ) and Community Development Quota (CDQ)

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<sup>1</sup> Letter to Eric Olson, Chair, North Pacific Management Council, and Denby S. Lloyd, Commissioner, Alaska Department of Fish and Game, from Robert D. Mecum, Acting Administrator, Alaska Region, United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Juneau, AK 99802-1668.

combined of 1.167 million lbs. (Bowers 2009). However, the total catch for the 2009/10 season (0.461 million lbs.; Zheng et al. 2010) was substantially below the TAC.

The St. Matthew Island blue king crab stock is inadequately surveyed by the annual NMFS EBS trawl survey due to the rocky bottom conditions that exist where legal male and mature female crabs are at highest densities. Therefore, abundance estimates of legal males from the trawl survey can be unreliable and virtually no information on mature females is provided by the trawl survey (Pengilly 2004). To address these problems, the ADF&G instituted a triennial pot survey program for St. Matthew Island blue king crabs in 1995 (Blau 1996) to augment the NMFS EBS trawl survey. The pot surveys continued in 1998, 2001, 2004 and 2007 (Blau and Watson 1999, Watson and Burt 2002, Watson 2005, and Watson 2008). Additionally, ADF&G included a nearshore component to the 1998 survey (Blau and Watson 1999) and 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 trawl survey. In 1995, a standard survey grid composed of 188 stations located between 59°30' and 60°48' N latitude and 172°00' and 174°00' W longitude (Figure 1) was established based on the historic concentration of fishing effort, and geographic distribution and density of blue king crabs observed in annual NMFS EBS trawl survey catches (Watson et al. 1995). Additionally, prior to the shallow-water surveys conducted by ADF&G in August 1998 and 1999, the NMFS trawl survey and the ADF&G pot survey did not sample the shallow-water ( $\leq 20$  fm) habitat in the St. Matthew Island area, resulting in the inadequate assessment of ovigerous female crabs that were believed to reside in the shallows. The presence of large numbers of ovigerous females in shallow waters was confirmed by the 1998 and 1999 ADF&G pot surveys; ovigerous females comprised nearly 82% of the 3,011 captured females, while during the standard pot surveys encompassing the nearshore surveys (1995, 1998 and 2001) ovigerous females averaged just 3% of the total catch (Watson 2004). Therefore, because so few ovigerous females were captured in standard triennial pot and annual trawl surveys the temporal trends in abundance and reproductive characteristics of females were not adequately sampled nor monitored, the standard survey grid was expanded in 2004 to include 12 additional stations, 10 of which are located in the shallow waters (11–20 fathom range) adjacent to the southern shore of St. Matthew Island that are known to be inhabited by females (Watson 2004).

The ADF&G pot survey provides information from commercially and biologically important areas that are not surveyed by the annual NMFS trawl survey and 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, Watson 2005). Changes in the relative abundance, measured as CPUE, of blue king crabs in the triennial pot surveys showed that legal male crab remained fairly high in the first three surveys, had declined five-fold by the 2004 survey, and in 2007 were at increased levels, slightly below those in 2001 (Table 1). Sublegal male crabs were relatively abundant in the first two surveys, but in 2001 CPUE had declined nearly 50% and by 2004 CPUE had further declined to 10% of 1995 levels. However, in 2007 CPUE of sublegal males increased substantially to a level between those in 1998 and 2001. As with sublegal males, female blue king crabs were also relatively abundant in the first two surveys, but declines in the next two surveys were greater than those observed of sublegal males. By 2001, female crab relative abundance had dropped over 70%; by 2004, female crab CPUE was less than 8% of the first two surveys; in 2007, CPUE increased and



for the 96 offshore stations fished in common in all surveys was at 2001 levels. Nine of the ten nearshore stations (stratum 3) added to the surveys in 2004 have been fished in common, and in 2007 had a substantially high CPUE for females (Table 2).

Analysis of tagged legal male blue king crab survey releases and recoveries in the 1995 and 1998 St. Matthew Island commercial fisheries has provided information relating to differential recovery rates of tagged crabs between discrete areas within the survey area (Pengilly and Watson 2004). During the 1995 fishery, legal males tagged and released in Stratum 2 (Figure 2) were recovered at over 8 times the rate of those tagged and released in 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.

Performance of the 2010 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 (e.g., Zheng et al. 2010). Collection of benthic habitat data within the survey area using a seabed classification system was initiated in 2007 and will continue as an important component of the 2010 triennial St. Matthew Island blue king crab survey. This operational plan describes the methodology for conducting the 2010 triennial blue king crab survey near St. Matthew Island.

## **OBJECTIVES**

Prioritized objectives for the 2010 St. Matthew Island blue king crab survey are as follows:

1. Obtain a relative stock abundance index (pot survey catch per unit effort) of male and female blue king crabs in the waters south of St. Matthew Island during the summer of 2010.
2. Describe a portion of the blue king crab population residing in shallow waters from 11 to 20 fathoms (20-m to 37-m) relative to sex, size, and reproductive characteristics.
3. Estimate spatial apportionment of fishery mortality, movements of crabs between seasons, and growth by tagging and releasing male blue king crabs during the pot survey and collecting recovery information from the 2010/11 and 2011/12 St. Matthew blue king crab fishery seasons (if prosecuted).
4. Characterize the benthic habitat in the survey area using a seabed classification system and obtain bottom ocean temperature profiles across the depth ranges fished during the survey.
5. Describe the overall species composition in the survey area, with emphasis on relative abundance and distribution by sex and size.
6. Collect live ovigerous female blue king crab needed for studies by NMFS Kodiak laboratory and Alutiiq Pride Shellfish Hatchery/Seward Marine Center, University of Alaska Fairbanks.

## **METHODS**

The pot survey will be conducted aboard the FV *North American*, a 110-ft (33.5-m) commercial crab-pot-fishing vessel from approximately July 23 to August 21, 2010. The 30-day charter will begin and end in Dutch Harbor with a captain, engineer, three crewmen, and four ADF&G biologists aboard. Details on methods are provided in the Shipboard Instructions (Appendix A). Approximately 2 of the 30 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, and 2007 survey operational plans (Watson et al. 1995, Blau and Watson 1998, Watson and Pengilly 2001, Watson 2004, and Watson 2007) and documented in respective survey reports (Blau 1996, Blau and Watson 1999, Watson and Burt 2002, Watson 2005, and Watson 2008).

## **SURVEY DESIGN**

The 2010 survey station grid encompasses the area between 59°30' and 60°30' N latitude and 172°00' and 174°00' W longitude and is composed of 141 primary and 24 secondary stations (Figure 2). Two geographic strata with different densities of survey stations are defined for the standard offshore area: a double-station density directly south of St. Matthew Island (Stratum 2) and a single-station density (Stratum 1) southward and offshore of Stratum 2 (Figure 2). Station layout in Stratum 2 is based on a grid in which stations are spaced 5 nmi north-to-south and east-to-west and overlaid with another 5-nmi by 5-nmi grid offset by 2.5 nmi north-to-south and east-to-west. Stratum 2 has historically produced the highest catches of mature females and legal males in the offshore area during the surveys (Watson 2008) and contains the area of highest effort in historic fisheries (Pengilly 2004). Station layout in Stratum 1 is based on a single 5-nmi by 5-nmi grid. Each station in Stratum 1 and 2 will be sampled using four rectangular king crab pots set 0.125 nmi apart and arrayed either north-to-south or east-to-west, depending on prevailing wind and tide conditions.

To better monitor and assess ovigerous females, 10 shallow-water stations (Stratum 3; Figure 3) were established near the south shore of St. Matthew Island in 2004 and most stations were sampled again during the 2007 survey. Each station in the shallow-waters Stratum 3 will be sampled in 2010. Stations are arrayed 2 nmi from adjacent stations and each station consists of four king crab pots set in a line perpendicular to shore from 11 to 20 fathoms in depth and spaced 3 fathoms apart.

A minimum of 141 stations (stations 1-121, 146-152, 201-203, and 301-310) will be fished. If weather and other survey conditions allow, up to 24 additional stations (stations 122-145) will also be fished. One 'block' of 9 stations will be set and pulled each day as outlined in Appendix B2; mid-point station coordinates are listed in Appendix B3. If all designated survey stations are sampled, additional stations will be selected from adjacent areas using coordinates from the established 200-station survey grid (Appendix B4).

Eighty-two king crab pots measuring 7 ft x 7 ft x 34 in supplied by ADF&G will be used and are the same or are identical to those used in the previous St. Matthew Island surveys. Each pot is webbed with #92 nylon twine with a stretch mesh of 2¾ in and has two opposing 8 in x 36 in tunnel eye openings. Each pot will be baited with 1 gallon of frozen chopped Pacific herring *Clupea pallasii*. The target soak time for each pot is 30 to 36 hours, and pots will be retrieved in the sequential order that they are set if existing conditions permit.

Fishing parameters such as station and 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 crabs, hair crabs *Erimacrus isenbeckii*, Tanner crabs *Chionoecetes bairdi*, and snow crabs *C. opilio*. A determination of legal-sized versus sublegal-sized males, shell condition of males and females, and female reproductive status will be assessed for each species. Carapace length (CL) of king crabs will be measured 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 Tanner crabs will be measured 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, legal size status of males, shell condition as described by Donaldson and Byersdorfer (2005) for king crabs and carapace width, legal size status of males, shell condition as described by Jadamec et al. (1999) for Tanner and snow crabs, female maturity and reproductive data for all crabs 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 below (i.e., legal male recruits and postrecruits, 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.

### Terms

#### *Blue King Crabs*

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

#### *Snow Crabs*

- Males:
  - Legal males: male crabs  $\geq 79$ -mm (3.1-in) CW outside lateral spines.
    - Industry-preferred legal males: male crabs  $\geq 102$ -mm (4-in) CW outside lateral spines.
  - Sublegal males: male crabs <79-mm CW outside lateral spines.
- Females:
  - Mature females: abdominal flap circular in shape and covers most of the ventral surface (see page 21 Jadamec et al. 1999).

- Immature females: abdominal flap covers about 2/3 of the ventral surface (see page 21 Jadamec et al. 1999).

### ***Tanner Crabs***

- Males:
  - Legal males: male crabs  $\geq 140$  mm (5.5 in) CW outside lateral spines.
  - Sublegal males: male crabs  $< 140$  mm CW outside lateral spines.
- Females:
  - Mature females: abdominal flap circular in shape and covers most of the ventral surface (see page 21 Jadamec et al. 1999).
  - Immature females: abdominal flap covers about 2/3 of the ventral surface (see page 21 Jadamec et al. 1999).

### ***Hair Crabs***

- Males:
  - Legal males: male crabs  $\geq 83$  mm (3.25 in) CW outside lateral spines.
  - Sublegal males: male crabs  $< 83$  mm CW outside lateral spines.
- Females:
  - Mature females: eggs or empty egg cases present on the pleopodal setae or with matted condition of the setae.
  - Immature females: no eggs or empty egg cases present on the pleopodal setae and with clean pleopodal setae.

Subsamples of blue king crabs will not be taken during this survey; however subsamples of male and female snow crabs for length distribution, shell condition, and female reproductive data may be taken when successive pots within a station contain a large number of crabs. 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 crabs in subsequent pots in the water, or unnecessarily delay overall survey progress. A minimum of 25 males and 25 females will be measured in each pot and the total count by sex and size category will be recorded on the Crab Subsampling Form (Appendix C4). The subsample will be randomly taken before non-measured crabs are counted and released.

All other captured invertebrates and fishes will be identified to species, if possible, and recorded on the Species Composition Form (Appendix C5). Commercially-important species, such as 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*, will be measured and lengths recorded on the Fish Length Form (Appendix C6). A complete list of all fish species to be measured is provided in Appendix C6.

## **TAGGING STRATEGY**

Blue king crabs will be tagged in anticipation of their recovery during possible commercial fisheries in fall 2010 and 2011. A maximum of 10 legal ( $\geq 140$  mm CW) male blue king crabs 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 10 crabs of legal size in each station that meet the tagging criteria will be tagged. If 10 eligible crabs are found in the first pot of a station, those 10 will be tagged,

regardless of the number available in the remaining three pots of that station. Crabs will be tagged through the isthmus muscle using Floy® poly ‘spaghetti’ tags as described in Gray (1965), and all tag numbers will be recorded on the Crab Measurement Form (Appendix C2).

## **LIVE BLUE KING CRAB COLLECTION**

Up to fifty (50) live ovigerous female blue king crabs will be captured during the survey and held for live delivery to Dutch Harbor and further transportation to Kodiak and Seward. Twenty-five (25) of these live crabs will be used for lab studies on ocean acidification effects on adult and larval survival and juvenile habitat preference to be conducted by National Marine Fisheries Service at the Kodiak Fisheries Research Center in Kodiak. The remaining twenty-five (25) live crabs will be used for research on the effective translation of small scale to large king crab culture at the Alutiiq Pride Shellfish Hatchery/Seward Marine Center, University of Alaska Fairbanks in Seward. This research includes determining optimal diets, culture conditions, larvae and juvenile growth rates, also, these crabs will be used to evaluate the fitness of laboratory and hatchery-reared larvae and juveniles.

The live specimens will be collected as late in the survey schedule as possible to minimize dead loss. Live blue king crab will be held in the circulating sea water tank of the F/V *North American* until delivery to the designated personnel in Dutch Harbor is completed.

Adult females to be collected should have no apparent injuries, old or new, and no obvious signs of disease or parasites. Any size female with eggs is acceptable. The preferred goal is for females with a full clutch with uneyed eggs. If these are not available, females with partial clutches with eyed eggs will be the second choice.

## **OCEANOGRAPHIC DATA COLLECTION**

Bottom temperature (°C) and depth profiles will be obtained during the survey by placing a data logger in a single pot at most stations fished. Seven Brancker® model TDR-2050/2051 data loggers that record temperature and depth, seven Brancker® model XR-420-CTD data loggers that record conductivity (salinity), temperature, and depth, and three model TR-1050 that record temperature will be deployed. Additionally, continuous water temperature reference data will be obtained by the deployment of two TR-1000 temperature loggers at yet to be determined locations for the duration of the survey. Temperature-depth profiles collected in the 2010 survey will be compared with those obtained during previous triennial surveys to describe changes, if any, in bottom temperature profiles by depth and station. 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.

## **BENTHIC HABITAT DATA COLLECTION**

Benthic habitat data will be collected during the survey.

### **Habitat Mapping**

Data on benthic habitat types or seabed classification within the survey area will be obtained during the charter using QTC VIEW<sup>2</sup> methodology (Gish 2007, Quester Tangent Corporation 2004a). It will consist of acquiring data from the ship’s echo sounder, in particular, the first

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<sup>2</sup> Use of trade names does not constitute an endorsement by ADF&G.

return ping or waveform. Waveforms vary according to the characteristic texture of the surficial seafloor sediment—the frequency distribution of grain sizes, or the immediate subsurface sediment. Waveforms are classified into groups according to different bottom types. Bottom type locations are correlated with a dedicated global positioning system, and color images of different bottom types are produced by applying QTC IMPACT software (Quester Tangent Corporation 2004b). Computer files created by QTC VIEW will be downloaded daily and documented on the QTC VIEW Form (Appendix C8).

### **Habitat sampling**

A minimum of one benthic sediment sample will be obtained from each bottom type to provide data to ground-truth the echo sounder data returns. The sediment samples will be classified according to the percentage of mud, sand, and gravel contained in each sample according to Folk (1954). Samples will be collected using a Van Veen grab deployed at or near slack tide to ensure successful deployment and retrieval (Gish 2007). Each sample will be placed in a one-gallon zip-lock bag, labeled with the date, time, latitude and longitude, and stored in the ship's bait freezer. Each sample will be documented on the Benthic Sample Form (Appendix C9).

### **TAGGED CRAB RECOVERY**

In the event the St. Matthew Island blue king crab fisheries are prosecuted in fall 2010 or 2011, at-sea shellfish observers from the ADF&G crab observer program will monitor catches for tagged crabs. Also, a dockside tagged-crab recovery program will be conducted involving ADF&G samplers placed at crab processing locations during fall 2010 and 2011 St. Matthew Island blue king crab fishery seasons. Prior to the fishery and during vessel tank inspections, research staff will contact vessel crews and processing facilities to explain the tagged crab recovery effort and attendant tag reward program. A news release will be issued to the Bering Sea crab industry outlining the tag recovery effort.

All recovered, tagged crabs will be measured and assessed for shell condition, with complete capture location and depth information to be obtained from vessel captains. All information will be documented on the Tagged Crab Recovery Form (Appendix C10).

## **DATA ANALYSIS**

Catch per unit effort (CPUE) of blue king crabs and snow crabs captured during the 2010 survey will be summarized by sex-size classes by individual station, survey stratum, 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. Frequency distributions of size and shell condition will be summarized and graphed for males and females separately. Female blue king crab reproductive characteristics will be summarized. The 2010 survey data will be tabulated and compared with that of the previous triennial survey data to describe changes in relative abundance, spatial distribution, and relative size classes. Snow crab data will be analyzed as detailed above for blue king crabs. Length distributions for captured commercially-important fish species will be summarized and graphed.

Ocean bottom temperature and depth information will be tabulated and compared with temperature-depth profiles obtained in previous triennial surveys. Distribution and relative abundance of blue king crabs will be compared to benthic habitat data collected during the survey and analyzed to determine if the blue king crab catches are correlated with bottom types.

Tag recovery rates from the 2010/11 fishery, if prosecuted, will be summarized overall, by survey stratum, and by station of release to determine spatial distribution of fishery mortality relative to preseason distribution. Minimum distance and direction trends in movements of crabs from preseason release site to fishery capture site will also be estimated. Tag recovery rates from the 2011/12 fishery, if prosecuted, will be summarized overall, by survey stratum, and by station of release to determine spatial distribution of fishery mortality relative to 2010 preseason distribution. Minimum distance and direction trends in movements of crabs from 2010 preseason release site to 2011/12 fishery capture site will also be estimated. Size and shell condition data recorded at release and recovery will be used to estimate molting probability and growth per molt by size-shell class of males.

## **SCHEDULES AND PERSONNEL**

Date(s)	Activity	Personnel
1/2010–6/2010	Project planning, vessel charter procurement, operational plan and shipboard instructions	Gish and Vanek
3/2010–7/2010	Purchase, prepare, and stage survey gear	Gish and Vanek
7/2010–8/2010	Conduct at-sea survey	Gish, Vanek, Salmon and Dela Cruz
8/2010–9/2010	Edit and compile survey data	Gish and Vanek
9/2010–10/2010	Enter survey data electronically	Chisum
10/2010–11/2010	Load data electronically into database	Shepard
11/2010–3/2011	Compile, analyze, and write final survey report	Gish and Vanek

## **REPORTS**

A post-survey memo will be written documenting the number of male and female blue king and snow crabs caught at each station and the number of male king crab tagged at each station during the survey. Complete documentation will also be made regarding vessel and at-sea crew performance, deviations in survey itinerary or sampling protocols, and any other items of importance that are not documented on survey forms.

A Fishery Management Report (FMR) detailing the results of the 2010 survey with comparisons to the 1995, 1998, 2001, 2004, and 2007 surveys will be produced.

Date	Report	Author(s)
6/30/2010	Project Operational Plan	Gish and Vanek
9/15/2010	Post-survey memo	Gish
3/15/2011	FMR 2010 survey	Gish and Vanek

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## **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, and 2007 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
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
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

<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 has declined from 70% of the stations in 1995 and 1998, to 61 % in 2001, and to about 55% of the 2004 and 2007 stations. 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 42 hours in 2007.

Table 2.—Summary of blue king crab catches and catch per unit effort (CPUE; average catch per pot lift) from Stratum 3, the nearshore waters, during the 2004 and 2007 triennial St. Matthew Island pot surveys. Data presented is from the 9 stations fished in common<sup>a</sup> in both survey years.

Year	Stations	Pots	Mature Males		Sublegal Males		Females	
			Number	CPUE	Number	CPUE	Number	CPUE
2004	9	36	3	<0.1	3	<0.1	31	0.9
2007	9	35	24	0.7	44	1.3	1,479	42.3

<sup>a</sup> Stations were 301-304, and 306-310.

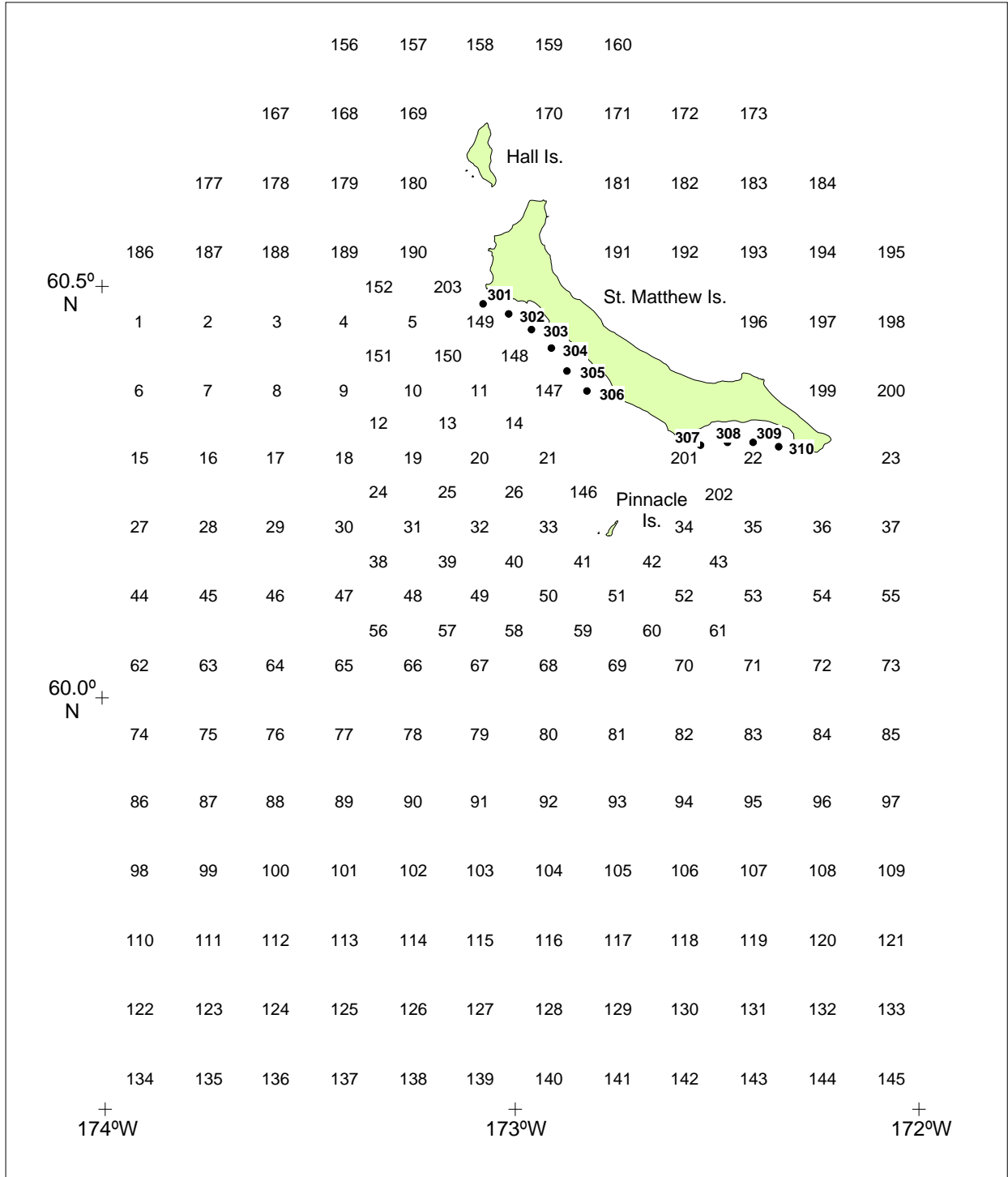


Figure 1.—Location of the 200-station grid established for triennial pot surveys of St. Matthew Island blue king crabs by the Alaska Department of Fish and Game in December 1995 (188 stations) after modification in June 2004 to include 12 additional stations (stations 202, 203 and 301–310).

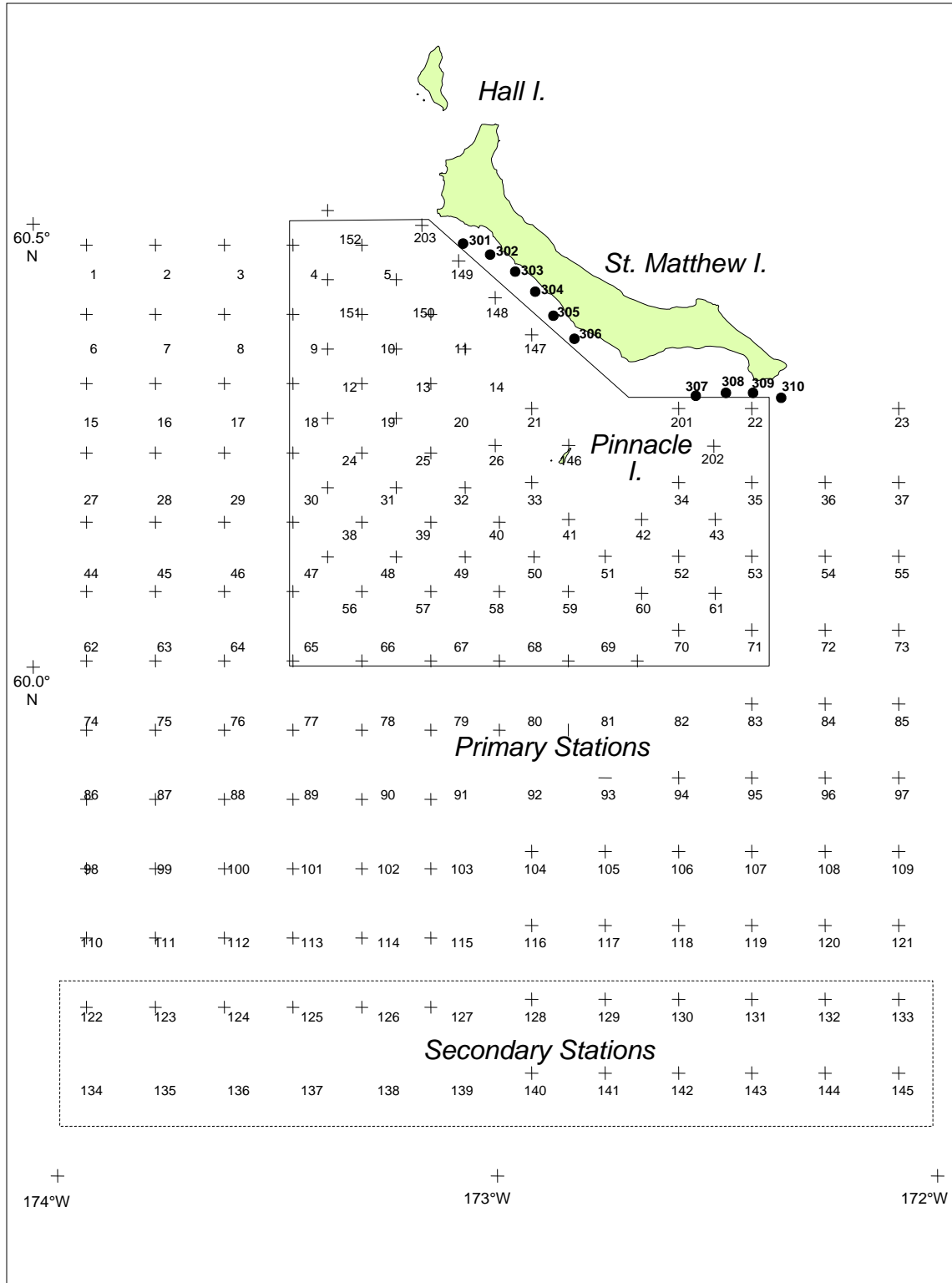


Figure 2.—Survey area and midpoint station locations for the 141 primary and 24 secondary stations to be fished during the 2010 St. Matthew Island blue king crab pot survey. Stratum 1 stations are outside the polygon, Stratum 2 stations are within the polygon, and Stratum 3 stations (shallow-waters) are noted in bold.

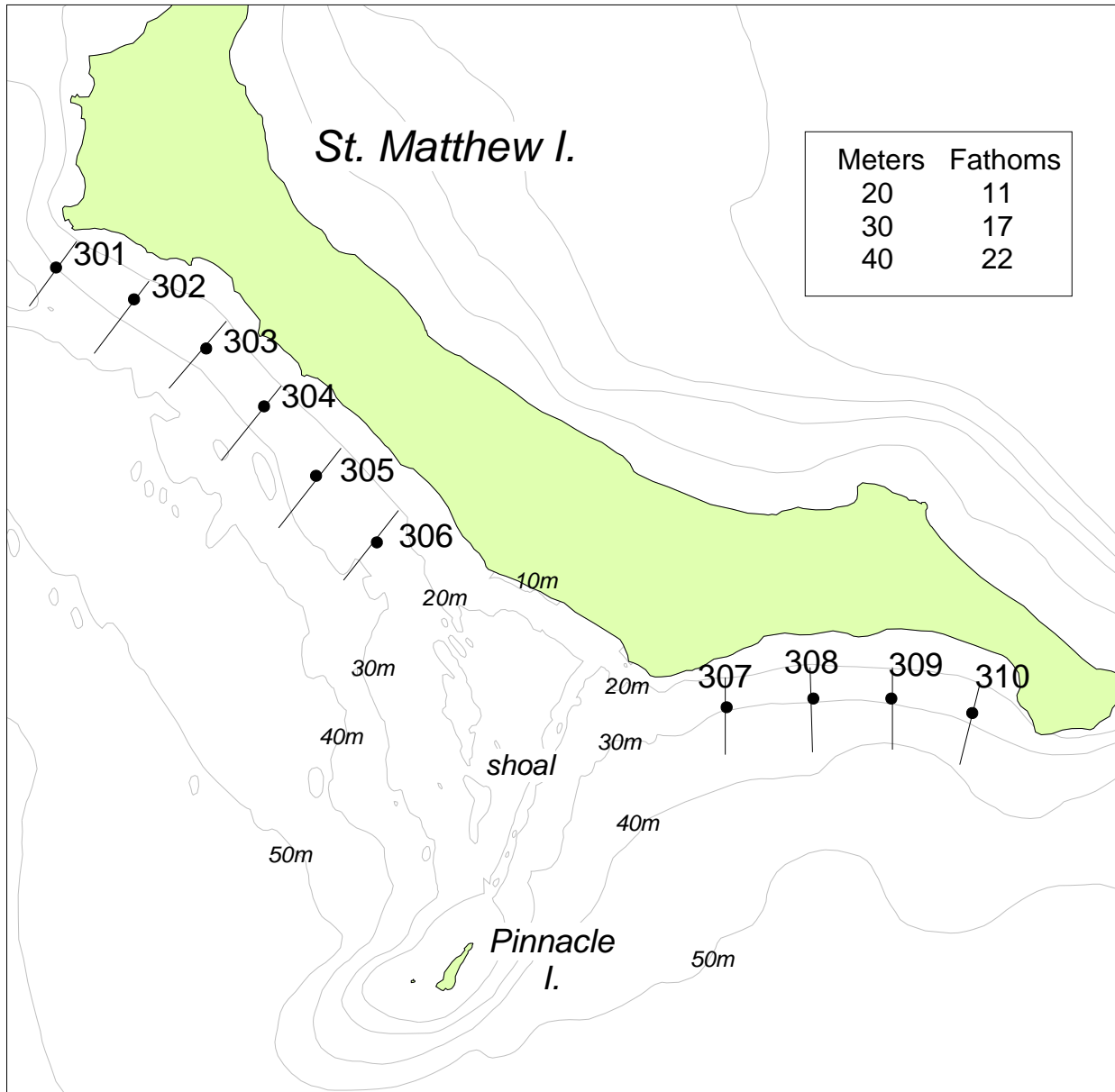


Figure 3.—Stratum 3 schematic array with bathymetric background for shallow-water stations 301–310 to be sampled during the 2010 St. Matthew Island pot survey. Four pots per station will be set in a line perpendicular to shore at 3 fathom intervals to sample the 11–20 fathom depth range (i.e. set at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



**APPENDIX A. SHIPBOARD INSTRUCTIONS FOR THE 2010  
ST. MATTHEW ISLAND BLUE KING CRAB SURVEY**

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## **GENERAL INFORMATION FOR ADF&G CREW**

The purpose of this manual is to provide instructions and information related to the 2010 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.

- Please read the entire operational plan.
- By regulation, all survey data is confidential until the closure of the St. Matthew Island blue king crab commercial fishery, which occurs from October 15, 2010 through February 1, 2011. As this fishery had been closed 1999–2008 due to the overfished status of the stock and reopened in 2009 for the first fishery to be prosecuted in 11 years, it is possible that the fishery will be closed preseason.

The 2010 survey will be conducted aboard the chartered FV *North American*, a 110-ft crab-pot-fishing vessel. The charter will be approximately 30 days in length, beginning on July 23 and ending on August 21, 2010.

The cruise leader will be responsible for resolving any conflicts that may arise between the vessel crew and ADF&G crew regarding charter service requirements.

The cruise leader will also be responsible for resolving any conflicts that may arise among the ADF&G crew. Insubordination to the cruise leader or captain will result in immediate suspension from at-sea duties, and if warranted, the subsequent return of the individual to Dutch Harbor.

Listed below are the names and titles of the personnel that will be participating in the survey:

- Skip Gish – biologist, cruise leader
- Vicki Vanek – biologist
- Melissa Salmon – biologist
- Dmitri Dela Cruz – biologist

### **Vessel Safety Briefing**

Prior to survey departure, the captain will provide both the vessel and ADF&G crews with a shipboard safety orientation to include the following:

1. The location and operation of lifesaving and emergency equipment (EPIRBs, immersion suits, life rafts, and medical kits)
2. Operation of 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, in the presence of USCG personnel, a fire fighting drill and an abandon ship drill.

After the vessel is underway, a drill will be held at an unspecified time to test the ability of the vessel and ADF&G crews to report to emergency locations and to don immersion suits and assist others to don theirs.

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 and Personal Floatation Devices (PFDs)**

Prior to vessel departure, it is the individual's responsibility to ensure that his/her immersion suit is ready for at-sea use. Supplied suits must be free of damage and have waxed, operable zippers. New 406 EPIRBs were purchased to replace the Mini B2 model that we have been using; ensure that you know how to activate the new EPIRB before attaching it to your suit. Supplied ACR FireFly3 strobe lights are new; ensure that new batteries have been installed and that you know how to turn it on before attaching it to your suit. A safety whistle must also be attached to your suit. Store your suit where you can easily get to it, away from heat registers and in a clean location.

Supplied personal floatation devices (PFDs) will be worn at all times when out on deck. Stormy Seas jackets are not USCG-approved PFDs and will not be used in lieu of the SOSpender PFDs supplied by ADF&G. New rearming kits have been installed and instructions for SOSpender use are attached to each PFD. Clean and inspect your PFD daily before use.

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

### **Shipboard Protocol for Bird Handling (Asian H5N1 Avian Influenza)**

We will use the 'better safe than sorry' approach for handling all species of birds that end up on the vessel. We will not be collecting dead seabirds for avian flu testing. Other than depositing dead birds back into the ocean or clearing disoriented live birds off the deck, the vessel and ADF&G crews will not handle birds that end up on the vessel. Disposable gloves will be provided and used for this purpose, and the proper technique for glove removal will be demonstrated. ADF&G crew will read the memorandum from McKie Campbell, former ADF&G Commissioner regarding personal protection measures against Avian flu for additional information.

## **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, and water use policy for showers and laundry.

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. At-sea tasks and responsibilities for successful survey completion will be assigned on a rotating basis to each ADF&G biologist. 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) operating temperature data loggers and managing their deployment; 6) monitoring the QTC benthic habitat recorder; 7) deployment and retrieval of the Van Veen grab and preservation of seabed samples; 8) photography and special project assignments, and 9) clean-up of deck sampling area and gear.

Completed data forms will be edited and filed daily and kept in a safe, dry place inside the house. 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. Although it is the crew leader's responsibility to ensure data integrity, it is expected that all at-sea staff will do their very best to aid in this effort.

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, hours worked, photographs taken, and other survey-related items that are not detailed on a sampling form. Any problems or concerns with survey procedures and suggestions for improving future surveys should also be noted in your daily log. Seabird and mammal observations will be tabulated by one lucky person, and that information will be forwarded to the appropriate federal agency.

There will be no home packing or unauthorized retention of any animals captured during the survey by vessel or ADF&G crewmembers. Sport fishing is allowed if a person has a valid 2010 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.

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, washing dishes, making coffee, cooking and general cleaning will be part of our daily routine. The vessel crew will have a busier schedule than the ADF&G crew; a cooperative effort toward daily chores and maintaining living quarters on the vessel can be a great benefit to everyone’s morale.

**Timesheets, Payroll Codes, Etc.**

Time sheets for pay periods ending July 31 and August 15 will be filled out, signed by the cruise leader, and sent to Tammy Walsh in the Kodiak office prior to survey departure. Ensure that your prepared timesheets are correctly coded; regular time to normal project code and sea pay as listed below.

Name	PCN	LOC	BSCR IX
Gish, R. – FB III	1857	CAA	11340559-11340559
Vanek, V. – FB II	1428	CAA	11340559-11340559
Salmon, M. – FB II	1919	BKB	11340559-11340559
Dela Cruz, D. – FB I	1117	BKB	11340559-11340559

**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 crabs captured in survey pots. If a sampled crab is not measurable (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.

Legal size status for blue king crabs 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>	5.5” CW, outside lateral spines
Hair crab <i>Erimacrus isenbeckii</i>	3.25” CW, outside lateral spines

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

### ***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. 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**

Blue king crabs will be tagged in anticipation of their recovery during possible commercial fisheries in fall 2010 and 2011. A maximum of 10 legal male blue king crabs 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 10 legal crabs 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 crabs will be tagged, regardless of the number available in the remaining three pots of that station. Crabs 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 (15,001–16,850).

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

In the event previously tagged blue king crabs are captured, record all required information (size, shell condition, location, and reproductive data) on the tagged crab recovery form (Appendix C10). The 1995 tags are yellow; the 1998 tags are fluorescent pink; the 2001 tags are fluorescent pink with fluorescent green tabs; the 2010 tags are fluorescent pink with white tabs. Sample tagged crabs 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, record the release location.

At-sea observers and dockside samplers will be asked to perform almost all tag recoveries from vessels, either while fishing or during offloading at the processing plants; they will record all required information (size, shell condition, location, and reproductive data) on the tagged crab recovery form (Appendix C12). The Dutch Harbor research staff will distribute the tag rewards.

### **Onboard QTC Data Management**

Each time data acquisition is started, or an automatic file break occurs (every 2 hours), a new data directory is created in the base directory. The directory names are derived from the date and time at which acquisition was started. The format for the directory name is D:\qtc\raw\qtc4\yyyymmdd\hhmmss.

For example, the data in the directory D:\qtc\raw\qtc4\20040217\101332 were created at 10:13:32 in the morning on Feb. 17, 2004.

There are several data files created in each data directory. The names and functions of each file are as follows:

1. **qtc4\_raw**: Contains the amplitude time series for each trace acquired during logging. This is the primary data file that is imported into QTC IMPACT and used for bottom classification.
2. **gps\_raw**: Contains the GPS NMEA strings acquired during logging. All NMEA strings are recorded, not just those used for parsing the navigation and time.
3. **acquisition.log**: This is a running status file used to record various real-time values generated during acquisition. The data in this file are used for debugging by QTC engineers and may also be used by operators in post processing to recall items of meta-data that are not recorded in the qtc4\_raw file.

The memory space on the D: drive of the survey laptop computer is limited and therefore the data generated by QTC must be moved to the external hard drive every couple of days or so. If the D: drive gets too full, the drive will simply stop recording data.

Moving the data from the D: drive to the external hard drive:

1. Set up a folder on the external hard drive to receive the daily QTC data folders. Name this folder *QTCDDataFromSurvey* (for example, *QTCDDataFromStMatts2010*).
2. Copy the data folder that QTC created for the day on the D: drive into the survey folder on the external hard drive.
3. After verifying the data was successfully copied, delete that day's data from the survey laptop D: drive.

Creating backups of the QTC data must also be done 2 or 3 times during a survey to ensure data is not lost in the event of a computer meltdown or something going wrong with the vessel's electrical system. The safest and most effective way to create independent backups of this data on the external hard drive is to burn it to CD's.

To create backups on CD's:

1. It is necessary to zip the data files in order to get the as much of the QTC data onto a CD as possible. Within the folder created above by moving the data from the D: drive to the external hard drive, select the data folder you want to zip, right click on it and move down to the ZipGenius option and select the "Create *yyyymmdd.zip*".
2. A normal, 700mb recordable CD can hold about 10 to 12 days worth of zipped QTC data. Therefore, around days 10, 20 and 30 of the survey, a CD should be burned that will contain the previous 10 (or so) days worth of data. For example, the CD burned on day 10 would have the data from days 1-10, the CD burned on day 20 would have the data from days 11-20 and the CD burned on day 30 would have the data from days 21-30.
3. It works well to create a separate folder to store all this zipped data. Name this folder *ZippedQTCDDataFromSurvey* (for example, *ZippedQTCDDataFromStMatts2010*).



4. To reduce confusion as to which zipped files are to be (or have been) burned to a CD, it is helpful to create subfolders within the folder created above in step 3 to hold only the zipped files that are to be burned to the CD. Name these folders CDBackupmm.ddtommm.dd. For example, if the zipped QTC data files from August 2<sup>nd</sup> through August 11<sup>th</sup> fit onto a blank CD, name the folder CDBackup8.2to8.11.
5. Burn a CD when there is enough zipped data to comfortably fit onto a CD and clearly label it "Zipped QTC Data From *Survey*" and indicate the dates of the data "Data From mm/dd/yy to mm/dd/yy".

Another thing one could do to help reduce the possibility of losing data is to have the external hard drive plugged into the survey laptop **only** when you are actually using the external hard drive (when moving files from the D: drive, zipping files or burning a backup CD for example). Keeping it disconnected from the laptop while not in use reduces the possibility of something happening to the external hard drive in the event something goes wrong with the laptop or the vessel's electrical system. That's it; now just don't lose the backup CD's!

## **Special Projects**

### ***Collection of Ovigerous Female Blue King Crabs***

#### **Objective:**

Up to fifty (50) live ovigerous female blue king crabs will be captured during the survey and held for live delivery to Dutch Harbor and further transportation to Kodiak and Seward.

#### **Purpose:**

These live crabs will be used for lab studies on ocean acidification effects on adult and larval survival and juvenile habitat preference to be conducted by National Marine Fisheries Service at the Kodiak Fisheries Research Center in Kodiak. The crabs will also be used for research on the effective translation of small scale to large king crab culture at the Alutiiq Pride Shellfish Hatchery/Seward Marine Center, University of Alaska Fairbanks in Seward. This research includes determining optimal diets, culture conditions, larvae and juvenile growth rates, and, also to evaluate the fitness of laboratory and hatchery-reared larvae and juveniles.

#### **Shipboard Instructions**

The live crabs will be collected as late in the survey schedule as possible to minimize dead loss. Adult females to be collected should have no apparent injuries, old or new, and no obvious signs of disease or parasites. Any size female with eggs is acceptable. The preferred goal is for females with a full clutch with uneyed eggs. If these are not available, females with partial clutches with eyed eggs will be the second choice. Handle in a way to prevent any injury. Live blue king crab will be held in the circulating sea water hold of the FV *North American* until delivery to the designated personnel in Dutch Harbor is completed.

#### **Packing to Ship:**

Four large coolers, with associated burlap bags and ice packs, will be provided by the NMFS-Kodiak lab and shipped to ADF&G in Dutch. To ship live crabs, position some frozen ice

packs at the bottom of the cooler, place seawater-soaked burlap bags on top of the ice packs, layer females in the cooler with seawater-soaked burlap bags and a few more ice packs. Make sure the crabs cannot come in contact with the ice packs. [NOTE: Kathy Swiney (NMFS-Kodiak lab) has found it easier to pack red king crab in normal position as they would be in the wild, and the Seward hatchery has often preferred to ship live crab upside down (top of carapace on the down side). Kathy reported that for red king crab, in her experience, the crabs kept trying to right themselves and grabbing onto each other when trying to pack upside down, but would remain still when kept in normal position.]

**Shipping:**

The four coolers with live crab will be shipped from Dutch Harbor to Anchorage via Goldstreak or Alaska Cargo, paid by NMFS – Kodiak Lab. Ben Daly (Shellfish Hatchery in Seward) will meet the coolers in Anchorage and forward two of the four on to Kodiak. For cargo shipping paperwork purposes, the Anchorage contacts are Ben Daly (phone: 907-224-4311, cell: 802-779-1549) and Jeff Hetrick (cell: 907-362-2378).

***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 IN THE PHOTO.

Anytime you switch to taking photos of another crab, take a photo first of the new crab's info. 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 crabs), 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.

**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 5 images, in consecutive order:

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 crabs 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 can remain on the memory card with the camera if the provided ADF&G camera (Pentax Optio W20) is used, or transferred to CD if a different camera is used or if the memory card becomes limited. The provided ADF&G camera is pre-set to take 5 megapixel images using the ‘natural portrait’ image mode, but camera settings can be adjusted as needed to maximize the image quality. Please return the camera and/or CDs of images to Vicki Vanek after the survey.

## **INSTRUCTIONS TO THE CAPTAIN**

### **Survey Overview**

The 2010 survey station grid is within the area between 59°30' and 60°30' N latitude and 172°00 and 174°00' W longitude and is composed of 141 primary and 24 secondary stations. Stations in Stratum 1 and 2 are 5— nmi apart and will be sampled using 4 king crab pots spaced 0.125 nmi apart and arrayed either north-to-south or east-to-west, depending on wind or tide conditions. 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-fathom intervals to sample the 11 to 20-fathom depth range. The target soak time for each pot within a station is 30 to 36 hours. To achieve the target soak time, stations will be set in ‘blocks’ of 6 to 8 stations (Appendices B1 and B2). Mid-point station coordinates for the 2010 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 2¾ in and has two opposing 8 in by 36 in tunnel eye openings. Each pot will be baited with one gallon of frozen chopped Pacific herring.

If the 141 primary stations have been successfully sampled, the secondary stations may also be fished (Appendix B3). Adequate time to fish both primary and secondary stations is expected; however, inclement weather or other factors may occasionally hamper survey progress. If all designated survey stations are sampled, additional stations from areas to the north of St. Matthew and Hall Islands may be sampled using coordinates from the established 200-station survey grid (Appendix B4).

## **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 pot at each station fished. Each logger will be externally marked to correspond with a 3-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 C11).

We will try to stay on a schedule of retrieving the first pot by 0700 hours each day. Notify the ADF&G crew at least 30 minutes before the first pot is pulled in the morning so that we are ready for sampling. As each pot comes aboard, you must 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.

## **E-mail Schedules**

The captain will check in daily via e-mail to Gen Tech (Cleanfish) office to report the vessel's location. Inmarsat C (Stratos) from the vessel will be used daily by the ADF&G cruise leader to convey basic catch information to the Kodiak and Dutch Harbor offices. Use of the ship's satellite telephone will only be used for emergencies or if Inmarsat C is not functioning. ADF&G crew will not use either means of communications for personal use unless authorized by the cruise leader.



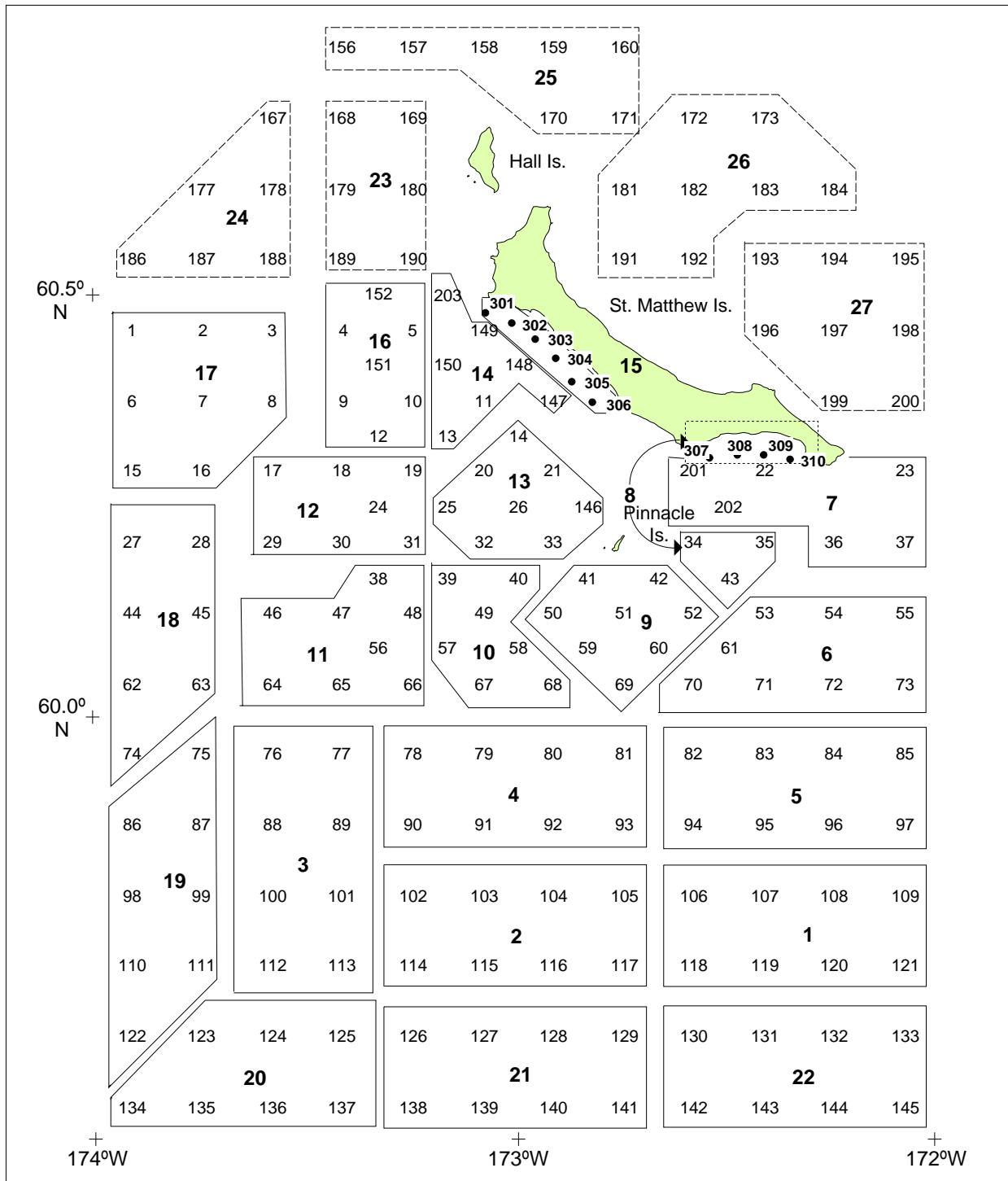
## **APPENDIX B. SURVEY ITINERARY AND LOCATION**

Appendix B1.–Itinerary for the 2010 St. Matthew Island blue king crab survey.

Date	Activity		Stations Set
<b>July</b>			
23	Load survey gear and travel to survey area.	-	-
24	Set Block 1 (sta. 106, 107, 108, 109, 118, 119, 120, 121)	-	8
25	Set Block 2 (sta.102, 103, 104, 105, 114, 115, 116, 117)	Pick Block 1	8
26	Set Block 3 (sta.76, 77, 88, 89, 100, 101, 112, 113)	Pick Block 2	8
27	Set Block 4 (sta.78 ,79, 80, 81, 90, 91, 92, 93)	Pick Block 3	8
28	Set Block 5 (sta.82, 83, 84, 85, 94, 95, 96, 97)	Pick Block 4	8
29	Set Block 6 (sta.53, 54, 55, 61, 70, 71, 72, 73)	Pick Block 5	8
30	Set Block 7 (sta.22, 23, 36, 37, 201, 202)	Pick Block 6	8
31	Set Block 8 (sta.34, 35, 43, 307, 308, 309, 310)	Pick Block 7	6
<b>August</b>			
1	Set Block 9 (sta. 41, 42, 50, 51, 52, 59, 60, 69)	Pick Block 8	7
2	Set Block 10 (sta. 39, 40, 49, 57, 58, 67, 68)	Pick Block 9	8
3	Set Block 11 (sta. 38, 46, 47, 48, 56, 64, 65, 66)	Pick Block 10	7
4	Set Block 12 (sta. 17, 18, 19, 24, 29, 30, 31)	Pick Block 11	8
5	Set Block 13 (sta. 14, 20, 21, 25, 26, 32, 33, 146)	Pick Block 12	7
6	Set Block 14 (sta. 11, 13, 147, 148, 149, 150, 203)	Pick Block 13	8
7	Set Block 15 (sta. 301, 302, 303, 304, 305, 306)	Pick Block 14	7
8	Set Block 16 (sta. 4, 5, 9, 10, 12, 151, 152)	Pick Block 15	6
9	Set Block 17 (sta. 1, 2, 3, 6, 7, 8, 15, 16)	Pick Block 16	7
10	Set Block 18 (sta. 27, 28, 44, 45, 62, 63, 74)	Pick Block 17	8
11	Set Block 19 (sta. 75, 86, 87, 98, 99, 110, 111, 122)	Pick Block 18	7
12	Set Block 20 (sta. 123, 124, 125, 134, 135, 136, 137)	Pick Block 19	8
13	Set Block 21 (sta. 126, 127, 128, 129, 138, 139, 140, 141)	Pick Block 20	7
14	Set Block 22 (sta. 130, 131, 132, 133, 142, 143, 144, 145)	Pick Block 21	8
15	Time-permitting, set additional Block 23 (sta. 168, 169, 179, 180, 189, 190)	Pick Block 22	6
16	Set additional Block 24 (sta. 167, 177, 178, 186, 187, 188)	Pick Block 23	6
17	Set additional Block 25 (sta. 156, 157, 158, 159, 160, 170, 171)	Pick Block 24	7
18	Set additional Block 26 (sta. 172, 173, 181, 182, 183, 184, 191, 192)	Pick Block 25	8
19	Set additional Block 27 (sta. 193, 194, 195, 196, 197, 198, 199, 200)	Pick Block 26	8
20	Pick Block 27 and travel to Dutch Harbor.	Pick Block 27	-
21	Travel to Dutch Harbor and offload survey gear.	Total Stations Fished	200



Appendix B2.—Layout of the 22 station blocks to be fished during the 2010 St. Matthew Island blue king crab survey; additional blocks 23–27 (dashed outline) may be sampled if survey time permits.



Appendix B3.—Midpoint latitude and longitude coordinates for the 141 primary and 24 secondary stations (noted in italics) to be fished during the 2010 St. Matthew Island blue king crab survey; an additional 35 stations in the northern portion of Stratum 1 may be sampled if survey time permits.

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-

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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
201	2	60	17.50	172	35.00
202	2	60	14.95	172	30.17
203	2	60	29.92	173	9.99
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

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Appendix B4.—Midpoint latitude and longitude coordinates for the 200-station grid established for triennial pot surveys of St. Matthew Island blue king crabs by the Alaska Department of Fish and Game in December 1995 (188 stations) as modified in June 2004 to include 12 additional stations.

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

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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	14.95	172	30.17
203	2	60	29.92	173	9.99
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 C. SURVEY DATA FORMS AND INSTRUCTIONS**

Appendix C1.—Survey pilot house log.

**Survey Pilot House Log**

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

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

ADF&G Number: \_\_\_\_\_  
 Page \_\_\_\_\_ of \_\_\_\_\_

SPN	STATION NUMBER	BUOY ID	SET GEAR		DEPTH (fathoms)	BOTTOM TYPE	LOCATION		LOGGER ID	LIFT GEAR		GEAR PERF.
			DATE (mm/dd/yy)	TIME (0000-2359)			LATITUDE (N) (dd°mm.mm)	LONGITUDE E or W (ddd°mm.mm)		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

## 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.

**Survey Code:** To be determined.

**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.

**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. 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

Appendix C2.-Crab measurement form.

**Crab Measurement Form**

Sample Date (mm/dd/yyyy): \_\_\_\_\_

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

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

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

Station Start Time: \_\_\_\_\_

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

SPN: \_\_\_\_\_ Buoy ID: \_\_\_\_\_

Station End Time: \_\_\_\_\_

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

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

(record times as 0000-2359)

Tag Series: \_\_\_\_\_

S P E C I E S	C O D E	S E X	C A R A P A C E S I Z E (mm)	C H E L A H E I G H T (mm)	L E G S I Z E	S H E L L C O N D I T I O N	M A T U R I T Y	E G G S					C O N D I T I O N	P A R A S I T E S	T A G N U M B E R	C O M M E N T S
								F U L L N E S S	D E V E L O P M E N T	C L U T C H	C O N D I T I O N	C O L O R				
1																
2																
3																
4																
5																
6																
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23																
24																
25																

<p><b>SPECIES CODES:</b></p> <ul style="list-style-type: none"> <li>1 = golden king</li> <li>2 = red king</li> <li>3 = blue king</li> <li>4 = hairy crab</li> <li>5 = hybrid, <i>C. borealis</i> x <i>C. opilio</i></li> <li>6 = <i>C. borealis</i></li> <li>7 = <i>C. opilio</i></li> <li>8 = <i>C. angulatus</i></li> <li>9 = Dungeness</li> <li>10 = <i>L. oregonus</i></li> <li>11 = <i>C. tasmanicus</i></li> <li>12 = <i>P. multispinus</i></li> <li>13 = <i>P. verreauxi</i></li> <li>41 = hybrid, <i>C. borealis</i></li> <li>42 = hybrid, <i>C. opilio</i></li> </ul>	<p><b>SEX:</b></p> <ul style="list-style-type: none"> <li>0 = unknown</li> <li>1 = male</li> <li>2 = female</li> <li>3 = hermaphrodite</li> </ul>	<p><b>SHELL CONDITION:</b></p> <ul style="list-style-type: none"> <li>0 = pre-molt / molting</li> <li>1 = soft</li> <li>9 = new, ptable</li> <li>2 = new</li> <li>3 = old</li> <li>4 = very old</li> <li>5 = very, very old</li> </ul>	<p><b>E G G S</b></p> <table border="1"> <tr> <td> <p><b>CLUTCH FULLNESS:</b></p> <ul style="list-style-type: none"> <li>0 = no eggs</li> <li>1 = trace to 1/8 full</li> <li>2 = 1/4 full</li> <li>3 = 1/2 full</li> <li>4 = 3/4 full</li> <li>5 = 100% full</li> </ul> </td> <td> <p><b>EGG DEVELOPMENT:</b></p> <ul style="list-style-type: none"> <li>1 = uneyed eggs</li> <li>2 = eyed eggs</li> <li>3 = hatching</li> </ul> </td> <td> <p><b>CLUTCH CONDITION:</b></p> <ul style="list-style-type: none"> <li>1 = no dead eggs</li> <li>2 = dead eggs &lt; 20%</li> <li>3 = dead eggs &gt; 20%</li> <li>4 = barren / clean setae</li> <li>5 = barren / matted setae</li> <li>6 = barren / no setae</li> </ul> </td> <td> <p><b>EGG COLOR:</b></p> <ul style="list-style-type: none"> <li>0 = other</li> <li>1 = cream</li> <li>2 = tan</li> <li>3 = yellow</li> <li>4 = orange</li> <li>5 = dark orange</li> <li>6 = pink</li> <li>7 = reddish</li> <li>8 = purple</li> <li>9 = purple-brown</li> <li>10 = brown</li> <li>11 = brownish-black</li> </ul> </td> </tr> </table>				<p><b>CLUTCH FULLNESS:</b></p> <ul style="list-style-type: none"> <li>0 = no eggs</li> <li>1 = trace to 1/8 full</li> <li>2 = 1/4 full</li> <li>3 = 1/2 full</li> <li>4 = 3/4 full</li> <li>5 = 100% full</li> </ul>	<p><b>EGG DEVELOPMENT:</b></p> <ul style="list-style-type: none"> <li>1 = uneyed eggs</li> <li>2 = eyed eggs</li> <li>3 = hatching</li> </ul>	<p><b>CLUTCH CONDITION:</b></p> <ul style="list-style-type: none"> <li>1 = no dead eggs</li> <li>2 = dead eggs &lt; 20%</li> <li>3 = dead eggs &gt; 20%</li> <li>4 = barren / clean setae</li> <li>5 = barren / matted setae</li> <li>6 = barren / no setae</li> </ul>	<p><b>EGG COLOR:</b></p> <ul style="list-style-type: none"> <li>0 = other</li> <li>1 = cream</li> <li>2 = tan</li> <li>3 = yellow</li> <li>4 = orange</li> <li>5 = dark orange</li> <li>6 = pink</li> <li>7 = reddish</li> <li>8 = purple</li> <li>9 = purple-brown</li> <li>10 = brown</li> <li>11 = brownish-black</li> </ul>	<p><b>PARASITES:</b></p> <ul style="list-style-type: none"> <li>blank = not examined</li> <li>0 = none</li> <li>1 = <i>B. celibatus</i></li> <li>2 = nematode worms</li> <li>3 = bitter crab</li> <li>4 = other</li> <li>5 = black mat</li> <li>6 = toech</li> <li>7 = cottage cheese</li> <li>8 = tubelarian worms</li> <li>9 = pepper crab</li> <li>10 = snailfish eggs</li> <li>12 = leatherback</li> </ul>
<p><b>CLUTCH FULLNESS:</b></p> <ul style="list-style-type: none"> <li>0 = no eggs</li> <li>1 = trace to 1/8 full</li> <li>2 = 1/4 full</li> <li>3 = 1/2 full</li> <li>4 = 3/4 full</li> <li>5 = 100% full</li> </ul>	<p><b>EGG DEVELOPMENT:</b></p> <ul style="list-style-type: none"> <li>1 = uneyed eggs</li> <li>2 = eyed eggs</li> <li>3 = hatching</li> </ul>	<p><b>CLUTCH CONDITION:</b></p> <ul style="list-style-type: none"> <li>1 = no dead eggs</li> <li>2 = dead eggs &lt; 20%</li> <li>3 = dead eggs &gt; 20%</li> <li>4 = barren / clean setae</li> <li>5 = barren / matted setae</li> <li>6 = barren / no setae</li> </ul>	<p><b>EGG COLOR:</b></p> <ul style="list-style-type: none"> <li>0 = other</li> <li>1 = cream</li> <li>2 = tan</li> <li>3 = yellow</li> <li>4 = orange</li> <li>5 = dark orange</li> <li>6 = pink</li> <li>7 = reddish</li> <li>8 = purple</li> <li>9 = purple-brown</li> <li>10 = brown</li> <li>11 = brownish-black</li> </ul>								
<p><b>LEGAL SIZE:</b></p> <ul style="list-style-type: none"> <li>0 = sublegal</li> <li>1 = legal, retained</li> <li>2 = legal, not retained</li> </ul>	<p><b>FEMALE MATURITY</b></p> <ul style="list-style-type: none"> <li>0 = unknown</li> <li>1 = immature</li> <li>2 = mature</li> <li>3 = mature - primiparous</li> <li>4 = mature - multiparous</li> </ul>	<p><b>CONDITION:</b></p> <ul style="list-style-type: none"> <li>blank = uninjured</li> <li>1 = flesh injury</li> <li>2 = dead</li> <li>3 = previously dead</li> </ul>									

## 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 the Sample Date, Station Number, Sequential Pot Number, Buoy ID, and Logger ID fields as directed in the *Survey Pilot House Log* instructions.

**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 crabs.

**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.

**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 and Dungeness, record the carapace width in mm CW.

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

**Legal Size:** Record the legal size/retention status code of male crabs 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:** Record the maturity status of each crab sampled. Codes 3 and 4 only apply to *Chionoecetes* crabs.

**Eggs:** When mature female crabs 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:** The crab is uninjured (*blank*), newly-injured, dead, or previously dead.



**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

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

**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 15,001 – 16,850).

**Comments:** Note items specific to the sampled crab e.g., severely injured, extensive bleeding, poor overall condition), and other observations not captured in required form fields.

### Crab Measurement Form Codes

**SPECIES CODES:**

1 = golden king  
2 = red king  
3 = blue king  
4 = hair crab  
5 = hybrid, *C. bairdi* x *C. opilio*  
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

Appendix C3.-Station catch summary forms.

BLUE KING CRAB

**Station Catch Summary Form**  
2007 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
		<105 (mm CL)	≥105 (mm CL)	Total	New-shell <134-mm CL	All Olds & News ≥134-mm CL	Total	Immature	Mature	Total	
STATION	TOTALS										
STATION	TOTALS										
STATION	TOTALS										
STATION	TOTALS										
TOTALS											

D:\STMATT2007\SURVEYFORMS\BKCSTATSUM07 - LJW 4/2007

-continued-

SNOW CRAB

**Station Catch Summary Form**  
 2007 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								

## INSTRUCTIONS FOR STATION CATCH SUMMARY FORM

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

This form documents the daily catch record for male and female blue king crabs by station and sequential pot number. An identical form will be used to summarize the daily catch record for male and female snow crabs. 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 Crabs

#### Legal Males

- Recruit: new-shell crabs <134 mm CL
  - Postrecruit: new-shell crabs  $\geq$  134 mm CL
  - Postrecruit: old- or very old-shell crabs of legal size
- Total number of legal males.

#### Sublegal Males

- Sublegals < 105 mm CL
  - Sublegals  $\geq$  105 mm CL
- Total number of sublegal males

#### Females

- Mature
  - Immature
- Total number of females

### Snow Crabs

#### Legal Males

- $\geq$  79-mm (3.1 in) CW
  - $\geq$  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.

Appendix C4.-Crab subsampling form.

**Crab Subsampling Form**

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

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

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

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

	STATION NUMBER	BUOY ID	SPECIES CODE	SEX	LEGAL SIZE	FEMALE MATURITY	SPECIAL CATEGORY	NUMBER NOT MEASURED	NUMBER MEASURED	TOTAL NUMBER	COMMENTS
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											

56

**SPECIES CODES:**  
 1 = golden king  
 2 = red king  
 3 = blue king  
 4 = hair crab  
 5 = hybrid, *C. bairdi* X *C. opilio*  
 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

**FEMALE MATURITY:**  
 0 = unknown  
 1 = immature  
 2 = mature  
 3 = mature, primiparous  
 4 = mature, multiparous

**SPECIAL CATEGORY - *C. opilio* only:**  
 1 = Sublegal males < 79-mm CW  
 2 = Legal males ≥ 79-mm CW  
 3 = Legal males 79 - 101 mm CW  
 4 = Legal males ≥102-mm CW  
 5 = Females

## INSTRUCTIONS FOR CRAB SUBSAMPLING FORM

This form will be NOT be used when sampling blue king crabs. However, it is very likely to be used for anticipated high catches of snow crabs at some stations. It is used to record the total number of crabs that have been subsampled at each pot by separate sex and size categories determined prior to conducting the survey. Measuring of snow crabs will not commence until crab counts for each subsampling category have been made and recorded.

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.

Special Category: Enter one of the five **snow crab** special category codes in the row containing the appropriate SPN and station number. The five special categories that will be used during the 2010 St. Matthew Island survey are listed below.

1 = Sublegal males < 79-mm CW

2 = Legal males  $\geq$  79-mm CW

3 = Legal males 79 – 101 mm CW

4 = Legal males  $\geq$  102-mm CW

5 = Females

**Number Not Measured (i.e., crabs counted and released to the sea):** Tally the number of unmeasured crabs by identified sex and size categories.

**Number Measured (i.e., subsample of crabs that were measured):** Tally the number of crabs measured by identified sex and size categories.

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

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

Appendix C5.-Species composition form.

**Species Composition Form**

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

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

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

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

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

	SPN	STATION NUMBER	BUOY ID	SPECIES NAME	SPECIES CODE (NMFS RACE)	TOTAL NUMBER	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 - ST. MATTHEW ISLAND**

- |                                |                               |                             |
|--------------------------------|-------------------------------|-----------------------------|
| 471 = Alaska skate             | 78403 = giant octopus         | 68578 = Pacific lyre crab   |
| 10120 = Pacific halibut        | 80590 = knobby 6-ray seastar  | 69010 = hermit crab unident |
| 10210 = yellowfin sole         | 80595 = Leptasterias unident. | 69086 = fuzzy hermit crab   |
| 20510 = sablefish (black cod)  | 81095 = rose sea star         | 71500 = snail unident.      |
| 21370 = Great sculpin          | 81780 = common mud star       | 71820 = Pribilof neptune    |
| 21720 = Pacific cod            | 82510 = green sea urchin      | 71882 = fat whelk           |
| 21740 = walleye pollock        | 83000 = brittlestar unident.  | 72743 = angled buccinum     |
| 40011 = hydroid unident.       | 83020 = basketstar            | 72751 = sinuous whelk       |
| 40500 = jellyfish unident.     | 83320 = notched brittlestar   | 72752 = silky buccinum      |
| 68577 = Circumboreal toad crab | 91000 = sponge unident.       | 72755 = polar whelk         |



## **INSTRUCTIONS FOR THE SPECIES COMPOSITION FORM**

This form is used to record total numbers of all identified species from sampled pots, except for the crab species documented on the *Crab Measurement Form*. If there are no species other than measured crabs in the pot, make a null symbol ‘Ø’ in the Species Name column for that SPN.

Enter the Sample Date, Survey Code, Vessel Name, Sequential Pot Number, Station Number, Buoy 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 near St. Matthew Island are listed at the bottom of the form; refer to the supplied 2010 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 (m/d/yyyy): \_\_\_\_\_

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

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

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

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

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

SPN	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
30152 - dusky rockfish	30060 - Pacific ocean perch	10220 - starry flounder
10170 - English sole	21710 - Pacific tomcod	21740 - walleye pollock
10130 - flathead sole	30475 - redbanded rockfish	30470 - yelloweye rockfish
10115 - greenland turbot	30430 - redstripe rockfish	10210 - yellowfin sole

## **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.

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 2010 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

Survey Dates: \_\_\_\_\_ Vessel Name: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_ Survey Code \_\_\_\_\_ Recorder: \_\_\_\_\_

Deck ID	Model	Serial Number	Maximum Depth in Fathoms	Buoy Number	Buoy Number	Buoy Number
219	XR-420-CTD	9643	2,185			
221	XR-420-CTD	9616	2,185			
222	TDR-2050	11879	3,280			
223	TDR-2050	11880	3,280			
224	TDR-2050	11818	3,280			
225	TDR-2050	11808	3,280			
226	TR-1050	12570	400			
227	TR-1050	12569	400			
228	TR-1050	12176	400			
229	TDR-2050	11884	3,280			
230	TDR-2050	11885	3,280			
231	TDR-2050	11886	3,280			
232	XR-420-CTD	13166	3,280			
233	XR-420-CTD	13167	3,280			
234	XR-420-CTD	13168	3,280			
235	TR-1000	7209	545			
236	TR-1000	8429	545			
237	XR-420-CTD	13234	3,280			
238	XR-420-CTD	13235	3,280			
239	TR-1000	8816	545			

### INSTRUCTIONS FOR DATA LOGGER FORM

This form is used to identify the unique logger ID number of the units that are deployed in survey pots. Enter the Sample Date, i.e., the date that the form was filled out and the 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.

**QTC VIEW Form**

<b>Date</b>	<b>Time</b>	<b>File Name</b>	<b>Comments</b>

**INSTRUCTIONS FOR QTC VIEW FORM**

This form is used to keep track of the data files created by the QTC VIEW. The primary purpose of form is to note any problems, ocean or weather conditions that may affect the quality of the data acquired.

**Date and Time:** record the current day and time the file is downloaded to the external hard drive.

**File Name:** record the year, month and day (yyyymmdd) corresponding to the particular data set being downloaded. The QTC VIEW automatically assigns this format to the data.

**Buoy Number:** enter the buoy number of all pots these loggers are place in during the survey here.

Appendix C9.–Benthic sampling form.

**Benthic Sample Form**

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

Sample Number	Sample Date (mm/dd/yy)	Time (0000-2359)	Location			Depth (fathoms)	Comments
			Latitude (N) (dd°mm.mm)	Longitude (W) (ddd°mm.mm)	E or W		
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

ADF&G SHELLFISH RESEARCH-REV JUNE 11, 2007

**INSTRUCTIONS FOR BENTHIC SAMPLE FORM**

This form is used to document benthic samples collected during the charter. Complete the form at the time the sample is taken. Enter the Vessel Name, Survey Code, Sample Date and Time, Location, and Depth as directed in the *Survey Pilot House Log* instructions. At the start of sample collection, ask the captain for the latitude and longitude coordinates (either he writes them down or he hails them to the deck) and depth. Sample Numbers will be unique and numbered sequentially beginning at ‘1’.

In the Comments section, note information pertinent to the collected sample such as current, tide, and weather conditions that may have hampered sample collection. Performance of the Van Veen grab during deployment and retrieval of the unit must also be detailed in the Comments section, including whether or not the grab landed properly and whether or not the grab was completely closed at retrieval.

Appendix C10.-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/yyyy): \_\_\_\_\_

CRAB NUMBER	CAPTURE DATE (mm/dd/yyyy)	TAG		DISPOSITION	CARAPACE SIZE (mm)	SEX	LEGAL SIZE	SHELL	FEMALE	EGGS					CONDITION	PARASITIC	LOCATION			STAT AREA
		SERIES	NUMBER							LATITUDE (N) (dd°mm.mm)	LONGITUDE (E or W) (ddd°mm.mm)	DEPTH (fathoms)	CLUTCH FULLNESS	EGG DEVELOPMENT			CLUTCH CONDITION	EGG COLOR		
1																				
2																				
3																				
4																				
5																				

<b>TAG DISPOSITION:</b> 1 = tag removed from crab 2 = tag left on crab and released	<b>SHELL CONDITION:</b> 1 = soft 2 = new, pliable 3 = old 4 = very old	<b>FEMALE MATURITY:</b> 0 = unknown 1 = immature 2 = mature	<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 eggs	<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 = Di. callotus 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
---	--	--	--	--	--	---	---	--

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 <input type="checkbox"/> NOT ISSUED <input type="checkbox"/>		
2	REWARD: ISSUED <input type="checkbox"/> NOT ISSUED <input type="checkbox"/>		
3	REWARD: ISSUED <input type="checkbox"/> NOT ISSUED <input type="checkbox"/>		
4	REWARD: ISSUED <input type="checkbox"/> NOT ISSUED <input type="checkbox"/>		
5	REWARD: ISSUED <input type="checkbox"/> NOT ISSUED <input type="checkbox"/>		

<sup>a</sup> Observer and fish ticket administrator use only  
<sup>b</sup> 1 = observer: catcher only vessel; 2 = observer: catcher processor; 3 = observer: floating processor; 4 = dockside sampler  
 Alaska Department of Fish and Game • Tagged Crab Recovery Form (Rev. Dec. 27, 2007)

## 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 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 F/V *North American* 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.

**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:** N/A for this survey—leave blank.

**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

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 crabs only. Leave blank if a female.

**Shell Condition:** Codes on form.

**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 health of the animal. 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 area crab were caught.

**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:** Use this space to write in the SPN (Sequential Pot Number) the tagged crab was re-caught 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.

**Weather Observation Form**

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

STATION NUMBER	DATE (mm/yyyy)	TIME (0000-2359)	CLOUD COVER	WIND		SWELL	BAROMETER (milibars)	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

Alaska Department of Fish and Game - Shellfish Research - Weather Observation Form (Rev. April 18, 2008)

**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 for wind speed code explanations) 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).

**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 D. CRAB CODE DESCRIPTIONS**

Appendix D1.–Crab code descriptions.

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	Tanner hybrid	68590	<i>Chionoecetes bairdi</i> and <i>C. opilio</i> hybrid
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	Cancer magister
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	<i>C. bairdi</i> hybrid	n/a	–
42	<i>C. opilio</i> hybrid	n/a	–

**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.

**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 crabs 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 crabs 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 crabs. Adult female Tanner crabs 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. Crabs of this shell age are usually listless upon capture.

**Female Maturity.** Maturity describes the relative reproductive stage of the animal.

**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.

**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.

**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 crabs, 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 crabs.

**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

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

**0** = Uninjured. No visible fresh injuries. (NOTE: our forms use blank for uninjured)

**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 observed during the course of routine field work are listed below. *Parasite and disease data is anecdotal unless otherwise noted (e.g., for special projects).*

**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.

**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**

1. Immersion suit with new 406 EPIRB and FireFly3 strobe
2. Rain gear, boots, gloves (6 pairs liners and 6 pairs rubber per person)
3. SOSpenders (approved Type V for use as a Type II)
4. TakTikka LED headlamps

### **DECK AND SAMPLING EQUIPMENT**

1. One 4' x 8' 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. (6) pair calipers, large size with millimeter scale
6. Measuring sticks: (4) 5.5" for blue king and Tanner crabs; (4) 3.1" for snow crabs.
7. (3) tape measures (cm) for fish measurements
8. (6) onion sacks for holding crabs, fish in tanks
9. (1) fish measuring board
10. (1) can WD-40
11. (4) dump totes
12. (25) fish baskets
13. (4) plastic Rubbermaid dishpans
14. Assorted plastic bags: (2 doz.) gallon and (100) quart zip-locks; (2 doz.) 25 gal. clear thick mil
15. (10) rolls electric tape
16. (1) liter of 100% formalin, with mixing jar
17. (1) gallon alcohol
18. (20) specimen jars
19. (1) dissecting kit
20. (12) Victorinox knives
21. (2) plastic toolbox for crab sampling equipment
22. (2) magnifying glasses, including (1) 4-inch diameter
23. safety mats, to stand on while sampling
24. (1) Van Veen grab sampler

## **TAGGING EQUIPMENT**

1. FLOY spaghetti tags—1850 tags:  
Fluorescent pink with white disks, “D” series, numbered “15,001–16,850”
2. Tagging rods
3. I bolts (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)

## **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
11. (90) research king crab pots with bridles attached
12. (90) buoy lines with attached buoys

## **FORMS**

1. 60 Survey Pilot House Log forms
2. 4,000 Crab Measurement forms (rite-in-rain) \*\*check on use of old forms\*\*
3. 80 Station Catch Summary forms (2 sets, one for blue king crab, 1 for snow crab)  
\*\*\*non-data entry\*\*\*
4. 100 Crab Subsampling forms (rite-in-rain) \*\*check on use of old forms\*\*
5. 400 Species Composition forms (350 rite-in-rain; 50 regular paper) \*\*check on use of old forms\*\*

6. 250 Fish Length forms (rite-in-rain paper) \*\*check on use of old forms\*\*
7. 2 Temperature Logger ID forms (rite-in-rain paper)
8. 10 Tagged Crab Recovery forms (rite-in-rain paper)
9. 10 QTC VIEW forms
10. 10 Benthic Sampling forms (rite-in-rain paper)
11. 20 Weather Observation forms
12. 10 sheets specimen labels (rite-in-rain paper)

### **CHARTS AND BOOKS**

1. NOAA Charts: St. Matthew and Bering Sea
2. 2010 NMFS Species Codebook (2)
3. 2008/2011 Commercial Shellfish Fishing Regulations (1; Dutch Harbor)
4. Checklist of Alaskan Crabs, B.G. Stevens 2002 (1)
5. Review of the Family Lithodidae, Zaklan 2002 (1)
6. Biological Field Techniques for Chionoecetes Crabs, Jadamec et al. 1999 (2)
7. Biological Field Techniques for Lithodid Crabs, Donaldson and Byersdorfer 2005 (2)
8. Alaska Saltwater Fishes and Other Sea Life, Kessler 1985 (2)
9. Guide to the Identification of some common eastern Bering Sea Snails, MacIntosh 1976 (2)
10. Common fish and inverts near Pribilof Islands – Byersdorfer 2004 (1)
11. Common fish and inverts near St. Matthew Island – Byersdorfer 2005 (1)
12. Field Guide to the Benthic Marine Invertebrates of Alaska's shelf and upper slope, Roger N. Clark, 2006 version, CD only. Copies to Gish, Vanek, Salmon, Byersdorfer, Renfro, Watson, and Alinsunurin.
13. Illustrated Key to west North American Pelecypod genera, Keen & Frizzel 1946 and Illustrated Key to west North American Gastropod genera, Keen & Pearson 1952 (1)
14. Names of Decapod Crustaceans AFS #17, Williams et al. 1989 (1)
15. Names of Mollusks AFS #16, Turgeon et al. 1988 (1)
16. Fishes of Alaska, Mecklenburg et al. 2002 (1)
17. Guide to northeast Pacific Flatfishes, Kramer et al. 1995 (1)
18. Guide to northeast Pacific Rockfishes – 2003 edition, Kramer & O'Connell 1986 (1)
19. A Field Guide to Alaskan Corals, Wing and Barnard 2004 (2)
20. Guide to Marine Mammals of Alaska – 3rd edition, Wynne 2007 (1)
21. Field Guide to Sharks, Skates, and Ratfish of Alaska, Stevenson et al. 2007

22. Field Guide to Common Fishes and Invertebrates of Alaska, Byersdorfer and Watson 2010
23. Under Alaskan Seas, Barr and Barr 1983 (1)
24. A Field Guide to the Birds of North America, National Geographic – 4th edition 2002 (1)
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
28. Pacific Coast Fishes, Eschmeyer et al. 1983
29. Pacific Fishes of Canada, Hart 1973
30. Brittle Stars, Lambert and Austin 2007
31. Sea Stars, Lambert 2000
32. Sea Cucumbers, Lambert 1997
33. Field Guide to Squids and Octopods, Jorgensen 2009

### **OFFICE AND MISC. SUPPLIES**

1. (2) cruise leader notebooks (L. Watson)
2. Cruise leader ADF&G collecting permit (L. Watson)
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. (2) calculators
6. (20) mechanical pencils
7. Pkg. 'No. 2' regular pencils
8. (5) ink pens
9. Permanent markers
10. (100) sheets plain paper
11. (50) sheets Rite-in-the-Rain paper
12. (20) pairs earplugs
13. 3-ring hole punch
14. Ass't. rubber bands (including large, for clipboards)
15. Ass't. rubber bands (including large, for clipboards)
16. (1) roll Scotch tape; (2) rolls duct tape
17. Ass't. paper and binder clips
18. (15) envelopes (data form filing)

19. North Star medical kit (inventoried and resupplied 6/30/2010)
20. (1) 25-ft extension cord

### **COMPUTERS**

1. Laptop, with case (2)
2. Power cord (2)
3. Mouse and mouse pad, if desired (2)
4. External keyboard, if desired (2)
5. Burnable CD-R (6)
6. Buss bar (2)

### **CAMERAS**

1. Olympus E-10 (digital)
2. Batteries and charger
3. Memory cards
4. Pelican case

### **TEMPERATURE LOGGERS**

1. 20 units:
  - Seven XR-420-CTDs  
XR-420-CTD (S/N 9616)  
XR-420-CTD (S/N 9643)  
XR-420-CTD (S/N 13166)  
XR-420-CTD (S/N 13167)  
XR-420-CTD (S/N 13168)  
XR-420-CTD (S/N 13234)  
XR-420-CTD (S/N 13235)
  - Seven TDR-2050s  
TDR-2050 (S/N 11808)  
TDR-2050 (S/N 11818)  
TDR-2050 (S/N 11879)  
TDR-2050 (S/N 11880)  
TDR-2050 (S/N 11884)  
TDR-2050 (S/N 11885)  
TDR-2050 (S/N 11886)
  - Three TR-1050s  
TR-1050 (S/N 12176)  
TR-1050 (S/N 12569)  
TR-1050 (S/N 12570)



- Three TR-1000s
  - TR-1000 (S/N 7209)
  - TR-1000 (S/N 8429)
  - 1. TR-1000 (S/N 8816)
- 2. RBR Submersible Data Logger User's Manual – 6/2007 edition
- 3. RBR software CD version 5.21, 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; TR-1000 requires 2

### **QTC EQUIPMENT**

1. QTC VIEW hardware, the 'blue box', with cable for attachment to the ship's echo sounder (ship's echo sounder retrofitted by Harris Electric with cable from the blue box)
2. QTC IMPACT software
3. Dedicated laptop for software installation and daily downloads from the blue box
4. Digital global positioning system (DGPS) with wide area augmentation system (WAAS)