Regional Information Report No. 1J08-02

Tanner crab pot survey methods for Southeast Alaska

by

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Alaska Department of Fish and Game Division of Commercial Fisheries

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log_2, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

This report describes the methods of the annual pot survey for Tanner crab, *Chionoecetes bairdi,* in Southeast Alaska (Alaska Department of Fish and Game, Region 1). A stratified random sampling design is used to assess relative abundance and distribution of Tanner crab in six historical fishing locations. The survey is conducted in October prior to the commercial fishery in February, using conical pots. Biological measurements, numbers, size, weight, shell condition and reproductive status of commercially important crab species—red, *Paralithodes camtschaticus*, blue, *Paralithodes platypus,* and golden king, *Lithodes aequispinus*, Tanner, and Dungeness, *Cancer magister,* crab are quantified. Accessory information regarding leg loss, bitter crab syndrome, parasites and pot and bycatch information are recorded.

Key words: Tanner crab, *Chionoecetes bairdi*, pot survey, method, Southeast Alaska, stock assessment

INTRODUCTION

The purpose of this report is to document the field and logistical preparation methods for the annual survey for Tanner crab, *Chionoecetes bairdi,* in Southeast Alaska.

The survey data is used to assess the status of commercially important Tanner crab stocks in Southeast Alaska, by survey location. The goal of the survey is to produce unbiased estimates of catch per unit effort (CPUE) by recruit class in order to 1) determine stock health by survey location and 2) provide input data for a three-stage catch-survey model. The catch survey model is used to estimate mature and legal population size while the stock health by survey location determines the appropriate mature harvest rates. This information is used to produce an annual biological recommendation on the amount of harvestable surplus, i.e. the guideline harvest level (GHLs) for the Southeast Alaska commercial Tanner crab fishery, which provides for sustainable harvest of stocks and minimizes the risk of recruitment failure—as mandated by the Alaska Board of Fisheries' "Policy on King and Tanner Crab Resource Management" (Hodson 1990). Other information currently used in the biological recommendation for the fishery includes Tanner crab catch in the red king crab pot survey, and catch and effort data reported on fish tickets.

The long term goal of the survey is to provide information on the spatial distribution and long-term health of the stocks. Information produced by the survey to achieve these goals includes CPUE, stock composition, female clutch fullness, female maturity, male length/weight relationship, male chela height/carapace width relationship and visual detection of disease and limb loss.

In Southeast Alaska a pot survey was chosen to achieve stock assessment goals. In the Eastern Bering Sea, Kodiak, Cook Inlet, and Prince William Sound areas of Alaska, trawl surveys are used to assess Tanner crab populations (Donaldson 1988; Kimker 1988; Dawe and Hoenig 1990; Stevens et al. 1992; Bechtol 1999, 2000). The Eastern Bering Sea and Kodiak areas are largely characterized by, broad expanses of soft, trawlable shelf bottom habitat of relatively similar depths, whereas the fjord habitat of Tanner crab in Southeast Alaska is of a smaller scale and the area of 'trawlable bottom' is smaller than elsewhere in the state. An advantage of pots is that micro-scale information on Tanner crab abundance, size and sex composition, bycatch species assemblages, and substrate type at individual pot locations can be collected, and compiled—allowing an extremely detailed picture of the species distribution within a survey area to emerge after a number of years. This detailed distribution information allows for restratification of pot effort allocation, which can considerably reduce the coefficient of variation of CPUE data (Clark et al. 2002). Also, trawl gear is not without problems of its own; while it has the advantage of catching a more representative sample of the population at large, there is still some selectivity, the extent of habitat must be independently determined, and catchability must be determined or assumed as 1. Other considerations were the very high handling mortality of Tanner crabs, and the destruction and homogenization of habitat, associated with bottom trawls. Finally, the department was already equipped with appropriate pot research gear and vessel.

The choice of pot gear for this survey intensifies the need for standard methods in order to minimize variation in pot catchability and selectivity and to avoid gear saturation. Invertebrate catchability has been shown to be influenced by environmental, physiological and behavioral factors (Caddy 1977). Gear selectivity for invertebrate fisheries is determined by the pot configuration, shape, and dimensions including: mesh size (Miller 1976b; Koike and Ogura 1977; Xu and Millar 1993), escape rings (Jow 1961; Jamieson 1992; Pengilly 2000), and entrance location and dimensions (Miller 1976a; Koike and Ogura 1977; Zhou and Kruse 1999). The gear saturation curve, or relationship between pot catch and time, in invertebrate fisheries is a function of: soak time (Bennett 1974; Bennett and Brown 1979; Sloan and Robinson 1985; Somerton and Merritt 1986; Smith and Jamieson 1989; Zhou and Shirley 1997b; Pengilly 2000; van Tamelen 2001; Rumble et al. 2006), pot volume (Miller 1977), amount of bait (Miller 1983), and type and presentation of bait (Miller 1980), and the height of bait in the pot (Zhou and Shirley 1997a) as well as ease of entry into and escape from the pot.

In this report we will describe standard methods used to reduce the variability in catchability, selectively and gear saturation associated with conducting pot surveys, as well as the biological sampling methods of the Tanner crab survey in Southeast Alaska.

METHODS

SURVEY DESIGN

Southeast Tanner crab stocks are assessed by using a stratified random sampling design. Six important historical fishing locations in Southeast Alaska are surveyed annually at the smallest tidal range in October of each year (Figure 1). They are separated into one to three defined strata (Figure 2-7) based on the expected magnitude of the catch. A predetermined number of pots are allocated to each stratum within a location and pot locations within each stratum are randomly selected using ArcMap (Appendix A 1) prior to going into the field.

The surveys are typically conducted aboard the R/V Medeia. It is 110 ft long and 28 ft wide, with a draft of 9 ft and 16 total berths. The deck is 40 ft long and 24 ft wide. It is equipped with a Seattle Crane knuckle/boom/rotate Model 1240, Marco pot hauler model J0107 and a 8 ft by 4 ft hydraulic ram pot launcher. The vessel maintains a crew of four; captain, engineer, first mate and mate. All crew members have a U.S. Coast Guard Master Near Coastal License. Three biological staff are aboard the vessel to conduct the survey, but an additional biologist is often aboard for special projects—such as the NOAA bitter crab sampling project.

Tanner crabs are caught with conical, top-loading commercial pots (Figure 8). These pots weigh approximately 350 lbs, and have two base rings, the bottom one with a diameter of 7 ft 4 inches. The sloping pot ‘sides’ are 37 inches long, with a 5 inch shoulder at the top—the pot is 30 to 32 inches high. Crabs enter the pots through a 12.75 inch deep rigid plastic tunnel with entrance diameter of 27.5 inches, and exit diameter of 20 inch. The mesh is smaller than that of commercial pots; the body webbing is 3.5 inch and purse webbing 4.5 inch stretch mesh, and the four, 4.75 inch diameter escape rings are cable-tied shut, allowing the gear to retain prerecruit and female crabs. To allow escapement in the event of gear loss, the pots have a slit in the webbing that is 18 inches long, and laced with 30-thread, biodegradable, 100% cotton twine. The bridle uses a 5/8 inches diameter, floating line that is about 5 ft long. Buoy line used is a 7/16 inches diameter, medium lay, “Ever-pro M” line, purchased from LSF fisheries supplies and cut into 25-fathom ‘shots’. Except for the buoy shot which is sinking, floating line is used. The buoy shot consists of 7/16 inches diameter sinking line attached to two LD-2 polyform® buoys; the first is tied to the end of the sinking buoy line and the second is attached to a separate 3.5-fathom length of floating line, at the end of which an eye is spliced—the sinking line runs through this eye to the first buoy (Figure 9). Sinking line is used on the buoy shot to prevent entanglement with the vessel as the gear is pulled, while floating line is used for the remainder of the buoy line to prevent entanglement with the pot after the gear is set.

One to two days before the survey the gear is loaded onto the Medeia at the NOAA dock facilities in Juneau. The vessels crane is used to load the survey supplies, gear and equipment including food, pots, buoy shots, shots of floating line, bait, crab sampling table and sorting bins. Approximately 28 pots are loaded and stacked.

Approximately 24 pots are deployed per day (Table 1). Each day, pots are baited with two perforated plastic 2 qt bait jars of chopped Alaskan winter-caught herring, and hanging bait of ½ a round pink salmon; the bait is suspended on opposite sides of the conical pot, no more than 18 inch above the bottom ring bar. Also, based on the depth, the appropriate shots of floating line are added to the pot. Then, the crane places the pot from the deck onto the pot launcher. When the skipper has the boat over the designated location, the skipper tells the crew to launch the pot into the water. At this time the line is also sent over. An eye is kept on the buoy to make sure there are no problems with the launch before moving to the next location. Pots are set each afternoon and picked the next morning after a soak time of about 15 to 20 h. A soak time experiment found no gear saturation occurring with the gear and standard soak period used in this survey (Rumble et al. 2006).

Pots are pulled in the same order as set. When the vessel approaches the buoy, the crew throws a grapple out past the buoy line to retrieve the line, which is fed through the block and coiled until the pot reaches the surface. The crane hook is then attached to the bridle and the pot is hoisted above the sorting table where the crabs are released (Figure 10). Afterwards, the pot is stacked on the back deck and the crabs are sorted.

In order to monitor trends in bottom temperature, HOBO Stowaway Tidbit® temperature loggers are attached to 5 of the pots set. The protocol for activating the temperature loggers is outlined in Appendix A 2. The pot data—pot location, pot number, latitude, longitude, date/time set, date/time hauled, depth, buoy number, and Tidbit numbers are recorded daily on the “Crab Pot Set Form” (Appendix B 1).

BIOLOGICAL INFORMATION

For each pot, commercially important crab species—red, *Paralithodes camtschaticus*, blue, *Paralithodes platypus,* and golden king, *Lithodes aequispinus*, Tanner, and Dungeness, *Cancer magister*, crab are sorted by species and sex and all or a portion of each species/sex group are sampled. Crab sampling data is recorded on the “Crab Survey Specimen Form” (Appendix B 2). Subsampling occurs by species and sex at a rate not to exceed 1:15 and usually from 1:2 to 1:5. This allows 50–150 crabs from each pot to be measured. Male Tanner crabs are generally sampled at 1:1 when they are present while other species and sex groups are subsampled. Methods and descriptions used for biological data collection, shell measurement and condition, female reproduction, chela height, and disease and parasites are detailed elsewhere (Jadamec et al. 1999; Donaldson and Byersdorfer 2005; Rumble et al. 2006). This data includes visually examining each Tanner crab sampled for the presence of the lethal bitter crab syndrome.

For each crab sampled, biological carapace width (Tanner crab), carapace length (king crab), or shoulder width immediately anterior to the 10th anteriolateral spine (Dungeness crab) is measured to the nearest mm using vernier calipers. Sex and shell condition (**Table 2**) are determined and recorded. Leg loss (Table 3) and the presence of black mat or parasites (Table 4) are recorded.

For females, additional information is collected on presence of eggs, percent clutch fullness, and stage of development and condition of eggs (Table 5). Clutch fullness is recorded in 10% increments (from 0 to 100%). It is somewhat subjective and varies with the location fished, although the consistency of survey timing should prevent temporal differences. A barren female will have 0 for percent clutch fullness.

Additionally, for male Tanner crabs, chela heights and individual weights are measured to monitor any changes in the size at functional maturity (point when mature males are "large clawed") and the length/weight relationship. Every year, for each survey location, a total of 120 male Tanner crabs are randomly selected until target numbers are achieved within each of 6 size groups (Table 6) and measured for biological carapace width (to the nearest 1 mm) and right chela height, (to the nearest 0.1 mm) using vernier calipers (Jadamec et al. 1999). Every third year, for each survey location, 100 randomly selected male Tanner crabs covering all size categories, with no observable parasites or black mat, are measured for biological carapace width and weighed to the nearest 0.001 kg. Weights were taken in 2006 and will be taken again in 2009.

INCIDENTAL SPECIES COMPOSITION, DEBRIS, AND SUBSTRATE

For each pot, all incidental species (Table 7) are identified, counted and recorded on the "Incidental Species Form" (Appendix B 3). An incidental species is defined as any animal besides a commercially important crab species, regardless of its motility. The pot condition and any debris and/or substrate (Table 8) clinging to a pot is also noted on this form; debris is confined to non-animals but does include algae.

DATA ENTRY

On the same day of collection, data is entered and stored in "portable" Alexander, the ADF&G regional Oracle-based database that is available on the survey vessel. After the data is entered, it is printed and verified with the data forms. Errors are corrected in the database. When the vessel returns to port it is uploaded to the main Alexander database.

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TABLES

Table 1.–Tanner crab survey effort distribution in terms of number of pots and days by location and strata. location code and strata number are the database numerical output of location and sublocation, respectively.

Location	Location code	Sublocation	Strata #	Pots	Days
Stephens Passage	1	South Douglas	1	24	2
		Point Hilda	2	3	
		Young Bay/Outer Pt	3	18	
Icy Strait	2	Pleasant Island	1	44	2
		Central	2	0	
Glacier Bay	3	Sandy/Bear/Whidbey	1	11	2
		Marble Islands	2	33	
Port Camden	4	Port Camden	1	22	1
Thomas Bay	5	Thomas Bay	1	44	2
Holkham Bay	8	Outer Bay	1	22	3
		Inner Bay	2	22	
		Tracy Arm	3	22	

Table 2.–Tanner crab survey, crab shell condition codes.

Category	Code	Shell age
soft	1	0–2 weeks
light	2	2–8 weeks
new	3	2–12 months
old	4	13-24 months
very old	5	25-36 months

Table 3.–Tanner crab survey, crab leg loss codes.

Code	Criteria
1	No legs missing or regenerated
2	1 leg missing or regenerated
3	2 or more legs missing or regenerated
4	Carapace damage
5	Combination of conditions

Table 4.–Parasite codes for Tanner crab survey.

Code	Parasite
1	None
2	Briarosacchus, single scar
3	Briarosacchus, double scar
4	Briarosacchus, single externa
5	Briarosacchus, double externa
6	Bitter crab, Hematodinium
7	Microsporidian
8	Nemertean worms

Table 5.–Female reproductive condition codes for Tanner crab survey.

Code	Clutch condition	Egg Development
1	Normal	Eyed eggs
2	<20% dead eggs in the clutch	Uneyed eggs
3	>20% dead eggs in the clutch	No eggs
4	Barren with silky setae	
5	Barren with matted setae and empty egg cases	

Table 6.–Sample goals by carapace width range category for male Tanner crab chela height measurements.

Carapace width	Sample goal
<106	10
106–114	25
115-122	25
123–131	25
132–152	25
>153	10

Table 7.–Description of debris, substrate and pot condition codes for Tanner crab survey.

Code	Description		
	Debris	**Substrate**	**Pot condition**
0		Unknown	
1	Large brown kelp	Mud	Normal
2	Mussels	Mud/gravel	Not baited
3	Shells	Mud/clay	Lost
4	Woody debris	Mud/shell	Door open
5	Hair kelp	Mud/soft	Broken webbing
6	Barnacles	Mud/hard	Upside down
7	Sponges	Clay	Collapsed tunnel
8		Sand	Not on bottom
9		Gravel	Pot open/broken
10		Boulder	Lost pot contents
11		Cobble	Closed escape ring
12		Rock	Open escape ring
13		Hard	
14		Soft	
15		Shell	
16		Coral	
17		Mixed	
18		Silt	
19		Barnacle	
20		Mussels	

Table 8.–Bycatch species codes for the Tanner crab survey.

Species	Common Name	Code
Gadus macrocephalus	Pacific cod	110
Family Pleuronectidae	Flounder family	120
Atheresthes stomias	Arrowtooth flounder	121
Hippoglossoides elassodon	Flathead sole	122
Lepidopsetta bilineata	Rock sole	123
Glyptocephalus zachirus	Rex sole	125
Limanda aspera	Yellowfin sole	127
Scorpaenidae	other rockfish	139
Sebastes alutus	Pacific Ocean Perch	141
Sebastes maliger	Quillback rockfish	147
Sebastes babcocki	Redbanded rockfish	153
Cottidae	Sculpin, general	160
Hexagrammidae	Greenling, general	190
Hexagrammos decagrammus	Kelp greenling	194
Hippoglossus stenolepis	Pacific halibut	200
Delolepis gigantea	Giant wrymouth	211
Theragra chalcogramma	Walleye Pollock	270
Brachiopoda	Brachiopods	301
Chorilia longipes or Oregonia gracilis	Decorator crab	311
Paguridae	Hermit crab	313
Hyas lyratus	Pacific Lyre crab	314
Placetron wosnessenskii	Scale crab	315
Telmessus cheiragonus	Helmet crab	316
Leptocottus armatus	Pacific staghorn sculpin	340
Hemitripterus spinosus	Bigmouth sculpin	341
Myoxocephalus polyacanthocephalus	Great sculpin	342
Enophrys bison	Buffalo sculpin	343
Hemilepidotus sp.	Irish lord, general	345
Hemilepidotus hemilepidotus	Red Irish Lord	346
Actinaria	Sea anemone	350
Buccinum spp.	Snail, *Buccinum* sp.	360
Fusitrition oregonensis	Snail, *Fusitriton* sp.	361
Neptunea lirata	Snail, *Neptunea* sp.	362
Lipardidae	Snailfish	370
Zaprora silenus	Prowfish	373
Asteroidea	Starfish, general	380
Pycnopodia helianthoides	Starfish, *Pycnopodia* sp.	381
Anoplopoma fimbria	Sablefish	710
Pectinidae	Scallop	850
Octopus dofleini	North Pacific octopus	870
Gastropoda	Snail, general	890
Strongylocentrotus droebachiensis	Green sea urchin	893
Holothuroidea	Sea cucumber	895
Strongylocentrotus spp.	Sea urchin	896
Cnideria	Coral	899
Lopholithodes sp.	Box crab	900
Cancer magister	Dungeness crab	910

Table 7.–continued (page 2 of 2)

Species	Common Name	Code
Paralithodes camtschaticus	Red king crab	921
Paralithodes platypus	Blue king crab	922
Lithodes aequispinus	Golden king crab	923
Chionoecetes bairdi	Tanner crab	931
Pandalus	General shrimp	960
Pandalus eous	Alaskan pink shrimp	961
Pandalus hypsinotus	Coonstripe shrimp	964
Pandalus platyceros	Spot shrimp	965
	Unknown	999

FIGURES

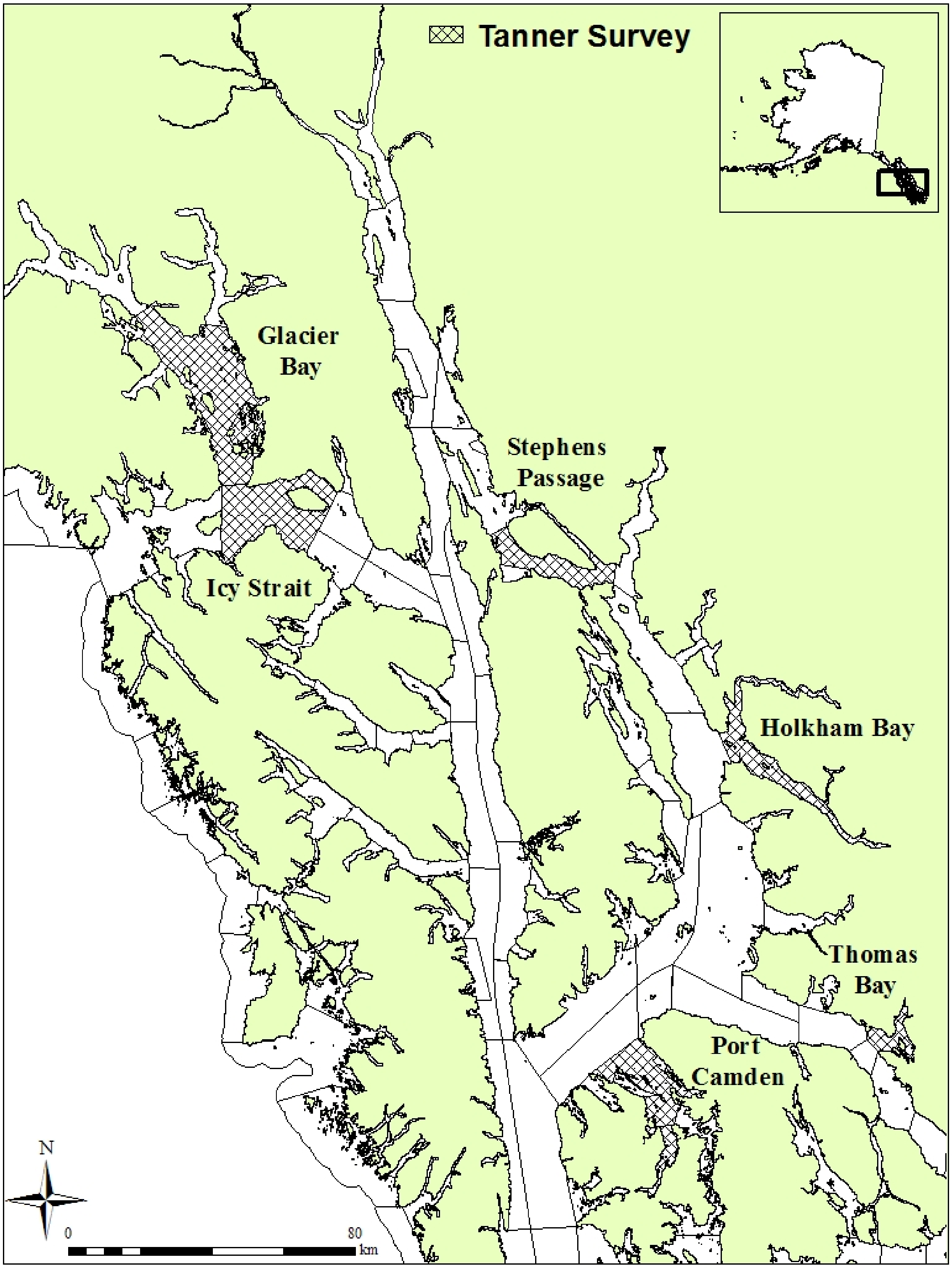

Figure 1.–Southeast Alaska annual Tanner crab stock assessment survey areas.

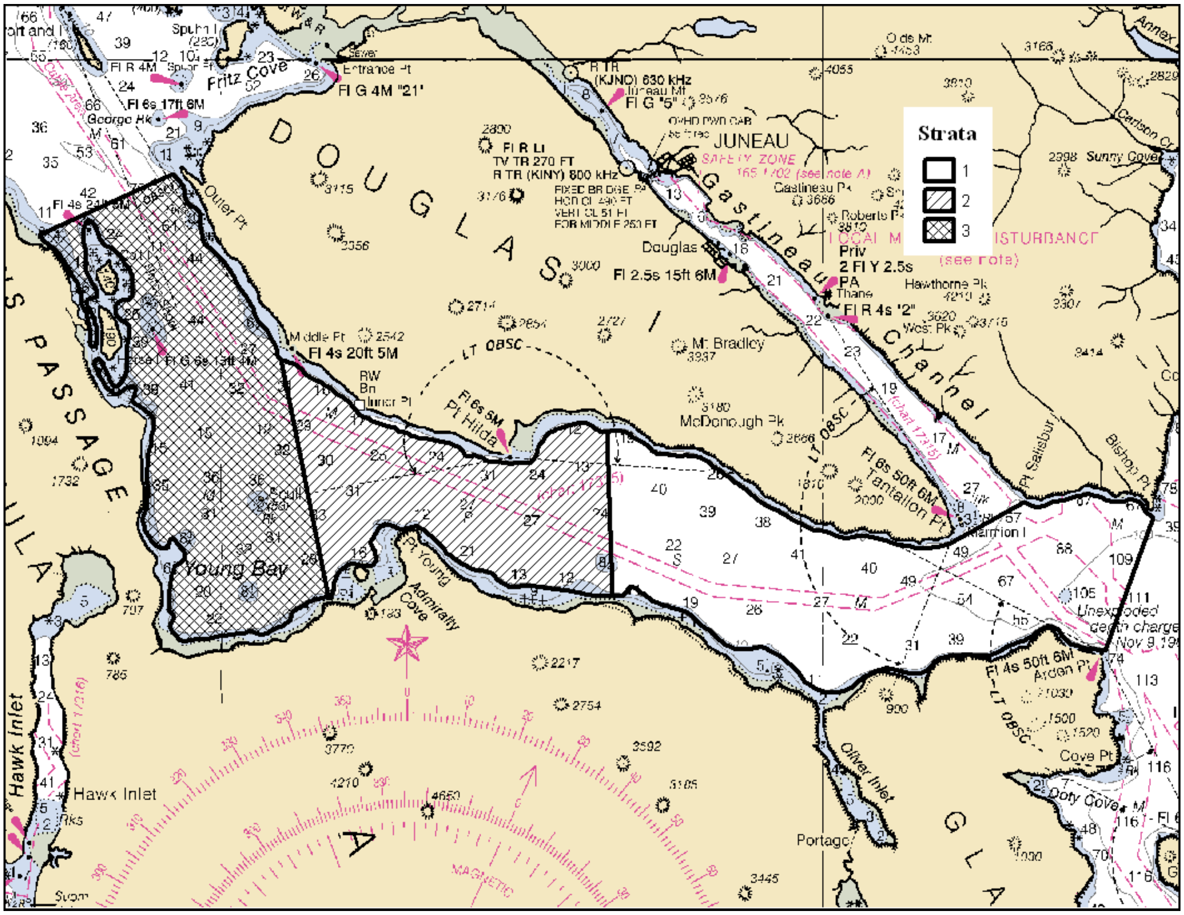

Figure 2.–Southeast Alaska Tanner crab survey, Stephens Passage area strata boundaries.

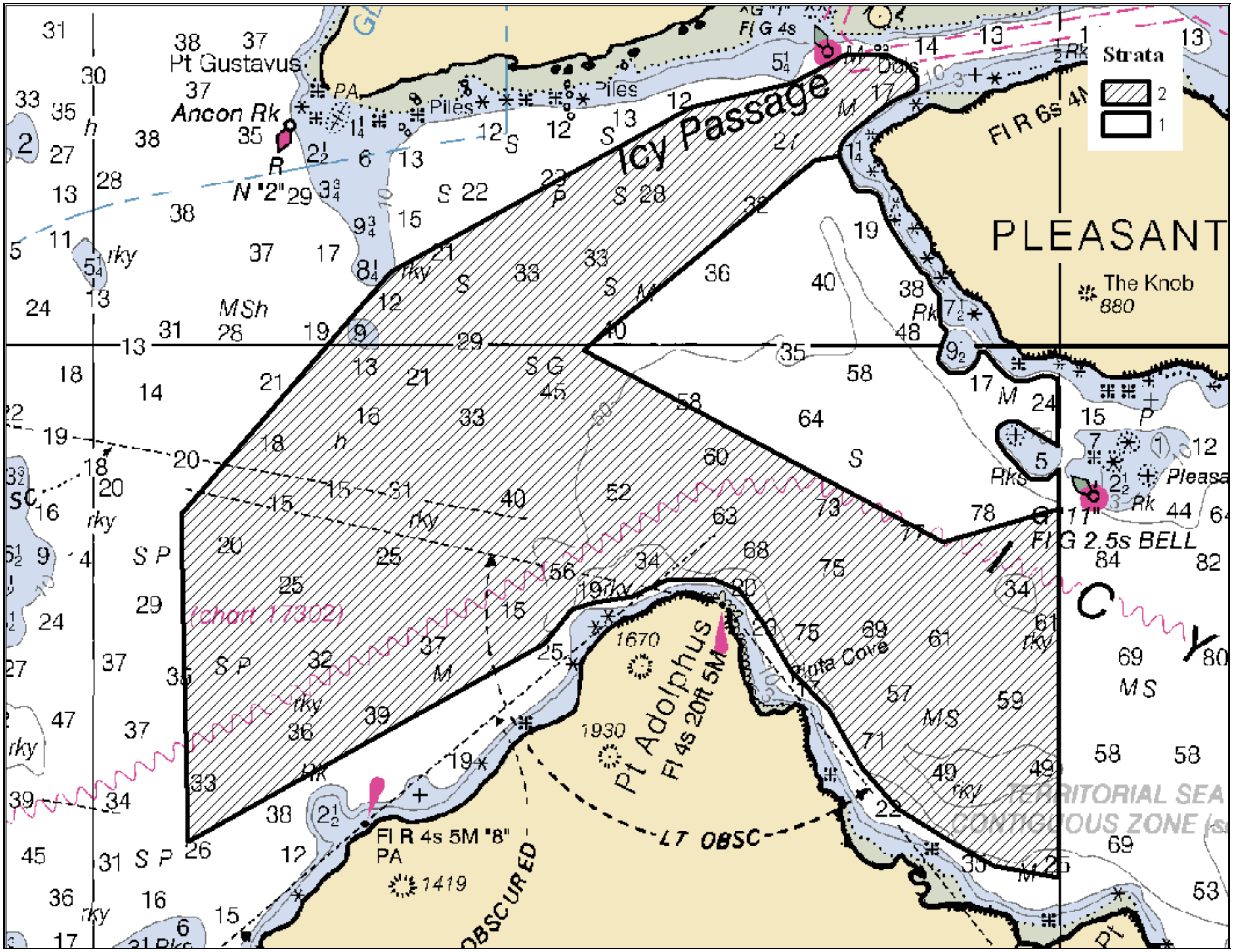

Figure 3.–Southeast Alaska Tanner crab survey, Icy Strait area strata boundaries.

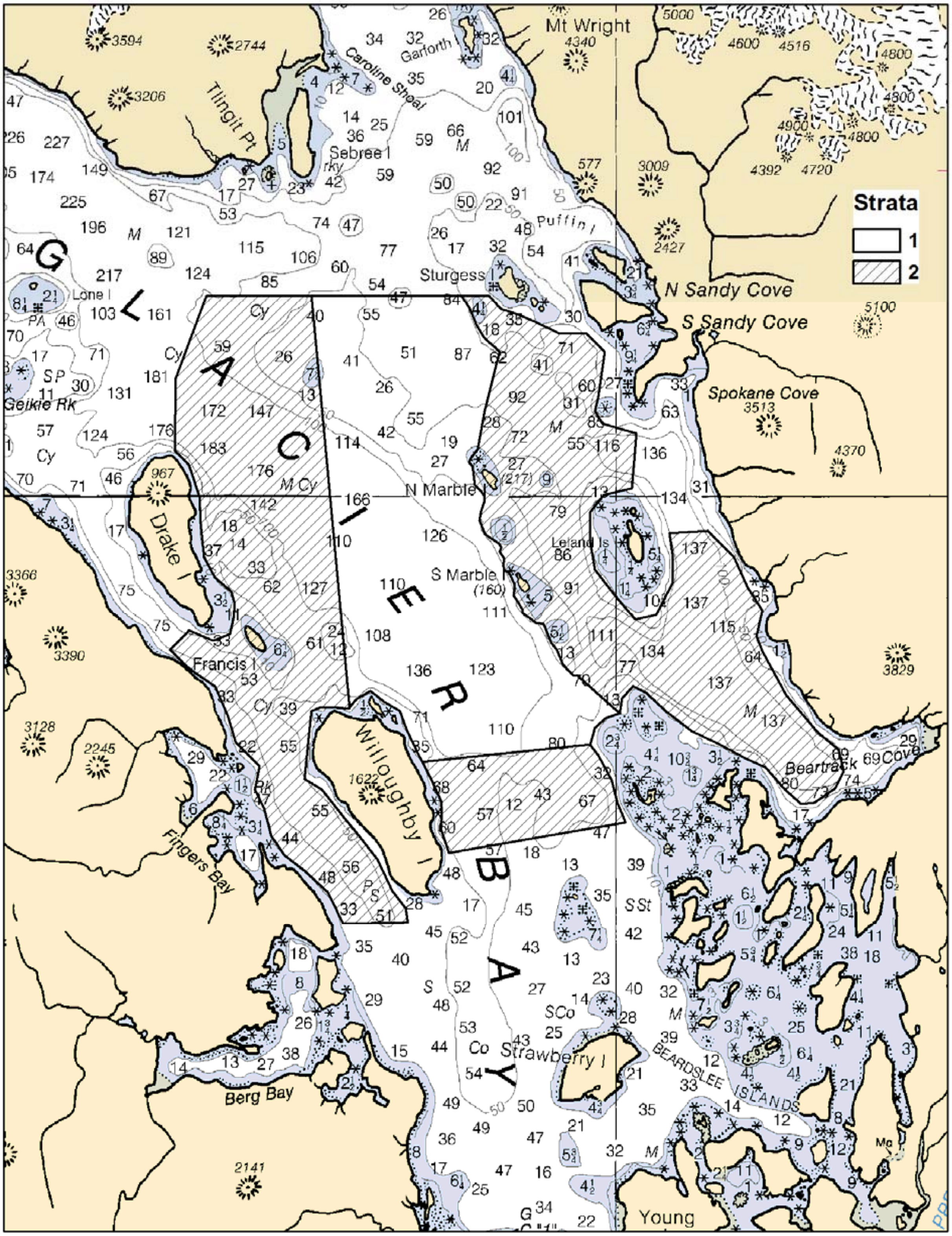

Figure 4.–Southeast Alaska Tanner crab survey, Glacier Bay strata boundaries.

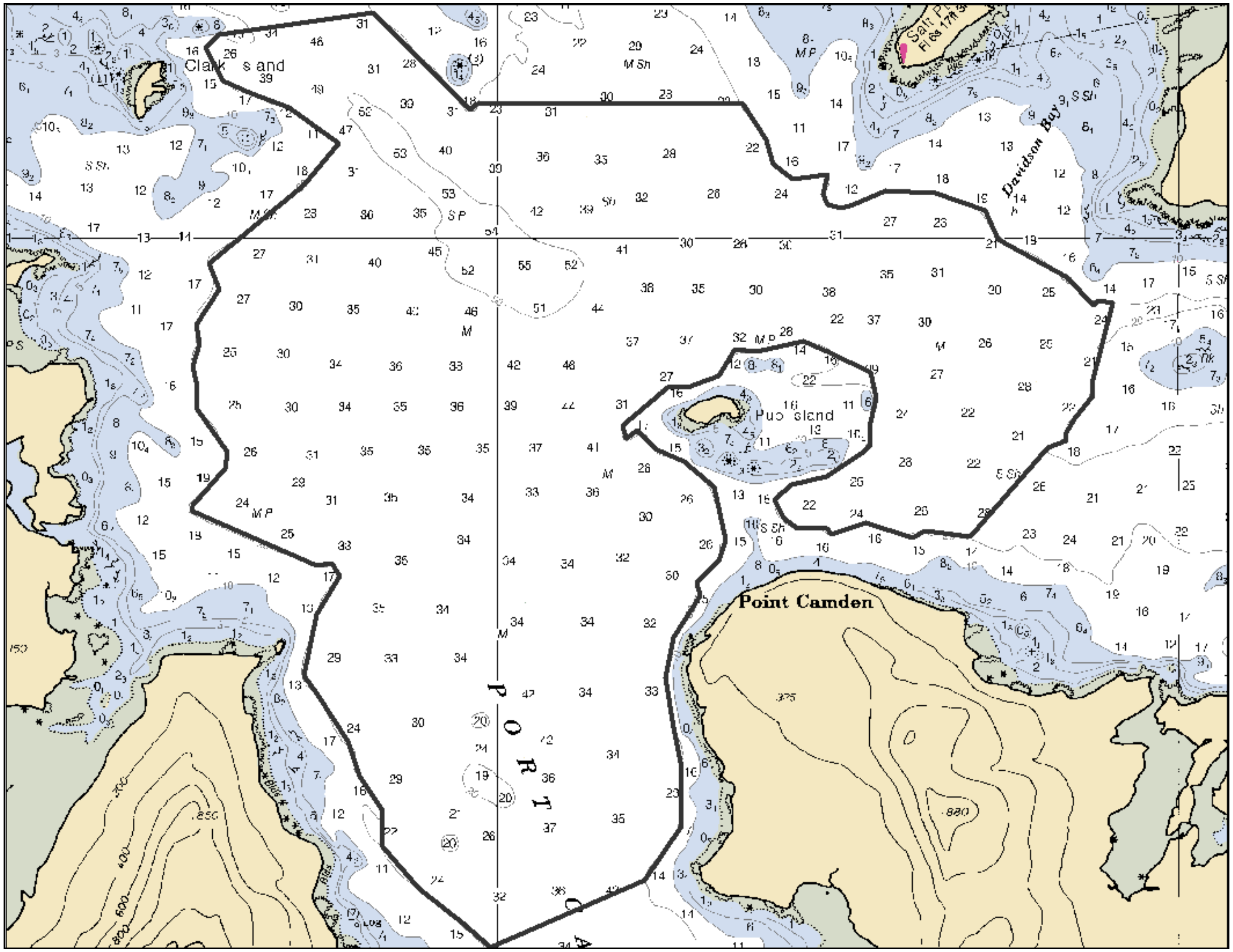

Figure 5.–Southeast Alaska Tanner crab survey, Port Camden strata boundaries.

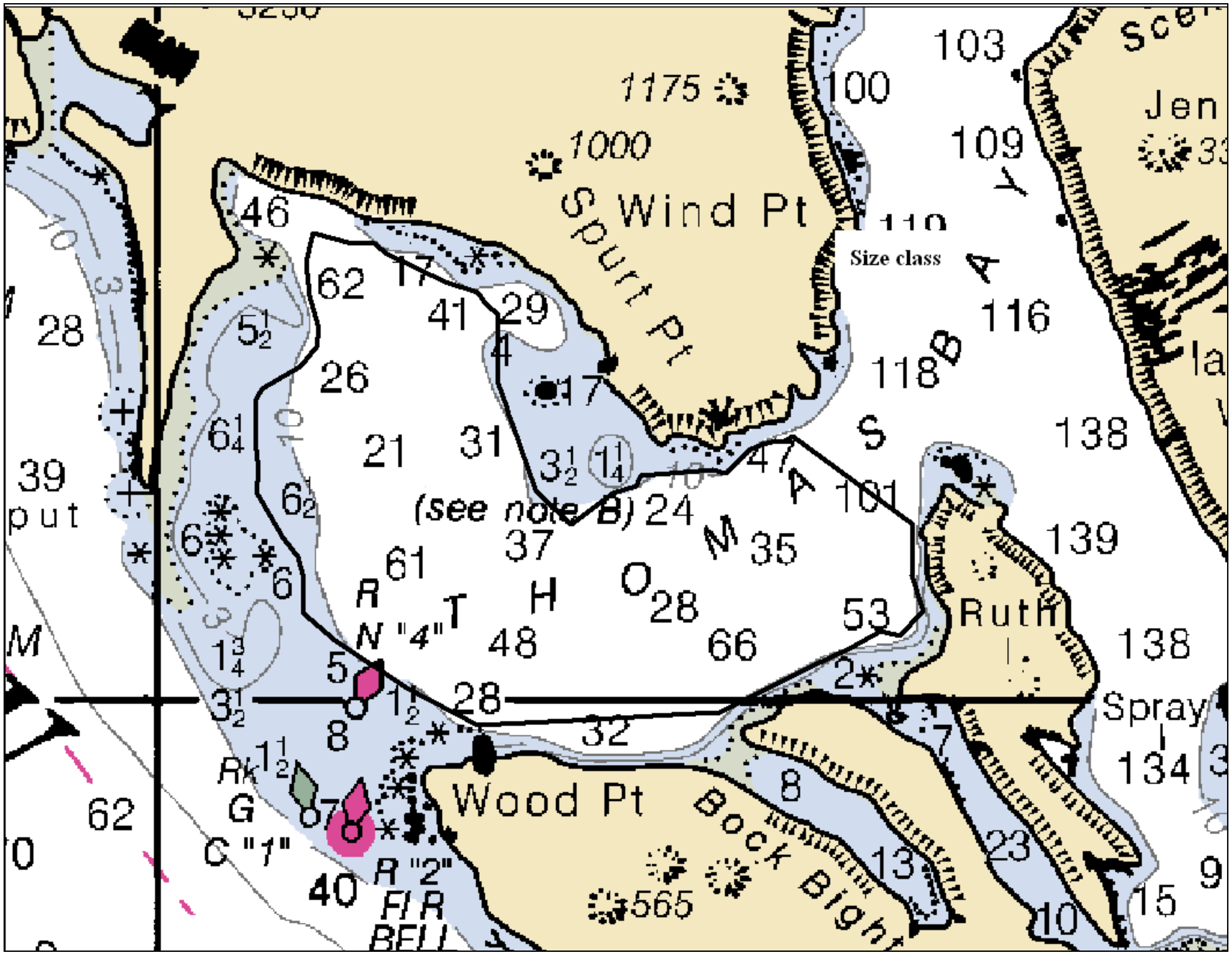

Figure 6.–Southeast Alaska Tanner crab survey, Thomas Bay strata boundaries.

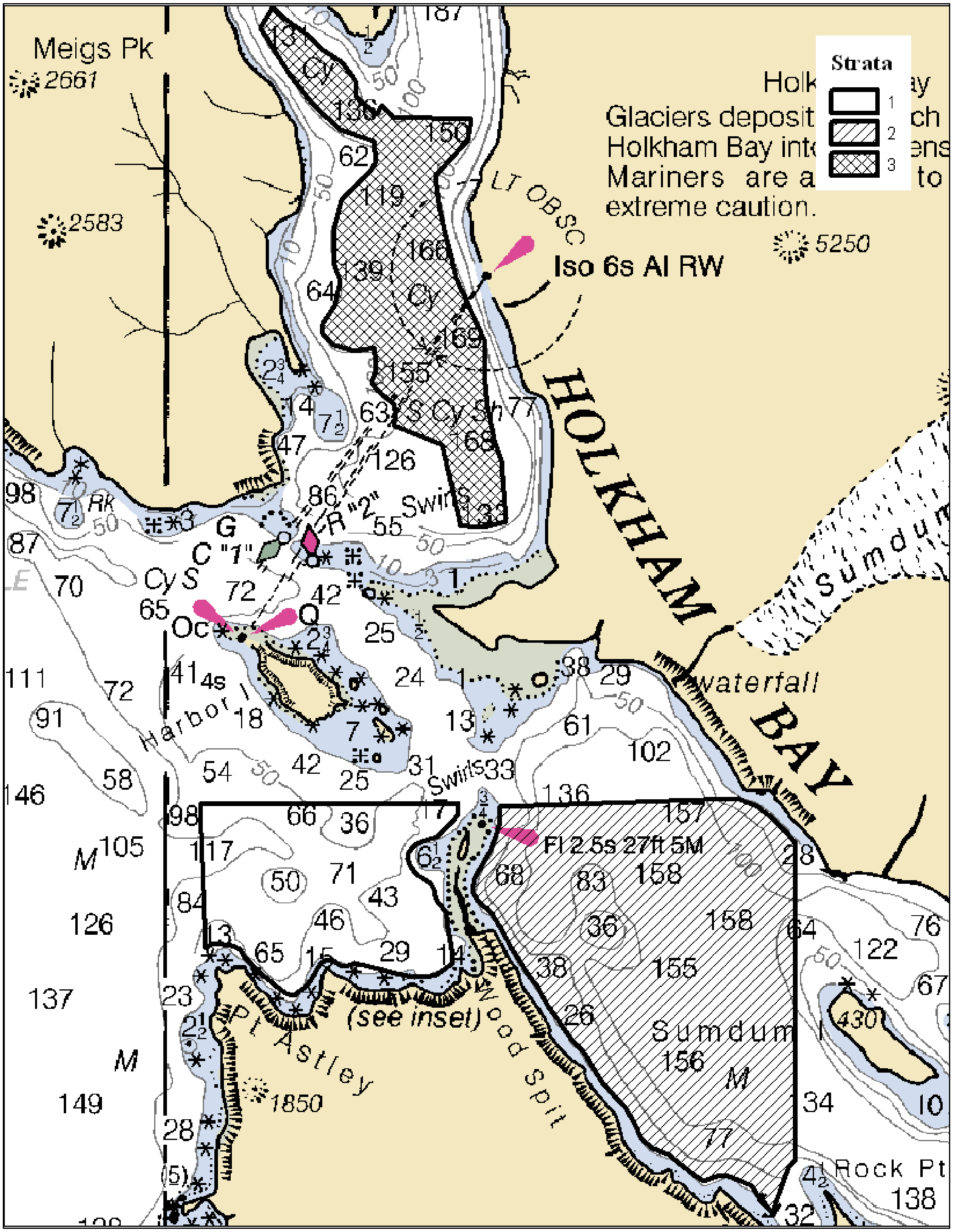

Figure 7.–Southeast Alaska Tanner crab survey, Holkham Bay strata boundaries.

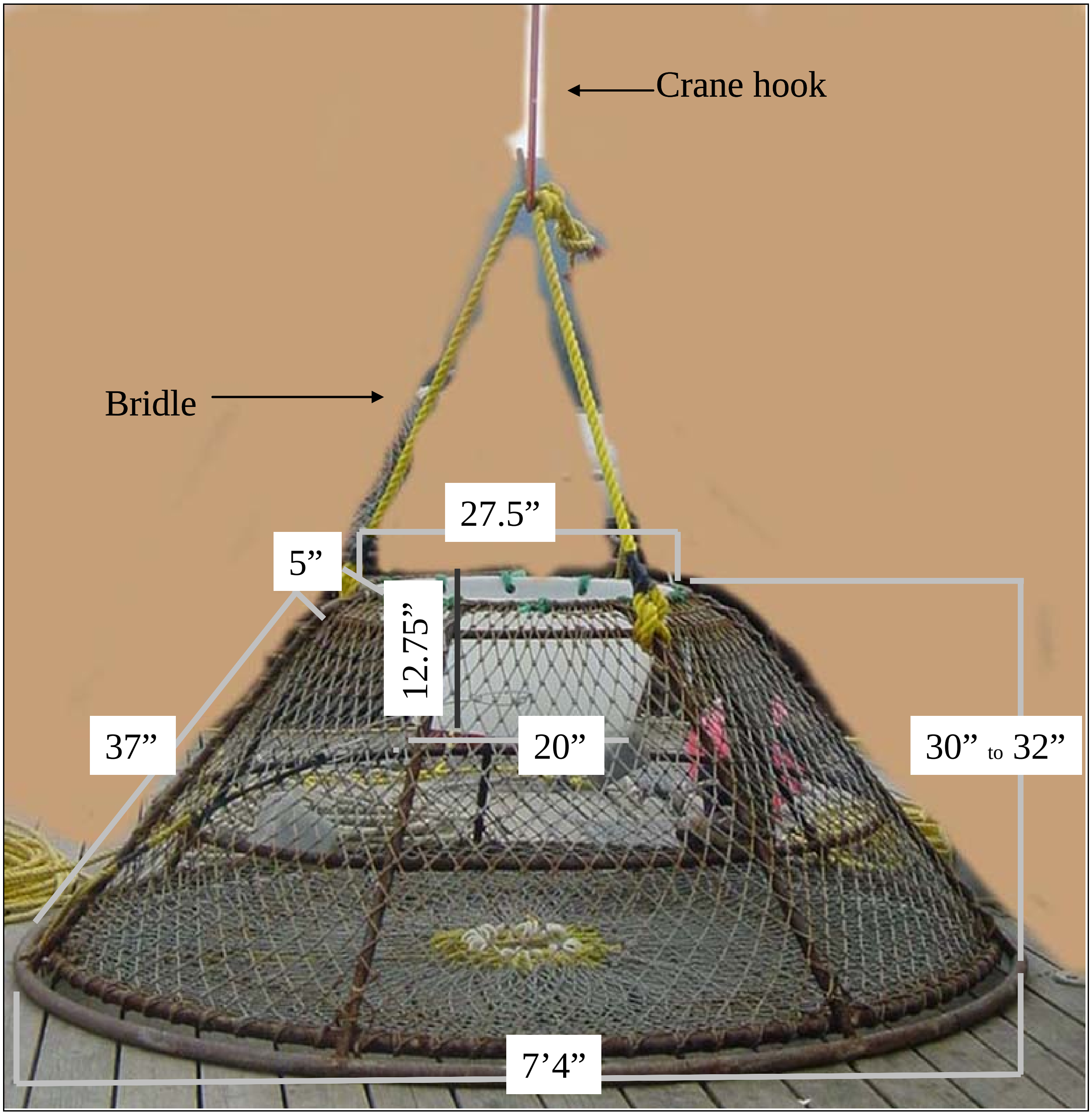

Figure 8.–Photograph of the cone pot gear used in the Southeast Alaska Tanner crab stock assessment survey.

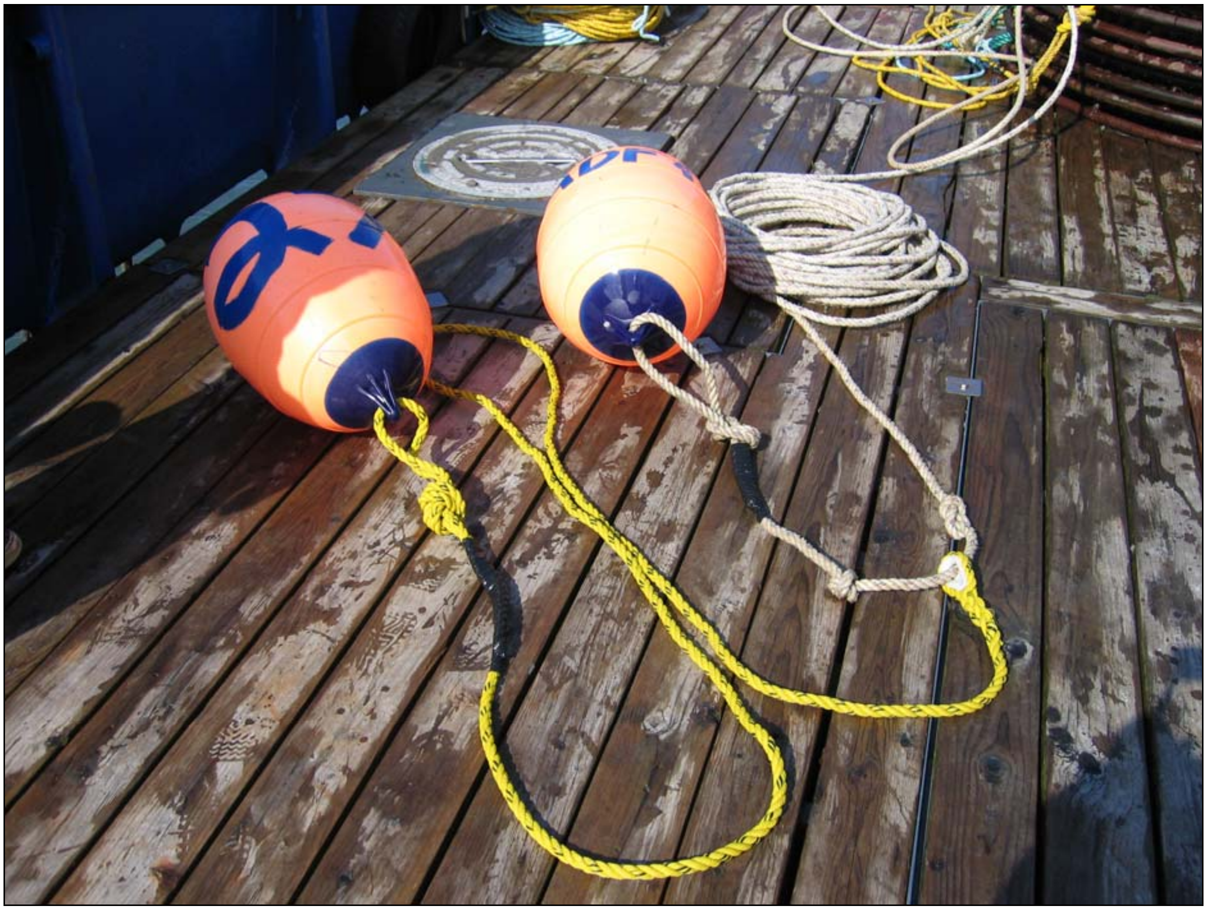

Figure 9.–Photograph of the buoy gear used in the Southeast Alaska Tanner crab stock assessment survey.

Figure 10.–Photograph of the crab pot hoisted over the sorting table.

APPENDIX A

Appendix A 1.–Protocol on how to generate pot placement in ArcView and upload to R/V Medeia Maptech navigational software.

Arc View pot point generation

- Open mxd (ESRI ArcMap Document) file in Arcview for a site.

(e.g.,R:/Divisions/CF/Shellfish/Research/Tanner/Survey/Tanner pot location maps/Camden/Port Camden.mxd)

- Look at Table 1 to get number of pots per strata for each site.
- Use Hawth's tools to generate random points for each strata (each reclassified layer) Hawth's tools/Sampling Tools/Generate Random Points. Download Hawth's tool from the ADFG GIS_library/downloads.
    - Select raster format and appropriate strata.
    - Prevent points from being located in NODATA cells.
    - Check enforce minimum distance (min distance is 185m (0.1nautical miles)). May have to reduce minimum distance to get Hawth tools to work and then remove bad points by "hand". Minimum distance of 100m works pretty well.
- Enter number of random points needed. Add 3-5 extra points (in case you need extra pot locations due to proximity to other pots or navigational hazard.
- Name layer: SitePOTstrataX (e.g., HolkhamPOTstrata1 for the pot locations in strata 1 of Holkham).
- Save in current year folder.
- Repeat for each strata.

Point verification

- Verify that all points are greater than 185m from one another (use measuring tool in Arcview).
- Highlight the needed number of pot locations in the attribute tables for each strata.
- If two pots are too close deselect one and add the next random pot location for that strata.
- Remove "bad" pot locations using the Editor toolbar. Editor/Start editing.
- Delete only pots that are too close and not all the extra pots.
- Highlight the whole cell and delete with delete button on keyboard.
- Editor/Stop Editing when finished.
- Re-verify that the new points are greater than 185m from other points.

Lat/long coordinates

- Use Xtools to generate lat/lons for each random point. Download Xtool from the ADFG GIS_library/downloads.
    - Xtools/Table Operations/Add X, Y, Z Coordinates
    - Highlight (CTRL-click) all the layers you need to add lat/longs. (i.e. each strata).
    - X field name "Longitude" Y field name "Latitude"
    - Click on "Specify" in Output projection box.
    - Click on Select.
        - Select WGS84 within Geographic Coordinate Systems/World/WGS 1984.
        - Click Next, click Finish, Click OK.
- Export each map as JPEG, save in Pot location 200X folder.

Pot locations

- Open attribute tables (dbf. file) in Excel (they have the .dbf suffix).
- Open Pot location template.xls (R:/…..Surveys).
- Copy lat/long data from each dbf file into template file. (lat/long will be reversed to accommodate Medeia computer).
- Enter appropriate strata number for each row.
- Status column should have "good" or "extra point" entered each cell.
- Save as "Site 200X" in Pot locations 200X folder.
- Print hardcopy.
- Delete rows with "extra point" in Status column and save as .txt file to upload to Medeia.

Copy all "Site 200X.txt" files and the "Medeia template" file (R:/ > Tanner pot location maps / Transfer to Media) to a memory stick and bring to Medeia.

Appendix A 1.–continued (page 2 of 2)

Medeia computer

- Open “Site 200X.txt file.
- Open “Medeia template” file.
- Cut and paste lat/long into appropriate columns from text file to template file.
  The lat/long column order is reversed in the template file. Make sure Latitude is before Longitude in the template file or Maptech will not recognize it.
- Cut and paste Strata into “Notes/Strata” column.
- Enter name. This entry must start with 48sgw for Maptech to recognize it.
- Individually name each pot location an (e.g., 48sgwHolkham 1, 48sgwHolkham 2, 48sgwHolkham 3).
- Save as “marks32.txt” (This is the only file name Maptech recognizes).

Maptech

- Open Maptech (on Medeia wheelhouse computer).
- File> Import from File and browse for the folder where the “marks32” file is located.
- Select all marks for the site and import. It will give the number of marks imported successfully.
- Check the chart to make sure pot locations have in fact shown up in the appropriate spot.
- Repeat procedure for each site text file.
- Overwrite the “marks32” file each time.
- A detailed explanation of the Maptech import/export format in R:/> /Tanner pot location maps /Transfer to Medeia> Maptech export format explanation.

Appendix A 2.–Protocol for HOBO temperature loggers.

Activate Tidbit

- Attach Optic Base Station to computer.
- Open boxcar R:/Shellfish/research/temperature/BOXCAR or on Medeia computer use Start/Programs.
  - Place Tidbit in Tidbit coupler.
  - Launch Tidbit logger/launch.
  - Check to see description matches Tidbit number on back of Tidbit.
  - Interval 1hour.
  - Temperature C.
- Cable tie Tidbit on all pots near tunnel. Place a piece of flagging near the Tidbit.
- Write in comments on skipper data 'Tidbit # X' (where X is the number of the Tidbit).
- Check the status of the Tidbit after each pull.

Download Tidbit

- Open Boxcar
  - Place Tidbit in Tidbit coupler.
  - Logger/readout.
  - Save file using the .dtf format.
  - Click on the Excel icon to export to a .txt format or -->Export-->Custom. Date format: Month/Day/Year, Date/Time Separator: Tab, Time Format: Hr:Min:Sec, Data Separator: Tab, and highlight Temperature (*C) only.
  - Save file as: 'T''Tidbitname',date. E.g. Tidbit #10 downloaded on 10/19/2005 would be named: T10,Oct192005.txt.

Edit data (e.g., remove surface temperature readings)

- Open .txt file in Excel.
- File-->Open (Do not double click the text file to open). Select "Finish" on the import menu.
- Delete all temperature data that does not correspond to time the pot was in the water (do not include data that is within 15 minutes of pot set time; e.g., if pot is set at 1200hrs and there is a temperature reading at 1210hrs delete data point).
- Files should be saved on a memory stick (or other media) aboard vessel; leave backup copy aboard Medeia computer.
- Files should be saved to: CF…Shellfish\Temperature\current year.

APPENDIX B

Appendix B 1.–Crab pot set form.

CRAB POT SET FORM

Year________ Project__________________________________ Trip #_______ Vessel name____

* Pot type: **S** = Square (7x7) **C** = Cone Location name____ Location code______ Recorders name_______________________________________
P = Pyramid **D** = Dungeness

Stratum	Pot # (order)	Pot type *	Buoy #	Depth (fathoms)	Set Gear			Lift Gear			Latitude/Longitude												Tidbit # (if used)	Comments
					Month	Date	Time (military)	Month	Date	Time (military)	Deg. N	Minutes to 1000^{th}					Deg. W	Minutes to 1000^{th}						
											(Examples below)						(Examples below)							
											55	2	0.	6	0	5	131	5	1.	2	7	0		

Appendix B 2.–Crab survey specimen form.

CRAB SURVEY SPECIMEN

Date _____ / _____ / _____ Page _______ of _______

Year _______ Project _______________________________________ Trip # _______ Recorder _______________________

Location Code _______ Location Name __________________________________ Pot # (Order) _______ Buoy # _______

Specimen #	Subsample Rate	910 Dung. 921 RKC 922 BKC 923 GKC 931 Bairdi	Sex	Size (mm)	Weight (gms)	Legal Size	Shell Condition	Blackmat 1= Present	Female Data Eggs			Parasite	Leg Condition	Tag Number	Tag Code	Comments
									Percent	Development	Condition					
1																
2																
3																
4																
5																
6																
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Appendix B 3.–Incidental species form.

INCIDENTAL SPECIES

Year ________ Project ______________________________ Trip # _____ Location Name ______________________________Code:_____ Recorder:____________

Pot #	Buoy #	Pot Condition	Substrate	Debris	Box crab	Buccinum	Fusitriton	Great Sculpin	Hairy crab	Halibut	Helmet crab	Hermit crab	Lyre crab	Neptunea	Pacific cod	Pycnopodia	Quillback	Sculpin (general)	Spot shrimp	Yellowfin sole									Comments
					900	360	361	342	312	200	316	313	314	362	110	381	147	160	965	127									

Codes for:

Pot Condition
1-Normal
2-Not baited
3-Lost
4-Door open
5-Broken webbing
6-Upside down
7-Collapsed tunnel
8-Not on bottom
9-Pot open/broken
10-Lost pot contents
11-Close escape ring
12-Open escape ring

Substrate
0-Unknown
1-Mud
2-Mud/gravel
3-Mud/clay
4-Mud/shell
5-Mud/soft
6-Mud/hard
7-Clay
8-Sand
9-Gravel
10-Boulder
11-Cobble

		964	Coonstripe shrimp	134	Greenland turbot	999	Misc. note in comments	270	Pollock	123	Rock sole	896	Sea urchin, general	691	Spiny dogfish shark
121	Arrowtooth flounder	899	Coral	190	Greenling, general	870	Octopus	373	Prowfish	139	Rockfish, other	960	Shrimp, general	355	Sponge
301	Brachiopods	311	Decorator crab	963	Humpy shrimp	212	Pacific hagfish	371	Ratfish	710	Sablefish	962	Sidestripe shrimp	380	Starfish, general
330	Brown rockfish	210	Eels or eel-like fish	345	Irish lord, general	141	Pacific ocean perch	346	Red Irish lord	315	Scale crab	157	Silvergray rockfish	129	Starry flounder
343	Buffalo sculpin	128	English sole	194	Kelp greenling	340	Pacific staghorn	892	Red sea urchin	850	Scallop	700	Skate, general	156	Widow rockfish