

Regional Information Report No. 4K12-07

**Special Project Plan: 2012 Bottom Trawl Survey of
Crab and Groundfish: Kodiak, Chignik, South
Peninsula, and Eastern Aleutian Districts**

by

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May 2012

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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

REGIONAL INFORMATION REPORT NO. 4K12-07

**SPECIAL PROJECT PLAN: 2012 BOTTOM TRAWL SURVEY OF CRAB
AND GROUND FISH: KODIAK, CHIGNIK, SOUTH PENINSULA, AND
EASTERN ALEUTIAN DISTRICTS**

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ABSTRACT

This report specifies the special project objectives and methods during the Alaska Department of Fish and Game's (ADF&G) 2012 Kodiak, Chignik, South Peninsula, and Eastern Aleutian districts bottom trawl survey of crab and groundfish. This Special Project Plan is used in conjunction with the Standard Project Operational Plan (Spalinger and Cavin 2004), which describes the bottom trawl survey sampling protocols. Special crab projects for 2012 include: conducting multiple trawl tows within selected offshore survey stations in the Kodiak District to assist in determining variance of Tanner crab *Chionoecetes bairdi* population estimates; collection of Tanner crab hemolymph for genetic analysis to determine bitter crab disease prevalence; collection of adult female Tanner crab to determine reproductive potential; and measurement of male Tanner crab chela height to determine size at maturity. Special groundfish projects for 2012 include: collection of stomachs and contents from walleye pollock *Theragra chalcogramma*, Pacific cod *Gadus macrocephalus*, flathead sole *Hippoglossoides elassodon*, arrowtooth flounder *Atheresthes stomias*, Pacific halibut *Hippoglossus stenolepis*, northern rock sole *Lepidopsetta polyxystra*, and spiny dogfish *Squalus acanthias* for a National Marine Fisheries Service (NMFS) food habits study; and collection of age-0 and age-1 walleye pollock, sablefish *Anoplopoma fimbria*, Pacific cod, arrowtooth flounder, and rockfish *Sebastes* spp. for a NMFS recruitment study. Additionally, specimen collection and photographs of various species will be taken for ADF&G field guides.

Key words: Tanner crab, shellfish, groundfish, trawl survey, Kodiak, Alaska Peninsula, Chignik, Eastern Aleutian Islands, special projects

INTRODUCTION

From June through September 2012, the Alaska Department of Fish and Game (ADF&G) will conduct a bottom trawl survey in waters of historic red king crab *Paralithodes camtschaticus* and Tanner crab *Chionoecetes bairdi* abundance around Kodiak Island and the Alaska Peninsula from Cape Douglas to False Pass, as well as the Eastern Aleutian Islands (Figure 1). Survey results will be used to estimate abundance of Tanner crab and red king crab populations and determine species composition and length frequencies of groundfish catch by tow and area.

This report details the survey schedule, station maps, and sampling procedures for special projects during the 2012 Westward Region trawl survey. Standard sampling protocols during the bottom trawl survey are described in detail in the Standard Project Operational Plan (Spalinger and Cavin 2004). Changes to standard procedures, or special projects associated with the 2012 survey are described in this document.

OBJECTIVES

Objectives for the 2012 shellfish special projects during the bottom trawl survey are:

1. Collect and freeze adult female Tanner crab from the Northeast, Eastside, and Westside sections of the Kodiak District for subsequent determination of fecundity, spermathecal load, and overall reproductive health;
2. Measure male Tanner crab chela height from the Northeast, Eastside, and Westside sections of the Kodiak District;
3. Collect and preserve Tanner crab hemolymph samples in addition to standard hemolymph smears in Alitak Bay (Spalinger and Cavin 2004), to identify genetic markers from the parasitic dinoflagellate that causes bitter crab disease;
4. Collect scallop meats from around Kodiak Island and the Shumagin Islands for isotope analysis;

5. Conduct multiple trawl tows for selected survey stations in Marmot Bay and Barnabas Gully of the Kodiak District to determine variability in Tanner crab population estimates at those stations.

Objectives for the 2012 groundfish special projects during the bottom trawl survey are:

1. Collect whole stomachs and stomach contents from walleye pollock *Theragra chalcogramma*, Pacific cod *Gadus macrocephalus*, flathead sole *Hippoglossoides elassodon*, arrowtooth flounder *Atheresthes stomias*, Pacific halibut *Hippoglossus stenolepis*, northern rock sole *Lepidopsetta polyxystra*, and spiny dogfish *Squalus acanthias* from Marmot and Chiniak bays;
2. Collect age-0 and age-1 walleye pollock, sablefish *Anoplopoma fimbria*, Pacific cod, arrowtooth flounder, and rockfish *Sebastes* and *Sebastolobus* from around Kodiak Island, Shelikof Strait, and the Shumagin Islands;
3. Speciate blackspotted rockfish *Sebastes melanostichus* from rougheye rockfish *S. aleutianus* (Orr and Hawkins 2008);
4. Record sex of all measured shark and skate *Raja* and *Bathyraja* species.

METHODS

SURVEY AREA AND TRAWL PROCEDURES

The 27.4 m ADF&G research vessel *Resolution* will conduct survey trawl tows using a 400-mesh eastern otter trawl in areas of known king crab and Tanner crab habitat in the Kodiak, Chignik, and South Peninsula districts of the Westward Region (Figure 1, Appendices A1–A13). Akutan, Unalaska, Makushin, and Pumicestone bays in the Eastern Aleutian District will be included in the 2012 survey (Appendices A14 and A15). Beaver Inlet stations will be surveyed if time allows.

Multiple Tows

Duplicate trawl tows will occur in pre-selected large offshore stations in the Northeast and Eastside sections of the Kodiak District. Stations were selected based on large Tanner crab population estimates from previous surveys (Spalinger *In prep*, Spalinger 2011, Spalinger 2010, Spalinger 2009). Four stations in Marmot Bay (Appendix A2) and four stations in Barnabas Gully (Appendix A3) are divided into four quadrants. In addition to the standard tow (Spalinger and Cavin 2004), two to three additional trawl tows, depending on time and weather, will be made in different quadrants of the selected stations. Stations with additional tows will be surveyed in the following order of priority: Marmot Bay: 255, 283X, 256, and MONX (Appendix A2); Barnabas Gully: 559, 655, 696, and 561 (Appendix A3). All Tanner, king, and Dungeness crabs will be sorted, weighed, and sampled according to the Standard Project Operational Plan (Spalinger and Cavin 2004).

In 2012 as time allows, previously unsurveyed stations around Sanak (Appendix A9) and Mitrofanina (Appendix A11) islands will be surveyed. These areas have been chosen based on reports of commercial quantities of Tanner crab during the most recent fisheries.

CRAB SAMPLING

Female Tanner Collection

Adult female Tanner crab will be collected from survey stations in the Northeast, Eastside, and Westside sections of the Kodiak District (Appendices B1 and B2). Female Tanner crab samples will be held on deck until the end of the day, or when tows in the sampling area are completed. Composite samples should represent all adult females caught the sampling area. For each size group and bay, 15 primiparous and 15 multiparous female Tanner crab will be collected (Appendix B3). Each crab collected for the composite sample will be classified by shell condition and placed in an individual bag with a label indicating the size category, shell condition, and sampling area. Crab will be kept separate to ensure legs remain with their respective carapace during freezing and transport. All bags containing crab from the same size group, sampling area, and maturity (primiparous or multiparous; Appendix B3) are placed into one larger bag labeled with sampling information, and placed in a box to prevent crushing in the freezer. Upon arrival in the laboratory, crab will be examined for shell condition, fecundity, spermathecal load, and overall reproductive health (i.e. ovary condition, presence of dead eggs).

Male Tanner Chela Height

Male Tanner crab chela height measurements will be collected from the Northeast, Eastside and Westside sections of the Kodiak District (Appendices A2, A3, and A8). Protocol for chela height measurement will follow the standard procedures in Spalinger and Cavin (2004), with one exception; measurements will only be collected from 50 male Tanner crab >50 mm in carapace width at each station. The cruise leader may adjust the sampling plan as needed to accommodate high numbers of crab encountered on the Eastside survey. In this situation the cruise leader may choose to measure chela from every third station, or modify the plan in other ways to allow for timely return of crab to the water. Cruise leaders will detail exact sampling procedures to be kept with data from each tow so data analysis can be conducted accordingly. Chela height to carapace width ratio will determine size at morphometric maturity of male Tanner crab and will be compared among areas and years.

Hemolymph Collection

Samples of hemolymph from Tanner crab in Alitak Bay (Appendix A5) will be preserved in ethanol for genetic testing to identify parasite DNA (Jensen et al. 2010; Appendix C1). Samples for this test will be collected in conjunction with the standard hemolymph smears as described in the Standard Project Operational Plan (Spalinger and Cavin 2004). Information will be recorded on an ADF&G Bitter Crab Sample Data Form (Appendix D1). After collection, preserved samples will be stored in a dark location at room temperature prior to shipping to a genetics laboratory for testing. Results from genetic testing will be compared to results from hemolymph smears to determine bitter crab smear disease prevalence accuracy, and the feasibility of replacing hemolymph smears with genetic testing.

Scallop Collection

Up to five scallop meats per station will be collected from around Kodiak Island and the Shumagin Islands (Appendix E). Samples from each tow will be put in a separate ziploc bag and frozen with a completed specimen collection form (Appendix D2).

Parasitic Barnacles

Red king crab will be examined for the parasitic rhizocephalan barnacle as part of standard sampling procedures (Spalinger and Cavin 2004). Barnacles invade and grow in the abdomen of king crab, causing sterilization, and have a stalk called an externa protruding from the underside of the crab's abdomen that is visible when lifting the crab's abdominal flap (Figure 2). Examine each king crab for parasitic barnacle externae and collect and freeze parasitized crab. If possible the first parasitized crab encountered will be preserved in ethanol. Each crab will have a specimen collection form attached (Appendix D2).

GROUND FISH SAMPLING

Stomachs and stomach contents from walleye pollock, Pacific cod, flathead sole, arrowtooth flounder, Pacific halibut, northern rock sole, and spiny dogfish will be collected in Marmot and Chiniak bays (Appendices A1 and A2). Sample sizes are 15 to 40 stomachs depending on species and size group (Appendix F1), with a maximum number of 20 stomachs per species per haul. The goal is to sample two to three species from every haul (Appendix F2).

Juvenile fish, age-0 and age-1, will be collected from survey stations around Kodiak Island and Shumagin Islands (Appendix G). Up to 40 specimens each of walleye pollock, sablefish, Pacific cod, arrowtooth flounder, and rockfish will be collected at each station encountered according to procedures detailed in Appendix G3. No more than 40 individuals of each species should be taken from each collection area (Appendix G1). Specimens will be placed in plastic bags according to species and tow number with a completed specimen collection form (Appendix D2). A combined total for all species and areas of 1,000 specimens will be collected throughout the survey.

Distinct differences to assist with speciating rougheye and blackspotted rockfish are shown in Appendix H1. If there is discrete spotting on the first dorsal fin the fish is a blackspotted rockfish. Genetic identification compared to visual identification in the field has shown that most rougheye rockfish are correctly identified in the field; however, only 40% to 80% of blackspotted rockfish are correctly identified. Small blackspotted rockfish in particular are often misidentified as rougheye (Heifetz et al. 2012).

The sex of each measured skate and shark will be determined. Males are easily identified by the presence of claspers (Figure 3). Small, immature skates and sharks that are difficult to sex will be recorded as unknown.

SPECIMEN COLLECTION

Photos and collection of rarely encountered species (Table 1) will update the marine fish and invertebrate field guide (Byersdorfer and Watson 2010). Organisms should be placed on a white or black background to show contrast, and multiple pictures should be taken of dorsal, ventral, and lateral views. Fins or legs should be spread as much as possible and close-up pictures of distinguishing characteristics taken. If identification of any organism is questionable the animal should be photographed and frozen with a completed specimen identification form (Appendix D2) included in the sample bag.

DATA FORMS AND SAMPLE CUSTODY

The cruise leader will ensure all samples and data forms are completed and removed from the boat after each survey leg, including downloading electronically collected data to the dryhold computer and making backup copies of all electronic data. Sampling tallies and logs will be complete and placed in a survey binder for reference. For projects continuing on the next survey leg, samples and data forms will be well organized, labeled, and dry. Forms are organized according to project and put into sequential order by tow, starting with the first tow on top. All data removed from the vessel is taken directly to Kally Spalinger, the lead trawl-survey biologist. Frozen samples must be labeled prior to removal from the R/V *Resolution* freezer and transferred to one of the freezers at the Kodiak Fisheries Research Center. Samples preserved in formalin must be stored in a location with adequate ventilation until shipped. It is important to inform the lead trawl-survey biologist of the location of all stored samples.

SPECIAL PROJECT EQUIPMENT CHECKLIST

Female Tanner crab collection

- Specimen labels
- Tally sheets
- Plastic shopping bags
- Garbage bags

Tanner crab genetic hemolymph collection

- Totes for transferring crab to sampling area
- Sampling tray
- 6 deep-well plates (96 wells of 1.2 ml capacity)
- Rubber well caps
- Syringes (3 cc)
- Syringe disposal containers
- Paper towels
- ADF&G Bitter Crab Sample Data Forms

Groundfish stomach sampling

- Specimen forms
- Specimen labels
- Tally sheets
- Five-gallon buckets with lids (10-12)
- 4 gallons Formalin
- Stomach bags
- One-liter plastic bottles
- Baking soda
- Luggage tags
- 1/8 cup measuring cup
- Hazardous materials bucket

Juvenile groundfish sampling

- Ziploc bags
- Tally sheets
- Specimen collection forms

PERSONNEL AND SURVEY SCHEDULE

R/V Resolution crew – Captain Denis Cox Jr., Kurt Pederson, Gary Wilson

*Chiniak Bay –
June 14 and 15*

Kally Spalinger (cruise leader)
Collin Hakkinen
Sherry Barker
David Gilliland

*Marmot Bay –
June 19 to 23*

Mark Stichert (cruise leader)
Philip Tschersich
Collin Hakkinen
Sherry Barker
David Gilliland

*Eastside Kodiak –
June 26 to July 15*

Kally Spalinger (cruise leader)
Collin Hakkinen
Sherry Barker
David Gilliland
Kim Phillips (Alitak)

*South Alaska Peninsula, Chignik,
and The Eastern Aleutians –
July 23 to August 28*

Rob Baer (cruise leader 1st ½)
Nicholas Sagalkin (cruise leader 2nd ½)
Collin Hakkinen
Sherry Barker
David Gilliland
Britta Baechler (Aleutians)

*Westside Kodiak and North Mainland –
September 4 to 14*

Mark Stichert (cruise leader)
Collin Hakkinen
Sherry Barker
David Gilliland

REFERENCES CITED

- Byersdorfer, S. C., and L. J. Watson. 2010. Field guide to common marine fishes and invertebrates of Alaska. Alaska Sea Grant College Program, University of Alaska Fairbanks, Fairbanks, Alaska.
- Jensen, P. C., K. Califf, V. Lowe, L. Hauser, and J. F. Morado. 2010. Molecular detection of *Hematodinium* sp. in Northeast Pacific *Chionoecetes* spp. and evidence of two species in the Northern Hemisphere. *Diseases of Aquatic Organisms* 89:155-166.
- Heifetz, J., K. Shotwell, A. J. Gharret, S. Wildes, J. Orr, and R. Stanley. 2012. Life history characteristics of two sympatric species of rockfish. Presented at the 17th Western Groundfish Conference, Seattle, WA.
- Orr, J. W., and S. Hawkins. 2008. Species of the rougheye rockfish complex: resurrection of *Sebastes melanostictus* (Matsubara, 1934) and a redescription of *Sebastes aleutianus* (Jordan and Everman, 1898) (Teleostei: Scorpaeniformes). *Fishery Bulletin* 106 (2) 111-134.
- Spalinger, K. *In prep.* Bottom trawl survey of crab and groundfish: Kodiak, Chignik, South Peninsula, and Eastern Aleutians management districts, 2011. Alaska Department of Fish and Game, Fishery Management Report, Anchorage.
- Spalinger, K. 2011. Bottom trawl survey of crab and groundfish: Kodiak, Chignik, South Peninsula, and Eastern Aleutians management districts, 2010. Alaska Department of Fish and Game, Fishery Management Report No. 11-40, Anchorage.
- Spalinger, K. 2010. Bottom trawl survey of crab and groundfish: Kodiak, Chignik, South Peninsula, and Eastern Aleutians management districts, 2009. Alaska Department of Fish and Game, Fishery Management Report No. 10-23, Anchorage.
- Spalinger, K. 2009. Bottom trawl survey of crab and groundfish: Kodiak, Chignik, South Peninsula, and Eastern Aleutians management districts, 2008. Alaska Department of Fish and Game, Fishery Management Report No. 09-25, Anchorage.
- Spalinger, K., and M. E. Cavin Jr. 2004. Standard project operational plan: bottom trawl survey of crab and groundfish: Kodiak, Chignik, South Alaska Peninsula, and Eastern Aleutian Areas. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K04-47, Kodiak.

TABLES

Table 1.–List of species to photograph and collect for identification confirmation and inclusion in ADF&G field guides.

Common Name	Species	Common Name	Species
Salmon Shark	<i>Lamna ditropis</i>	Setose hermit crab	<i>Pagurus setosus</i>
Darkblotched Rockfish	<i>Sebastes crameri</i>	Bluespined hermit crab	<i>Pagurus kenerlyi</i>
Redstripe Rockfish	<i>Sebastes proriger</i>	Pribilof hermit crab	<i>Pagurus undosus</i>
Bocaccio	<i>Sebastes paucispinis</i>	Long-hand hermit crab	<i>Pagurus tanneri</i>
White-spotted greenling	<i>Hexagrammas stelleri</i>	Horny-hand hermit crab	<i>Pagurus cornutus</i>
Spectacled sculpin	<i>Triglops szepticus</i>	Northern sun star	<i>Solaster endeca</i>
Pacific staghorn sculpin	<i>Leptocottus armatus</i>	Morning sun star	<i>Solaster dawsoni</i>
Thorny sculpin	<i>Icelus spiniger</i>	Evening sun star	<i>Solaster paxillatus</i>
Ribbed sculpin	<i>Triglops pingelii</i>	Grooved sun star	<i>Crossaster borealis</i>
Brown Irish lord	<i>Hemilepidotus spinosus</i>	Greenland sea star	<i>Leptasterias groenlandica</i>
Longfin Irish lord	<i>Hemilepidotus zapus</i>	Sheathed sea star	<i>Leptasterias stolocantha</i>
Butterfly sculpin	<i>Hemilepidotus papilio</i>	Knobless 6-rayed star	<i>Leptasterias hexactis</i>
Fourhorn sculpin	<i>Myoxocephalus quadricornis</i>	White sea urchin	<i>Strongylocentrotus pallidus</i>
Arctic sculpin	<i>Myoxocephalus scorpioides</i>	Purple urchin	<i>Strongylocentrotus purpuratus</i>
Warthead sculpin	<i>Myoxocephalus niger</i>	Bubble jelly	<i>Aequorea sp.</i>
Frog sculpin	<i>Myoxocephalus stelleri</i>	Lion's mane jelly	<i>Cyanea sp.</i>
Spinycheek starsnout	<i>Bathyagonus infraspinus</i>	Barbed eualid	<i>Eualus barbatus</i>
Small-mouth ronquil	<i>Bathymaster leurolepis</i>	Short-scaled eualid	<i>Eualus suckleyi</i>
Northern ronquil	<i>Ronquilus jordani</i>	Two-spined crangon	<i>Crangon communis</i>
Polar eelpout	<i>Lycodes polaris</i>	Ridged crangon	<i>Crangon dalli</i>
Marbled eelpout	<i>Lycodes raridens</i>	Stefansson's melon snail/ shouldered whelk	<i>Volutopsius stefanssoni</i>
Black eelpout	<i>Lycodes diapterus</i>	Keeled aforia	<i>Aforia circinata</i>
Ebony eelpout	<i>Lycodes concolor</i>	Vermillion sea star	<i>Mediaster aequalis</i>
Twoline eelpout	<i>Bothrocara brunneum</i>	Sand star	<i>Luidia foliolata</i>
Pallid eelpout	<i>Lycodapus mandibularis</i>	Northern sand star	<i>Dipsacaster sp.</i>
Wolf eel	<i>Anarchichthys ocellatus</i>		
Bering flounder	<i>Hippoglossoides robustus</i>		
Sand sole	<i>Psettichthys melanostictus</i>		
Giant rock scallop	<i>Crassadoma gigantes</i>		
Spiny scallop	<i>Chlamys hastate</i>		
Island scallop	<i>Chlamys islandica</i>		
Flat-tip piddock	<i>Penitella penita</i>		
Chimney piddock	<i>Penitella penita</i>		

FIGURES

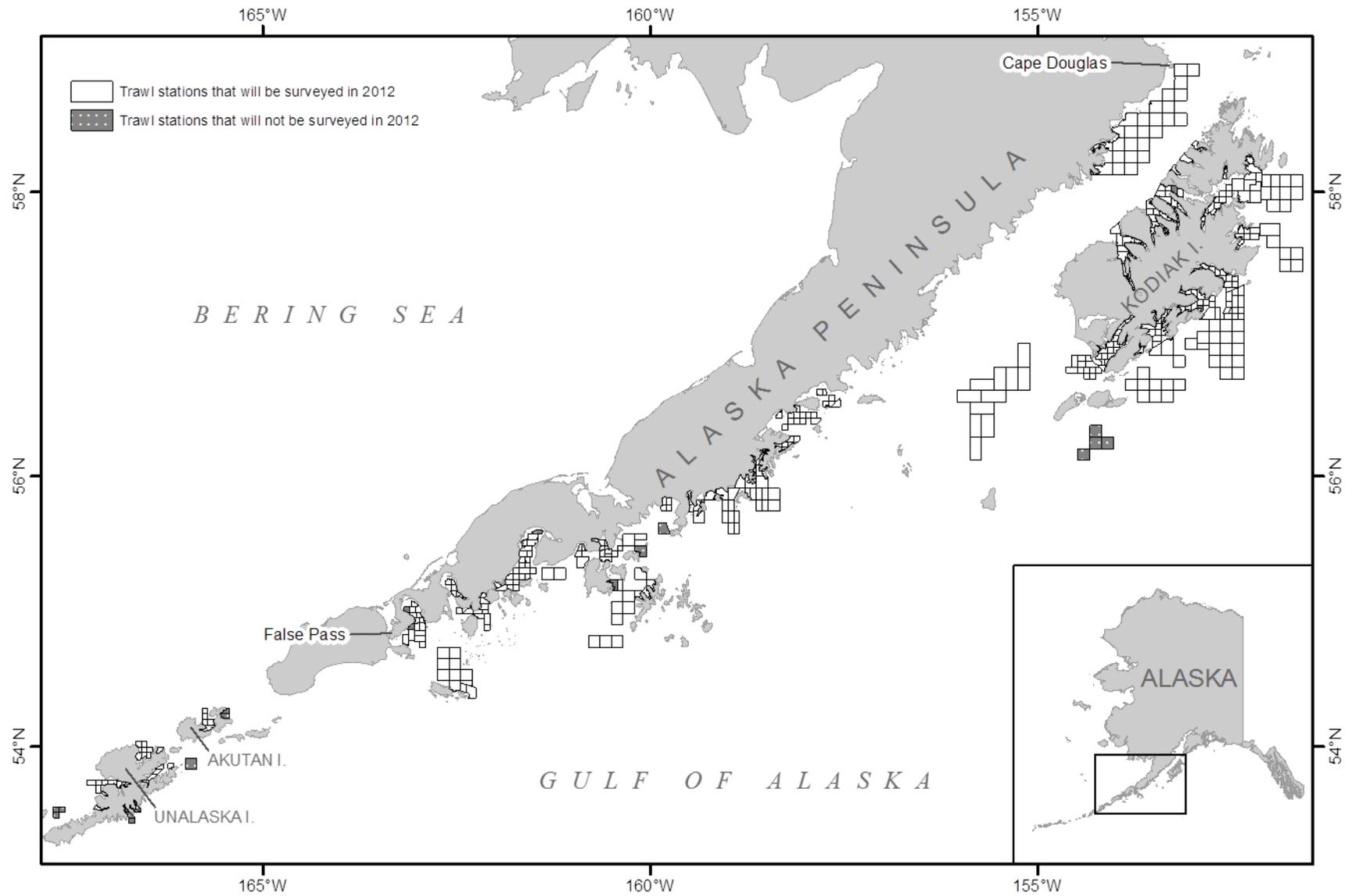


Figure 1.—Westward Region trawl survey area, 2012.

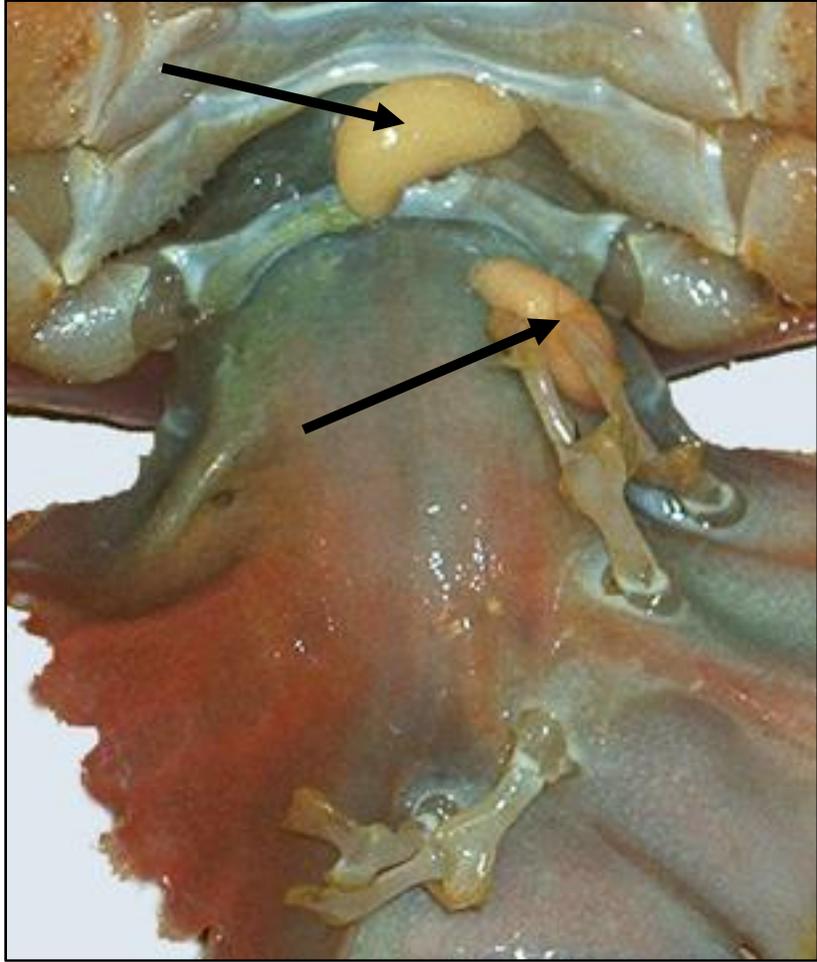


Figure 2.–Rhizocephalan barnacle parasite on a king crab abdominal flap.

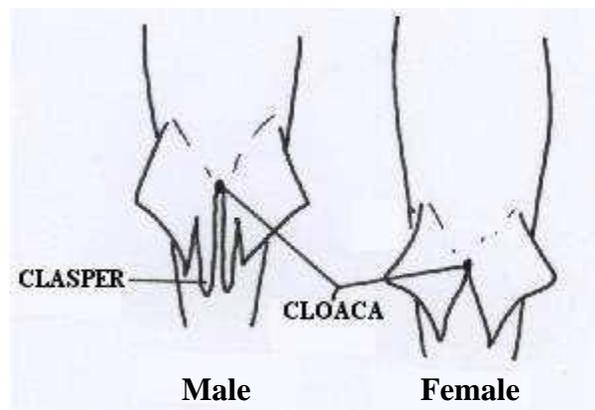
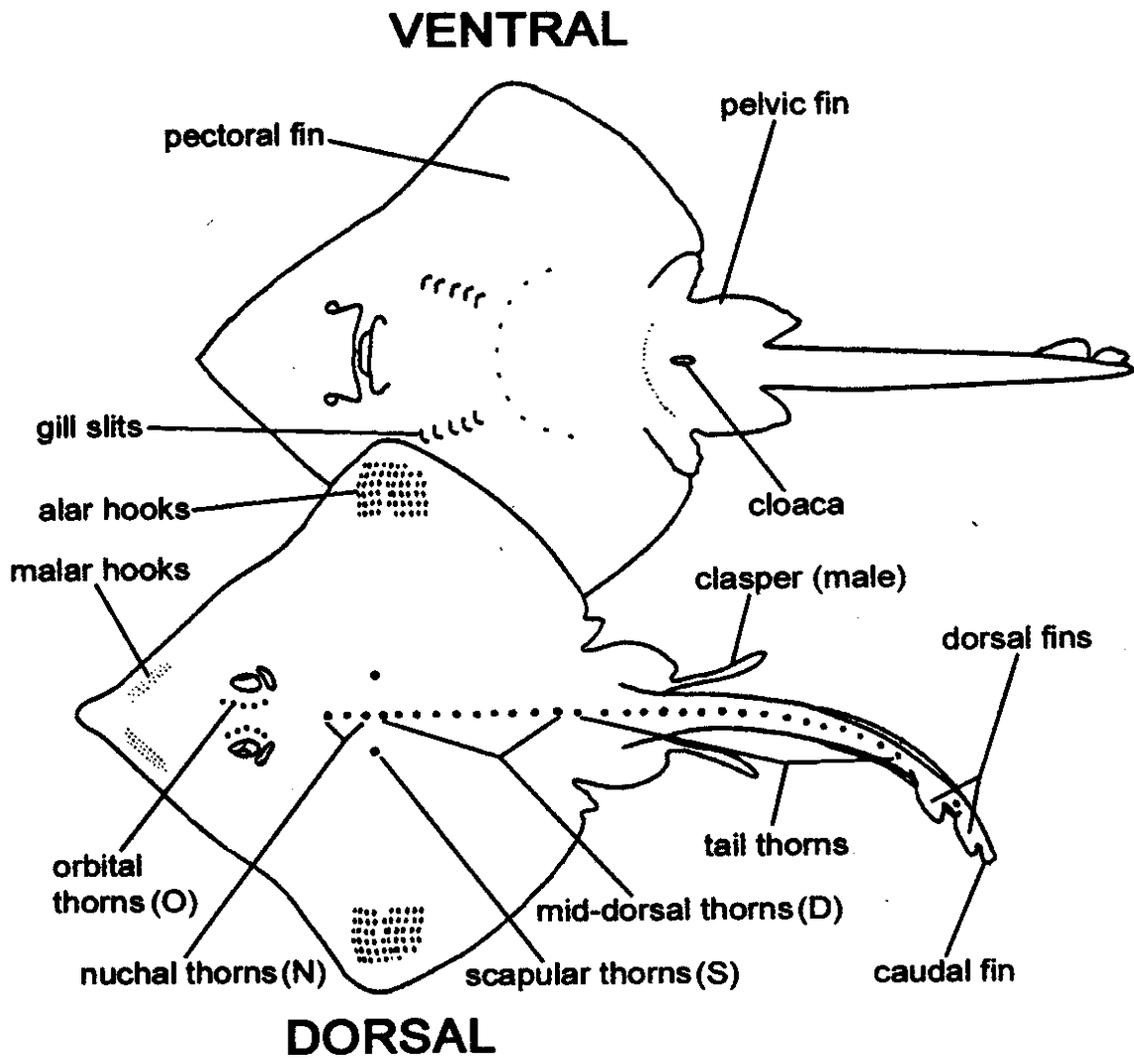
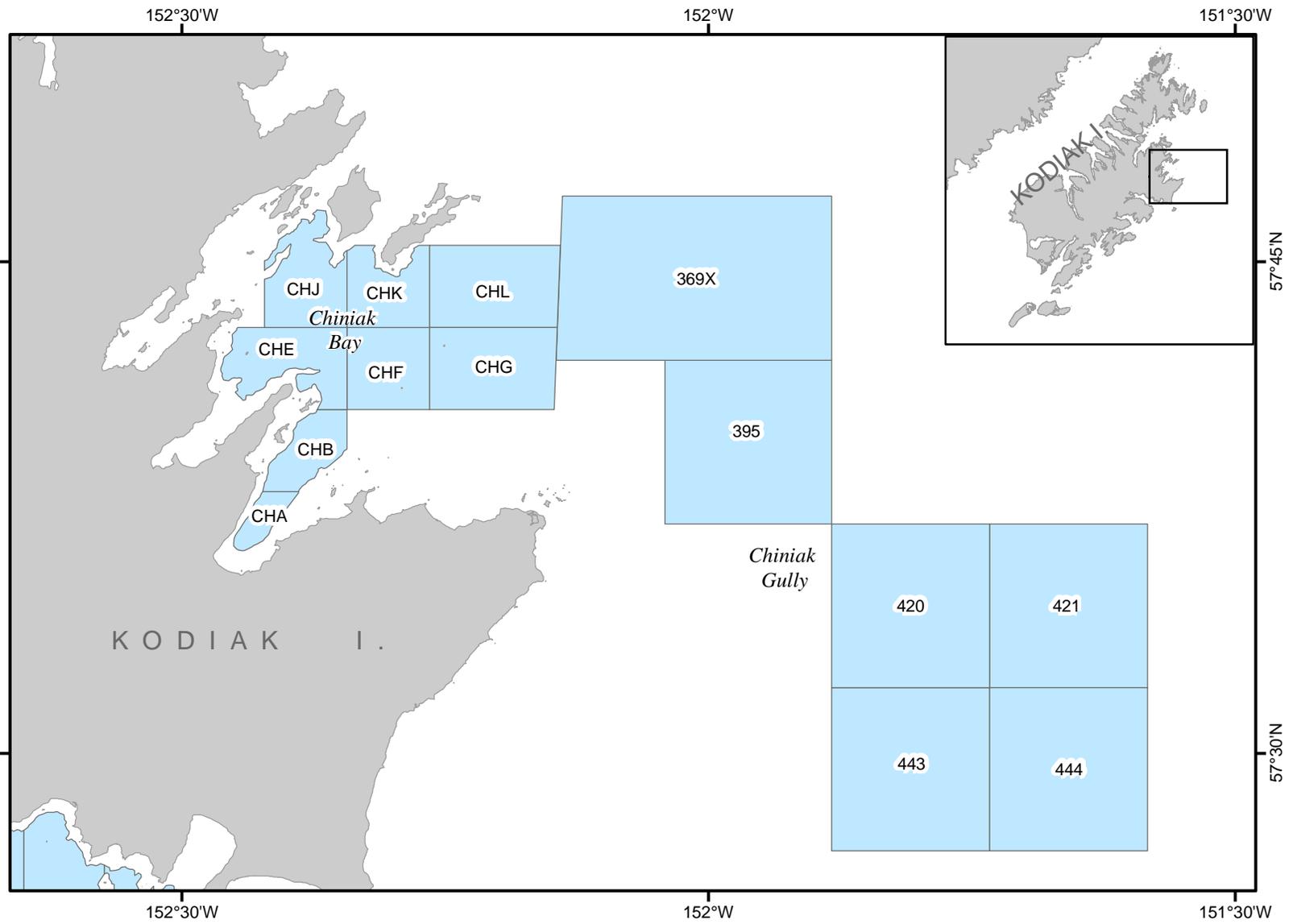
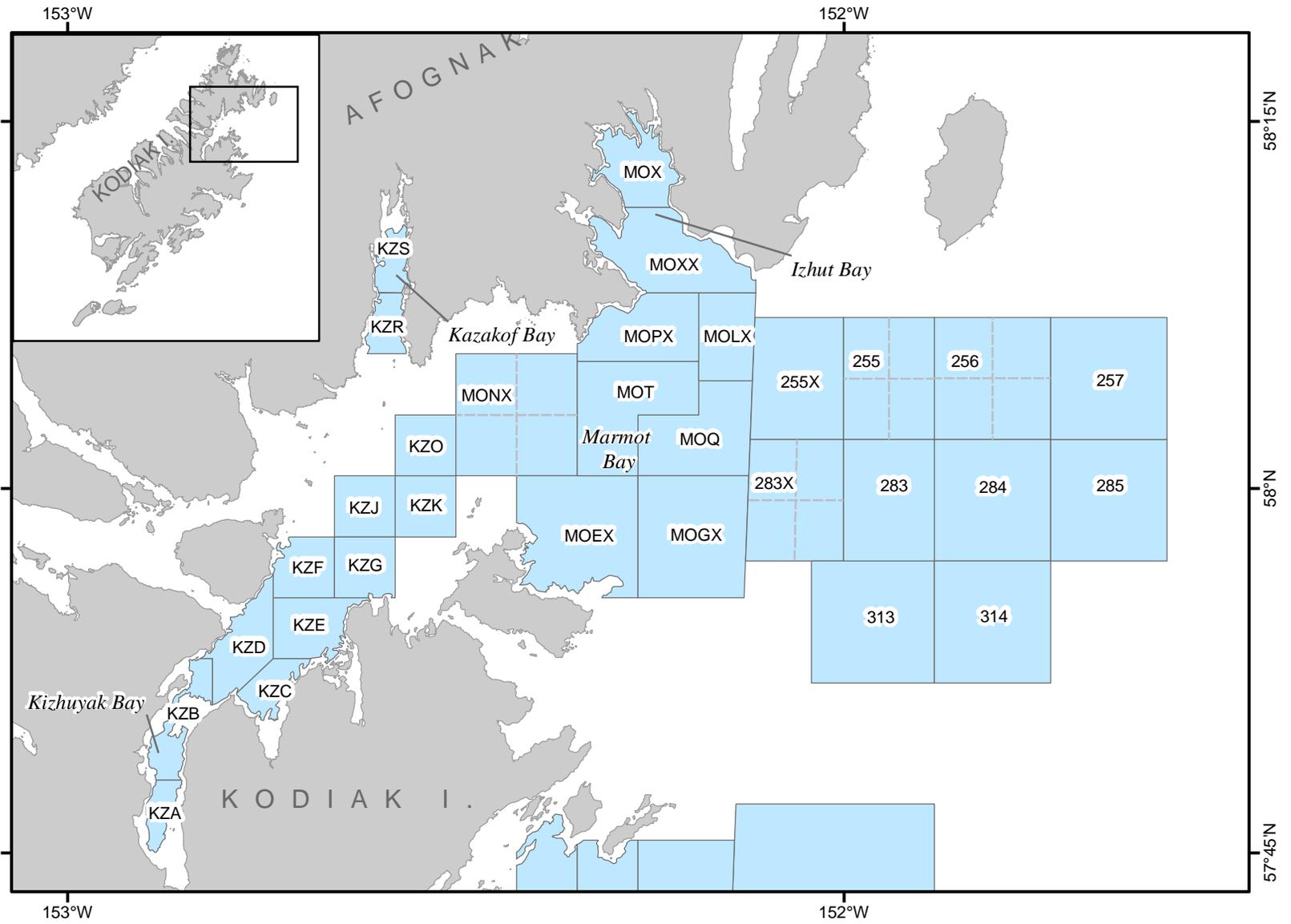


Figure 3.—Basic external skate (top) and shark (bottom) anatomy

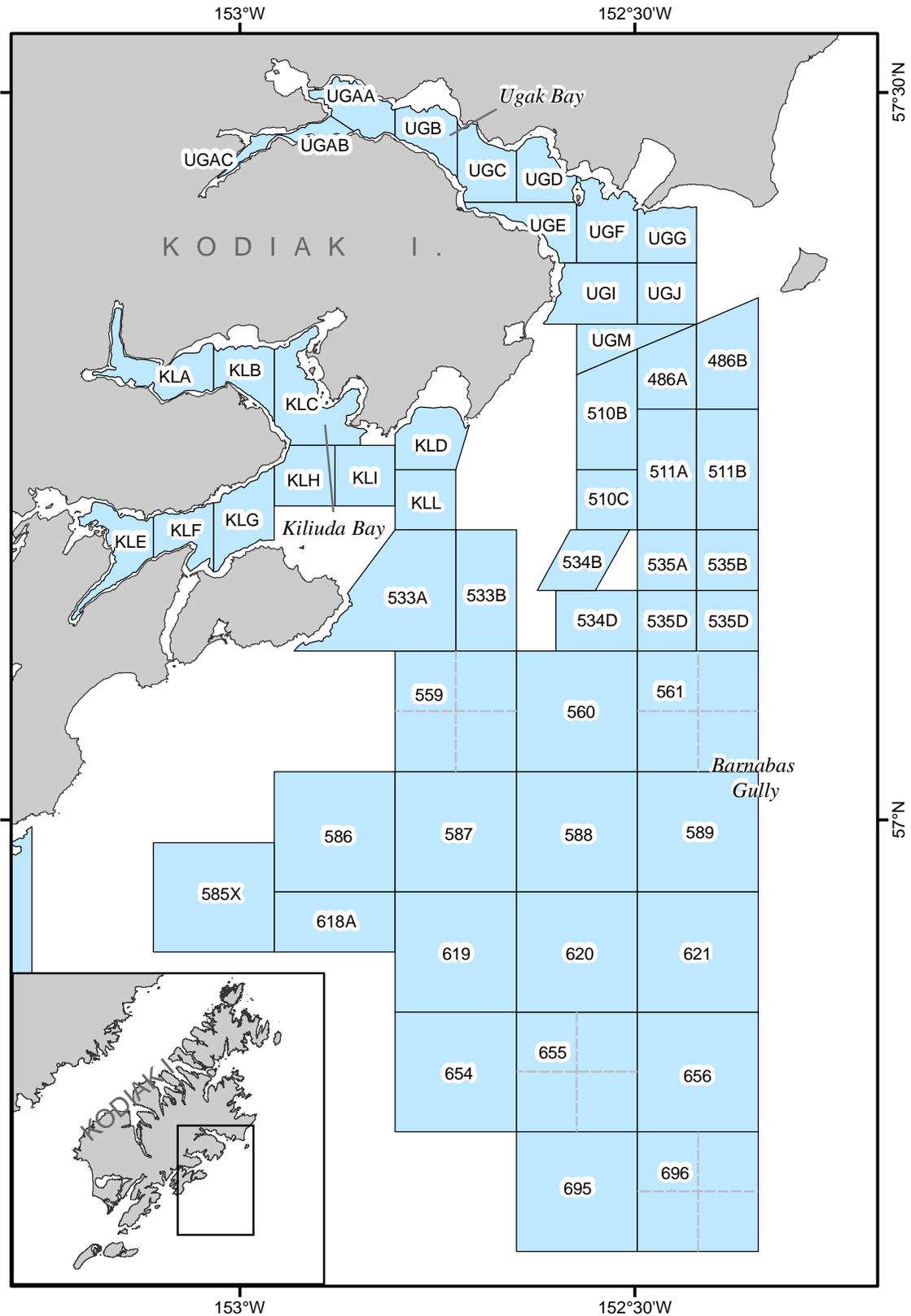
APPENDIX A. TRAWL SURVEY STATION MAPS



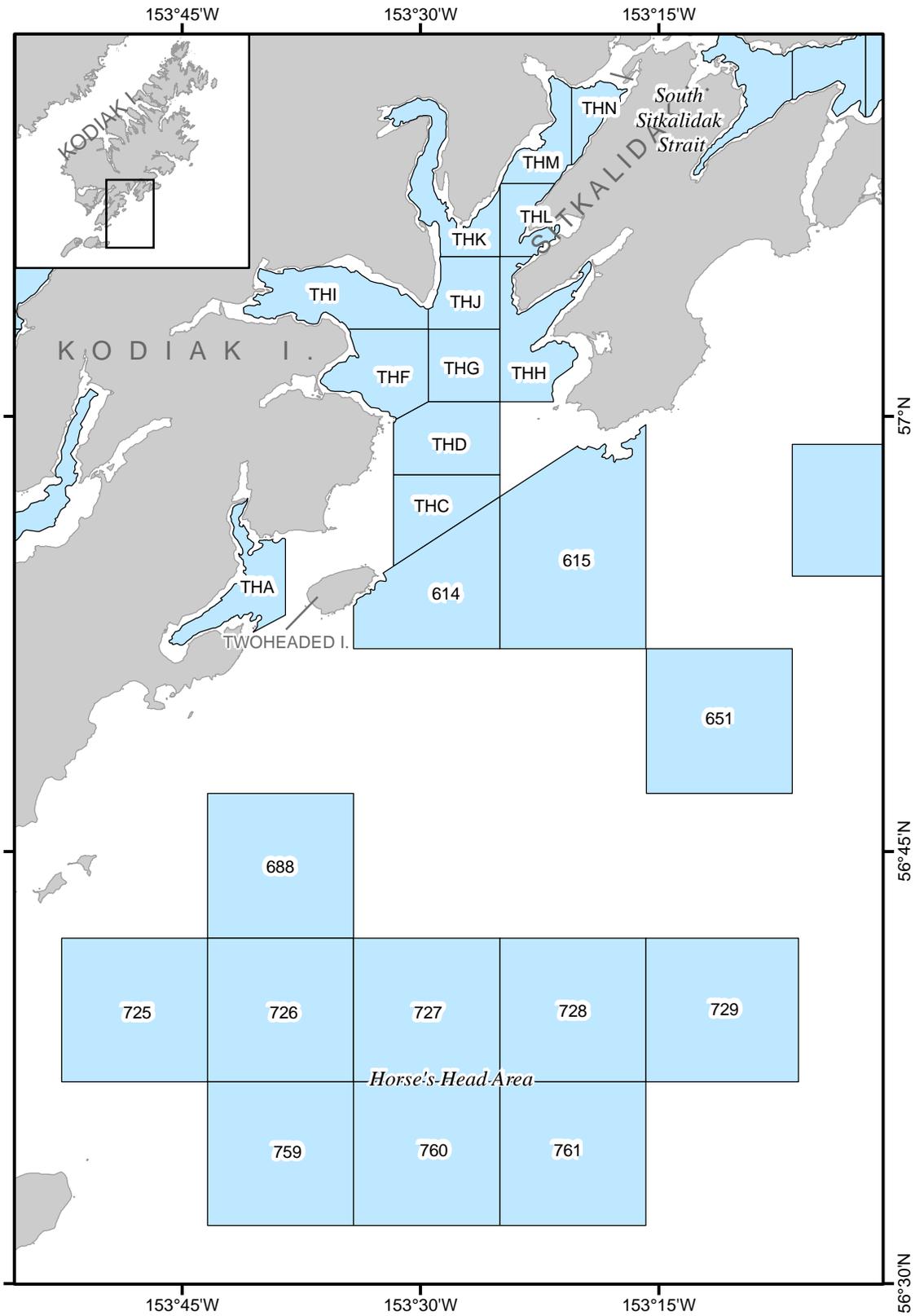
Appendix A1.—Station boundaries and names, Chiniak Bay and Chiniak Gully, 2012 Kodiak District trawl survey.



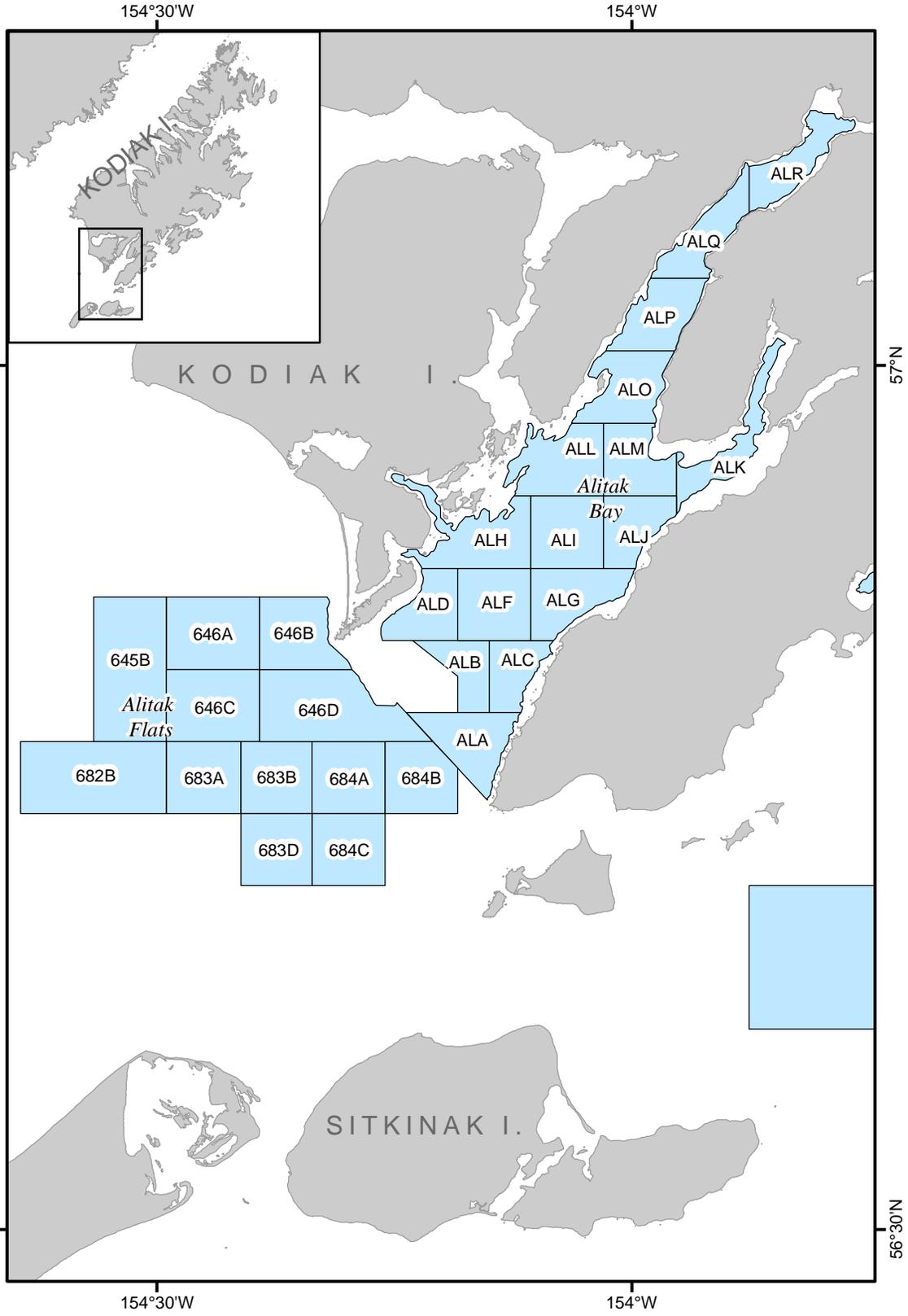
Appendix A2.—Station boundaries and names, Izhut, Kazakof, Kizhuyak, and Marmot bays, 2012 Kodiak District trawl survey.



Appendix A3.—Station boundaries and names, Ugak Bay, Kiliuda Bay, and Barnabas Gully, 2012 Kodiak District trawl survey.



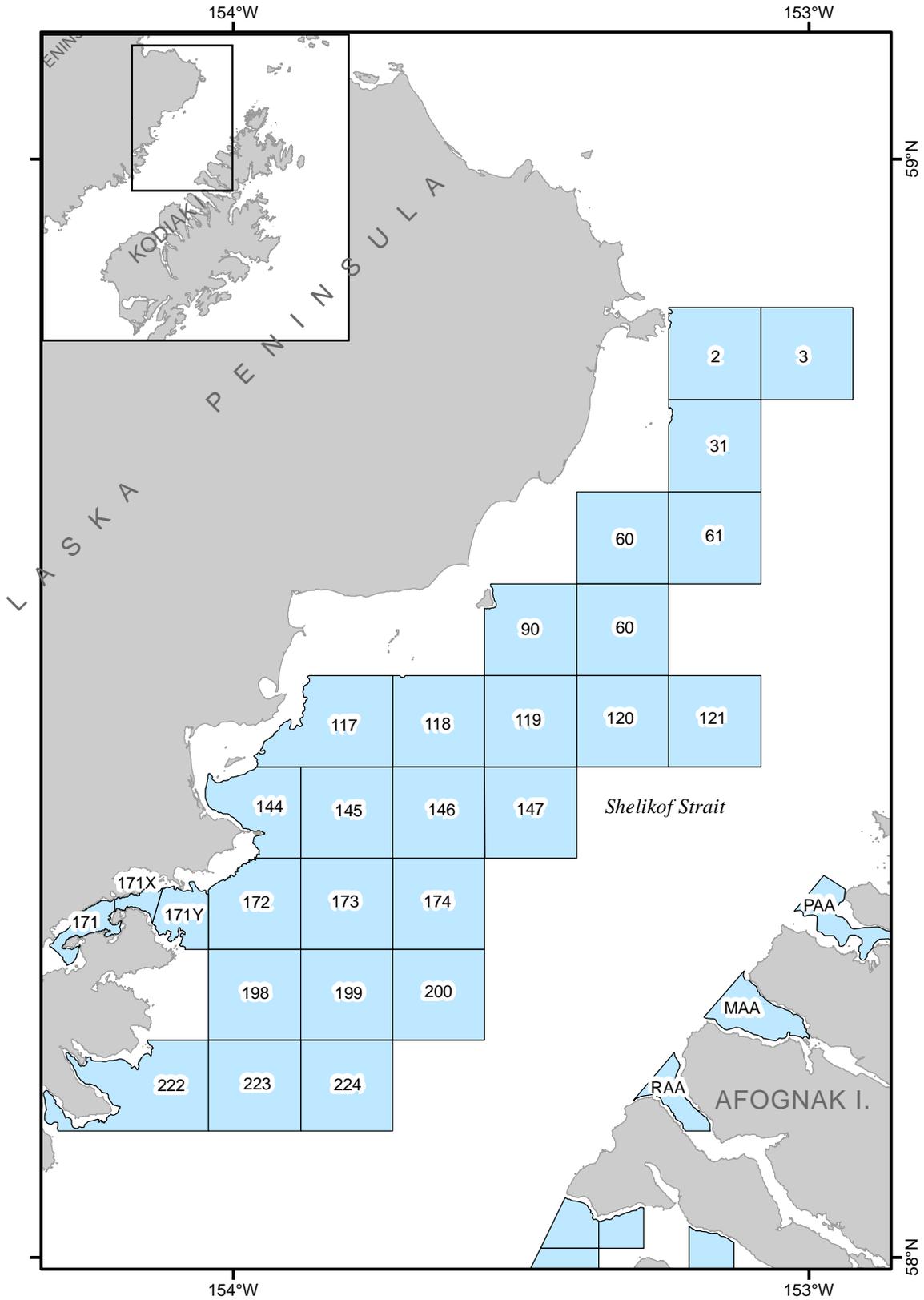
Appendix A4.–Station boundaries and names, South Sitkalidak Strait, Two Headed Island, and Horse's Head area, 2012 Kodiak District trawl survey.



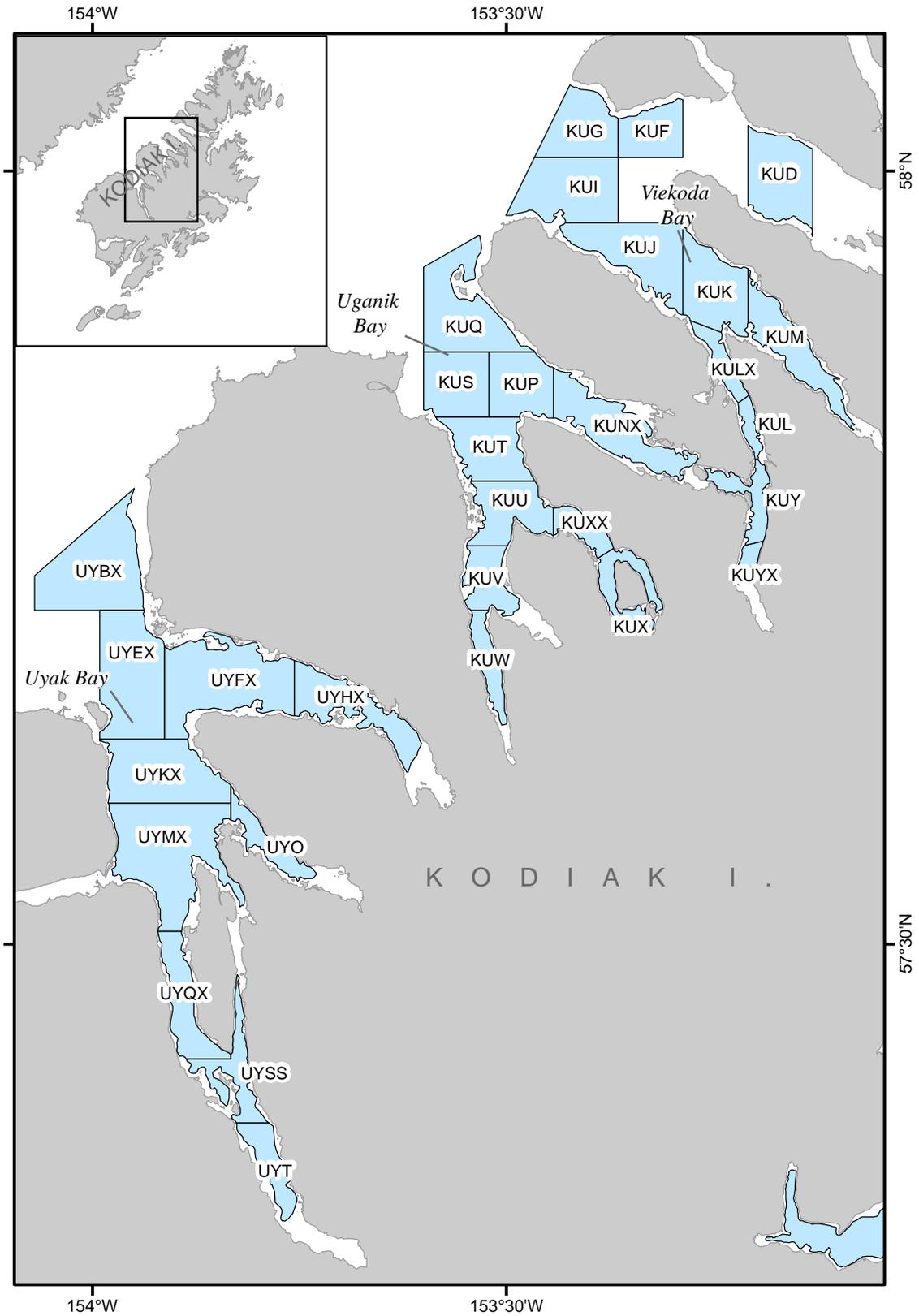
Appendix A5.—Station boundaries and names, Alitak Bay and Alitak Flats, 2012 Kodiak District trawl survey.



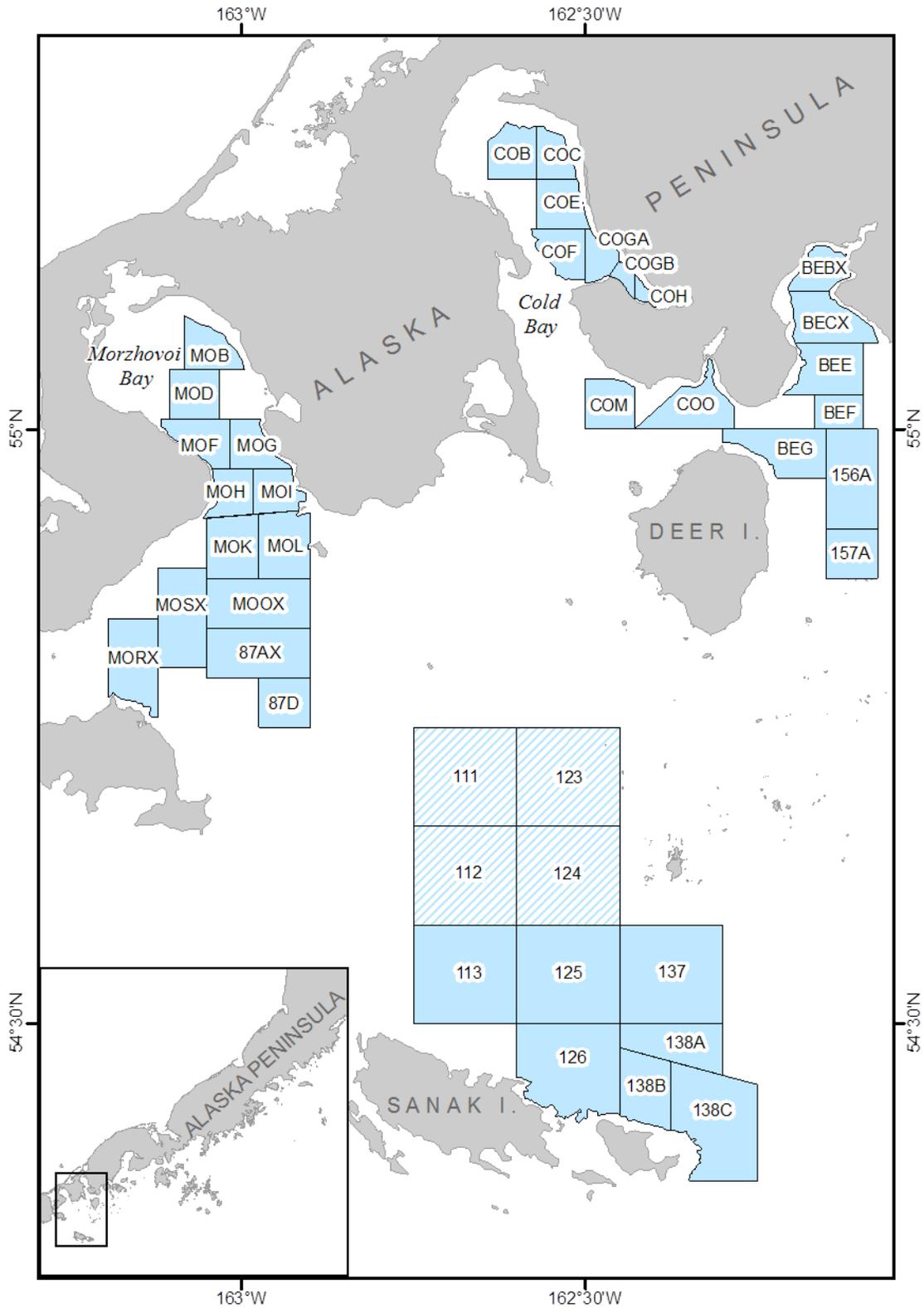
Appendix A6.—Station boundaries and names, Southwest Kodiak offshore, 2012 Kodiak District trawl survey.



Appendix A7.—Station boundaries and names, Shelikof Strait, 2012 Kodiak District trawl survey.

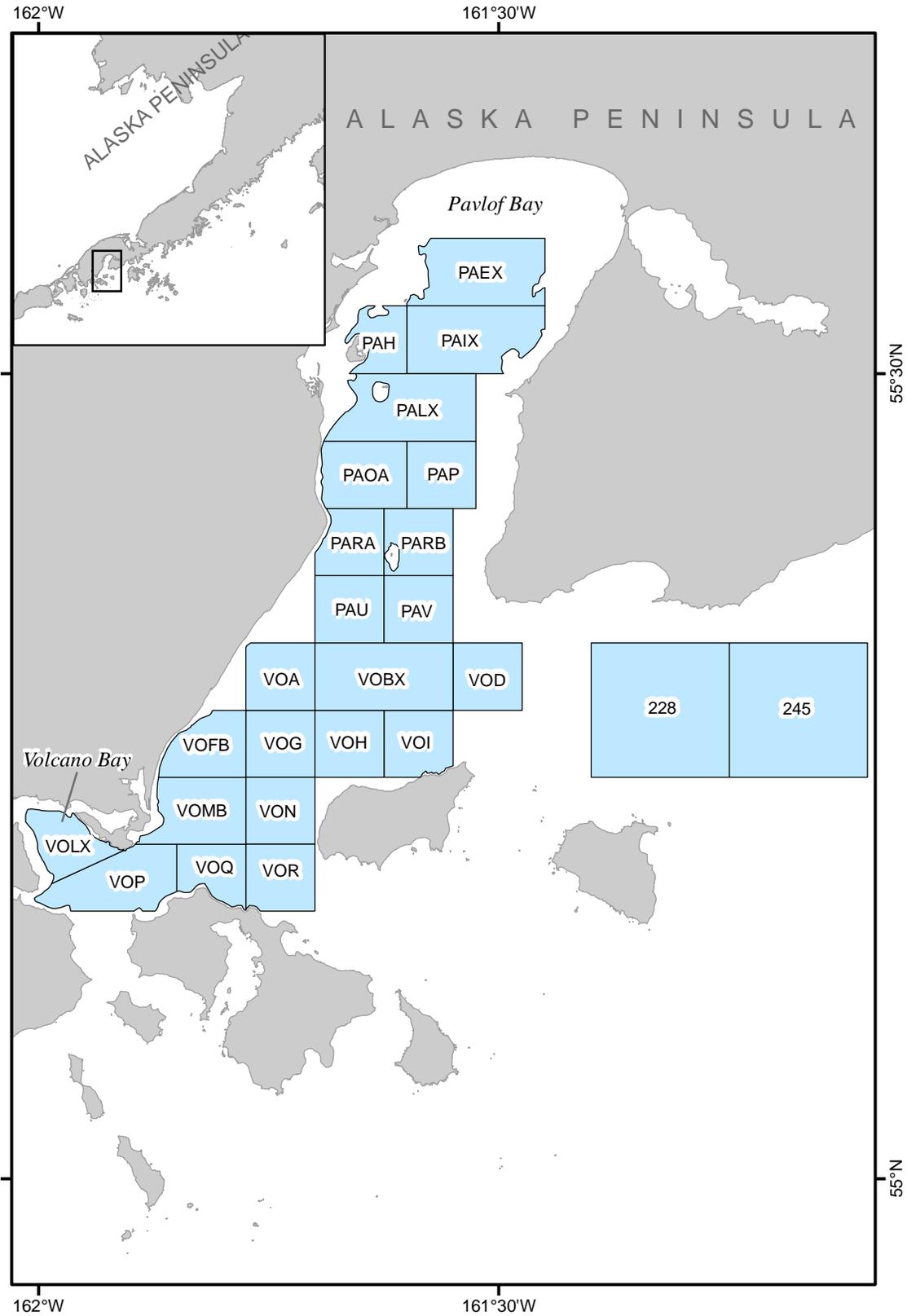


Appendix A8.—Station boundaries and names, Uyak, Uganik, and Viekada bays, 2012 Kodiak District trawl survey.

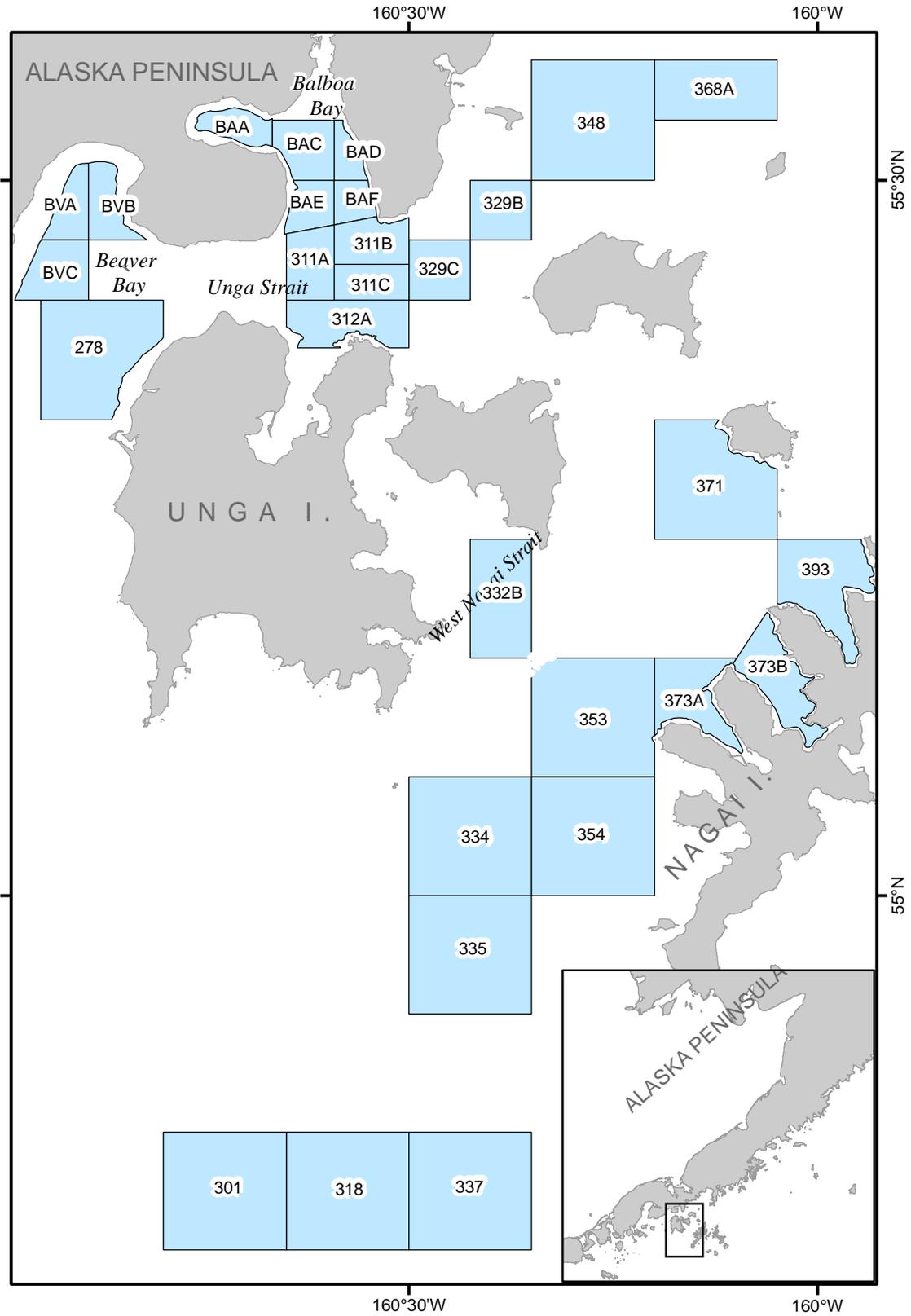


Note: Lightly shaded stations will be surveyed if time allows.

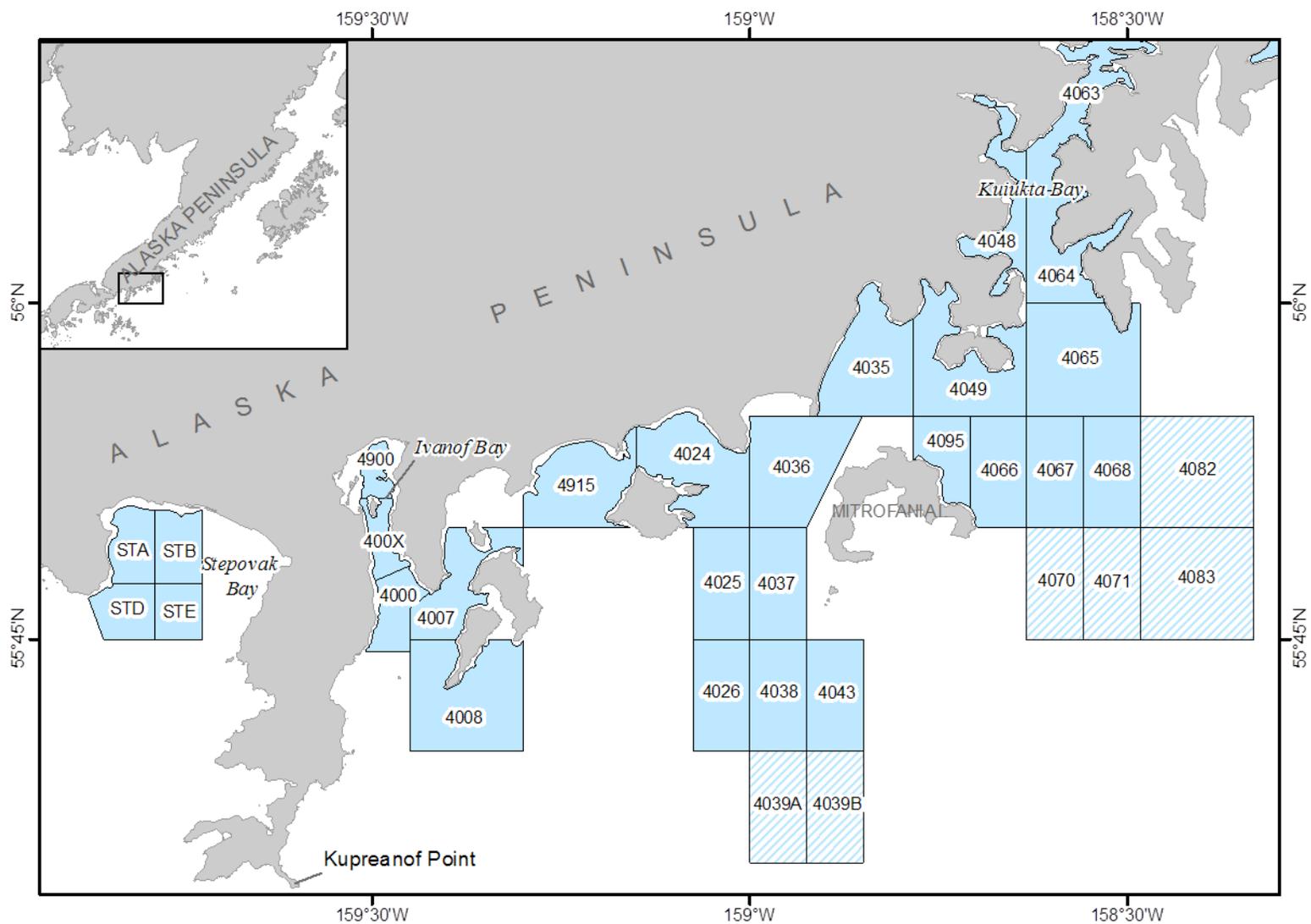
Appendix A9.—Station boundaries and names, Morzhovoi Bay, Cold Bay, Deer Island, and Sanak Island, 2012 South Peninsula District trawl survey.



Appendix A10.—Station boundaries and names, Pavlof and Volcano bays, 2012 South Peninsula District trawl survey.

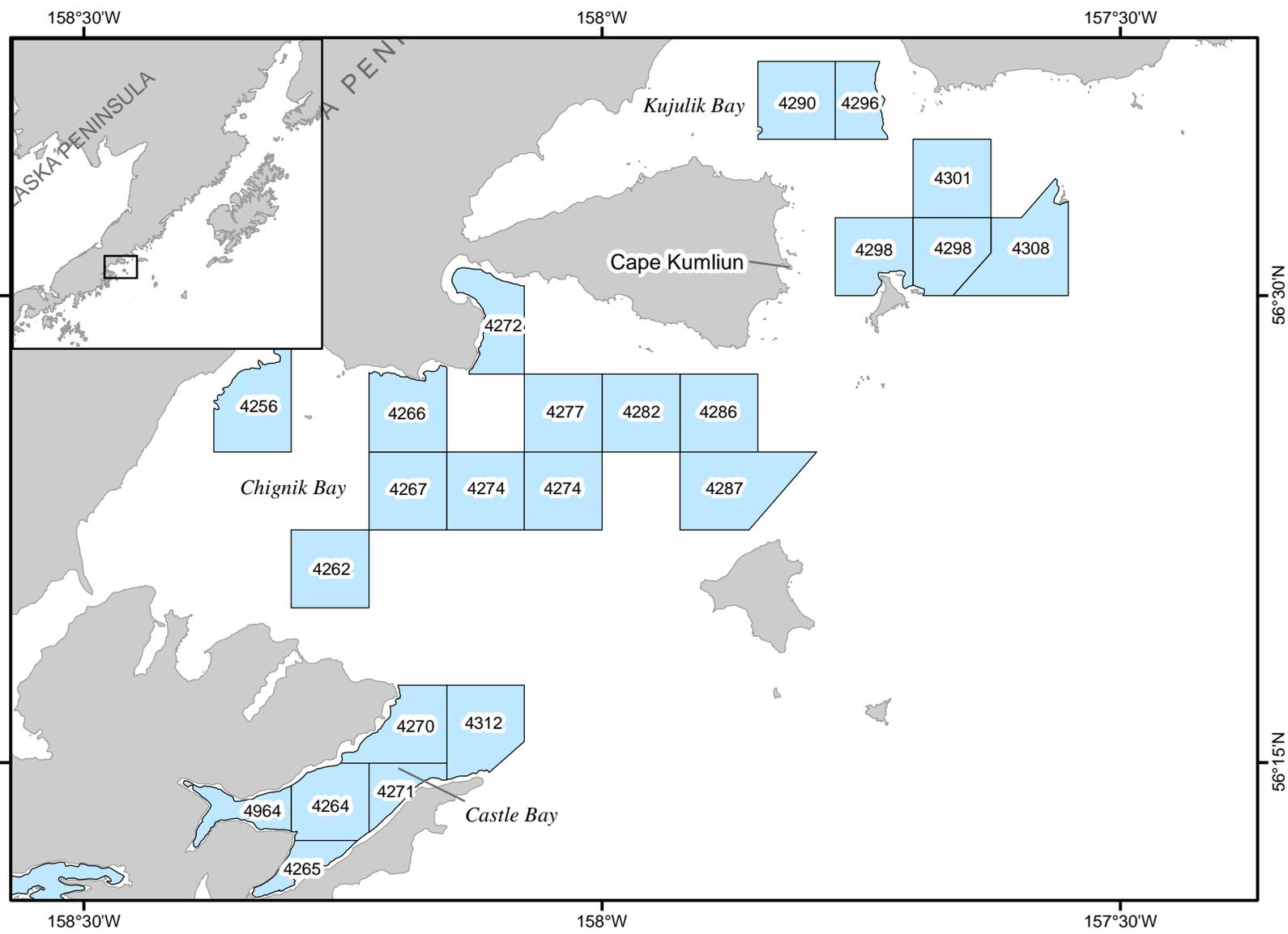


Appendix A11.—Station boundaries and names, Unga Strait, Beaver Bay, Balboa Bay, and West Nagai Strait, 2012 South Peninsula District trawl survey.

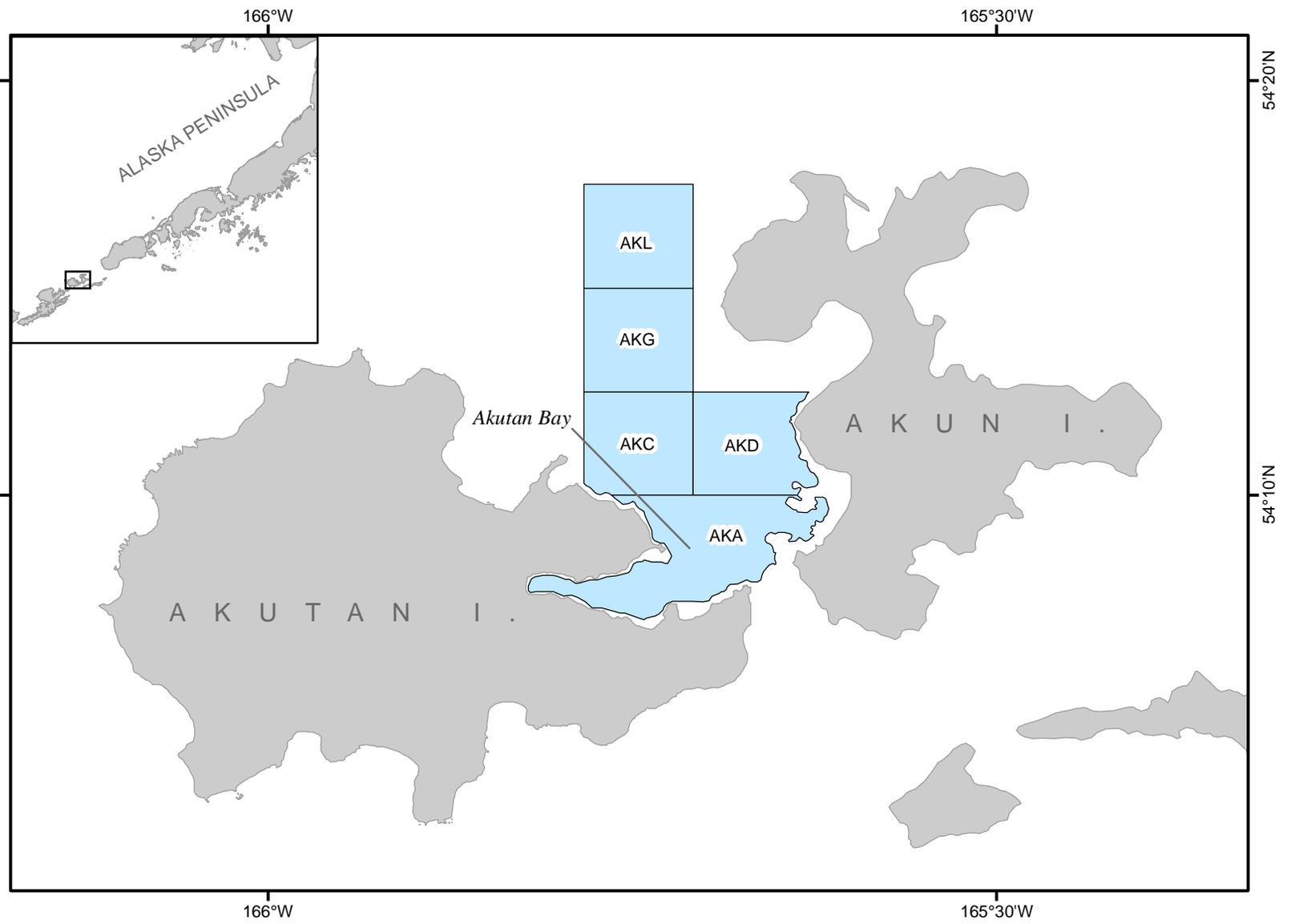


Note: Lightly shaded stations will be surveyed if time allows.

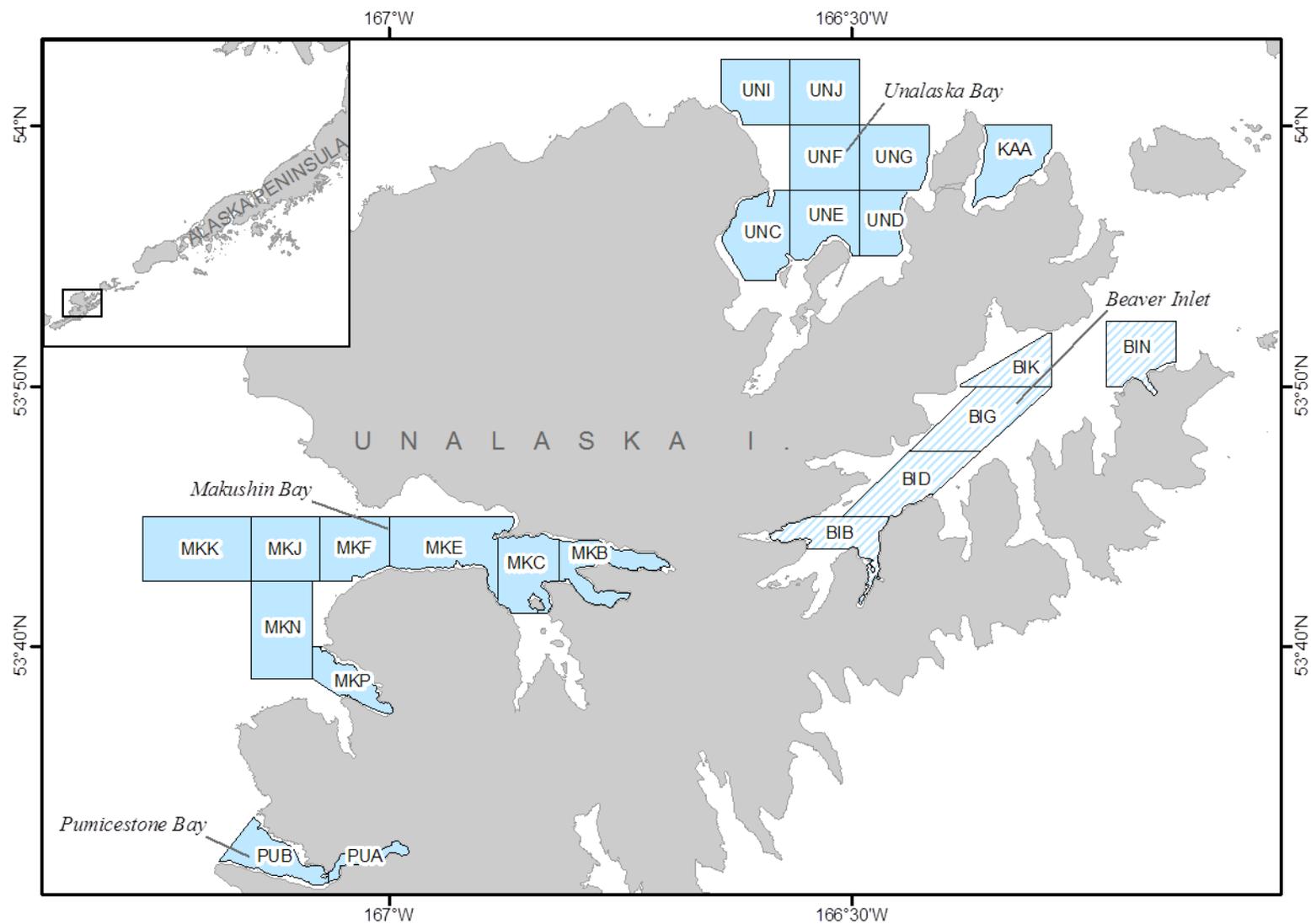
Appendix A12.—Station boundaries and names, Stepovak Bay, Ivanof Bay, Mitrofanial, and Kuiuikta Bay, 2012 South Peninsula and Chignik District trawl survey.



Appendix A13.—Station boundaries and names, Kujulik, Chignik, and Castle bays, 2012 Chignik District trawl survey.



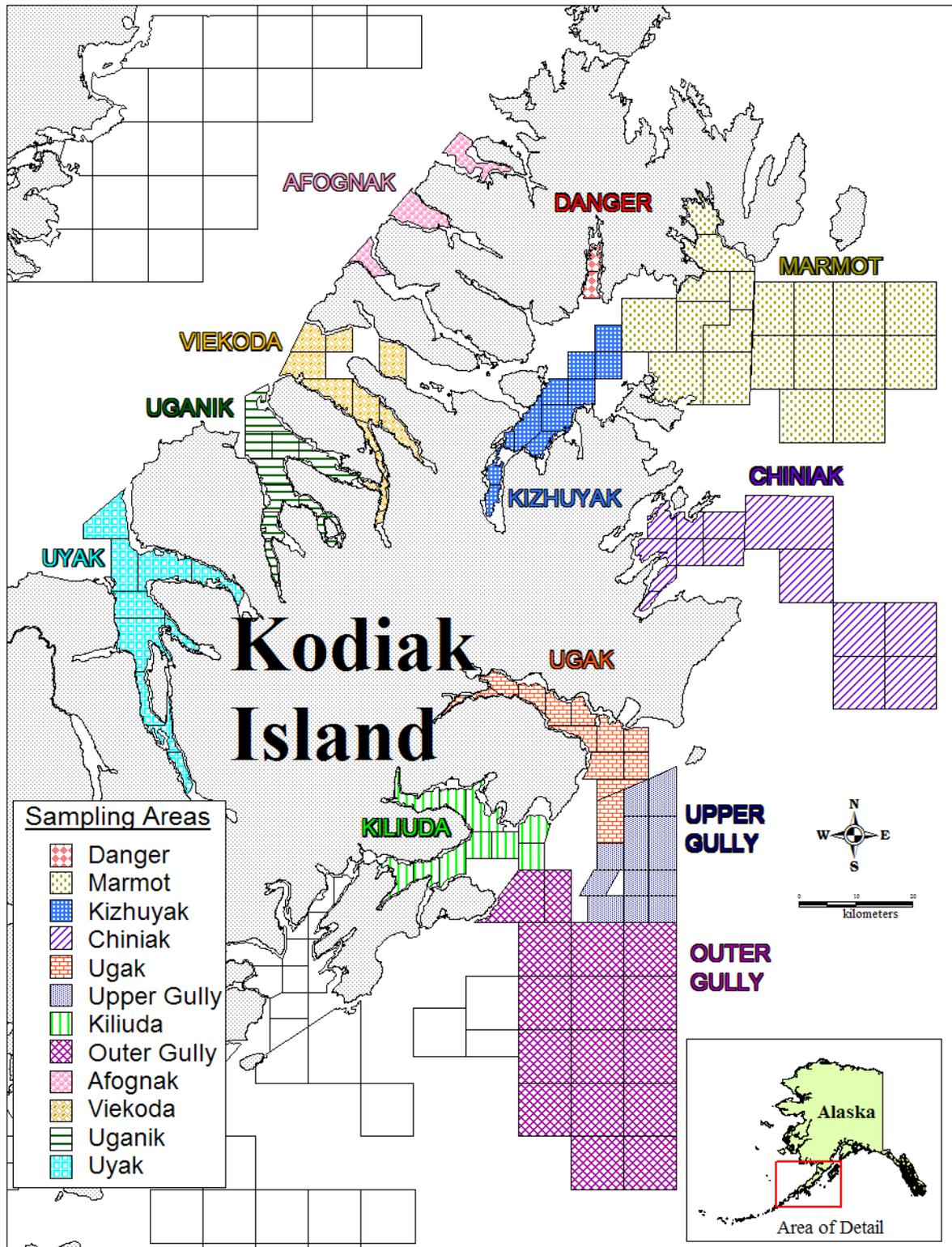
Appendix A14.—Station boundaries and names, Akutan Bay, 2012 Eastern Aleutian District trawl survey.



Note: Lightly shaded stations will be surveyed if time allows.

Appendix A15.—Station boundaries and names, Beaver Inlet, Unalaska, Makushin, and Pumicestone bays, 2012 Eastern Aleutian District trawl survey.

**APPENDIX B. MATURE FEMALE TANNER CRAB
COLLECTION**



Appendix B1.–Sampling areas for mature female Tanner crab collection.

Appendix B2.—Stations to be considered part of each sampling area for mature female Tanner crab collection.

NORTHEAST

Danger Bay:

KZS, KZR

Marmot:

MOX, MOXX, MONX, MOPX, MOLX, MOT, MOQ, MOEX, MOGX, 255X, 255, 256, 257, 283X, 283, 284, 285, 313, 314

Chiniak:

CHA, CHB, CHE, CHJ, CHF, CHK, CHL, CHG, 369X, 395, 420, 421, 443, 444

Kizhuyak:

KZA, KZB, KZC, KZD, KZE, KZF, KZG, KZK, KZJ, KZO

EASTSIDE

Ugak:

UGAC, UGAB, UGAA, UGB, UGC, UGD, UGE, UGF, UGG, UGI, UGJ, UGM, 510B

Upper Gully:

486A, 486B, 510C, 511A, 511B, 534B, 534D, 535A, 535B, 535C, 535D

Kiliuda:

KLA, KLB, KLC, KLD, KLE, KLF, KLG, KLH, KLI, KLL

Outer Gully:

559, 560, 561, 587, 588, 589, 619, 620, 621, 654, 655, 656, 695, 696

WESTSIDE

Uganik:

KUQ, KUS, KUP, KUT, KUNX, KUU, KUXX, KUV, KUW, KUX

Viekoda:

KUD, KUF, KUG, KUI, KUJ, KUK, KUM, KULX, KUL, KUY, KUYX

Uyak:

UYBX, UYEX, UYFX, UYHX, UYKX, UYMX, UYO, UYQX, UYSS, UYT

Afognak:

RAA, MAA, PAA

Appendix B3.–Sample sizes for female Tanner crab collection by sampling area, size groups, and maturity.

Northeast									
Size	Danger Bay		Marmot		Chiniak		Kizhuyak		Total
CW (mm)	Primiparous	Multiparous	Primiparous	Multiparous	Primiparous	Multiparous	Primiparous	Multiparous	
<75	15	15	15	15	15	15	15	15	120
75-89	15	15	15	15	15	15	15	15	120
≥90	15	15	15	15	15	15	15	15	120

360

Eastside									
Size	Ugak Bay		Upper Gully		Kiliuda Bay		Outer Gully		Total
CW (mm)	Primiparous	Multiparous	Primiparous	Multiparous	Primiparous	Multiparous	Primiparous	Multiparous	
<75	15	15	15	15	15	15	15	15	120
75-89	15	15	15	15	15	15	15	15	120
≥90	15	15	15	15	15	15	15	15	120

360

Westside									
Size	Uganik		Viekoda		Uyak		Afognak		Total
CW (mm)	Primiparous	Multiparous	Primiparous	Multiparous	Primiparous	Multiparous	Primiparous	Multiparous	
<75	15	15	15	15	15	15	15	15	120
75-89	15	15	15	15	15	15	15	15	120
≥90	15	15	15	15	15	15	15	15	120

360

Note: Primiparous = new shell, first clutch; Multiparous = old/very old shell, has had previous clutch(es).

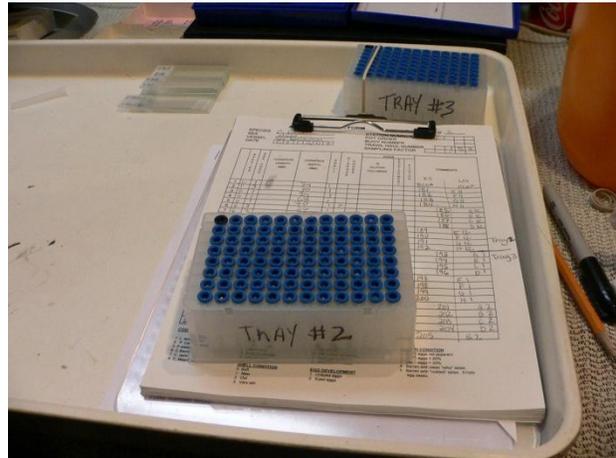
CW = Carapace width

**APPENDIX C. TANNER CRAB HEMOLYMPH
COLLECTION: PROTOCOL FOR GENETIC SAMPLING**

Appendix C1.–Tanner crab hemolymph collection protocol for genetic samples.

Preparation

1. **6 well plates will be needed for hemolymph sample collection from 480 crabs in Alitak Bay.**
2. **Pre-fill each well with 0.8 ml of biotechnology grade ethanol**
3. **Press the rubber caps onto each filled well**
4. **Label the plates consecutively and color code the top left corner - well A1 (with all trays oriented the same way) to denote the starting position**
 - a. The plates are labeled across the top with numbers and down one side with letters.
 - b. Color the caps of cells B10, D3, and F8 a distinctive color. These cells should NOT be filled with a sample and will be used as controls in the laboratory.
 - c. Remaining cells should be filled from left to right, starting with A1.
5. **Wrap a rubber band around the plate to move down one row at a time as you fill wells with samples**
6. **Completely fill out all applicable header information on the ADF&G Bitter Crab Sample Data Form (Appendix B2).**
 - a. Instructions on filling out the form can be found on page 2 of Appendix D1.



Sample Collection

The same 30 crabs used to make hemolymph smears for visual bitter crab disease determination (Spalinger and Cavin 2004) will be used for genetic sampling and the methods used to collect hemolymph are the same.

1. **Arrange crab on table in way to facilitate sampling and reduce error.**
 - a. Typically I will set up 5 crab at a time. It is easier to keep track of and a handy multiple of 30.
 - b. If you place the crabs carapace up, with their mouths facing right, it will expose the preferred sampling leg, the right cheliped.
 - c. Wipe the joint membrane clean with a paper towel so extraneous material does not contaminate the sample.
2. **Using a new syringe freshly out of its wrapper for each crab, draw hemolymph from the elbow joint of the right cheliped.**



- a. Slightly raise stopper on syringe before inserting needle.
- b. Being careful not to puncture yourself insert needle into joint, about halfway, or far enough to ensure angled hole in needle is inside crab tissue.
- c. Raise stopper just until you see semi-clear fluid being drawn into syringe. If you can see it, you have enough. If the crab is heavily infested with BCS it may be more difficult to draw hemolymph.
- d. Small crabs may be more difficult. You may have to try drawing blood from a different leg, particularly if the preferred leg is injured.

-continued-

3. **Make a blood smear on a slide for visual examination in the laboratory (Spalinger and Cavin 2004).**
 - a. This smear only requires a drop or two of hemolymph, so enough should remain in the syringe for genetic sampling purposes.
 - b. It is important to finish the blood smear before inserting the needle into the well containing ethanol, as ethanol remaining on the tip of the needle could dilute the hemolymph resulting in an inadequate amount of cells for visual examination.
 4. **With the syringe, inject 0.2 ml of hemolymph into each well** (one well per crab)
 - a. Fill wells from left to right, then top to bottom, like reading a book.
 - b. If you inject too much hemolymph, or a lot of air, the cap may pop off the well and spray hemolymph/ethanol over adjacent caps.
 - c. To mix the blood and ethanol, invert the plate once in a while
 5. **Complete the information on the ADF&G crab data form.**
 - a. Instructions on filling out the form can be found on page 2 of Appendix D1.
 6. **After verifying that all information has been recorded and that the correct sample number and PCR well number is written you can discard the crab.**
 - a. Always check with the on-deck leader before discarding crab over the side. Weights and sizes still need to be accounted for in the haul composition data.
 7. **At the end of haul composition sampling coordinate with the on-deck leader to determine how data from crab sampled for BCS will be handled.**
 - a. If all crab in the haul were measured and counted (whole-hauled), then enter the data from the BCS sample forms into the crab database.
 1. The easiest way to do this is to use the on-deck computer.
 - b. If crab were subsampled, the weight from the BCS sample should be removed from the on-deck form, and only those crab actually in the subsample should be included in the crab database.
 - c. If other sampling methods were used (i.e. %m/f) it is the cruise leaders responsibility to ensure that the crab being sampled for BCS are properly accounted for.
-

APPENDIX D. DATA FORMS

ADF&G BITTER CRAB SAMPLE DATA FORM

SPECIES STATION NUMBER _____
 VESSEL _____ TRAWL HAUL NUMBER _____
 DATE - - SURVEY NUMBER _____ Page _____ of _____

1	SEX CODE	LEGAL CODE	FEMALE MATURITY	CARAPACE SIZE (MM)	SHELL	DISEASE	CLUTCH			BCS SLIDE NO. <small>SAMPLER INITIALS</small>	PCR WELL NO. <small>SAMPLER INITIALS</small>	PCR TRAY NO.	COMMENTS	BCS SLIDE RESULT <small>LAB USE</small>
							FULL-NESS	CONDITION	EGG DEVELOPMENT					
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
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17														
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26														
27														
28														
29														
30														

SPECIES	FEMALE MATURITY	DISEASE CODE	CLUTCH FULLNESS	CLUTCH CONDITION
2. <i>P. CAMTSCHATICUS</i>	1. Juvenile Female	1. Parasitic barnacle	0. empty	1. Dead Eggs Not Apparent
6. <i>C. BAIRDI</i>	2. Adult Female	2. Nemertean worms	1. trace to 1/8	2. Dead Eggs < 20%
9. <i>C. MAGISTER</i>	SHELL CONDITION	3. Bitter crab	2. 1/8 to 1/4	3. Dead Eggs > 20%
SEX CODE	1. Soft	5. Black Mat	3. 1/4 to 1/2	4. Barren with Clean "Silky" Setae
1. Male	2. New	EGG DEVELOPMENT	4. 1/2 to 3/4	5. Barren with "Matted" setae
2. Female	3. Old	1. Uneyed eggs	5. 3/4 to full	empty Egg Cases
LEGAL CODE	4. Very Old	2. Eyed eggs		6. Barren with no visible setae
0. Sublegal Male		3. Hatching-eyed eggs and empty egg cases		
2. Legal Male (returned to water after sampling)				

Check here when crab data has been entered into crab database

-continued-

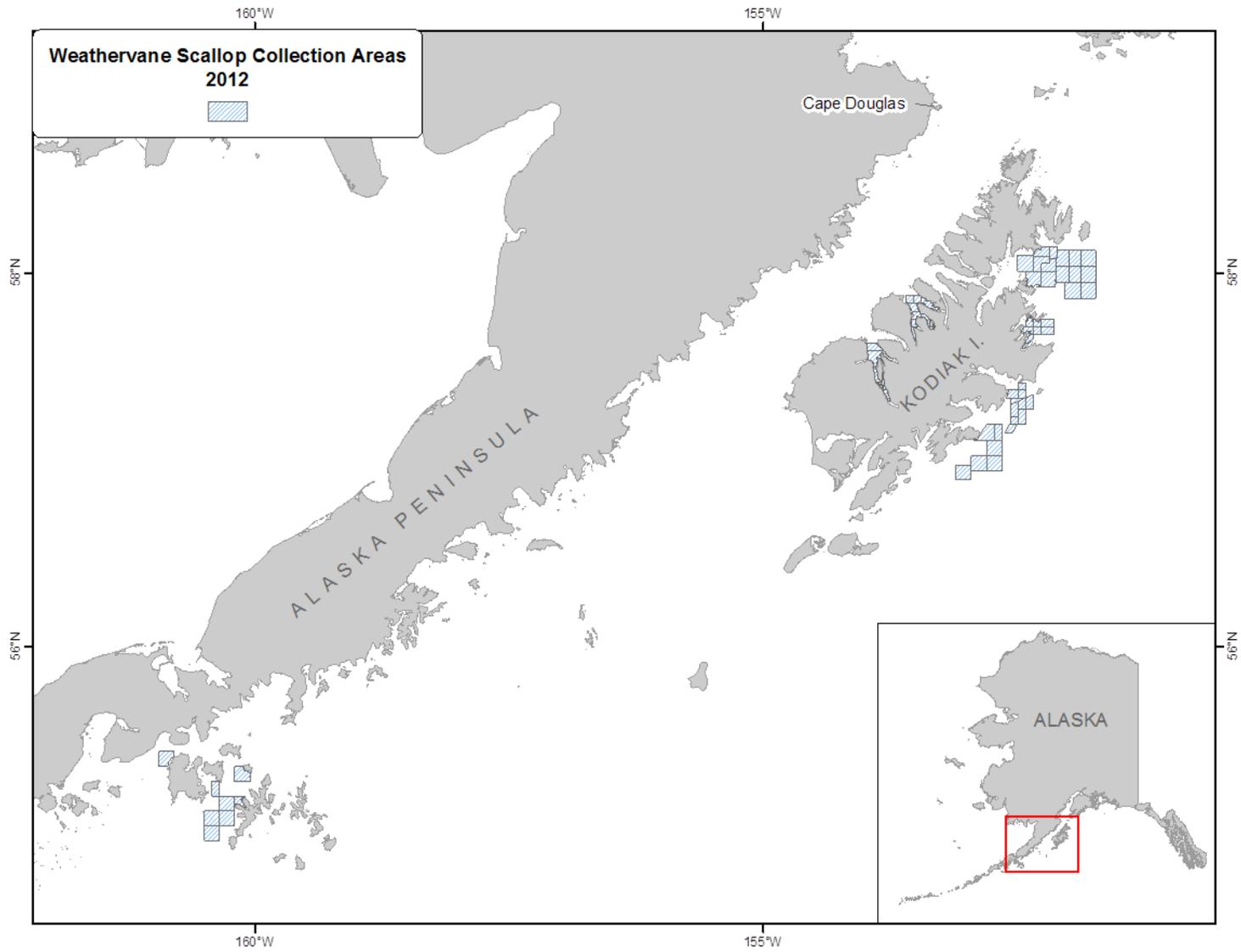
ADF&G Bitter crab sample data form

Species	Use the numeric codes from the bottom of the form, and write in the common name of the crab species being sampled.
Vessel	Name of vessel samples were collected from.
Date	Month, day, and year.
Station number	The name of the station the crabs are from. (May be completed later using haul number)
Trawl haul number	Fill in the tow number where the crabs were captured.
Survey number	The 2012 large-mesh survey is number “1201”
Page ___ of ___	If multiple pages required for samples from the location, note here.
Sex code	Use codes from bottom of form
Legal code	Males only Use codes from bottom of form If the crab is legal and retained (fishery, sample collection, etc. use code 1)
Fem(ale) Maturity	Females only Use codes from bottom of form
Carapace Size	Distance across the carapace between spines, in mm, for Tanner and Dungeness. Distance from right eye socket to the middle of the posterior margin of the carapace for king crab.
Shell (condition)	Use codes from bottom of form
Disease	Use codes from bottom of form Note additional diseases or parasites in the comments
Clutch fullness	Use codes from bottom of form
Clutch condition	Use codes from bottom of form
Egg development	Use codes from bottom of form
BCS slide number	The sequential number of the slide with the hemolymph smear. Include the initials of the sampler making the smear
PCR well number	The location of the well containing the hemolymph sample for genetic testing (i.e. A1, B1, etc.) Include the initials of the sampler depositing the sample into the wells.
PCR tray number	The sequential number of the PCR tray that the sample is in.
Comments	Sampling notes or items of interest (diseases/parasites)
BCS slide result	Leave blank in the field. To be used when examining the slide under a microscope.
Check box at bottom	This circle should be checked after the data have been transferred to the main database.

Specimen collection form <i>R/V Resolution</i>		
Species (suspected):		
Date:		
Haul Number:		
General Location:		
Collector:		
Photo Taken?	yes	no
file location:		
Reason for collection:	<input type="checkbox"/>	Confirm ID
	<input type="checkbox"/>	Special Project
	<input type="checkbox"/>	Guide Inclusion
	other (specify) _____	

Species (suspected)	Name of organism(s) being collected, or the best guess if unknown
Date	Month, day, and year
Haul Number	The tow number where the organism(s) were captured
General Location	Name of bay, gully, or area where tow occurred
Collector	Name of person collecting the organism(s)
Photo Taken?	Circle “yes” or “no”. If “yes” then record the location the picture file will be saved.
Reason for collection	Check the appropriate box, or complete the “other” line. If collecting for a special project, include a project description.

APPENDIX E. WEATHERVANE SCALLOP COLLECTION



Appendix E1.—Sampling areas for weathervane scallop collection.

NORTHEAST

Chiniak:

CHA, CHB, CHE, CHJ, CHK, CHF, CHL, CHG

Marmot:

MONX, MOPX, MOLX, MOT, MOQ, MOEX, MOGX, 255X, 255, 256, 283X, 283, 284, 313, 314

EASTSIDE

Ugak:

UGG, UGI, UGJ, UGM, 510B

Upper Gully:

486A, 486B, 510C, 511A, 534B, 533A, 533B

Outer Gully:

559, 586, 587, 585X

WESTSIDE

Uganik:

KUS, KUP, KUT, KUNX, KUU, KUXX, KUV, KUW, KUX

Uyak:

UYKX, UYMX, UYO, UYQX, UYSS, UYT

SHUMAGIN ISLANDS:

278, 332B, 371, 353, 373A, 334, 354, 335

**APPENDIX F. GROUND FISH STOMACH SAMPLING
PROTOCOL**

Appendix F1.–Number of stomachs, by species and size groups (cm), to be collected in the 2012 Chiniak and Marmot bays survey.

Species	Number	Species	Number
Walleye pollock		Arrowtooth flounder	
< 30 cm	20	< 30 cm	40
30-44	20	30-49	40
45-54	40	≥ 50	40
≥ 55	40	total	120
total	120		
Pacific cod		Pacific halibut	
< 30 cm	20	< 40 cm	15
30-44	20	40-54	15
45-59	40	55-69	30
≥ 60	40	≥ 70	30
total	120	total	90
Flathead sole		Northern rock sole	
< 20 cm	20	< 20 cm	20
20-39	20	20-39	20
≥ 40	20	≥ 40	20
total	60	total	60
Spiny dogfish			
< 40 cm	20		
40-79	20		
≥ 80	20		
total	60		

Appendix F2.–2012 Chiniak and Marmot bays groundfish stomach sampling protocol.

At every tow, after the catch has been dumped in the bin and the major species in the catch are evident, choose two to three species from Appendix E1 which are abundant enough for stomach sampling purposes (about one full basket). With the concurrence of the sorting crew, designate which specimens are to be set aside for stomach dissection after the baskets have been weighed. Set the baskets in a cool, shaded area until the rest of the catch has been processed.

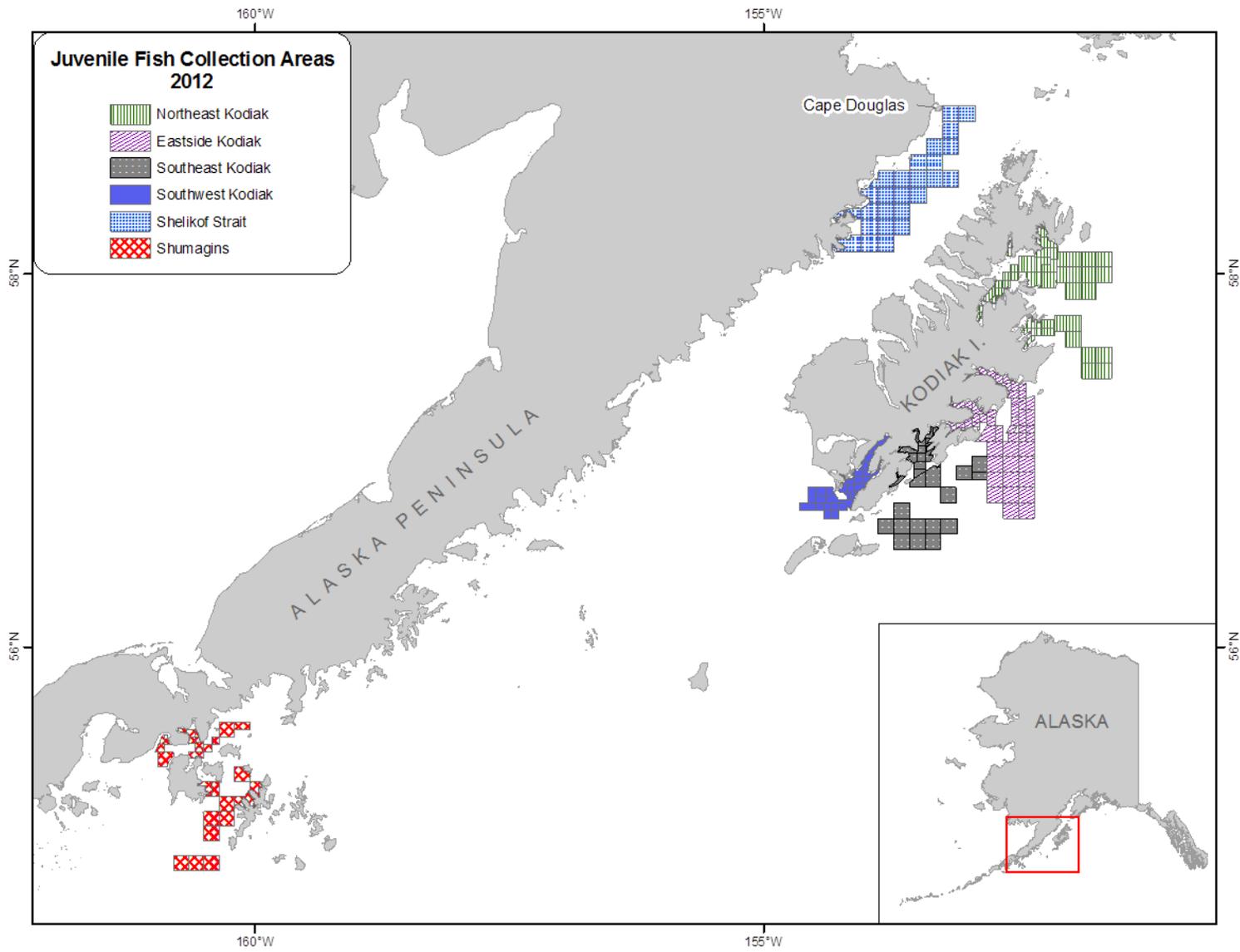
Sampling procedures:

- (1) Collect fish that show **no** sign of either net feeding or regurgitation.
*Signs of net feeding and regurgitation (DO NOT KEEP THESE):
 - prey items in mouth or gill rakers
 - flaccid (loose and bloated) looking stomach*Signs of "natural" stomachs (KEEP THESE!):
 - naturally empty stomachs appear tight and contracted
 - stomachs appear tight around any prey inside
- (2) If the fish is determined to be collectable, measure the fork length, determine the sex and spawning condition, excise the stomach and place in a stomach bag with a label. Try to collect 5 specimens from each size group (e.g. collect 5 stomachs from each of the <30 cm, 30-44 cm, 45-54 cm, and ≥55 cm pollock) in one haul. For small fish (≤20 cm), do not excise the stomach but instead make a slit in the body cavity to allow penetration of Formalin to the gut. Place the samples of whole fish in a large stomach bag with a label. Submerge samples in a bucket of 10% buffered Formalin. To make the Formalin solution, fill a 5-gallon bucket about half full with sea water, then add one liter 37% Formalin to the bucket. Add one rounded 1/8 cup of baking soda per bucket.
- (3) Each stomach bag should contain a specimen label which records the species, vessel, cruise, tow, specimen number, the fork length of the fish, sex, and the spawning condition (spawning=1 or not spawning=0).
- (4) For each species, start specimen number at "1" and assign a number consecutively until the end of the cruise.
- (5) A specimen form is also filled out for each species in each haul. The specimen form should record the species, vessel, cruise, tow, fork length, sex, spawning condition (spawning or non-spawning), date, and specimen number (individual fish weight does not have to be taken).
- (6) Use the broken lids to cover the bucket each time you add some stomach collections into it. Seal the bucket (by using the unbroken lid) only when the bucket is full or at the end of the cruise.
- (7) Put different species collections in different buckets. Use the permanent mark pen to write the species name, vessel, the address (National Marine Fisheries Service, Food Habits Lab, Bldg. 4, 7600 Sand Point Way NE, Seattle, WA 98115-0070) on the unbroken lid each time you seal a bucket.
- (8) When the cruise is over, please double-check that the lids are completely labeled and add a luggage tag to the bucket handle. The luggage tag should indicate '2010, Marmot Bay, pollock (species), Resolution (boat), and your name'.
- (9) Collect at least 20 stomachs per haul, and you can reach the goal.

End of the Cruise:

At the end of the cruise, the buckets (along with the specimen forms) and the remaining equipment should be taken off the vessel and delivered to NMFS, Kodiak Laboratory in Kodiak. Please inform Mei-Sun Yang or Geoff Lang and they will make arrangements to ship them to Seattle.

APPENDIX G. JUVENILE FISH COLLECTION



Appendix G1.—Juvenile fish sampling areas, 2012.

Appendix G2.—Number of juvenile fish, by species and size groups (cm), to be collected in the 2012 survey around Kodiak and Shumagin islands.

Species	Number	Species	Number
Walleye pollock		Arrowtooth flounder	
30-130 mm	100	20-160 mm	100
131-300	100	161-300	100
subtotal	200	subtotal	200
Sablefish		Rockfish (All)	
100-200 mm	100	40-130 mm	100
201-350	100	131-300	100
subtotal	200	subtotal	200
Pacific cod			
40-120 mm	100		
121-350	100		
subtotal	200		
Total	1,000		

PROJECT OVERVIEW

Project Title: Surviving the Gauntlet: A comparative study of the pelagic, demersal, and spatial linkages that determine groundfish recruitment and diversity in the Gulf of Alaska ecosystem

Principle Investigator (PI)/Point of Contact: Jamal Moss

Division: Auke Bay Laboratories

Email: jamal.moss@noaa.gov

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General Description: The overall goal of our proposed research focuses on identifying and quantifying the major ecosystem processes that regulate recruitment strength of key groundfish species in the Gulf of Alaska (GOA). We concentrate on a functional group of five predatory fish species that are commercially important and account for most of the predatory fish biomass in the GOA. Taken together they encompass a range of life history strategies and geographic distributions that provide contrast to explore regional ecosystem processes. We focus on recruitment success because large swings in the abundance of these species have occurred despite precautionary fishing levels. Their early life begins with an offshore pelagic phase followed by a nearshore settlement phase. Spatial distribution, food preference, and habitat suitability of these two life history phases are poorly known. Fieldwork will define a critical environmental window for these five focal species by examining the gauntlet they endure while crossing from offshore spawning to nearshore settlement areas. We will contrast two regions: the central GOA with a broad shelf dominated by high oceanographic variability and large demersal fish biomass and the eastern GOA with a narrower shelf, lower demersal biomass, and higher species diversity. Retrospective data analysis combined with environmental covariates and multispecies stock assessment models will determine the relative influence of environmental parameters and identify processes influencing recruitment. Regional differences will be linked to dietary preference of top level predators to infer causal mechanisms for population trends and influence of climate change on ecosystem structure and diversity.

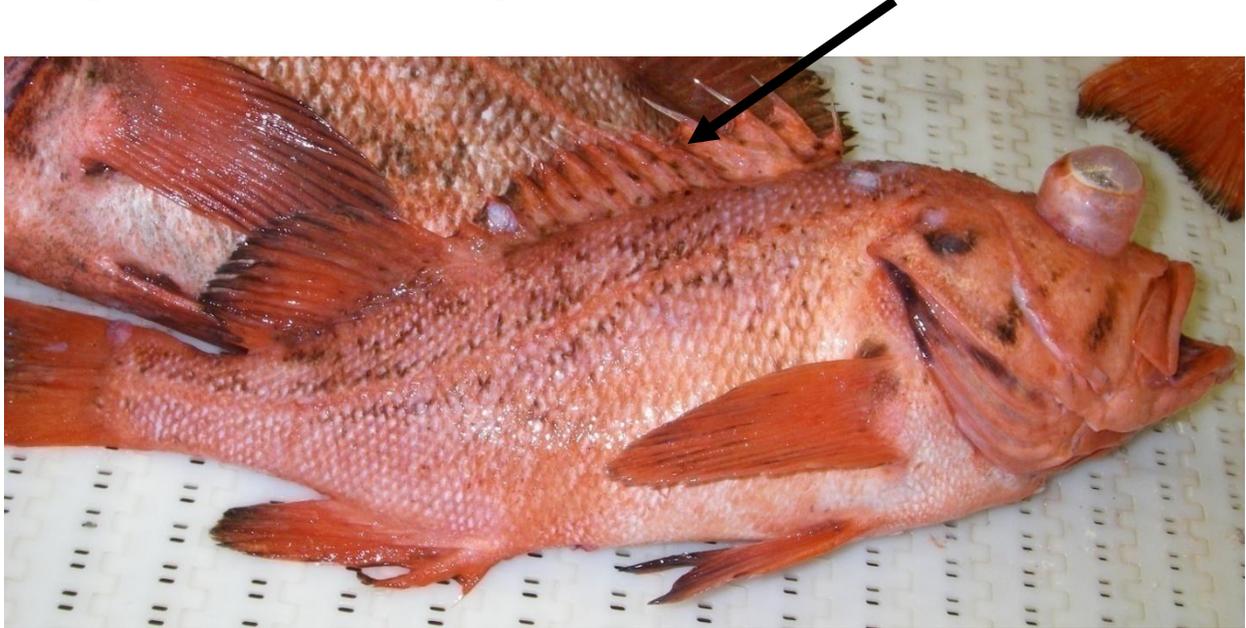
Detailed collection procedures: Our samples can be collected as part of the routine bottom trawl sampling plan at the pre-determined stations. Collect up to 20 specimens of the following age-0 and age-1 marine fish species at each survey station in the central GOA that they are encountered: Walleye pollock (30-130mm = age-0; 131- 300mm = age-1), sablefish (100-200 = age-0; 200 - 350mm = age-1), Pacific cod (40-120mm = age-0; 121- 350mm = age-1), arrowtooth flounder (20-160mm = age-0; 161-300mm = age-1), and rockfish (40-130mm =age-0; 131-300mm = age-1). Randomly select 10 of each species and age class (10 age-0, 10 age-1) (per haul), up to a total of 200 specimens of a particular species for the region for a grand total of 1,000 individuals for all 5 species. Specimens are to be sealed in a Ziploc bag according to species and frozen immediately. Each Ziploc bag should be labeled with the tow number, survey vessel name, date, and species name with a permanent marker.

**APPENDIX H. DISTINGUISHING CHARACTERISTICS
BETWEEN ROUGHEYE AND BLACKSPOTTED
ROCKFISH**

Rougheye and Blackspotted Rockfish

The recent separation of the rougheye rockfish into two species (rougheye and blackspotted rockfish) necessitates the re-examination of the life history of these species (Orr and Hawkins 2008). *Sebastes melanostictus*, the blackspotted rockfish, is distinguished from *S. aleutianus*, the rougheye rockfish, by the presence of spotting on the spinous dorsal fin and a darker color morph and in general is thought to have a more offshore distribution.

Blackspotted rockfish with distinct spots (not blotches) on the first dorsal fin



Rougheye (top) and blackspotted (bottom) rockfish

