Regional Information Report No. 4K07-9

Special Project Plan: 2007 Bottom trawl survey of crab and groundfish: Kodiak, Chignik, South Peninsula, and Eastern Aleutian Districts

by

Kally Spalinger

May 2007

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 Department of Fish and Game	ADF&G
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

REGIONAL INFORMATION REPORT NO. 07-9

SPECIAL PROJECT PLAN: 2007 BOTTOM TRAWL SURVEY OF CRAB AND GROUNDFISH: KODIAK, CHIGNIK, SOUTH PENINSULA, AND EASTERN ALEUTIAN DISTRICTS

by

Kally Spalinger

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

May 2007

The Regional Information Report Series was established in 1987 and was redefined in 2006 to meet the Division of Commercial Fisheries regional need for publishing and archiving information such as project operational plans, area management plans, budgetary information, staff comments and opinions to Board of Fisheries proposals, interim or preliminary data and grant agency reports, special meeting or minor workshop results and other regional information not generally reported elsewhere. Reports in this series may contain raw data and preliminary results. Reports in this series receive varying degrees of regional, biometric, and editorial review; information in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author or the Division of Commercial Fisheries if in doubt of the level of review or preliminary nature of the data reported. Regional Information Reports are available through the Alaska State Library and on the Internet at: http://www.sf.adfg.ak.us/statewide/divreports/html/intersearch.cfm.

Kally Spalinger,
Alaska Department of Fish and Game, Division of Commercial Fisheries,
211 Mission Road, Kodiak, AK 99615, USA

This document should be cited as:
Spalinger,K. 2007. Special project plan: 2007 Bottom trawl survey of crab and groundfish: Kodiak, Chignik, South Peninsula, and Eastern Aleutian Districts. Alaska Department of Fish and Game, Regional Information Report No 4K07-9, Kodiak.

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ABSTRACT

This report specifies the methods and procedures of special projects during the 2007 bottom trawl survey of crab and groundfish in the Kodiak, Chignik, South Peninsula, and Eastern Aleutian Districts of the Westward Region. This special project plan is used in conjunction with the Standard Project Operational Plan (Spalinger and Cavin 2004), which describes the annual trawl survey sampling protocols. Special shellfish projects for 2007 include: a legal-size-male Tanner crab tagging project; multiple tows within selected offshore stations in the Kodiak District to assist in determining the variance of Tanner crab population estimates. Special groundfish projects for 2007 include: collection of stomachs 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; collection of sculpin Cottidae lengths and otoliths. In addition, personnel from Moss Landing Marine Laboratory (MLML) will be joining the survey during various survey legs to collect data on skates *Raja* and *Bathyraja*.

Key words: shellfish, groundfish, trawl survey, Kodiak, Alaska Peninsula, Chignik, Eastern Aleutian Islands

INTRODUCTION

From June through September 2007, the Alaska Department of Fish and Game (ADF&G) will conduct a bottom-trawl survey in portions of the Westward Region (Figure 1). The survey will focus on waters of historic Tanner crab abundance around Kodiak Island and the Alaska Peninsula from Cape Douglas to False Pass, as well as the Eastern Aleutian Islands. The survey results will be used to estimate the abundance of Tanner crab *Chionoecetes bairdi* and red king crab *Paralithodes camtschaticus* populations and to determine species composition and length frequencies of the groundfish catch by haul and area.

This report details the survey schedule, station maps, and sampling procedures for special projects during the 2007 Westward Region trawl survey. All standard sampling protocols that are used during the trawl survey are described in detail in the Standard Project Operational Plan (Spalinger and Cavin 2004). Any changes to standard procedures, or special projects incorporated into the 2007 survey are described in this document.

OBJECTIVES

Special shellfish objectives for the 2007 trawl survey are to tag legal-size-male Tanner crabs from the Northeast, Eastside and Southeast sections of the Kodiak District, and the Eastern Aleutian District. Tag recovery will help determine migration occurring between the time of the survey and the winter commercial fishery.

Special groundfish objectives are to collect whole 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* from Marmot and Chiniak Bays for the National Marine Fisheries Service (NMFS). Lengths and otoliths from four species of sculpins will also be collected for NMFS. For the fourth year, the sex of each skate *Raja* and *Bathyraja* measured will be recorded. In addition, during the Eastside, South Peninsula/Chignik, and Westside/Shelikof portions of the survey, personnel from the Moss Landing Marine Laboratory (MLML) Pacific Shark Research Center will be present and collecting skate data.

Multiple tows in selected stations in Marmot and Barnabas gullies of the Kodiak District will occur for the purpose of determining the accuracy of Tanner crab station population estimates.

METHODS

SURVEY AREA AND TRAWL PROCEDURES

The 27.4 m ADF&G research vessel *Resolution* will conduct survey trawl tows in areas of known king and Tanner crab habitat throughout the Kodiak, Chignik, South Peninsula, and Eastern Aleutian Districts of the Westward Region (Figure 1). Tows will be made using a 400-mesh eastern otter trawl.

Unalaska Bay, Makushin Bay, Pumicestone Bay, and Akutan Island in the Eastern Aleutian District will be included in the 2007 survey (Appendices A13, 14). All survey maps for 2007 can be found in Appendix A.

This year duplicate tows will occur in some of the large offshore stations in the Northeast and Eastside sections of the Kodiak District. Stations were selected based on large Tanner crab population estimates in previous surveys (Spalinger in press, Spalinger 2006, Spalinger 2005, Spalinger 2004, Spalinger 2003). Four stations in Marmot Bay (Appendix A2) and four stations in Barnabas Gully (Appendix A3) have been divided into four quadrants. In addition to the traditional tow in these stations, which will be sampled according to the Standard Project Operational Plan (Spalinger and Cavin 2004), two to three additional tows, depending on time and weather, will be made in different quadrants of the stations. Stations with multiple tows will be surveyed in the following order of priority: Marmot Gully- 255, MONX, 256, and 284; Barnabas Gully- 561, 655, 696, and 589. Total catch from the extra tows will be weighed, but only Tanner crabs will be sorted and weighed individually. Crabs will be handled according to the Standard Project Operational Plan (Spalinger and Cavin 2004).

CRAB SAMPLING

Legal-size-male Tanner crabs captured from the Northeast, Eastside, and Southeast Sections of the Kodiak District (Appendices A1-5), as well as from the Eastern Aleutian District (Appendices A13, 14), will be tagged. After all the crabs have been measured, legal-size males will be tagged using the following method. A small hole will be made in the right side of the carapace, above the lower, left corner of the branchial lobe (Figure 2). The hole can be made using either a handmade punch with a short nail attached that will not penetrate deeply into the body cavity, or a tagging gun with an epoxy stopper attached that limits the depth the needle can be inserted. Once the hole is made, a dart with a numbered disc tag attached will be inserted into the hole. The tag numbers, carapace width, and shell condition will be recorded on the Tanner crab tagging form (Appendix B1) along with the latitude and longitude of the location where the crabs are released. Tagged crabs will be recovered during the January 2008 commercial Tanner crab fishery if population estimates are sufficient for an opening.

GROUNDFISH SAMPLING

During the Marmot and Chiniak Bay survey tows, stomach samples from walleye pollock, Pacific cod, flathead sole, arrowtooth flounder, Pacific halibut, northern rock sole, and spiny dogfish will be collected. Sample sizes are 20 stomachs per size group (Appendix C), with a maximum number of 20 stomachs per species per haul. The goal is to sample two to three species from every haul. A precise outline of the sampling procedure is outlined in Appendix C.

Throughout the 2007 survey fish lengths and otoliths from four species of large sculpins will be collected. All plain sculpins *Myoxocephalus jaok*, great sculpins *M. polyacanthocephalus*, bigmouth sculpins *Hemitripterus bolini*, and yellow Irish lords *Hemilepidotus jordani* from the subsample will be measured and otoliths will be collected as follows: three otolith samples will be collected from each sex and size, to the nearest cm. (e.g. males = three otoliths from 14 cm, three otoliths from 15 cm, etc. females = three otoliths from 14 cm, three otoliths from 15 cm, etc.). Additional samples may be taken at the cruise leader's discretion after other sampling priorities are complete, taking care to keep subsampled sculpin separate from whole-haul sampled sculpin. More specific instructions for sampling sculpins are included in Appendix D.

In 2007, we will continue to determine the sex of each measured skate and spiny dogfish. Males are easily identified by the presence of claspers (Figure 3). Small, immature skates and dogfish may be difficult to sex, and in that case the sex will be recorded as unknown. The personnel onboard the vessel from the MLML Pacific Shark Research Center will be sampling skate species using their own sampling protocol. They will assist ADF&G staff with sorting and weighing the catch prior to conducting their sampling duties. ADF&G staff will assist with the additional skate sampling only when all other sampling duties are complete.

DATA FORMS AND SAMPLE CUSTODY

Completion and proper disposition of data and samples is the same for the special projects as for standard data. It is the responsibility of the cruise leader to ensure that all samples and forms are completed and removed from the boat after each survey leg. Forms are to be 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 to be taken directly to the shellfish office and given to Kally Spalinger, the lead trawl-survey biologist to prevent lost data. Frozen samples must be well labeled when removed from the R/V *Resolution* freezer and transferred to one of the freezers at the Kodiak Research Center, until they can be processed or shipped to their final destination. Samples preserved in formalin should be stored in a location with adequate ventilation until they are shipped. It is also important to inform the lead trawl-survey biologist of the location of all stored samples.

SURVEY EQUIPMENT CHECKLIST

Stomach sampling
- ✓ Specimen forms
- ✓ Specimen labels
- ✓ Five-gallon buckets with lids
- ✓ Formalin
- ✓ Stomach bags
- ✓ One-liter plastic bottles
- ✓ Baking soda
- ✓ Luggage tags
- ✓ 1/8 cup measuring cup
- ✓ Hazardous materials bucket

Tanner tagging
- ✓ Darts with Peterson disc tags
- ✓ Tagging guns with "stops"
- ✓ Handmade nail punch
- ✓ Tagging forms

Sculpin sampling
- ✓ Otolith vials
- ✓ Specimen forms
- ✓ Specimen labels
- ✓ Forceps
- ✓ Serrated knife or hacksaw
- ✓ Victornox

PERSONNEL AND SURVEY SCHEDULE

R/V Resolution crew – Captain Denis Cox Jr., Kurt Pederson, Boat officer

Chiniak Bay – June 16 and 17	*Marmot Bay – June 20-25*	*Eastside Kodiak – June 28 to July 15*
Kally Spalinger (cruise leader)	Kally Spalinger (cruise leader)	Lynn Mattes (cruise leader)
Lynn Mattes	Nicholas Sagalkin	Dave Gilliland
Dave Gilliland	Dave Gilliland	Collin Hakkinen
Collin Hakkinen	Collin Hakkinen	Sherry Barker
Sherry Barker	Sherry Barker	Nicholas Sagalkin (Alitak)
Lee Hulbert	Dan Urban	Jasmine Fry
Ric Shepard	Rachel Latham	

South Alaska Peninsula, Chignik, and The Eastern Aleutians - July 21 to August 26	*Westside Kodiak and North Mainland – September 6-16*
Kally Spalinger (cruise leader)	Nicholas Sagalkin (cruise leader)
Dave Gilliland	Dave Gilliland
Collin Hakkinen	Collin Hakkinen
Sherry Barker	Sherry Barker
Barbi Failor-Rounds (Aleutians only)	Simon Brown
Shaara Ainsley	

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FIGURES

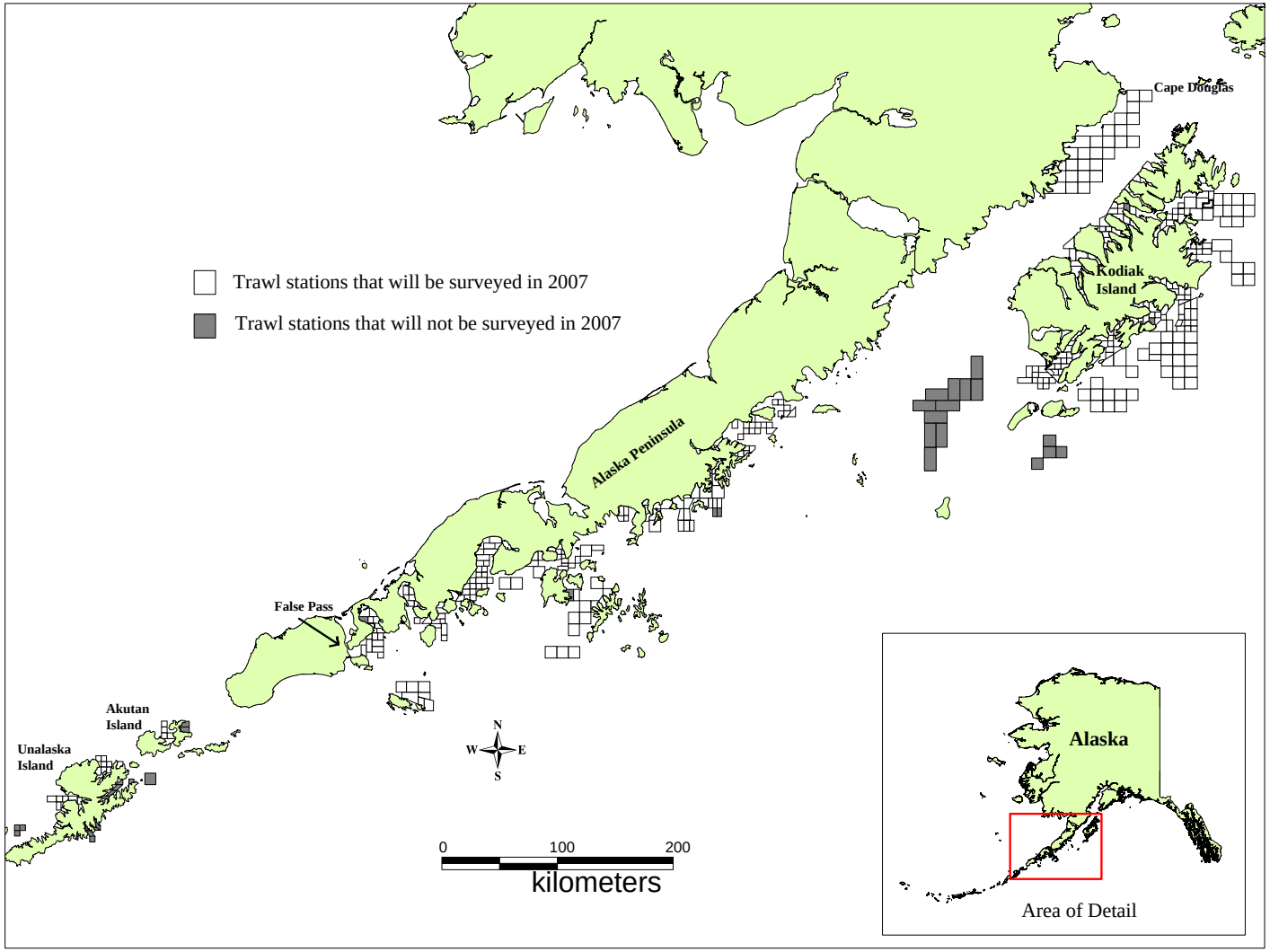


Figure 1.–Westward Region trawl survey area.

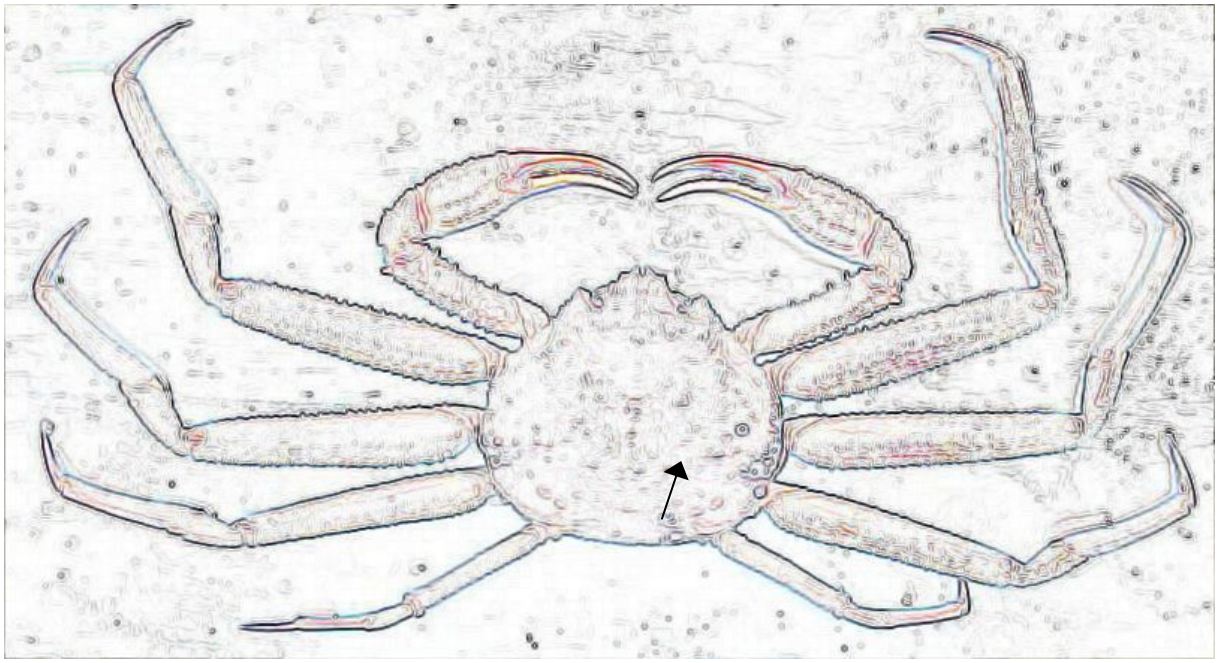


Figure 2.–Diagram of tag insertion location on Tanner crab.

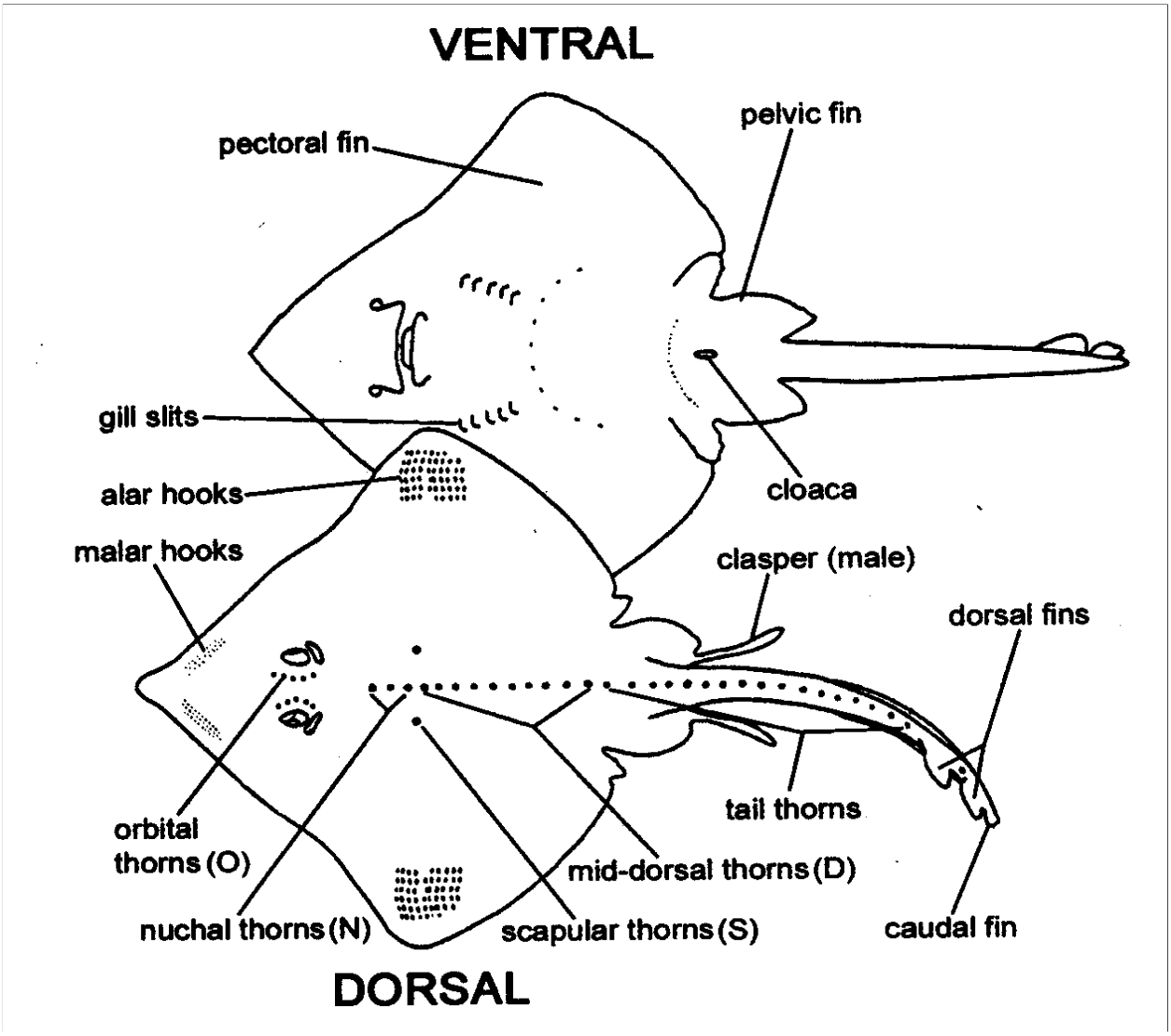
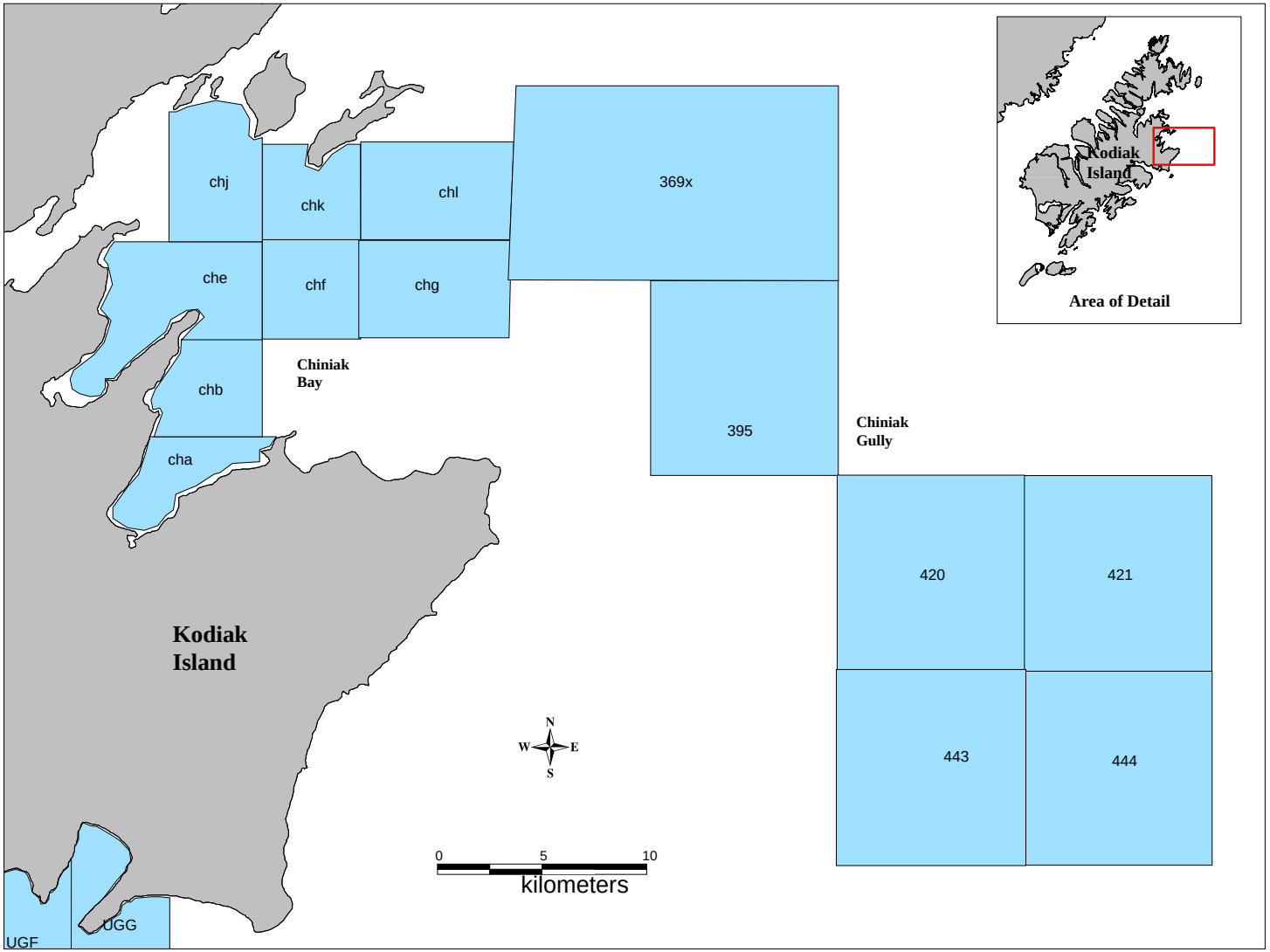
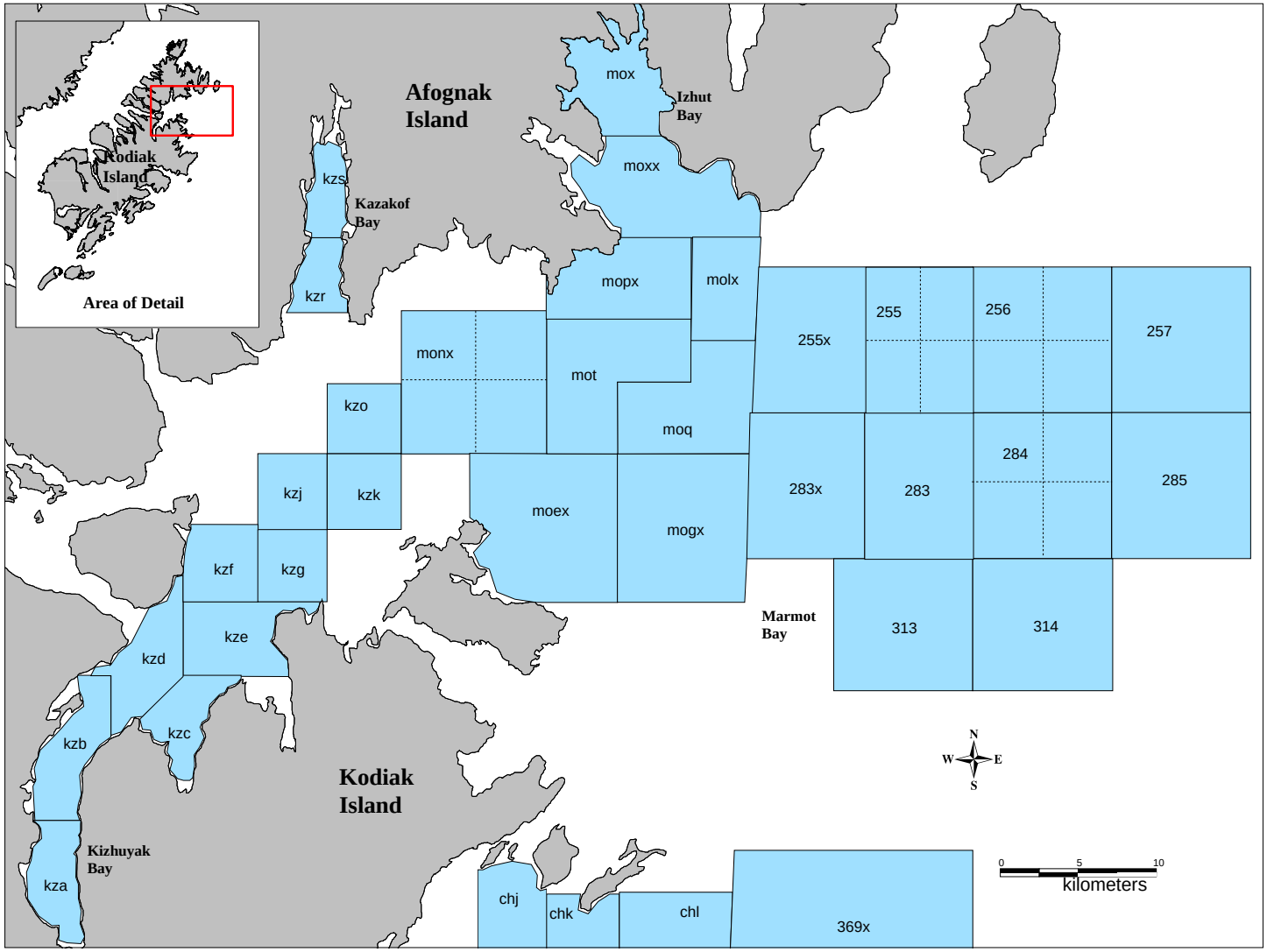


Figure 3.–Basic external skate anatomy

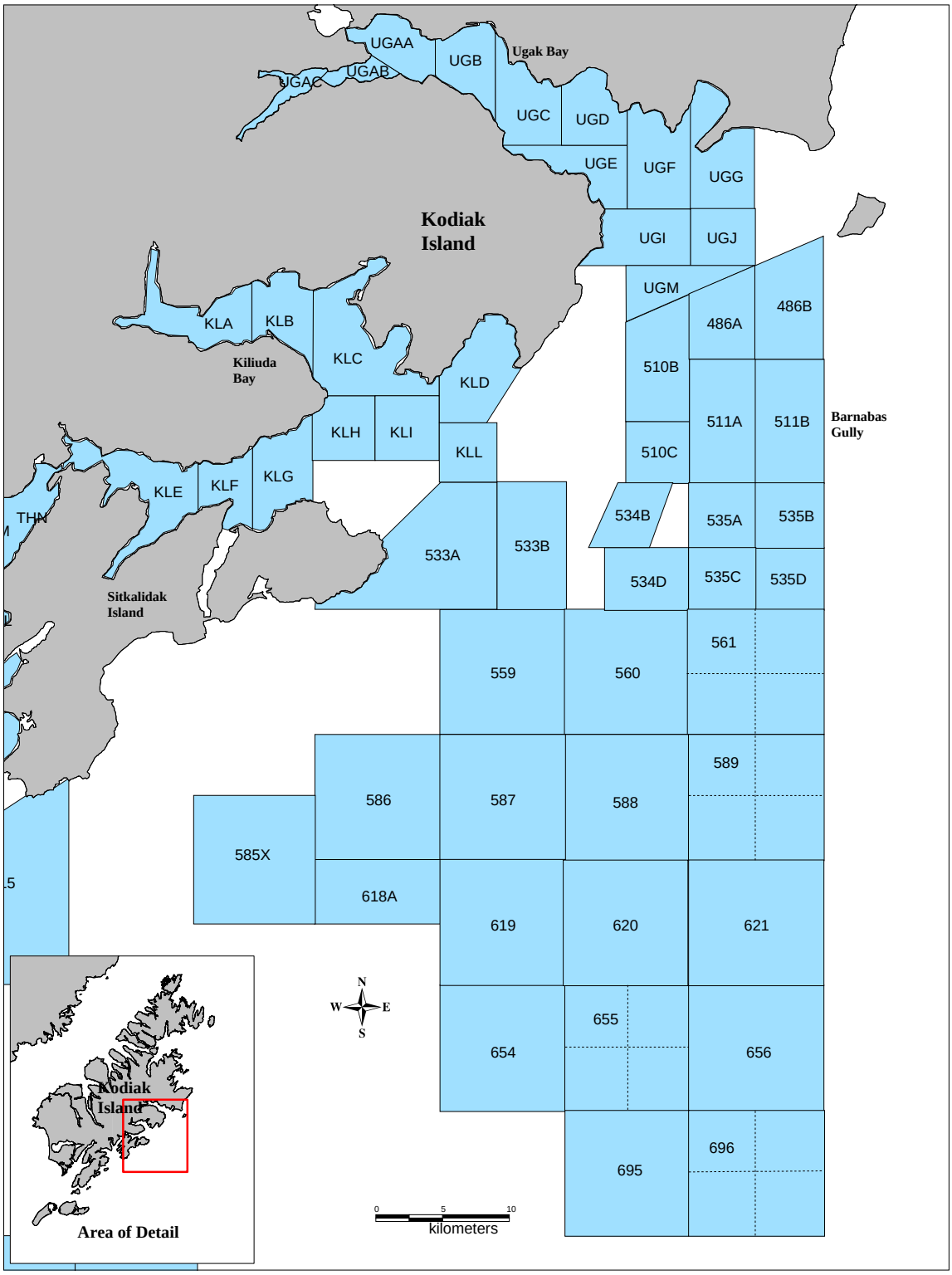
APPENDIX A. TRAWL SURVEY STATION MAPS



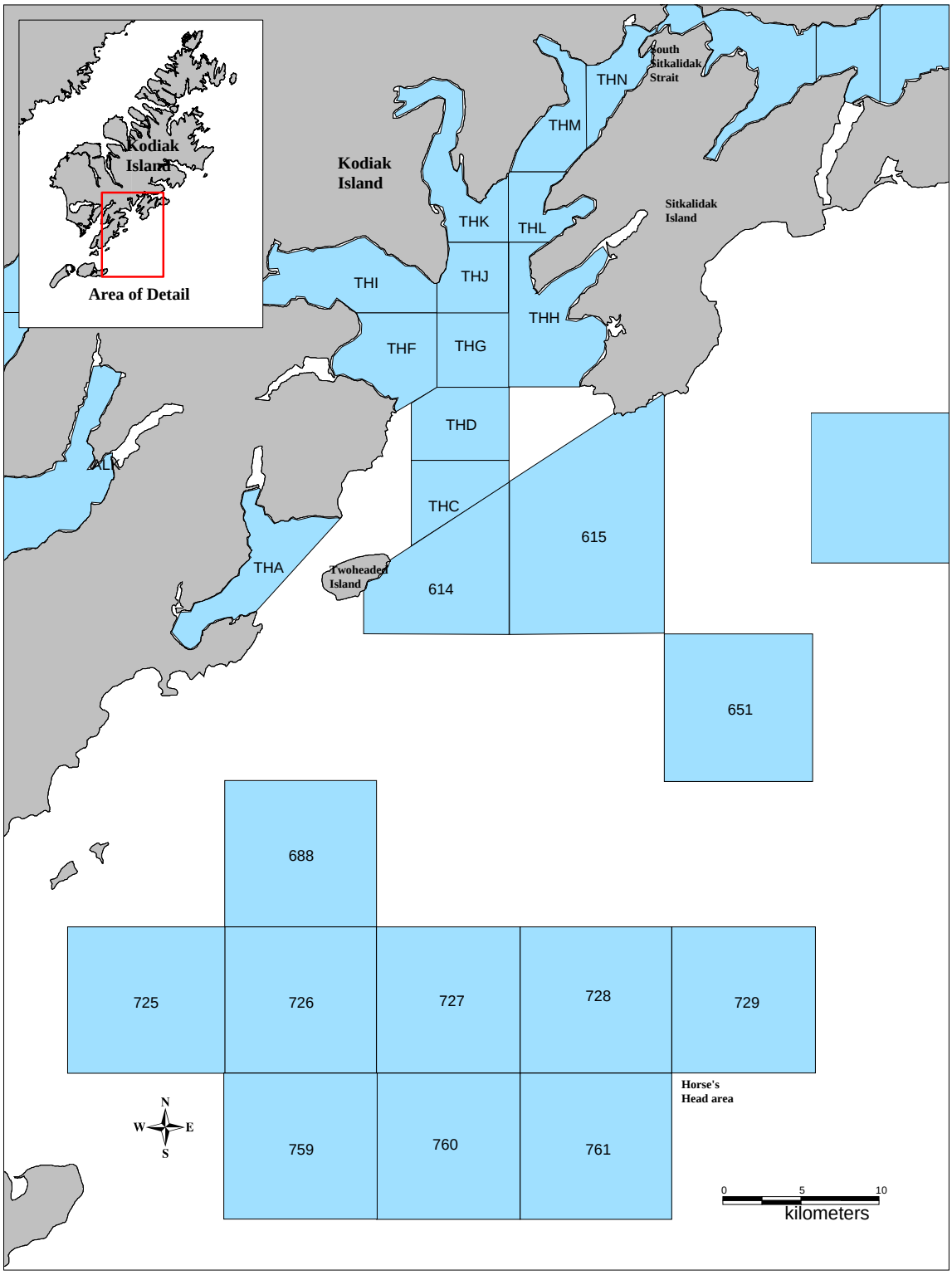
Appendix A1.-Station boundaries and names, Chiniak Bay and Chiniak Gully, 2007 Kodiak District trawl survey.



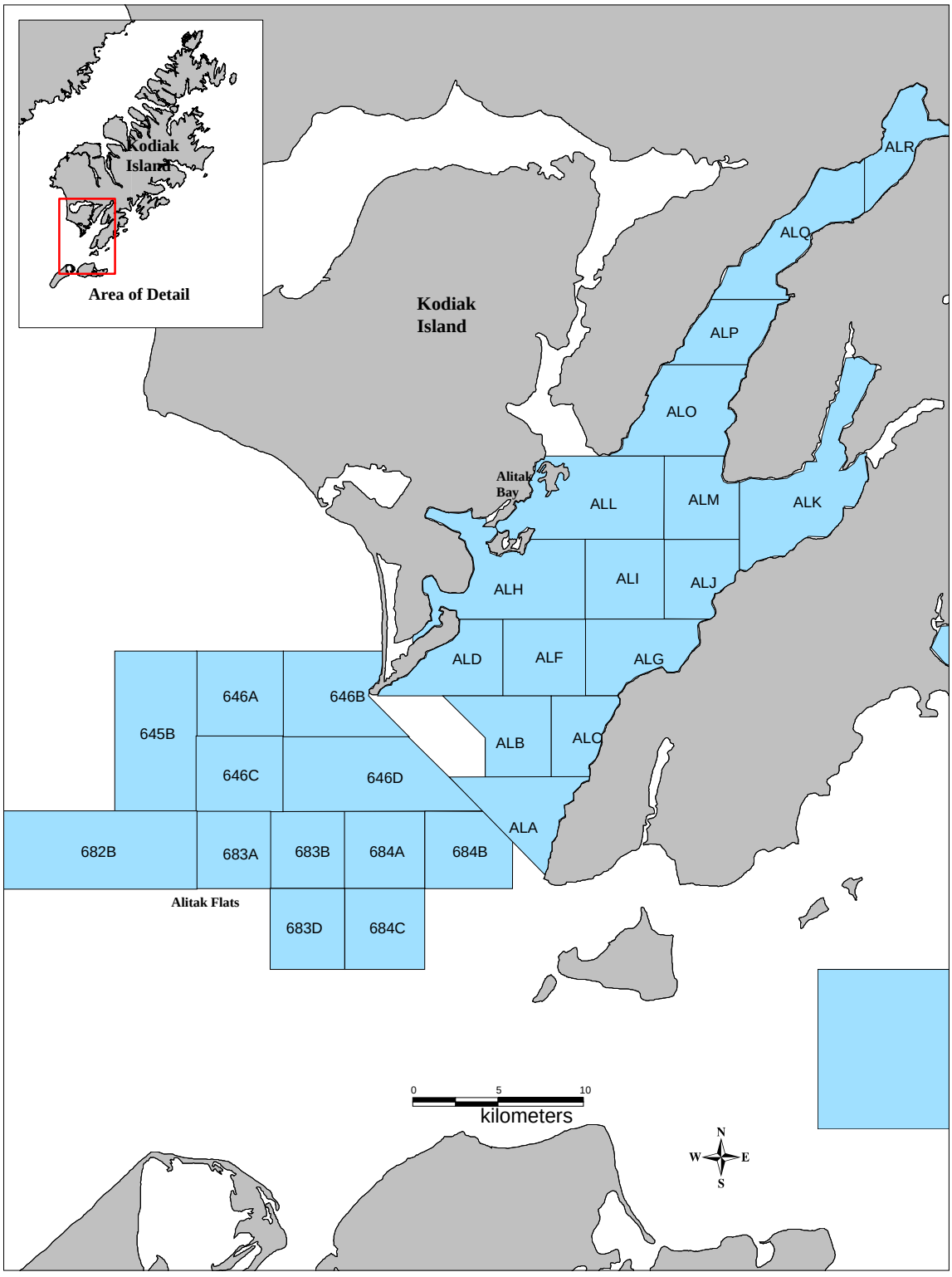
Appendix A2.-Station boundaries and names, Izhut, Kazakof, Kizhuyak, and Marmot Bays, 2007 Kodiak District trawl survey.



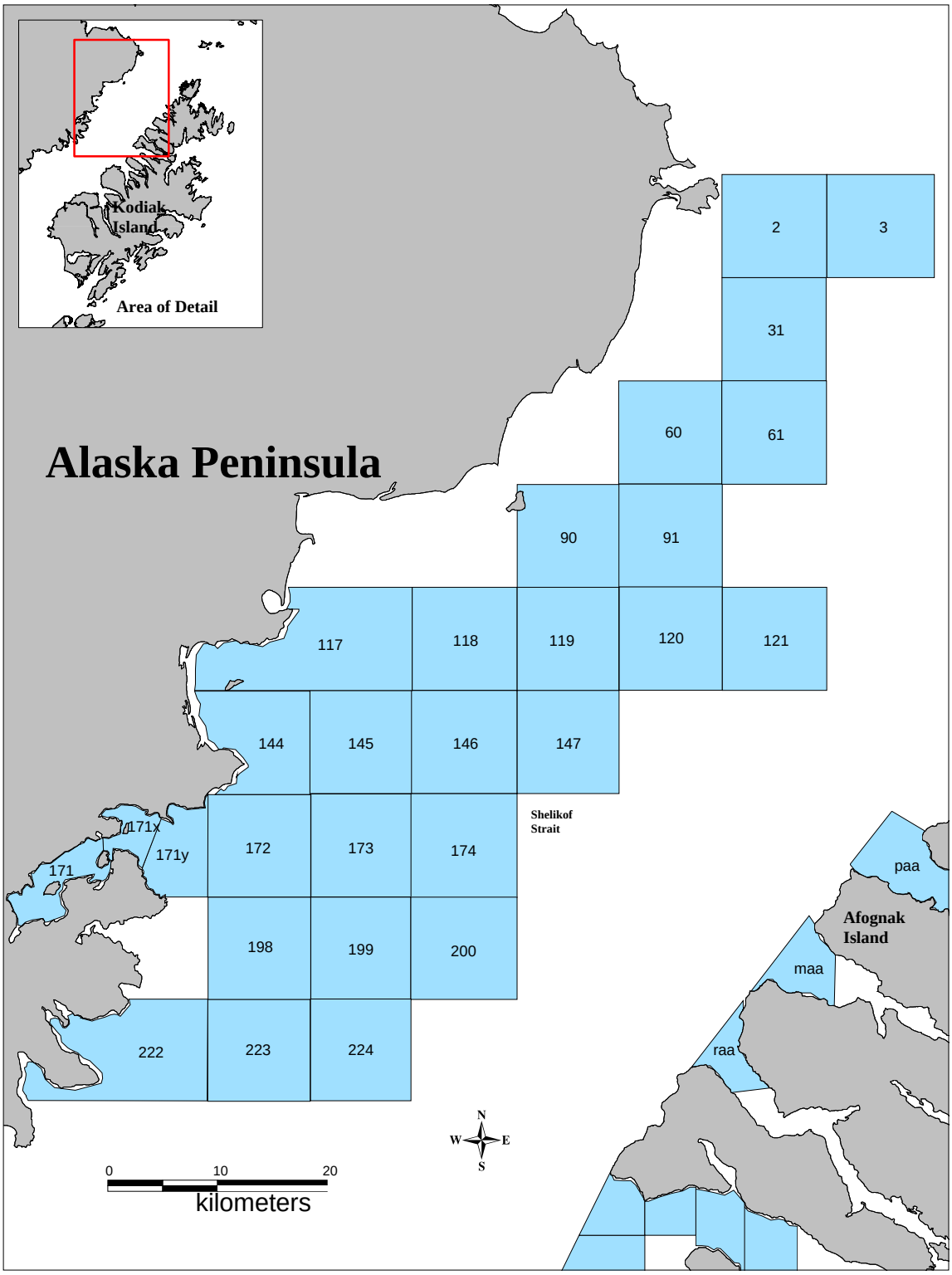
Appendix A3.-Station boundaries and names, Ugak Bay, Kiliuda Bay, and Barnabus Gully, 2007 Kodiak District trawl survey.



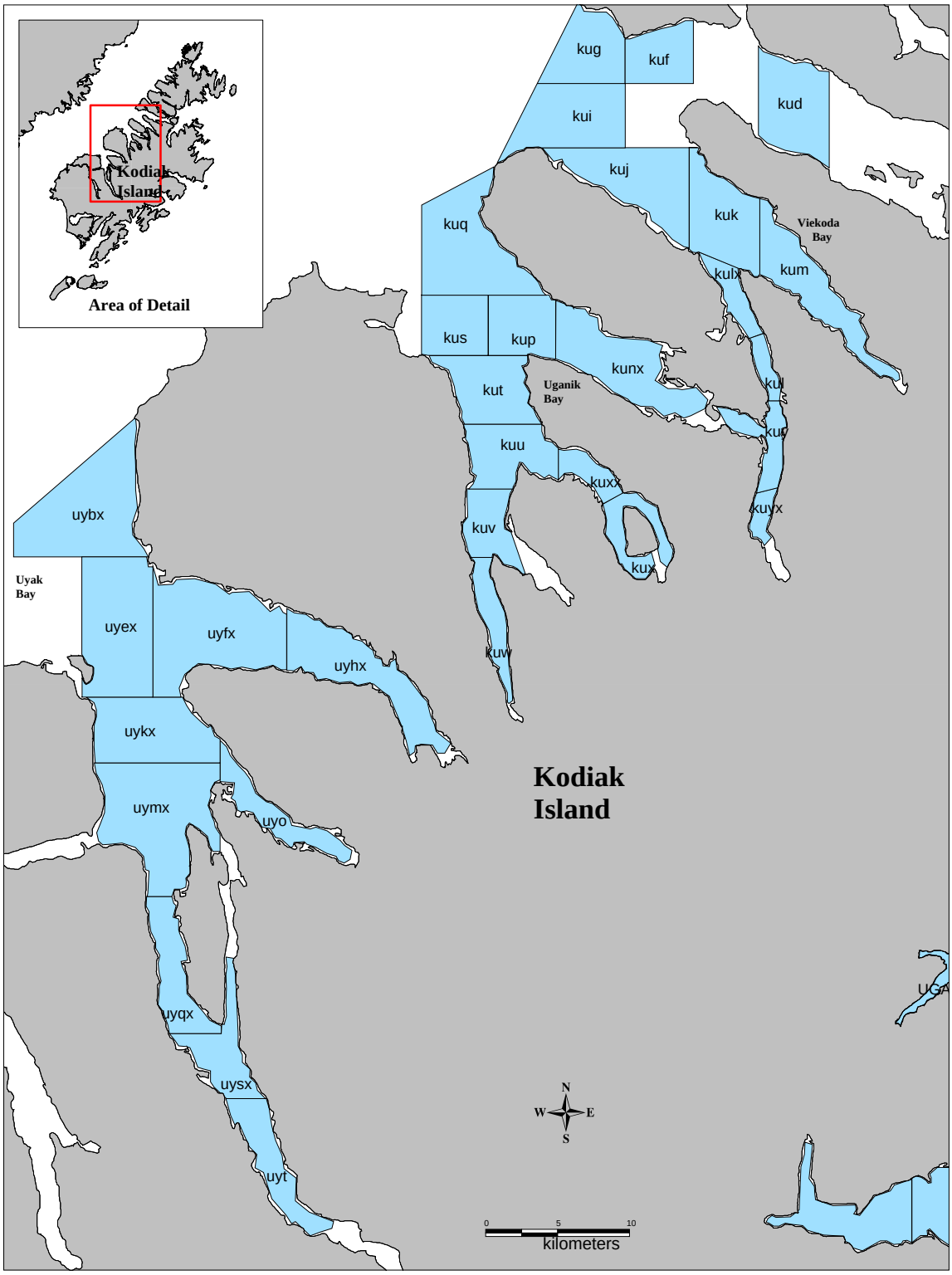
Appendix A4.-Station boundaries and names, South Sitkalidak Strait, Two Headed Island, and Horse's Head area, 2007 Kodiak District trawl survey.



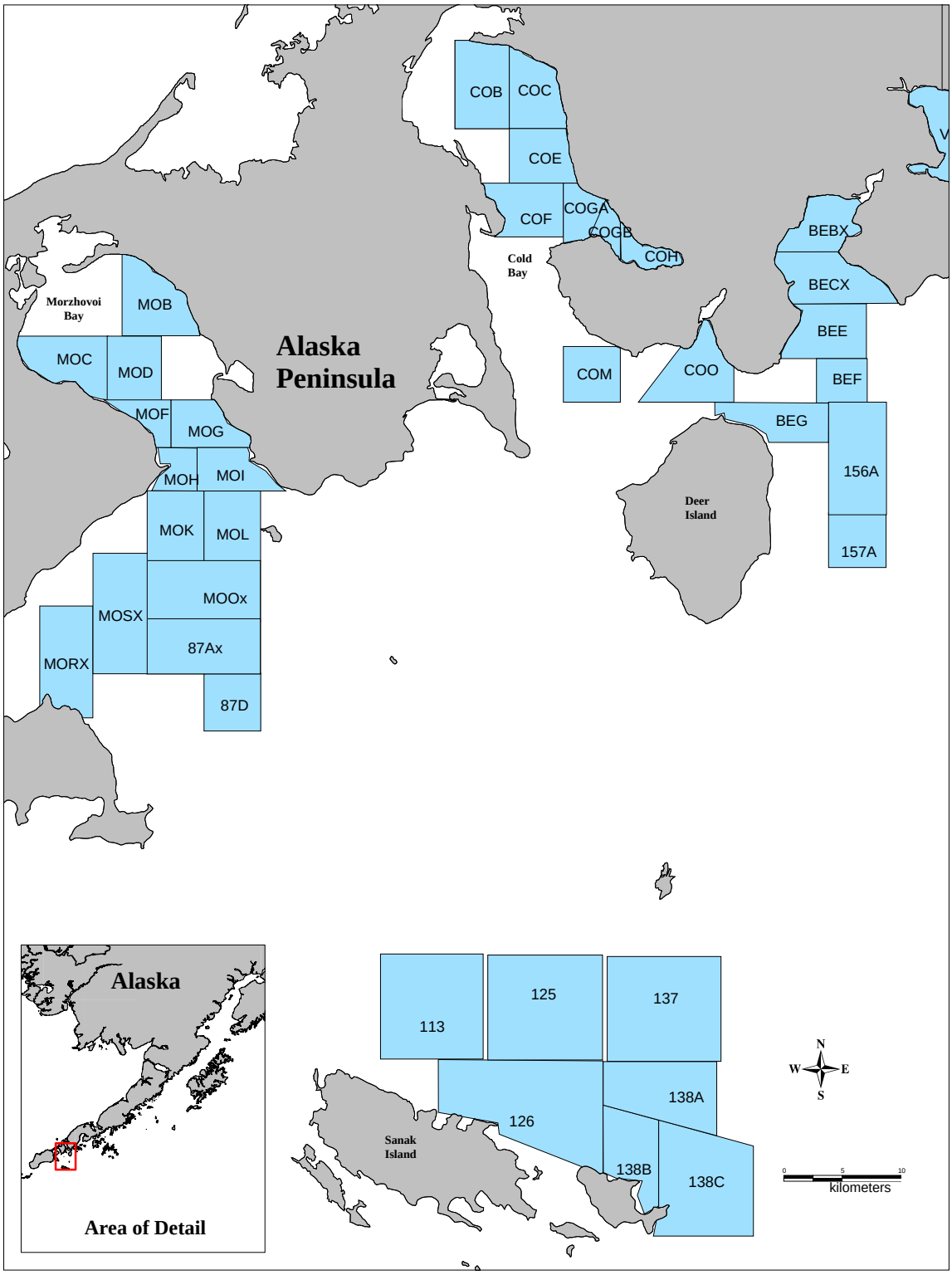
Appendix A5.-Station boundaries and names, Alitak Bay and Alitak Flats, 2007 Kodiak District trawl survey.



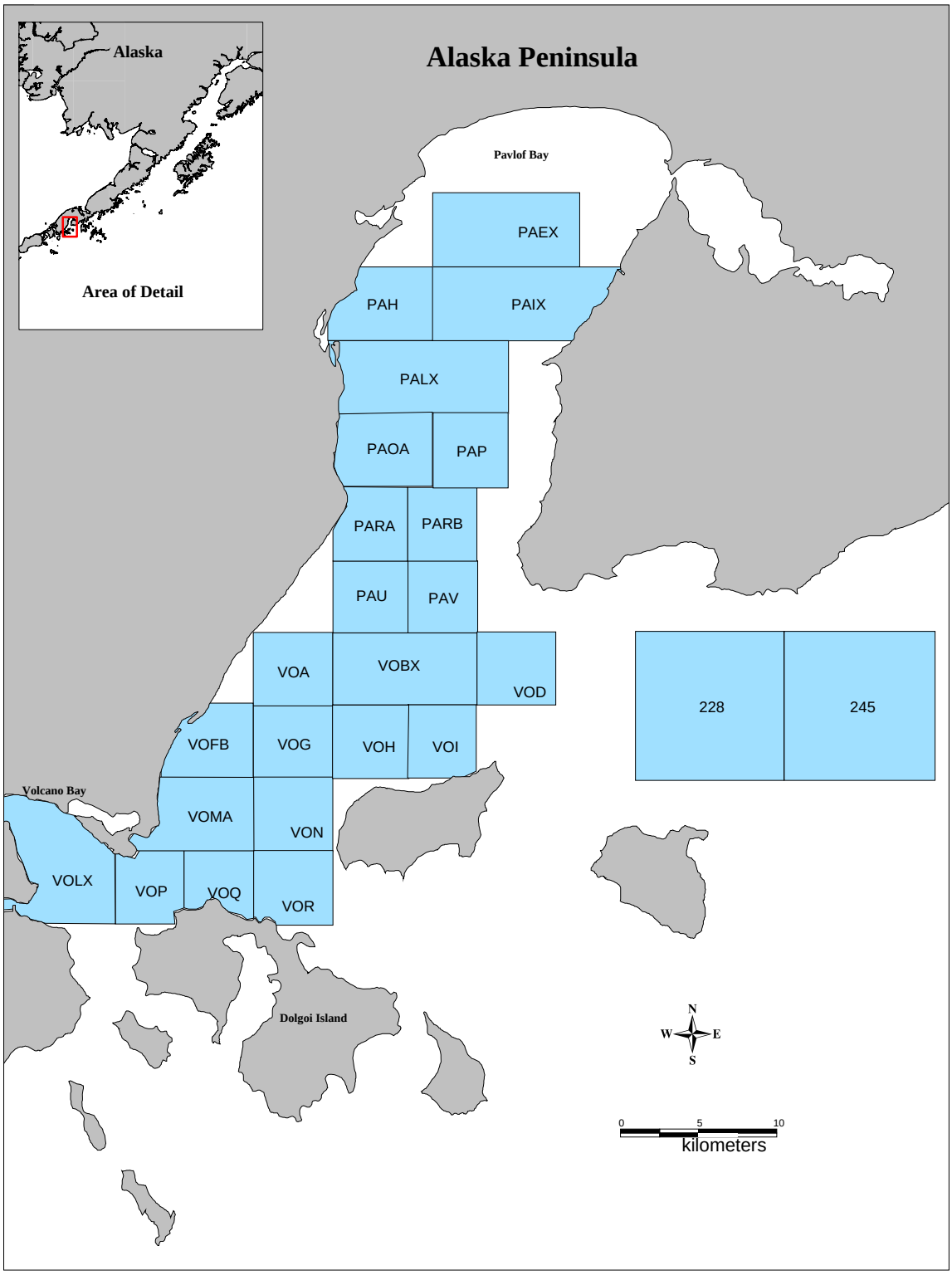
Appendix A6.-Station boundaries and names, Shelikof Strait, 2007 Kodiak District trawl survey.



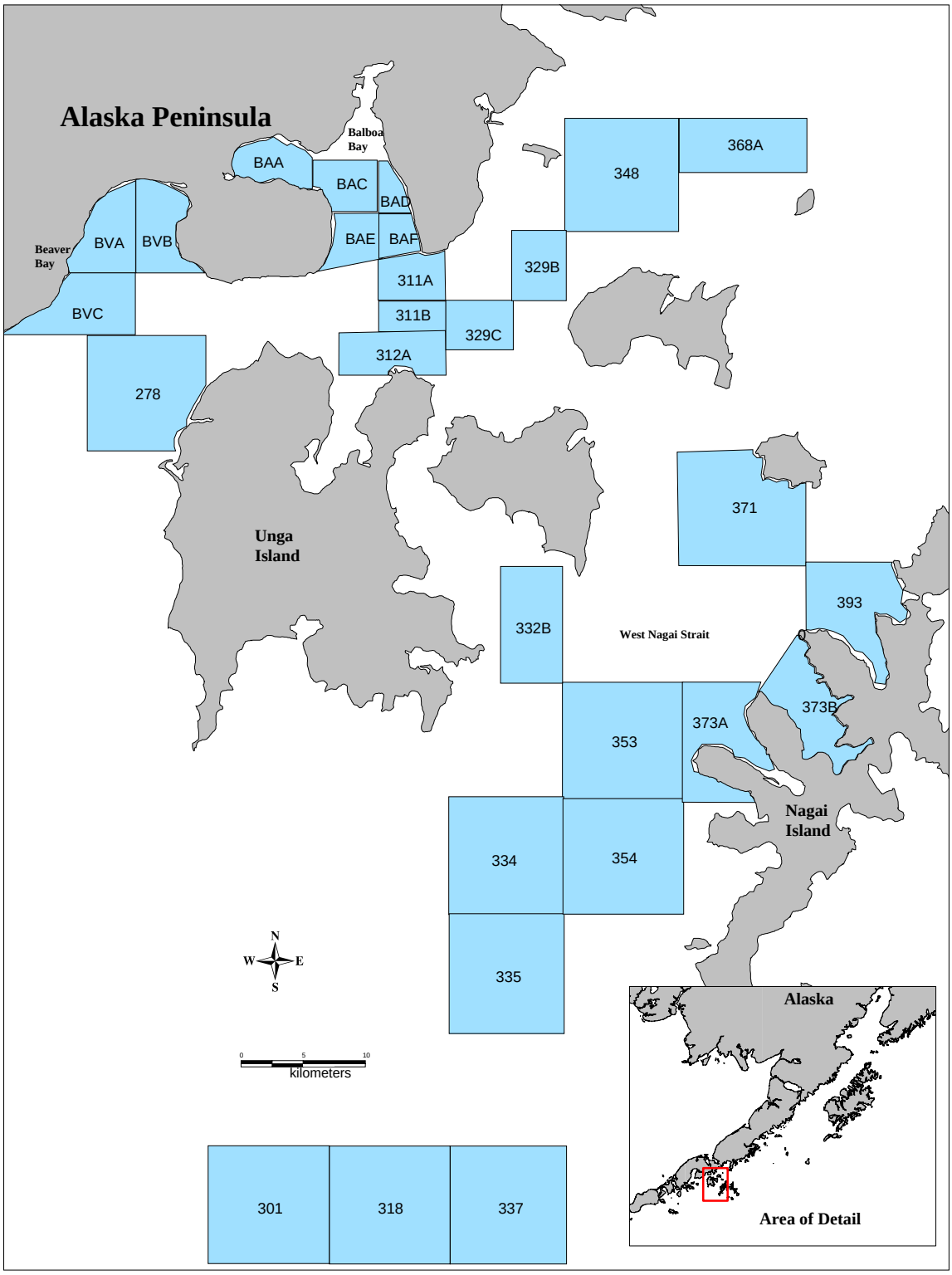
Appendix A7.-Station boundaries and names, Uyak, Uganik, and Viekoda Bays, 2007 Kodiak District trawl survey.



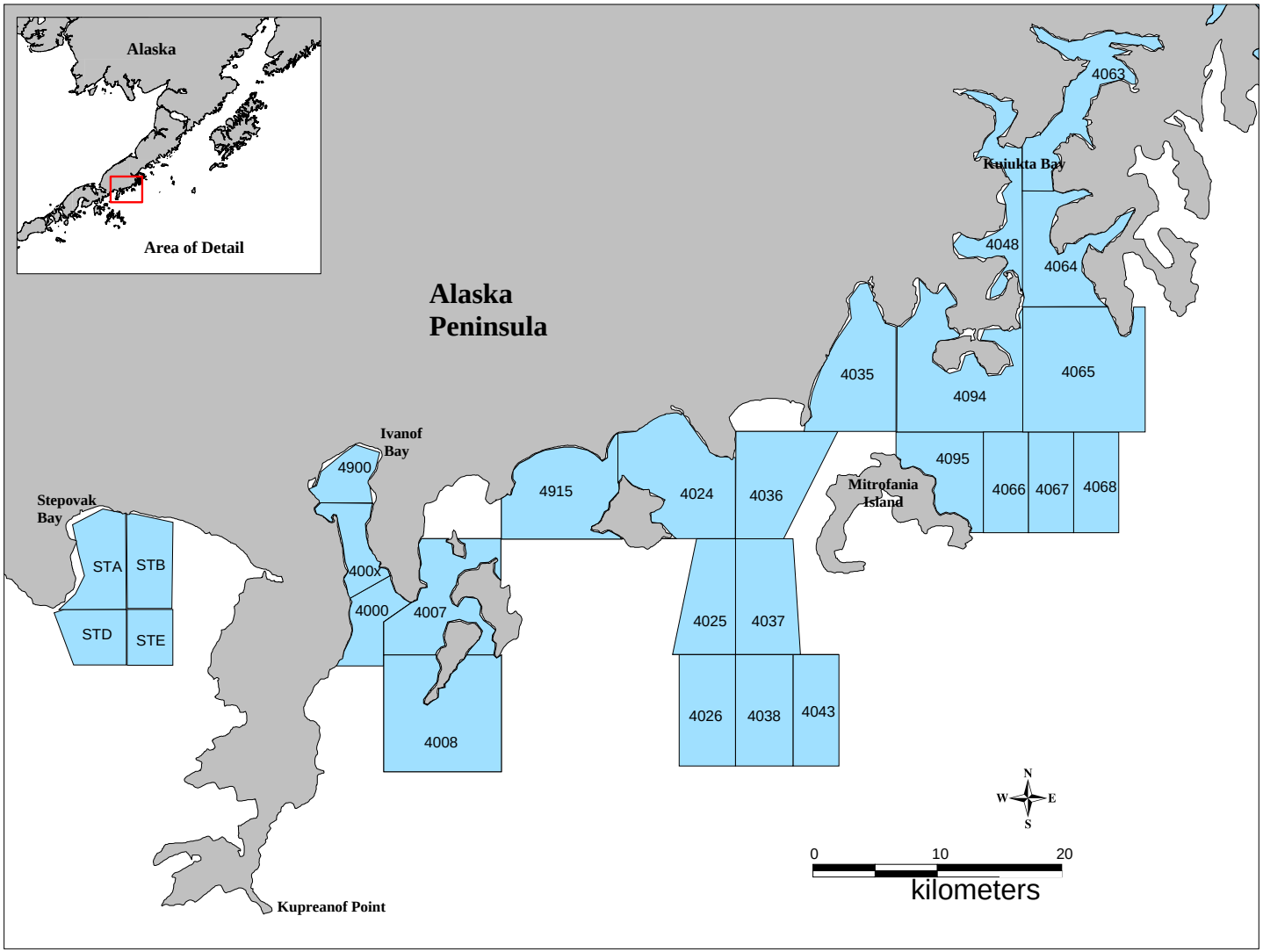
Appendix A8.-Station boundaries and names, Morzhovoi Bay, Cold Bay, Deer Island, and Sanak Island, 2007 South Peninsula District trawl survey.



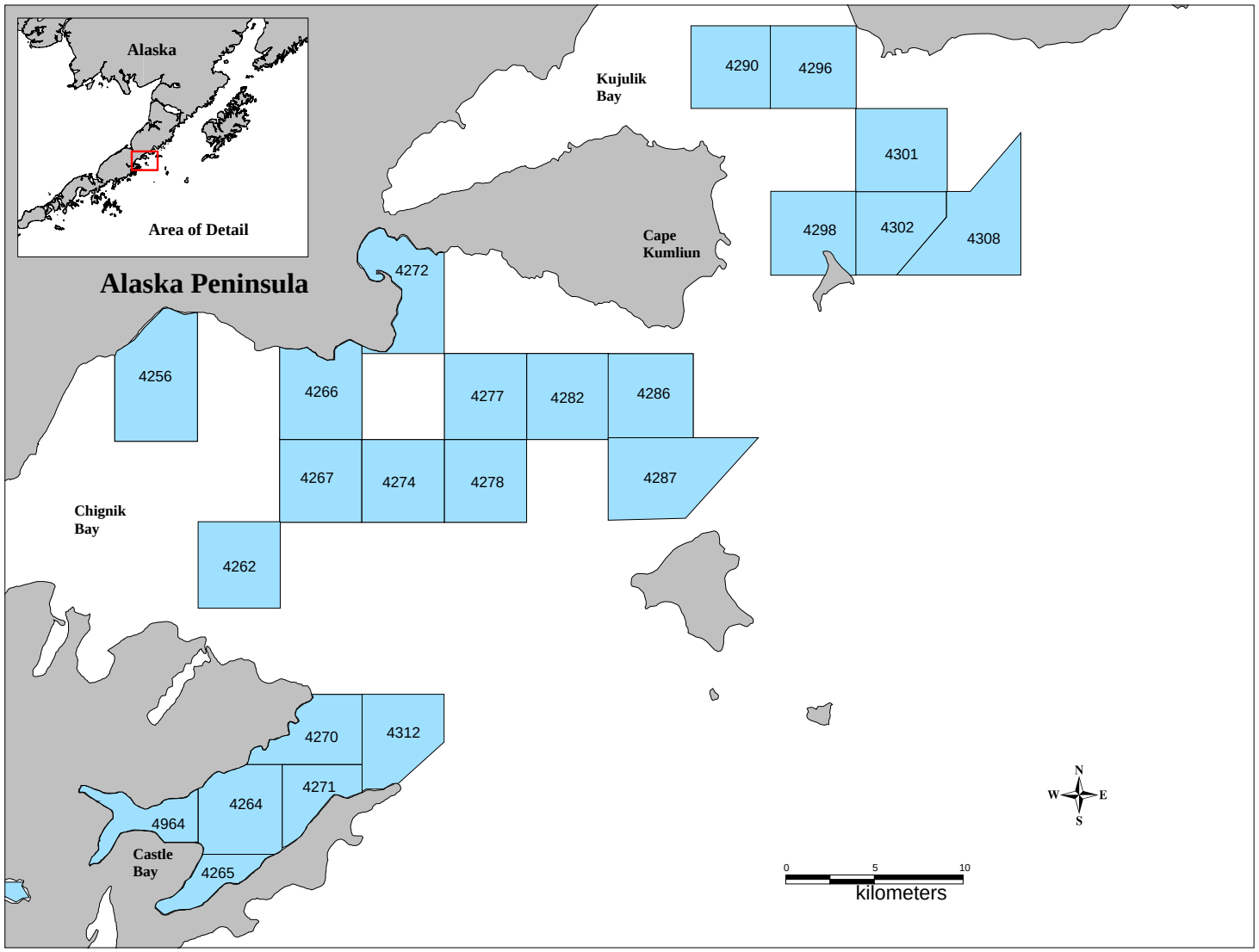
Appendix A9.-Station boundaries and names, Pavlof and Volcano Bays, 2007 South Peninsula District trawl survey.



Appendix A10.-Station boundaries and names, Unga Strait, Beaver Bay, Balboa Bay, and West Nagai Strait, 2007 South Peninsula District trawl survey.

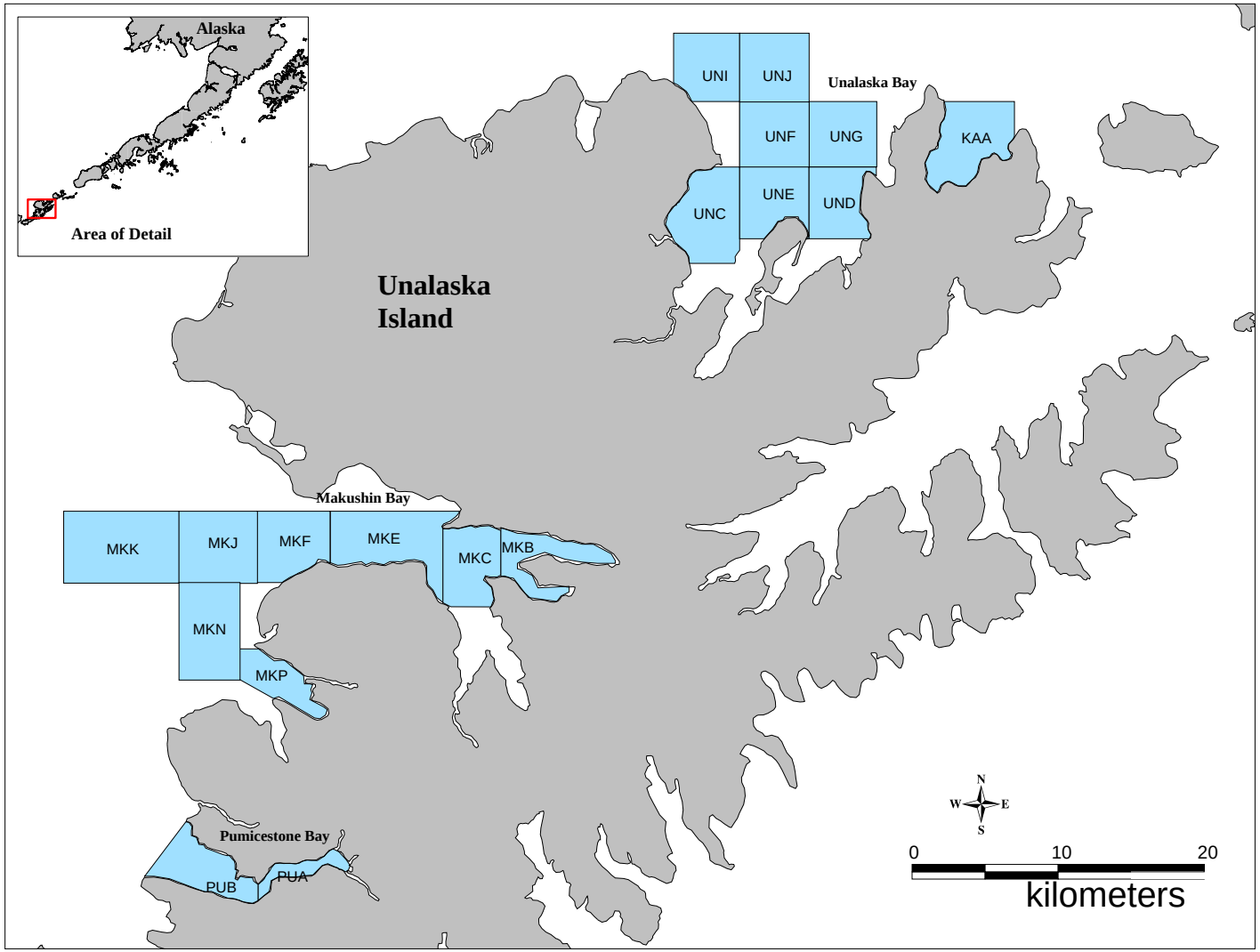


Appendix A11.-Station boundaries and names, Stepovak Bay, Ivanof Bay, Mitrofania Island, and Kuiukta Bay, 2007 South Peninsula and Chignik District trawl survey.



Appendix A12.-Station boundaries and names, Kujulik, Chignik, and Castle Bays, 2007 Chignik District trawl survey.

Appendix A13.-Station boundaries and names, Akutan Bay, 2007 Eastern Aleutian District trawl survey.



Appendix A14.-Station boundaries and names, Unalaska, Makushin, and Pumicestone Bays, 2007 Eastern Aleutian District trawl survey.

APPENDIX B. DATA FORMS

Appendix B1.-Tanner crab tagging form and instructions.

Tanner Crab Tagging Form 2007 - Legals											
Beginning tag number = T 0											
TAG #	DATE	HAUL	CARAPACE WIDTH	SHELL CONDITION	RELEASE LOCATION	TAG #	DATE	HAUL	CARAPACE WIDTH	SHELL CONDITION	RELEASE LOCATION
01						**26**					
02						**27**					
03						**28**					
04						**29**					
05						**30**					
06						**31**					
07						**32**					
08						**33**					
09						**34**					
10						**35**					
11						**36**					
12						**37**					
13						**38**					
14						**39**					
15						**40**					
16						**41**					
17						**42**					
18						**43**					
19						**44**					
20						**45**					
21						**46**					
22						**47**					
23						**48**					
24						**49**					
25						**50**					

-continued-

Tanner crab tagging form

Beginning tag number	Write in the thousand and hundred digit from the tag series to keep the sheets from becoming confused. The tag numbers listed on the sheet only refer to the last two digits of the tag, so it is important to fill in this line.
Date	Month and date.
Haul	Fill in the haul number where the crabs were captured.
Carapace Width	Distance across the carapace between spines, in mm.
Shell Condition	1=soft 2=new 3=old 4=very old
Release Area	If the crabs are returned to the water at a location away from the haul site, please record the latitude/longitude of the release location.

APPENDIX C. GROUNDFISH STOMACH SAMPLING PROTOCOL

Appendix C1.-2007 Chiniak and Marmot Bays groundfish stomach sampling protocol.

1. Species and numbers to be sampled:

Table 1.Number of stomachs to be collected in 2007 ADFG Chiniak, Marmot Bay SUMMER survey, by species, and size groups (cm)

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	**subtotal**	**120**
subtotal	**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
subtotal	**120**	**subtotal**	**90**
Flathead sole		**Northern rock sole**	
< 20 cm	20	< 20 cm	20
20-39	20	20-39	20
≥ 40	20	≥ 40	20
subtotal	**60**	**subtotal**	**60**
Spiny dogfish			
< 40 cm	20		
40-79	20		
≥ 80	20		
subtotal	**60**		
Total	**630**		

At every haul, after the catch has been dumped in the bin and the major species in the catch are evident, choose two to three species from Table 1 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.

2. 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

-continued-

(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, haul, 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, haul, 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 '2007, 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 D. SCULPIN SAMPLING PROTOCOL

Appendix D1.-2007 Sculpin sampling protocol.

Species: plain sculpin *Myoxocephalus jaok*
great sculpin, *M. polyacanthocephalus*
yellow Irish lord, *Hemilepidotus jordani*
bigmouth sculpin, *Hemitripterus bolini*

Need for data:

Collection of this data will help in filling life history data gaps (e.g. age and growth). Currently, there are data-limited issues for sculpins in the Gulf of Alaska, and information from this collection will improve stock assessments for this non-target group.

Collection protocol:

Length measurements should be collected from all sculpins in the subsamples and otolith should be taken based on the following schedule: 3 otoliths per sex/cm per species.

The type of length measurement is tip of snout to tail fork.

Determining the sex of sculpins is similar to determining sex of other fish species. Internal ID is required.

The otolith collection is a target sample size, so fewer may be expected. Otolith collection of sculpins is similar to collecting otoliths for many roundfish species such as pollock and Pacific cod. Cut vertically through the head above the pre-operculum, (approximate location denoted by arrows in figure, example-great sculpin). Note: bigmouth sculpin otoliths are small compared to fish body size.

At the end of the survey, samples and data will be sent to:

Alaska Fisheries Science Center, REFM, Stock Assessment Program
7600 Sand Point Way NE,
Seattle WA 98115
Contact(s): Todd TenBrink – Todd.TenBrink@noaa.gov **Phone**: 206-526-4697
Rebecca Reuter – Rebecca.Reuter@noaa.gov 206-526-4942