

Regional Operational Plan CF.1J.2018.07

**Operational Plan: Southeast Alaska Pot Shrimp
Survey, 2018–2022**

by

Quinn Smith

November 2018

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, χ^2 , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient (simple)	r
		corporate suffixes:		covariance	cov
Weights and measures (English)		Company	Co.	degree (angular)	$^\circ$
cubic feet per second	ft ³ /s	Corporation	Corp.	degrees of freedom	df
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	greater than	>
inch	in	District of Columbia	D.C.	greater than or equal to	\geq
mile	mi	et alii (and others)	et al.	harvest per unit effort	HPUE
nautical mile	nmi	et cetera (and so forth)	etc.	less than	<
ounce	oz	exempli gratia	e.g.	less than or equal to	\leq
pound	lb	(for example)		logarithm (natural)	ln
quart	qt	Federal Information Code	FIC	logarithm (base 10)	log
yard	yd	id est (that is)	i.e.	logarithm (specify base)	\log_2 , etc.
		latitude or longitude	lat or long	minute (angular)	'
Time and temperature		monetary symbols (U.S.)	\$, ¢	not significant	NS
day	d	months (tables and figures): first three letters	Jan, ..., Dec	null hypothesis	H_0
degrees Celsius	$^\circ\text{C}$	registered trademark	®	percent	%
degrees Fahrenheit	$^\circ\text{F}$	trademark	™	probability	P
degrees kelvin	K	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	α
hour	h	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	β
minute	min	U.S.C.	United States Code	second (angular)	"
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
Physics and chemistry				standard error	SE
all atomic symbols				variance	
alternating current	AC			population sample	Var
ampere	A			sample	var
calorie	cal				
direct current	DC				
hertz	Hz				
horsepower	hp				
hydrogen ion activity (negative log of)	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

REGIONAL OPERATIONAL PLAN CF.1J.2018.07

**OPERATIONAL PLAN: SOUTHEAST ALASKA POT SHRIMP SURVEY,
2018–2022**

by

Quinn Smith

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

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November 2018

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SIGNATURE PAGE

Project Title: Southeast Alaska Pot Shrimp Survey
Project leader(s): Quinn Smith, Fishery Biologist III
Division, Region, and Area: Commercial Fisheries, Southeast Alaska
Period Covered: 2018–2022
Field Dates: August–September
Plan Type: Category II

Approval

Title	Name	Signature	Date
Project leader	Quinn Smith		08/03/18
Biometrician	Katie Palof		08/03/18
Research Coordinator	Karla Bush		08/03/18

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PURPOSE

The goal of the standardized pot shrimp survey is to develop long-term fishery independent indices of relative abundance of spot shrimp, *Pandalus platyceros*, across Southeast Alaska for stock assessment decisions. Relative abundance metrics will be derived from comparing annual survey catch rates by size class; mean carapace lengths; and the size at which 50% of shrimp change sex (L50) to recent surveys and area specific baselines.

Key words: pot survey, spot shrimp, *Pandalus platyceros*, Southeast Alaska

OBJECTIVES

Primary:

1. Obtain a preseason index of abundance for spot shrimp.
2. Describe spot shrimp size and sex composition.
3. Obtain catch information by product type for comparison to the actual size composition of the unsorted, unprocessed survey catches.

Secondary:

1. Record incidental catch (numbers and weight) of commercially important species and shrimp predators.

Tertiary:

1. Address particular area management concerns.
2. Special short term projects.

BACKGROUND

Spot shrimp (*Pandalus platyceros*), the target species for the shrimp pot fishery in Southeast Alaska, are widely distributed within the North Pacific Ocean. They occur from the intertidal to depths of greater than 1,500 ft, from the Korea Strait to the Sea of Japan, along the Siberian east coast, and from Unalaska to San Diego, California (Butler 1964).

Stock assessment surveys currently conducted in Southeast Alaska include an annual shrimp pot survey in five districts. These surveys are all relatively recent; the District 3 survey started in 1997, Districts 7 and 13 in 1999, District 12 in 2000, and Districts 1 and 2 in 2011. The District 13 survey was cut in 2015 due to program budget reductions; as funds are available periodic sampling in District 13 may occur. Fishery Managers have used the results of these surveys to set guideline harvest limits (GHLs) and manage the commercial pot shrimp fishery.

METHODS

CATCH SAMPLING

Catch sampling priority will be structured by tiers as follows:

Tier I–Spot shrimp

Tier II–Predator and commercial species bycatch

Tier III–Special projects

If necessary, tiers can be dropped from sampling to meet Tier I priority.

GEAR AND BAIT

Sets of longlined shrimp pots will be used to capture spot, *P. platyceros*, and incidentally coonstripe, *P. hypsinotus*, shrimp. Floating groundline (1/2-in) will be used to longline each pot in the set at 20 fathom intervals. Each pot will have two pints of chopped winter-caught bait herring in a bait jar and one-half of a pink salmon hanging bait. Baiting will occur daily, bait will not be thawed more than 12 hours prior to use. Sets will consist of five 42-in pots with 1 1/8-in mesh and four tunnels. A single Tidbit® temperature logger will be affixed to an end pot in each string. Pots are spaced 20 fathoms apart to maintain statistical independence from each other (Smith 2012).

SETTING AND PULLING

A minimum of nine sets will be made daily. These will be a mix of established and experimental stations. Established stations are set at the same coordinates every year, while experimental station locations may vary year to year. An accounting of established and experimental stations by District is displayed in Table 1.

Prior to setting, the vessel GPS should be set to accept and output spatial data in WGS84. Station start and end positions will be entered into the vessel navigational software to allow sets to accurately duplicate respective station positions. During setting, the skipper will navigate to the set start position, locate the appropriate set start depth and begin setting pots following a course to the location and depth of the set end position. Information on the set start time, location, and depth will be recorded on the “Pot Shrimp Set Form” (Appendix A).

In some cases, station start and end positions and/or depths may conflict with field observations. Possible problems include:

1. Depth of either station start or station end is much different than that recorded,
2. Distance between station start and station end exceeds or is much less than 100 m.
3. Station start and station end depths do not differ by 10–30 fathoms.

If one of these problems occurs, then station positions and/or depths should be corrected in consult with the Primary Investigator. To do this, start from a known (start or end) position heading toward the probable (start or end) position, making note of the new coordinates and depths.

Pots will be set from 13:00 to 18:00 each afternoon and pulled from 08:00 to 13:00 each morning, to achieve a soak time of 16–22 hours. Depending upon wind and tidal current direction, it may be necessary to pull pots in a reverse order from that in which they were set in order to prevent longlined pot gear from fouling the bottom. Hauling order should be noted on the “Pot Shrimp Set Form”.

SAMPLING SHRIMP

To avoid bias due to pots 1 and 5 sometimes being off the bottom, only shrimp from pot numbers 2–4 will be sampled from each set. As each set is hauled, pot condition will be recorded for each pot and the pot contents will be dumped into a separate basket, pre-labeled with the pot order (1–5). When sets are hauled in the opposite order set, begin with pot (and basket) number 5 and when they are hauled in the same order as set, begin with pot number 1.

Bycatch will be removed from the baskets sorted, counted, and numbers recorded for each commercially important bycatch species. Pot condition and bycatch data will be recorded on the “Pot Shrimp Set Summary Form” (Appendix B).

CARAPACE LENGTH FREQUENCY

For pot numbers 2–4, lengths for all or a subsample of spot shrimp will be measured to the nearest 0.5 mm. The presence or absence of eggs, parasites, and soft-shell condition will also be recorded. Before sampling, shrimp should be sorted by presence or absence of eggs; they are then sorted by number, taking care to randomly select shrimp for measuring. Non-egged and egged shrimp may be subsampled at different rates depending on their numbers, with the goal of obtaining a subsample of 50–100 shrimp per sampled pot.

Pots planned for sampling that have zero shrimp should be entered as subsample rate zero, and the comment “NO SHRIMP” should be entered in the comments of the pot shrimp set summary form, and in the Alex database.

In all districts, measure one pink, coonstripe, and/or one sidestripe shrimp carapace length to represent the entire group of that species in the pot. Other shrimp species will not be measured, but their numbers will be recorded as bycatch under “general shrimp”. Length frequency data will be recorded on the “Pot Shrimp Specimen Data Form” (Appendix C).

SIZE AT-SEX

Daily, approximately 50 shrimp will be randomly selected from any three pots for a total of 150 per day and 600 shrimp per trip (300 for Tenakee). These shrimp should never be individually selected for sexing; handfuls may be taken from a pot with an abundance of moderately sized shrimp. Because of the database structure, each sample should be taken from a single pot, either sampled or unsampled. Place each sample in a hard plastic container with a lid; label the sample both externally and internally prior to freezing with: project, date, trip, set, and pot number (Appendix D). Care should be taken to freeze these samples as quickly as possible to maintain shrimp condition.

DATA INTEGRITY

Data forms should be checked for completeness and errors or confusion at the end of each day. This will facilitate catching errors early while there is still some hope of correcting them. To the extent logistically possible, all collected data will be entered into the Zander database onboard survey vessels and verified prior to disembarking. If it is not possible to complete entry of carapace length frequency data while aboard the vessel, entry will be coordinated immediately after surveys conclude by Shellfish research staff in Juneau. All data is housed in OceanAK, a relational database available via intranet to ADF&G researchers and managers statewide (subject area: Region 1 – Invertebrates – Surveys – Shrimp). Raw datasheets will be scanned with both digital copies and physical sheets archived.

DATA ANALYSIS

Data collected in the southeast pot shrimp surveys will continue to be analyzed as described in Bishop et al. 2009.

SURVEY LOGISTICS

All survey areas will be sampled annually. Survey areas are listed in Table 1 and shown in Figures 1–5.

Table 1.—Annual survey locations for the southeast Alaska preseason pot shrimp survey.

District	Analysis Area	Statistical Area	# of sets
1	Bach Behm Canal	101-80	18
1	West Behm Canal	101-90, 95	18
2	Kasaan Bay	102-60	18
2	Cholmondeley Sound	102-40	18
3	Hetta Inlet	103-25	18
3	Mid Cordova Bay	103-21, 23	18
7	Upper Ernest Sound	107-20	22
7	Lower Ernest Sound	107-10	14
12	West Tenakee	112-45, 48	18

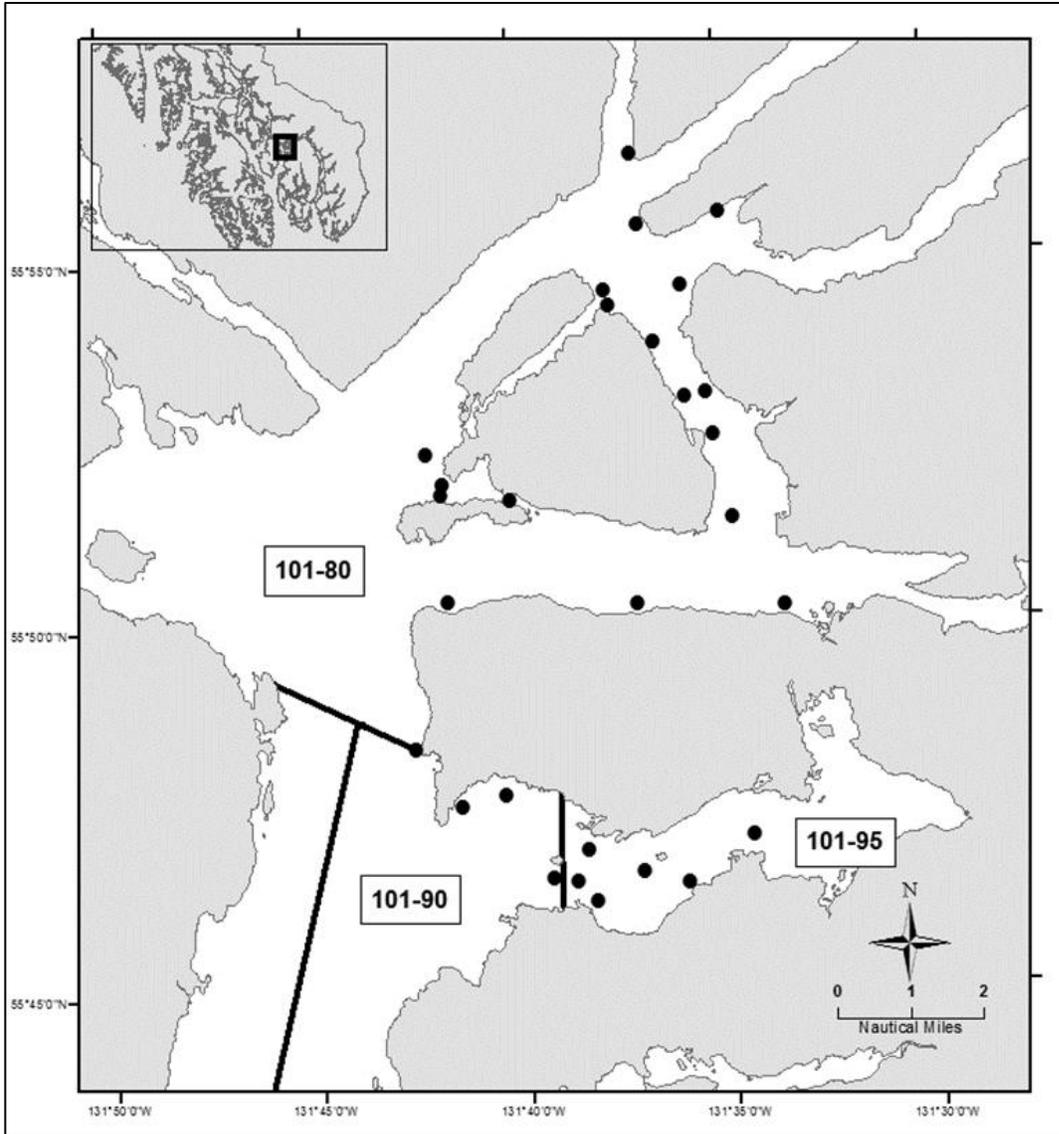


Figure 1.—Survey station locations, and statistical area line in District 1.

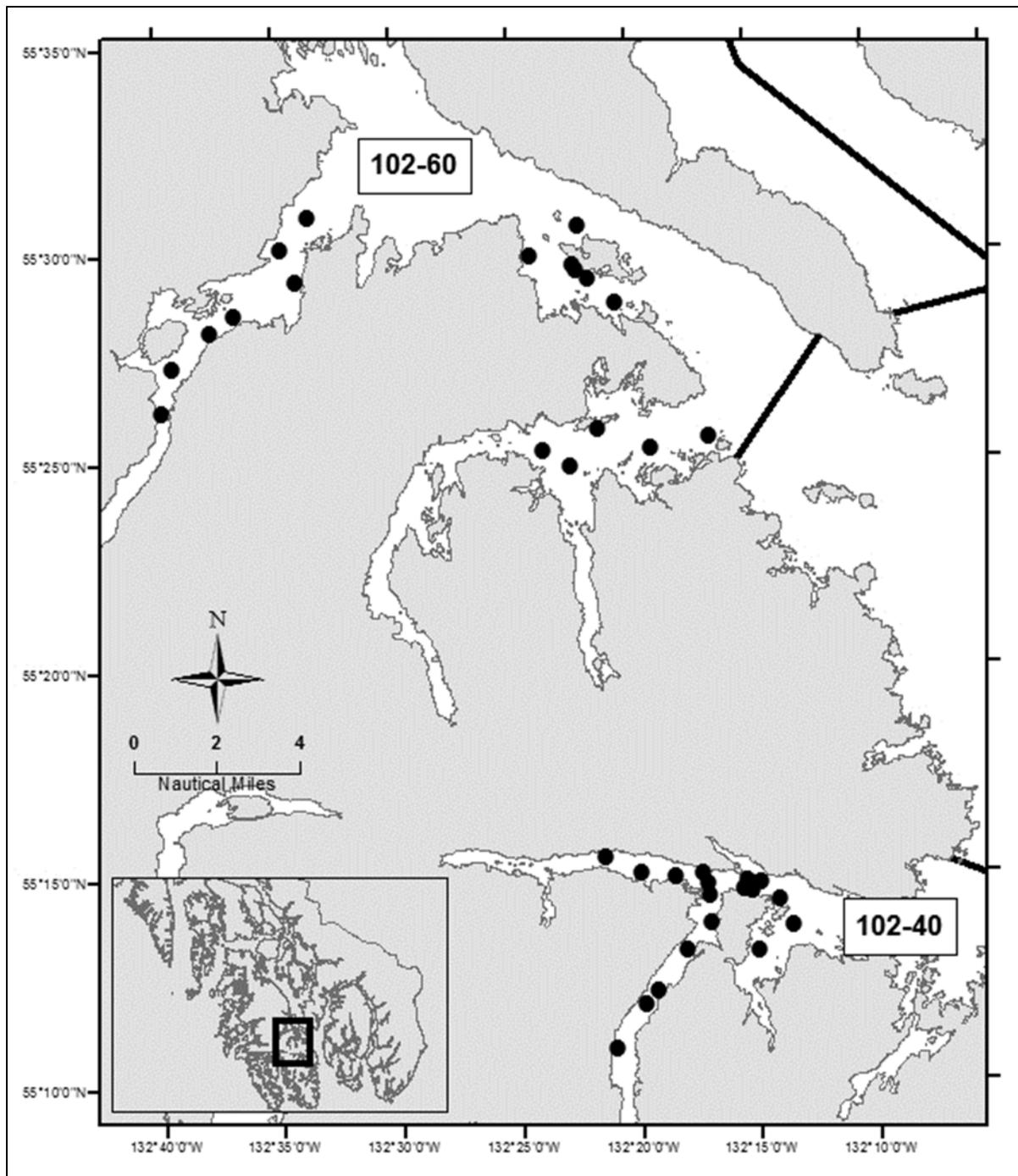


Figure 2.—Survey station locations, and statistical area lines in District 2.

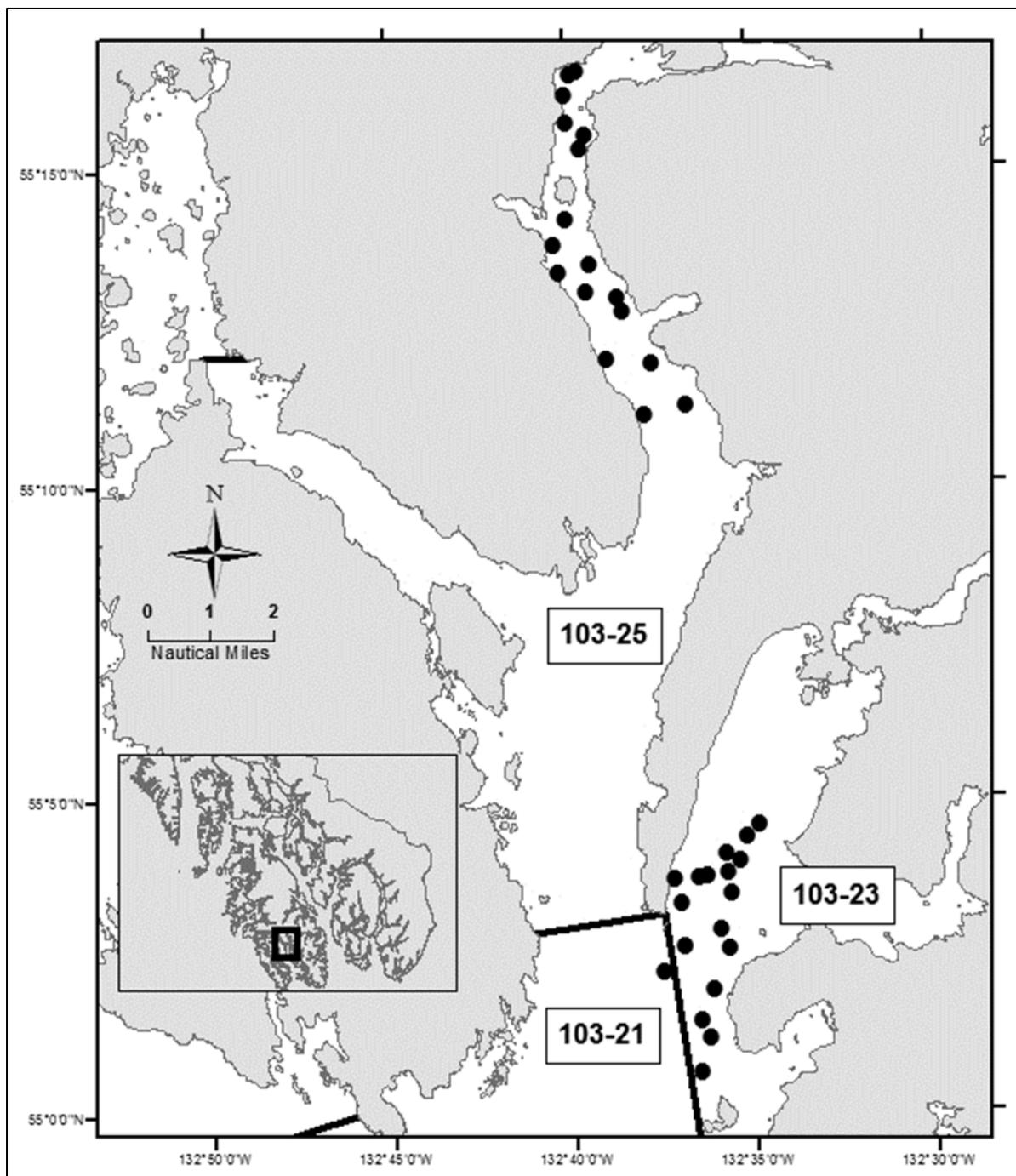


Figure 3.—Survey station locations, and statistical area lines in District 3.

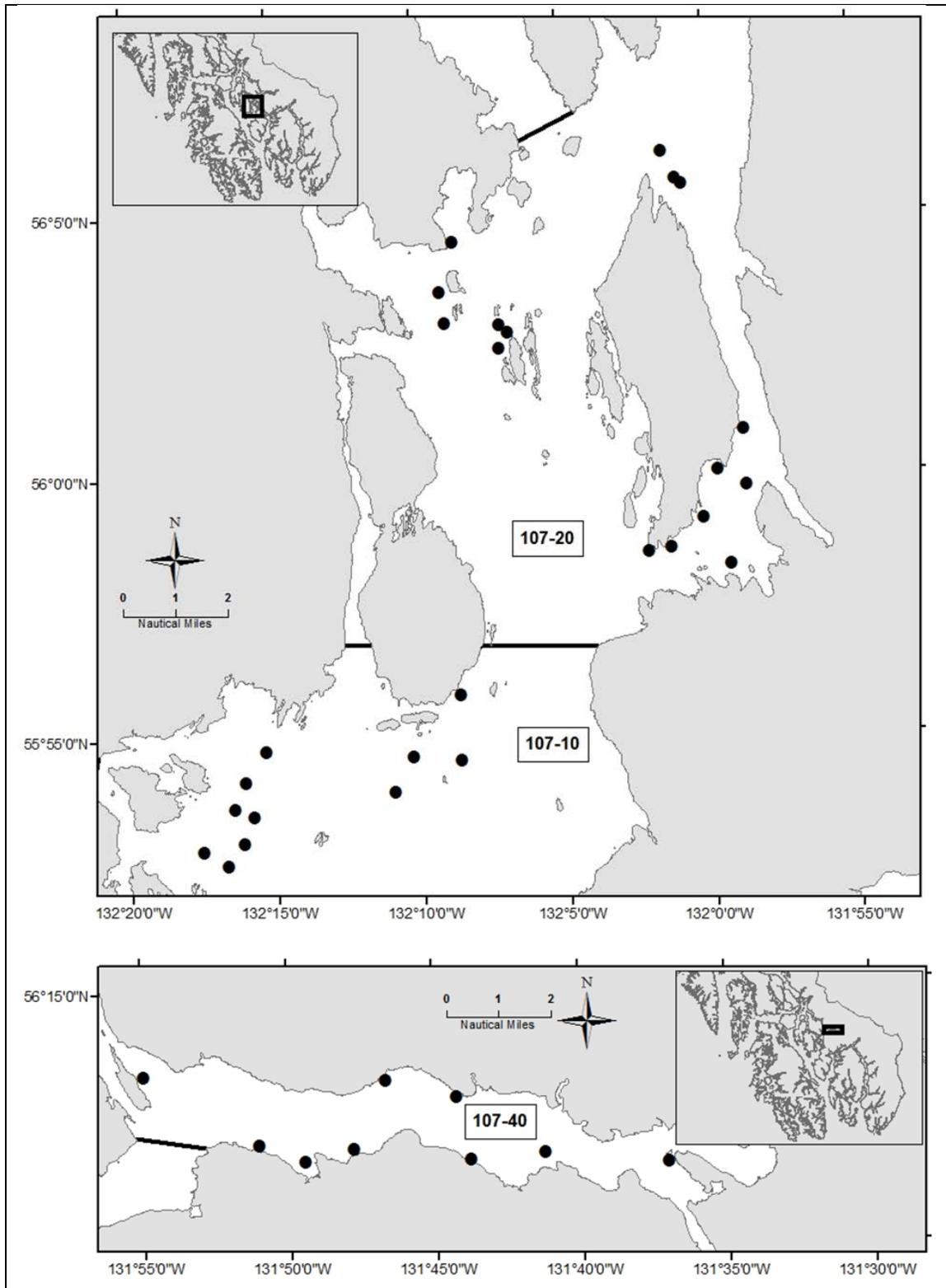


Figure 4.–Survey station locations, and statistical area lines in District 7.

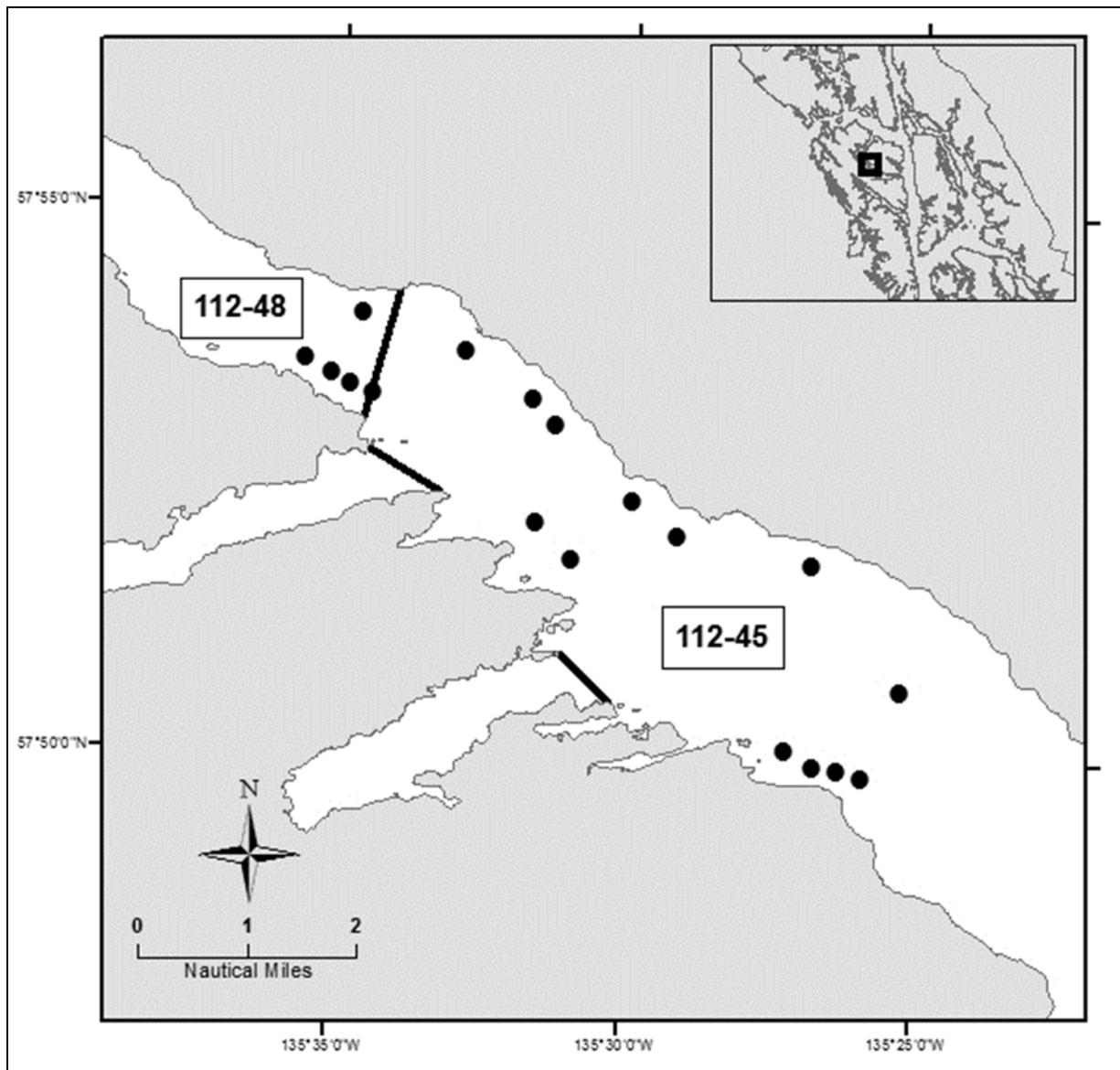


Figure 5.—Survey station locations, and statistical area lines in District 12.

SCHEDULE AND DELIVERABLES

Time Frame	Activity
June–Aug	Survey preparation
Aug–Sep	Field surveys
October–November	Data entry and QA/QC
November-February	Laboratory sexing of collected samples
January–April	Integration of survey results into annual stock assessment memo
April	Results submitted to fishery managers
May	Data sets archived

RESPONSIBILITIES

Quinn Smith, Fishery Biologist III

Duties: Responsible for all aspects of the project. He will be assisted by biometrician for study design. Coordinates vessel and staff scheduling, and acts as Field Lead for data collection. Responsible for all data coordination, analysis, and interpretation.

Katie Palof, Biometrician II

Duties: Serve as project biometrician and provide input in sampling design and analysis techniques.

REFERENCES CITED

- Bishop, G., C. Siddon, and J. Bednarski. 2009. Stock Status of spot shrimp in Southeast Alaska prior to the 2008-09 season. Alaska Department of Fish and Game, Fisheries Data Series. 09-46, Douglas.
- Butler, T. H. 1964. Growth, reproduction, and distribution of pandalid shrimps in British Columbia. *Journal of the Fisheries Research Board of Canada* 21:1403–1452.
- Olson, A., and A. Baldwin. 2018. *Eptatretus* spp. (Hagfish) occurrence in Southern Southeast Alaska. Alaska Department of Fish and Game, Regional Operational Plan ROP.CF.1J.2018.02, Douglas.
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APPENDICES

Appendix A.–Pot Shrimp Survey Set Form.

POT SHRIMP SET FORM																									
Year: _____		Project: <u>Pot Shrimp Preseason Survey</u>				Trip #: _____			Dist/Subdistrict: _____				Location: _____				Recorder: _____								
STATION NO.	SET TYPE	BEGIN / END	SET				LIFT				BUOY NO.	SOAK PERIOD	HAULBACK ORDER	NUMBER OF POTS	LENGTH OF SET	POT DISTANCE	DEPTH			LATITUDE / LONGITUDE				TIDBIT NUMBER	COMMENTS
			MONTH/ DAY	TIME	MONTH/ DAY	TIME	BEGIN	MID	END	DEG. N							MINUTES TO 1,000ths	DEG. W	MINUTES TO 1,000ths						
	S/E	Begin	/			/																			
		End	/			/				12/24			S/O												
	S/E	Begin	/			/																			
		End	/			/				12/24			S/O												
	S/E	Begin	/			/																			
		End	/			/				12/24			S/O												
	S/E	Begin	/			/																			
		End	/			/				12/24			S/O												
	S/E	Begin	/			/																			
		End	/			/				12/24			S/O												
	S/E	Begin	/			/																			
		End	/			/				12/24			S/O												

Appendix B.–Pot Shrimp Survey Set Summary Form.

POT SHRIMP SURVEY SET SUMMARY FORM																	
Year	Project				Trip #	Stat Area				Recorder							
Preseason Survey																	
STATION #	POT #	POT TYPE	MESH SIZE	POT SIZE	CONDITION	Incidental Species										Comments	Incidental Species
	1	C	1.125	42													931 Tanner Crab
	2	C	1.125	42													910 Dungeness
	3	C	1.125	42													921 Red King Crab
	4	C	1.125	42													923 Brown King Crab
	5	C	1.125	42													922 Blue King Crab
	1	C	1.125	42													966 Yellow Leg Shrimp
	2	C	1.125	42													270 Pollock
	3	C	1.125	42													110 Pacific Cod
	4	C	1.125	42													870 Octopus
	5	C	1.125	42													212 Hagfish
	1	C	1.125	42													194 Kelp Greenling
	2	C	1.125	42													130 Lingcod
	3	C	1.125	42													710 Sablefish
	4	C	1.125	42													342 Great Sculpin
	5	C	1.125	42													345 Irish Lord
	1	C	1.125	42													340 Sgahorn Sculpin
	2	C	1.125	42													341 Bignouth Sculpin
	3	C	1.125	42													147 Quillback Rockfish
	4	C	1.125	42													145 Yelloweye Rockfish
	5	C	1.125	42													153 Red Banded Rockfish
	1	C	1.125	42													139 General Rockfish
	2	C	1.125	42													961 Spiny Dog Fish
	3	C	1.125	42													211 Wrymouth
	4	C	1.125	42													Std. Sizes
	5	C	1.125	42													Pot Type: Cone
	1	C	1.125	42													Mesh Size: 1.125"
	2	C	1.125	42													Pot Size: 42"
	3	C	1.125	42													Pot Conditions
	4	C	1.125	42													01 Normal
	5	C	1.125	42													02 Not Baited
	1	C	1.125	42													03 Lost
	2	C	1.125	42													04 Door open
	3	C	1.125	42													05 Broken webbing
	4	C	1.125	42													06 Upside down
	5	C	1.125	42													07 Collapsed tunnel
	1	C	1.125	42													08 Not on bottom
	2	C	1.125	42													09 Pot open/broken
	3	C	1.125	42													10 Lost pot contents
	4	C	1.125	42													
	5	C	1.125	42													

Appendix C.-Pot Shrimp Survey Specimen Data Form.

POT SHRIMP SPECIMEN DATA FORM																					
											Page _____ of _____										
Year _____ Project <u>Preseason Survey</u> Trip _____ Set _____ Pot no. _____ Recorded By: _____																					
Sample Type (circle one): size · sex · atypical · length/weight											Date _____ / _____										
											Month Day										
SPECIMEN #	SUBSAMPLE RATE	961 Pink 962 Sidestripe 963 Humpy 964 Coonstripe 965 Spot			CARAPACE LENGTH (mm)			00 - unknown 01 - yes 02 - no			SPECIMEN #	SUBSAMPLE RATE	961 Pink 962 Sidestripe 963 Humpy 964 Coonstripe 965 Spot			CARAPACE LENGTH (mm)			00 - unknown 01 - yes 02 - no		
		SPECIES CODE	0	0.	0	EGGS?	PARASITES?	SOFT?	SPECIES CODE	0			0.	0	EGGS?	PARASITES?	SOFT?				
1											51										
2											52										
3											53										
4											54										
5											55										
6											56										
7											57										
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40											90										
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42											92										
43											93										
44											94										
45											95										
46											96										
47											97										
48											98										
49											99										
50											100										

Appendix D.–Pot Shrimp Survey Size at Sex Sample Tag.

ADF&G Size-at-Sex
Shrimp Survey Sample

Yr:____ Project:_____
Date:____ Stat. Area:_____
Trip #:____ Station #:____ Pot #:____

ADF&G Size-at-Sex
Shrimp Survey Sample

Yr:____ Project:_____
Date:____ Stat. Area:_____
Trip #:____ Station #:____ Pot #:____

ADF&G Size-at-Sex
Shrimp Survey Sample

Yr:____ Project:_____
Date:____ Stat. Area:_____
Trip #:____ Station #:____ Pot #:____

ADF&G Size-at-Sex
Shrimp Survey Sample

Yr:____ Project:_____
Date:____ Stat. Area:_____
Trip #:____ Station #:____ Pot #:____

ADF&G Size-at-Sex
Shrimp Survey Sample

Yr:____ Project:_____
Date:____ Stat. Area:_____
Trip #:____ Station #:____ Pot #:____

ADF&G Size-at-Sex
Shrimp Survey Sample

Yr:____ Project:_____
Date:____ Stat. Area:_____
Trip #:____ Station #:____ Pot #:____

ADF&G Size-at-Sex
Shrimp Survey Sample

Yr:____ Project:_____
Date:____ Stat. Area:_____
Trip #:____ Station #:____ Pot #:____

ADF&G Size-at-Sex
Shrimp Survey Sample

Yr:____ Project:_____
Date:____ Stat. Area:_____
Trip #:____ Station #:____ Pot #:____

ADF&G Size-at-Sex
Shrimp Survey Sample

Yr:____ Project:_____
Date:____ Stat. Area:_____
Trip #:____ Station #:____ Pot #:____

ADF&G Size-at-Sex
Shrimp Survey Sample

Yr:____ Project:_____
Date:____ Stat. Area:_____
Trip #:____ Station #:____ Pot #:____

Trip 1, District 3,
 Quinn Smith (P.I.), Dan Gray, Adam Messmer
 R/V Kestrel August 27–September 4, 2018

<i>Date</i>	<i>Morning</i>	<i>Afternoon</i>
27-Aug	Depart Petersburg	Run Cordova Bay
28-Aug	Continue Run	Set Pots Hetta
29-Aug	Haul Pots	Set Pots Hetta
30-Aug	Haul Pots	Set Pots Nutkwa
31-Aug	Haul Pots	Set Pots Nutkwa
1-Sep	Haul Pots	Set Pots Long Island
2-Sep	Haul Pots	Set Pots Long Island
3-Sep	Haul Pots	Run Ketchikan
4-Sep	Continue Run	Sell & Crew Swap

Trip 2, District 2,
 Quinn Smith (P.I.), KTN AMB, Andrew Olson
 R/V Kestrel, September 5–10, 2018

<i>Date</i>	<i>Morning</i>	<i>Afternoon</i>
5-Sep	Depart KTN	Set pots Kasaan Bay
6-Sep	Haul Pots	Set pots Kasaan Bay
7-Sep	Haul Pots	Set pots Cholmondeley
8-Sep	Haul Pots	Set pots Cholmondeley
9-Sep	Haul Pots	Crew Swap
10-Sep	Run PSG	Run PSG

Trip 3, District 13
 Quinn Smith (P.I.), Karla Bush, Aaron Dupuis
 R/V Medeia September 12–16, 2018

<i>Date</i>	<i>Morning</i>	<i>Afternoon</i>
12-Sep	Run Hoonah Sound	Continue Run
13-Sep	Continue Run	Set Hoonah Sound
14-Sep	Haul Hoonah Sound	Set Hoonah Sound
15-Sep	Haul Hoonah Sound	Set Hoonah Sound
16-Sep	Haul Hoonah Sound	Run Tenakee

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Trip 4, District 12

Karla Bush (P.I.), Dave Harris, Jodi Neil

R/V Medeia September 17–September 20, 2018

<i>Date</i>	<i>Morning</i>	<i>Afternoon</i>
17-Sep	Run Tenakee	Set Tenakee
18-Sep	Haul Tenakee	Set Tenakee
19-Sep	Haul Tenakee	Run Funter Bay(ish)
20-Sep	Run Juneau	Run Juneau

Trip 5, District 7

Quinn Smith (P.I.), Tom Kowalske, Sara Miller

R/V Kestrel September 18–22, 2018

<i>Date</i>	<i>Morning</i>	<i>Afternoon</i>
18-Sep	Run Bradfield	Set Bradfield
19-Sep	Haul Bradfield	Set Upper Ernest
20-Sep	Haul Upper Ernest	Set Upper Ernest
21-Sep	Haul Upper Ernest	Set Lower Ernest
22-Sep	Haul Lower Ernest	Run Back Behm

Trip 6, District 1

Quinn Smith (P.I.), Kevin Clark, KTN AMB

R/V Kestrel September 23–28, 2018

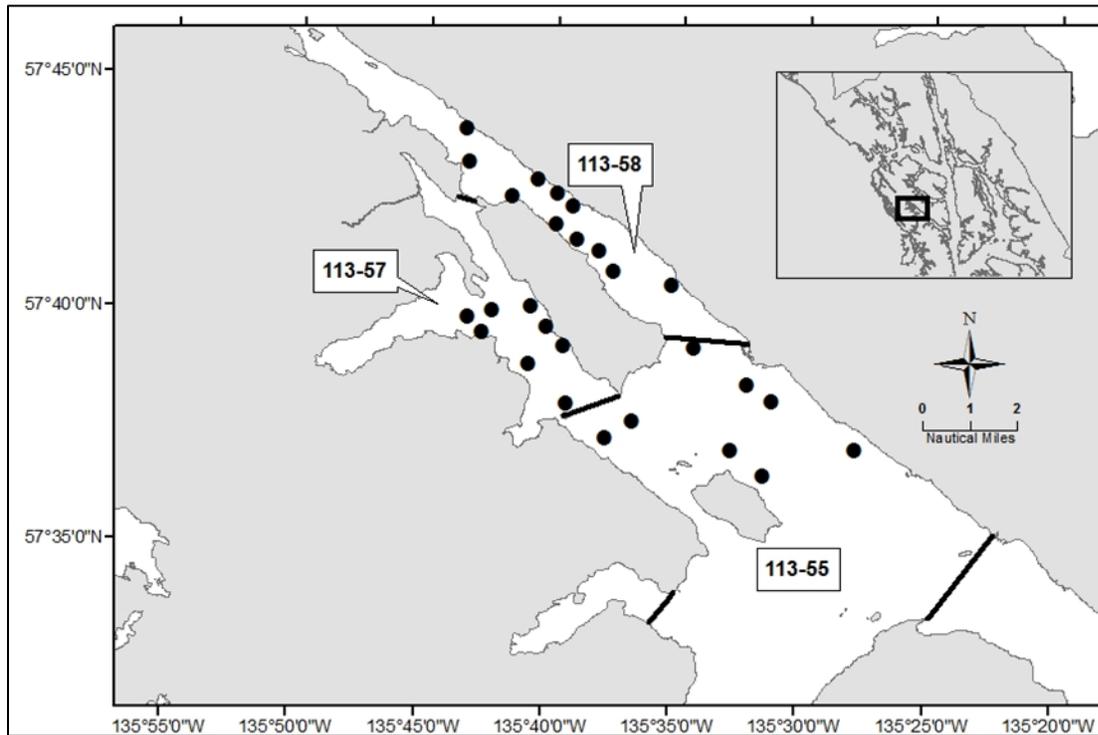
<i>Date</i>	<i>Morning</i>	<i>Afternoon</i>
23-Sep	Run Back Behm	Set pots Back Behm
24-Sep	Haul Pots	Set pots Back Behm
25-Sep	Haul Pots	Set pots West Behm
26-Sep	Haul Pots	Set pots West Behm
27-Sep	Haul Pots	Run Petersburg
28-Sep	Continue Run	Continue Run

Special Projects

District 13 survey

The District 13 survey was discontinued beginning in 2015 due to budget cuts. However, due to current stock health concerns an abbreviated survey will be conducted in Hoonah Sound in 2018 with 27 of the 36 previously surveyed stations fished.

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Hagfish Distribution Sets

One Hagfish distribution set will be made in District 2 (55.3042, -131.964) using methods outlined in the hagfish sampling ROP (Olson and Baldwin 2018).

UAS Shrimp Collection

Live collections will be completed in Tenakee Inlet on September 19 and delivered to Dr. Sherry Tamone at UAS as part of a joint study on spot shrimp life history. Sample sizes are shown in the table below.

Water for the onboard aquarium should be collected during the run to Tenakee as far away from freshwater influence as possible. The day before collecting shrimp check the aquarium water salinity with a refractometer and add “instant ocean” solution as necessary to obtain a reading of at least 33.5 ppt (approx. 1.3392 refractive index), and turn on the aquarium pumps to ensure oxygenation.

Live collection sample sizes:

Sample Size	Stage
100	Male
50	Female
25	Juvenile