

Operational Plan: Prince William Sound Shrimp Harvest Monitoring, 2023–2027

by

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

REGIONAL OPERATIONAL PLAN NO. ROP.SF.2A.2023.13

**OPERATIONAL PLAN: PRINCE WILLIAM SOUND SHRIMP HARVEST
MONITORING, 2023–2027**

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SIGNATURE/TITLE PAGE

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ABSTRACT

The noncommercial pot shrimp fishery in Prince William Sound, Alaska has been monitored periodically (2002–2005, 2009–current) with a permit that requires users to report the location, duration, and harvest of their sets. The objectives of this project are to continue to estimate effort and harvest of the noncommercial shrimp fisheries in Prince William Sound and to evaluate the methods used in achieving this goal. New to this operational plan is the Failure to Report process which was implemented by the Alaska Board of Fisheries in March 2022.

Keywords: harvest, management, permit, pot, noncommercial, sport, personal use, subsistence, spot shrimp, *Pandalus platyceros*, Prince William Sound

INTRODUCTION

PURPOSE

This project utilizes mandatory permit and reporting requirements for the noncommercial Prince William Sound shrimp fishery to estimate harvest and effort in the Prince William Sound Management Area. This information is used for monitoring harvest and effort trends in the fishery and setting pot limits in subsequent years.

BACKGROUND

Prior to 2001, the Alaska Department of Fish and Game (ADF&G) collected shrimp harvest data collected through the annual statewide harvest survey (SWHS¹). Effective January 1, 2001, the Alaska Board of Fisheries (BOF) required a shrimp permit for noncommercial users fishing for shrimp in Prince William Sound (PWS). This permit requirement was part of a shellfish proposal that addressed concerns of depressed shrimp populations throughout Prince William Sound. After the initial 4 years of data collection on PWS noncommercial shrimp fisheries (2001–2005), and a comparison of permit and SWHS data, it was determined permits were not necessary to manage the noncommercial fisheries. The BOF adopted a proposal to eliminate the noncommercial shrimp permit in the 2005–2006 statewide shellfish BOF meeting.

However, in March 2009, the BOF adopted the *Prince William Sound Pot Shrimp Management Plan* establishing a noncommercial fishery guideline harvest level for shrimp taken by pot gear as 60 percent of the total allowable harvest (TAH) for the area, allocating the other 40 percent to the commercial fishery. To manage the noncommercial fishery allocation, it became necessary to reinstitute the noncommercial fishery permit beginning in 2009. In addition to the permit requirement, shrimp regulations were approved by the BOF to reduce the number of pots to no more than 5 per person, with a maximum of 5 pots per vessel, and established an open season from April 15 to September 15, with no bag limit.

Preseason emergency orders were issued from 2016 to 2023 restricting the number of pots allowed in the PWS shrimp noncommercial fisheries (Table 1). Pot limits have varied year to year depending on harvest and catch-per-unit-effort information during previous years.

¹ <https://www.adfg.alaska.gov/sf/sportfishingsurvey/>

Table 1.—Prince William Sound noncommercial shrimp pot fishery emergency orders (EOs) issued by the Division of Sportfish liberalizing or reducing the regulated 5 pots per person with a maximum of 5 pots per vessel, 2010–2023.

Emergency order	Effective date	Explanation
2010 Calendar year		
2-SHR-6-03-10	4/15/2010	Liberalized number of shrimp pots allowed to harvest shrimp in the Prince William Sound sport fishery to 8 pots per person with a maximum of 8 pots per vessel.
2011–2015 Calendar years		
No noncommercial fisheries EOs issued.		
2016 Calendar year		
2-SHR-6-13-16	4/15/2016	Restricted number of shrimp pots allowed to harvest shrimp in the Prince William Sound sport fishery to 4 pots per person with a maximum of 4 pots per vessel.
2-SHR-6-14-16	4/15/2016	Restricted number of shrimp pots allowed to harvest shrimp in the Prince William Sound personal use fisheries to 4 pots per person with a maximum of 4 pots per vessel.
2017 Calendar year		
2-SHR-6-11-17	4/15/2017	Restricted number of shrimp pots allowed to harvest shrimp in the Prince William Sound sport fishery to 4 pots per person with a maximum of 4 pots per vessel.
2018 Calendar year		
2-SHR-6-05-18	4/15/2018	Restricted number of shrimp pots allowed to harvest shrimp in the Prince William Sound sport fishery to 4 pots per person with a maximum of 4 pots per vessel.
2019 Calendar year		
2-SHR-6-15-19	4/15/2019	Restricted number of shrimp pots allowed to harvest shrimp in the Prince William Sound sport fishery to 3 pots per person with a maximum of 3 pots per vessel.
2020 Calendar year		
2-SHR-6-13-20	3/10/2020	Restricted number of shrimp pots allowed to harvest shrimp in the Prince William Sound sport fishery to 3 pots per person with a maximum of 3 pots per vessel.
2021 Calendar year		
2-SHR-6-15-21	3/8/2021	Restricted number of shrimp pots allowed to harvest shrimp in the Prince William Sound noncommercial fisheries to 2 pots per person with a maximum of 2 pots per vessel.
2022 Calendar year		
2-SHR-6-18-22	3/15/2022	Restricted number of shrimp pots allowed to harvest shrimp in the Prince William Sound noncommercial fisheries to 3 pots per person with a maximum of 3 pots per vessel. Of those 3 pots only 2 pots may be used near the Port of Valdez, near the Port of Whittier, and in portions of Port Wells and Culross Passage.
2023 Calendar year		
2-SHR-6-16-23	3/7/2023	Restricted number of shrimp pots allowed to harvest shrimp in the Prince William Sound noncommercial fisheries to 3 pots per person with a maximum of 3 pots per vessel. Of those 3 pots only 2 pots may be used near the Port of Valdez, near the Port of Whittier, and in portions of Port Wells and Culross Passage.

Note: For the noncommercial fisheries, Division of Sport Fish is responsible for issuing emergency orders for sport fisheries; Division of Commercial Fisheries is responsible for issuing emergency orders for subsistence fisheries.

Permit Reporting

The noncommercial “shrimpers” in PWS currently fall under 2 categories: sport and subsistence. Sport shrimpers are required to have a valid sport fishing license and can shrimp in all waters of the PWS Management Area. Subsistence shrimpers are not required to have a sportfishing license although they are required to be an Alaska resident. Subsistence shrimpers are also not allowed to shrimp in the Valdez nonsubsistence area. Both user groups are required to have a PWS shrimp permit with them while shrimping and they must record their harvest. Historically, harvest and other information were recorded on the permit issued to the shrimper, and then the permit was turned in to ADF&G, but over the last 3 years, most reporting has been completed in the online Harvest Reporting system. While online reporting is requested and most permit holders report online, some permits and harvest records are still received in the mail and entered by ADF&G staff. In March 2022, the Alaska Board of Fisheries implemented the Failure to Report (FTR) process where shrimpers are denied a permit the following season if a harvest report was not filed. Annual reporting rates without the FTR process ranged from 85% to 92% during 2009–2022 (Table 2).

Table 2.—Number of permits returned by mailing, 2002–2005 and 2009–2022.

Year	Estimated number of permits issued	Voluntary returns ^a (%)	Returned after first reminder (%)	Returned after second reminder (%)	Returned after third reminder ^b (%)	No response (%)	Total response rate
2002	717	38	37	8	1	16	84
2003	1,061	38	31	18	4	9	91
2004	1,649	34	39	17	—	10	90
2005	2,112	45	13	32	—	10	90
2009	2,733	46	38	6	—	11	90
2010	3,181	46	38	6	—	11	90
2011	3,309	51	27	10	—	12	88
2012	3,098	49	27	12	—	12	88
2013	3,101	51	31	7	—	11	89
2014	3,134	52	25	9	—	14	86
2015	3,033	51	27	9	—	13	87
2016	3,592	67	17	7	—	9	91
2017	3,441	65	17	10	—	8	92
2018	3,810	64	17	9	—	10	90
2019	4,211	35	43	10	—	12	88
2020	4,501	54	26	9	—	11	89
2021	4,412	72	14	6	—	8	92
2022	4,475	61	19	5	—	15	85
Average							
2002–2005	1,385	39	30	19	—	11	89
2009–2022	3,574	55	26	8	—	11	89

^a Voluntary households are those that voluntarily returned their completed permits without being mailed a reminder letter.

^b Added to the nonresponse rate when the average was calculated; third mailing discontinued after 2003.

OBJECTIVES

The primary and secondary objectives of this plan are for 2023–2027 and their subsequent reporting periods.

PRIMARY OBJECTIVE

Estimate effort (pot-days of effort) and harvest (pounds of shrimp) for permit holders in the PWS noncommercial shrimp fisheries for 2023–2027 seasons such that the annual estimates of total harvest are within 10% of the true values 95% of the time.

SECONDARY OBJECTIVE

Estimate the mean weight per gallon of sport caught shrimp in Prince William Sound.

METHODS

DATA COLLECTION

Permit Requirements

All participants in the noncommercial Prince William Sound shrimp fisheries are required to get a permit (Appendix A1) or be named on the permit of another household member through the ADF&G store (<https://www.adfg.alaska.gov/Store/>). A household can have more than one permit, but a single permit per household is recommended. Permits are sequentially numbered and 2 pages in length. When necessary, an Emergency Order and Advisory Announcement will be attached. Identifying information (permittee's name, address, residency, driver's license number, etc.) will be completed on the permit. The permittee will have the option of getting a sport (requires a sportfish license) or subsistence permit. The permit will also provide space for recording harvest and effort data. The second page of the permit will provide information about the PWS shrimp fishery. This permit is required to be in the possession of the person working the shrimp gear. Permit holders are required to record their effort (number of pots and soak time) and harvest (in gallons of whole shrimp) on the permit prior to leaving the fishing site or concealing the shrimp from view and must return the permit to ADF&G or submit the information online by October 15 of that year. A PWS shrimp permit may also be activated on the ADF&G Mobile App as a substitute to a printed paper copy. All the same permit holder and harvest reporting information will be on the ADF&G Mobile App.

Harvest Reporting Reminders

Notification Process

Reminder emails, letters, social media posts, and Advisory Announcements will be sent according to a predetermined schedule (Table 3) and will ensure that all individuals with permits receive sufficient notification to help them comply with reporting requirements. Each reminder email and letter will include the permit holder's name and permit number or a way to look up their permit number.

Table 3.—Timeline for reminder notifications.

Action	Time	Method
Reminder to report	15-21 days prior to fishery closure	Social media post
AA of fishery closing and reminder to report online	Week prior to fishery closure	Gov Delivery email to anyone who has subscribed
Reminder to report	5-7 days before season close day	Social media post
Reminder to report	5-7 days after season closes	Email to all permit holders regardless of reporting status
Reminder to report	2 weeks after fishery closes (~Oct 1 for pulling list; ~Oct 6 for mailing)	Pull nonrespondent list; mail out 1st reminder letter- USPS postcards
Reminder to report	~Oct 7: 1 week prior to deadline to report harvest	Social media post
Reminder to report	After October 16	Email to nonrespondents explaining appeal process
Reminder to report/appeal process	Last week of October (~Oct 24 pull non-respondent list, ~Nov 1 2nd reminder/appeal process letter)	Pull nonrespondent list; mail out 2nd reminder/appeal process letter- USPS postcards
Final reminder to report and appeals process	5 days prior to end of appeals process (~Nov 10)	Email nonrespondents a reminder to report harvest.

Harvest reporting requirements are listed on both permits (sport and subsistence). The on-time reporting deadline will be 30 days after the close of the fishery (15 October) with an appeals period from October 16 through November 15. An Advisory Announcement will go out to anyone that subscribes to the Prince William Sound fishing information/Gov Delivery system 1 week prior to the close of the shrimp fishery. In addition, all permit holders who provide an email address will receive an email reminder to report harvest 5–7 days after the season closes.

Approximately 14 days prior to the October 15 on-time reporting deadline, a list of nonrespondents will be pulled and a postcard will be mailed reminding permit holders of the on-time reporting date (Appendix B1). After the October 15 reporting deadline, a list of nonrespondents will be generated and an email will be sent explaining the appeals process and reminding permit holders to report during the appeal period or be placed on the FTR list for the following year. A second reminder postcard will be sent by November 1, 2 weeks prior to the end of the appeals period (Appendix B2). This United States Postal Service postcard notifies nonrespondents that they missed the deadline to report and are therefore not eligible to receive a sport or subsistence shrimp permit the following season unless they report their harvest during the appeals period and submit a written appeal by email or mail. The appeals letter must be received by November 15, approximately 2 weeks from when the notification is delivered, meaning the appeals process will end at most 1 month after the reporting deadline, and 2 months after the fishery has closed for the season. A final notification will be delivered individually via email to those who submitted appeals notifying them of the decision to approve or deny their appeal. This final notification will occur by December 1. The online harvest reporting form will no longer be available the day after the appeals process ends (November 15).

Data Checking

Estimating Harvest and Effort (Primary Objective)

The permit holder is required to use the ADF&G online harvest reporting system, which allows the user to enter each day's fishing through an easy-to-use web interface. The permit holder has the option of entering this information periodically throughout the fishing season or waiting until all fishing has been completed for the season to enter everything. The permit holder has the option of hand-delivering the completed harvest reporting form, but this is not encouraged. Reporting forms that come into the ADF&G offices will be key-punched by staff in License Admin System (LMS). The physical harvest reports will be filed.

All harvest information reported by permit holders who return their harvest reports before the reporting deadline will be treated as a census of compliant permit holders. Information obtained from permit holders who return their permits after the reporting deadline will be used to estimate harvest for nonrespondents. The ability to report on shrimp permits for the season will be disabled at 12:01 AM on the day following the end of the appeals period (November 16).

The initial permit return rate is expected (based on the 2020–2022 average) to be approximately 62%, with an additional 27% response to the first and second mailings (Table 2). The number of issued permits is expected to be approximately 4,460 per year (2020–2022 average). Of these, approximately 2,750 permit holders are expected to comply with the October 15 reporting deadline. Accordingly, about 1,700 permit holders will be sent a reminder letter in late October and 800 permit holders will be sent a second reminder letter in early November. The estimated total number of respondents is expected to be about 3,925 per year or 88%.

Sample Size and Precision

Effort and harvest from the 2002–2005 and the 2009–2022 shrimp permits (Table 4) were used to predict the sampling variances and related levels of relative precision. During this time, relative precision at the 95% confidence level has been less than 7% and recently (2014–2022) it has been less than or equal to 5% for both estimated harvest and estimated effort. It is anticipated that similar levels of relative precision should be reached, and precision criteria for the primary objective should be fulfilled for future years, provided permit return rates remain at similar levels.

Estimation of mean weight per gallon of sport caught shrimp will be done opportunistically and therefore has no set sample size for the objective criteria.

Table 4.–Shrimp harvest and effort in Prince William Sound, 2002–2005 and 2009–2022.

Year	Estimated harvest (gallons)	Standard error (gallons)	95% Relative precision (%)	Estimated effort (pot-days)	Standard error (pot-days)	95% Relative precision (%)
2002	3,870	83	4	19,387	187	4
2003	5,819	132	4	24,094	861	7
2004	10,706	322	6	30,694	1,103	7
2005	13,312	386	6	37,271	1,054	5
2009	23,383	278	2	47,631	1,071	5
2010	36,541	193	1	78,083	805	2
2011	24,659	247	2	56,543	922	3
2012	23,235	182	2	52,620	668	2
2013	22,105	188	2	48,967	887	4
2014	22,919	253	2	48,283	714	3
2015	23,669	297	2	48,521	676	3
2016	26,423	160	1	45,012	335	1
2017	23,606	144	1	45,509	225	1
2018	33,126	306	2	51,704	815	3
2019	28,196	303	2	39,816	466	2
2020	36,115	410	2	40,685	531	3
2021	22,366	260	2	25,671	324	2
2022	21,837	361	3	27,716	700	5

Identifying Duplicate and Multiple Permits

Following the close of harvest reporting, the list of permits for which harvest reports have been received will be compared to the list of individuals who obtained permits. Most simply, an individual obtains 1 permit and either reports their harvest or does not for that permit. However, even with stops in place within the permit application, some individuals may get a second permit (“duplicate permits”) either because they bypassed the online store checks that attempt to prevent duplication or because of an electronic error with the online store. In the event of duplicate permits, the permit with reported harvest will be used and permit without reported harvest will be voided. The permit holder will be contacted if there are questions on duplication of a permit and any duplicates will be voided.

Proofing Harvest Reports and Extracting Data from License Admin System

After November 16, no more reported harvest will be accepted, and no more reports will be entered into the system and a finalized extraction from LMS will be made by ADF&G management staff. Data will be sorted to look for data that appears outside the range of normal harvest ability. Staff will identify reports that exceed allowable pot limits, abnormally high soak times and gallons of whole shrimp harvested, and missing locations. The permit holders will be contacted to resolve these errors.

There will be 3 spreadsheets extracted from LMS and imported into a Microsoft Access file:

1) Permit Information

This spreadsheet will include all contact information for the permit holder, including permit number and reporting status (whether harvest date or did not fish was entered).

2) Effort Information

This spreadsheet will include the permit number and associated effort and location information.

3) Harvest Recorded

This spreadsheet will include the permit number, recorded harvest (gallons of whole shrimp), and the harvest date.

Once Anchorage management staff have determined that data errors have all been resolved, the output will be sent to an ADF&G biometrician to assign statistical area location codes to each location. Locations that need to be resolved will be sent back to the Anchorage management staff who will correct these location errors and simultaneously correct these errors in LMS.

The cleaned location code file will be sent back to the biometrician who will then determine the estimate of unreported harvest.

The data will be presented in 2 tables:

- 1) PWSPMC—Contains the permit holder name, address, and other personal information as well as the final status of the permit itself (i.e., whether and how they responded).
- 2) PWSHVC—Contains any harvest or harvest effort information associated with any permits that responded with harvest or harvest effort from table PWSPMC.

A variety of data queries will be performed to verify data integrity before the files are passed to the biometrician:

- 1) All records in table PWSHVC must have a matching permit number in table PWSPMC for the respective year.
- 2) All records in table PWSPMC must have a valid status value assigned (H, N, U, Z):
(H)—Harvest (or harvest effort) received. At least 1 harvest record must exist in table PMCHVC.
(N)—Did not fish. Participant responded and indicated that they did not participate in the fishery. No record should exist in table PWSHVC.
(U)—Unknown. Participant responded with a blank harvest report. No record should exist in table PWSHVC.
(Z)—Did not respond. Participant never responded even after the reminder process was executed. No record should exist in table PWSHVC.
- 3) Mailing value in table PWSPMC should reflect what the participant responded to and should be based on the last reminder sent (if any). For example, if 2 paper reminders are sent to the participant and they respond by sending in the first mailed reminder, the mailing value in PWSPMC will be 2, not 1. Any participant that responds unprompted is assigned a mailing value of 0.
- 4) Mailing value in table PWSHVC should reflect the actual value of the associated report returned. Valid mailing values in this table are 0, 1, 2, and 4, with 4 reflecting online reporting. In the example given above, the mailing value in PWSPMC will be 2, but the mailing value in PWSHVC would be 1 because that is what was physically returned. Had the participant chosen to go online to report after receiving their mailed reminders, then the mailing value in PWSPMC would still be 2, but the mailing value in PWSHVC would now be 4.

- 5) All harvest dates in table PWSHVC should be for year of permit only or 1990, which is used to reflect that the date was missing on the harvest report.

DATA ANALYSIS

Effort and Harvest (Primary Objective)

The number of permits issued (N) is known and will be divided in 4 groups:

$$N = N_{cf} + N_{cz} + \hat{N}_{df} + \hat{N}_{dz} \quad (1)$$

where

N_{cf} = the number of compliant households who reported fishing,

N_{cz} = the number of compliant households who reported they did not fish,

\hat{N}_{df} = The estimated number of noncompliant permits that fished, and

\hat{N}_{dz} = the estimated number of noncompliant households who reported they did not fish,

where

$$\hat{N}_{df} = [N - (N_{cf} + N_{cz})]\hat{w} \quad (2)$$

and

$$\hat{w} = \frac{n_{df}}{n_d} \quad (3)$$

where

n_{df} = the number of noncompliant households responding to the second reminder that reported fishing,

n_d = the number of noncompliant households responding to the second reminder,

and finally, where

$$\hat{N}_{dz} = N - (N_{cf} + N_{cz} + \hat{N}_{df}) \quad (4)$$

Harvest or effort will be estimated by the following procedure (with subscripts denoting parameter of estimation deleted for simplicity):

$$\hat{H} = H_{cf} + \hat{H}_{df} \quad (5)$$

where:

\hat{H} = estimated total harvest or effort,

H_{cf} = harvest or effort reported by compliant households, and

\hat{H}_{df} = estimated harvest by noncompliant households,

where

$$\hat{H}_{df} = \hat{N}_{df}\bar{h}_{df} \quad (6)$$

and where

\bar{h}_{df} = the mean harvest or participation per household for noncompliant households that reported fishing,

or

$$\bar{h}_{df} = \frac{\left(\sum_{j=1}^{n_{df}} h_{dfj}\right)}{n_{df}} \quad (7)$$

where

h_{dfj} = reported harvest by responding noncompliant household j , and

n_{df} = the number of noncompliant households responding to the second reminder.

Variance of \hat{H} will be calculated as follows (Goodman 1960):

$$\text{var}(\hat{H}) = \text{Var}(H_{cf}) + \text{var}(\hat{H}_{df}) = 0 + \text{var}(\hat{H}_{df}) \quad (8)$$

therefore

$$\text{var}(\hat{H}) = \text{var}(\hat{H}_{df}) \quad (9)$$

and from Equation 6

$$\text{var}(\hat{H}_{df}) = \text{var}(\hat{N}_{df}\bar{h}_{df}) = \hat{N}_{df}^2 \text{var}(\bar{h}_{df}) + \bar{h}_{df}^2 \text{var}(\hat{N}_{df}) - \text{var}(\bar{h}_{df})\text{var}(\hat{N}_{df}) \quad (10)$$

where from Equation 2

$$\text{var}(\hat{N}_{df}) = \text{var}(N - (N_{cf} + N_{cz})\hat{w}) = [N - (N_{cf} + N_{cz})]^2 \text{var}(\hat{w}) \quad (11)$$

and from Equation 3

$$\text{var}(\hat{w}) = \left[\frac{\hat{w}(1 - \hat{w})}{n_d - 1} \right] \quad (12)$$

and from Equation 7

$$\text{var}(\bar{h}_{df}) = \left(1 - \frac{n_{df}}{\hat{N}_{df}} \right) \frac{s_{df}^2}{n_{df}} \quad (13)$$

for which s_{df}^2 is the sample variance for the reported harvest by responding noncompliant households:

$$s_{df}^2 = \frac{\sum_{j=1}^{n_{df}} (h_{dfj} - \bar{h}_{df})^2}{n_{df} - 1} \quad (14)$$

Standard errors will be calculated from the square root of the variance estimates.

Mean Weight per Gallon (Secondary Objective)

The PWS management plan for the noncommercial shrimp pot fishery allows for harvest of 60% of the total allowable harvest (TAH). The TAH is determined using ADF&G Division of Commercial Fisheries (CF) shrimp pot surveys. Survey results are currently used to assess the relative abundance of spot shrimp in PWS, and these data, along with survey catch per unit effort

(CPUE) and total catch weight, are used in combination with harvests from the commercial and noncommercial fisheries each year to model the harvestable surplus of spot shrimp in PWS. Model results provide the following year's TAH and guideline harvest levels (GHL) for both commercial and noncommercial spot shrimp fisheries in pounds of shrimp. The reported shrimp harvest is converted from gallons of whole shrimp to pounds of shrimp using the conversion factor 3.89 lb/gal whole shrimp (Maria Wessel, Division of Commercial Fisheries Biologist, ADF&G, Cordova; unpublished data). This conversion factor was derived from a reevaluation of an earlier estimate and is substantially higher than the conversion factor previously used in this project. To test whether the conversion factor is not changing over time or not biased by CF sampling gear, Division of Sport Fish (SF) staff will opportunistically deploy noncommercial shrimp gear to estimate a conversion factor. These samples will be collected using gear commonly available to noncommercial shrimpers and will be deployed during the established season. Harvested shrimp will be placed in both 1-gallon and 5-gallon buckets and weighed. These bucket sizes represent the most common ways that noncommercial shrimpers measure their catch. On land, the 1-gallon bucket will be filled with whole shrimp and weighed. The number of shrimp in the 1-gallon bucket will then be counted and recorded. The same process will be repeated using a 5-gallon bucket that has a 1-gallon premarked line around interior perimeter of the bucket. If the observed pound-per-gallon conversion estimates obtained from this opportunistic sampling appear to substantially differ (>15%) from the current conversion factor (3.89 pound per gallon), a more formal evaluation will be conducted to more accurately estimate harvests in pounds.

Arithmetic mean weight per gallon and the associated variance will be calculated using standard procedures.

Failure to Report (FTR) Lists

Reviewing the Appeals Process

Written and emailed appeals will be reviewed by the SF area manager (or designated staff) and approved if the appellant has submitted their harvest report prior to the appeals deadline and demonstrates that either 1) an error was made by ADF&G in receiving the permit harvest report, 2) the permittee missed the reporting deadline due to unavoidable circumstances, or 3) not participating in the subsistence fishery the following year would result in extreme hardship. Individuals whose appeals are not approved (or those permit holders who do not make any attempt to report their harvest) will be placed on the failure to report (FTR) list for the appropriate fishery for the following season.

Compiling the FTR Lists

The FTR lists will consist of nonrespondent and noncompliant individuals. Nonrespondents are those who did not report their permit. Noncompliance is those who reported after the reporting deadline and did not submit an appeal or who reported after the reporting deadline and submitted an appeal but it was denied. Individuals who reported on time or who reported late but submitted an appeal that was approved will be considered compliant and will not be placed on an FTR list. Based on regulations, ADF&G may only deny a permit within the same fishery that the individual failed to report. This means there will be separate FTR lists established for the sport and subsistence fisheries. Before compiling and finalizing these lists, the data will be proofed to check for individuals who may have received duplicate or multiple permits as described above. Individuals who reported one of their duplicate permits on time will be considered compliant. If

individuals obtained both sport and subsistence permits and only reported one, a determination of compliance will be made on a case-by-case basis.

Implementing the FTR Lists

When individuals on the FTR list attempt to obtain a permit from the online store, a pop-up message will notify them that they are ineligible to receive a permit because they did not report their harvest on time the previous season. The popup will provide contact information for Anchorage office management biologists. The Anchorage office staff will field public concern about the FTR list or other Prince William Sound shrimp permit issues.

SCHEDULE AND DELIVERABLES

The following milestones must be met annually to keep the harvest monitoring on schedule:

Dates	Activity
Mid-March	Permit for each year updated and given to the Analyst Programmer for review.
First week of April	Permits for each year will be available online.
April 15–September 15	Shrimp will be sampled opportunistically to determine mean weight per gallon.
October	Harvest and effort information from voluntary returns will be entered into the database.
Early October	Nonrespondents will be identified and the first reminder letter will be mailed.
Late October	Nonrespondents from the first mailing will be identified and a second reminder letter will be mailed.
Mid December	Final checked data set, along with metadata and log of the edits will be given to project leader by end of December of each year.
Early/mid-January	Data analysis will be completed and final complete dataset along with metadata will be sent to regional SF and CF staff.

Results from this project will be written as an ADF&G Fishery Data Series (FDS) report once every 3 years coinciding with the Statewide Miscellaneous Shellfish and Provisions Board of Fisheries cycle (2024 and 2027). Harvest data will also be reported in the Prince William Sound Area Management Reports.

RESPONSIBILITIES

Brittany Blain-Roth, Area Manager, Fisheries Biologist III, Project Supervisor

Duties: As project leader, provides overall project supervision, manages budget, prepares operational plan, updates the permit, and authors the FDS report.

Donald Arthur, Assistant Area Manager, Fisheries Biologist II, Project Leader

Duties: As project leader, provides overall project supervision, manages budget, prepares operational plan, updates the permit, and authors the FDS report.

Michael Martz, Biometrician

Duties: Technically reviews study design, sampling methods, and data analysis of operational plan, and reviews report.

Ryan Snow, Programmer

Duties: Maintains data entry and data checking program.

Samantha Renner, Program Technician
Duties: Data entry; assist with FTR process.

BUDGET SUMMARY

This study involves collecting data on noncommercial shrimp fisheries in Prince William Sound, which includes sport and subsistence users. These fisheries are jointly managed by the Divisions of Sport Fish and Commercial Fisheries. For all years covered by this plan, Division of Sport Fish costs will be absorbed by the Anchorage–North Gulf Coast–PWS management budget.

Budget manager: Brittany Blain-Roth, Fishery Biologist

Line item	Category	Budget (\$K)
100	Personal Services	0
200	Travel	0
300	Contractual	2.0
400	Commodities	0.5
500	Equipment	0
Total		2.5


Personnel	Job class	Months budgeted
Michael Martz	Biometrician	0.0
Samantha Renner	Program Technician	0.0
Donald Arthur	Fisheries Biologist II	0.0
Total		0.0

REFERENCES CITED

Goodman, L. A. 1960. On the exact variance of products. *Journal of the American Statistical Association* 55(292):708-713.


APPENDIX A: SHRIMP PERMIT

Appendix A1.–Example of Prince William Sound shrimp permit.



Alaska Department of Fish and Game
202X Prince William Sound Shrimp Permit

*This permit is valid through
September 15th, 202X*

Permit Number

XXXX

Last Name

First Name

M.I.

Mailing Address

City **State** **Zip Code** **Phone Number**

E-Mail Address

Residency

Permit Type

Sport Fishing License #

Driver's License # **State**

Names of other household members authorized to fish this permit:

This permit is valid for the period April 15th – September 15th, 202X

► You must have this permit with you while taking shrimp in the waters of Prince William Sound (from Cape Fairfield to Cape Suckling).


► If you share pots with a friend or relative, be careful to report harvest on **ONLY** one permit.

► Harvest information must be recorded prior to leaving the fishing site or concealing the shrimp from view.

► The permit holder is responsible for reporting harvest online by October 15 even if the permit holder did not fish.

► Failure to report is a violation, and the permit holder **WILL NOT** be eligible to receive a permit the following season.

To Report Online:
Scan the QR code or visit us at
<https://www.adfg.alaska.gov/Harvest/>



Permit Holder Signature

Electronically Signed:

Date

► Record each set of pots you shrimped and record your harvest, even if you did not catch anything.

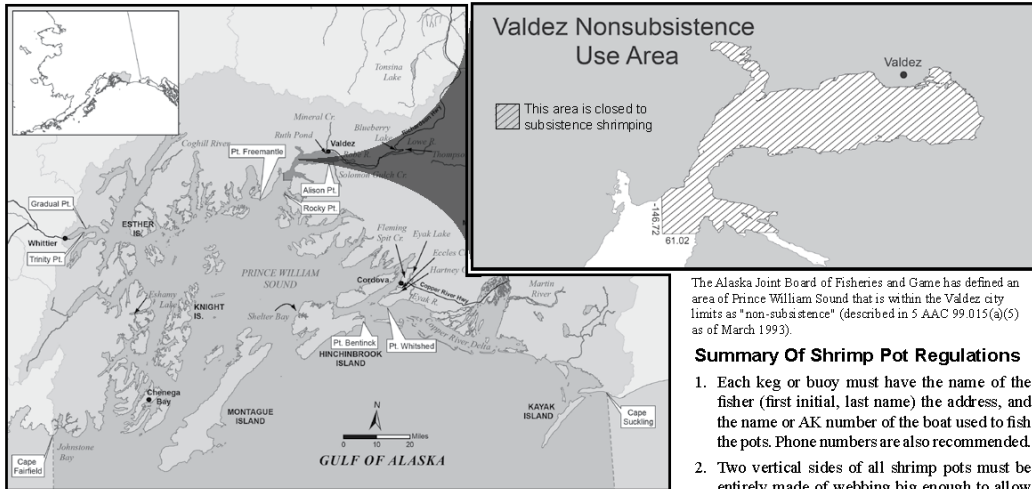
Report in GALLONS of whole shrimp (shrimp heads attached):
Examples: 0.5 = ½ gallon whole shrimp (shrimp heads on)
5 = 5 gal, 0.25 = 1/4 gal, 1.75 = 1 3/4 gal

DATE (Pots Set)		LOCATION shrimp was harvested from in Prince William Sound	NUMBER OF POTS FISHED	TIME SOAKED	WHOLE SHRIMP HARVESTED	
MM	DD	Examples include: specific bay, fjord, canal, arm, etc.	Pots	Hours	Gallons	
1.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
2.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
3.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
4.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
5.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
6.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
7.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
8.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
9.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
10.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
11.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
12.	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>

Please continue on another piece of paper if you need more lines to report your harvest.

Harvest must be recorded as you are actively shrimping on your paper permit. Final reports of each individual set made, and associated harvest, must be submitted online by October 15.

-continued-



Summary Of Shrimp Pot Regulations

1. Each keg or buoy must have the name of the fisher (first initial, last name) the address, and the name or AK number of the boat used to fish the pots. Phone numbers are also recommended.
2. Two vertical sides of all shrimp pots must be entirely made of webbing big enough to allow a 7/8-inch round wooden dowel to go through without stretching or otherwise deforming the opening. The two vertical sides must touch each other. The webbing on these two sides cannot be covered by anything. The other two sides, as well as the top and bottom, can be composed of any material. The 7/8-inch size allows undersized and juvenile shrimp to escape.
3. A pot with no definable sides, such as a round pot, must have 50% of its vertical surface area covered with the 7/8-inch webbing. The other 50% of the vertical sides, as well as the top and bottom, may be composed of any material.
4. The 7/8-inch requirement does not apply to the tunnels.

Summary of regulations	Sport	Subsistence
Alaska residency required?	No	Yes
Fishing license required?	Yes	No
Open season?	April 15 - September 15	
Bag limit?	none	
Number of pots allowed?	Per Emergency Order: Up to 3-pots per vessel may be fished in PWS of which only 2 of those 3-pots can be fished near Whittier or Valdez (Supplemental map on next page). These areas are defined on supplemental map.	
Open areas?	All salt waters of PWS	All salt waters of PWS (except "Valdez non-subsistence area", see map above)
Can I carry extra pots	Yes	
Can I keep crab and finfish?	No	
Can keep octopus?	Yes	

Escape Mechanisms

Rigid mesh pots: Each pot must have an opening at least four (4) inches square with its lower edge within six (6) inches of and parallel to the bottom of the pot. This opening may be covered with a single panel secured with no more than four (4) single loops of 100% untreated cotton twine no larger than 30-thread. Each single loop of cotton twine may contain only one knot. Cotton twine fastenings may not be looped or laced along the edges of the opening. The panel must be attached in such a manner that when the cotton twine degrades the panel will drop away leaving the opening fully exposed.

Net mesh pots and pots with no definable sides: Each pot must have an opening at least six (6) inches long on one sidewall. The opening must be within six (6) inches from the bottom of the pot. The opening must be parallel to the bottom of the pot. To lace the opening together, you must use 100% untreated cotton twine no larger than 30-thread. Knots may be used only at each end of the opening, not in the middle. The twine cannot be tied to or looped around the web bars.

If a pot is lost, the 100% cotton twine will degrade and allow shrimp to escape.

Report harvest online at <https://www.adfg.alaska.gov/Harvest/>

Final report must be reported online by October 15, 202X - even if you did not fish.

Questions on harvest reporting contact ADF&G Sport Fish Info Center 907-267-2218

Guide to reporting accurately:

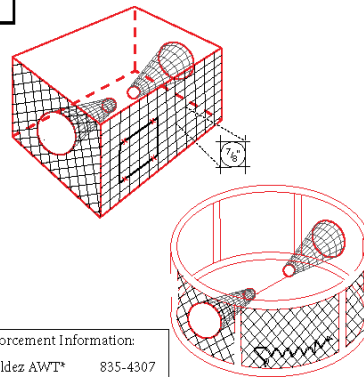
MMDD = Month and Day shrimp gear deployed.

Location = specific name of bay, canal, arm or fjord in PWS.

Time soaked = The hours between when you dropped your gear to the time you check your gear.

Report in **GALLONS** of whole shrimp (shrimp heads attached):
Examples: 0.5 = 1/2 gallon whole shrimp (shrimp heads on)
0.25 = 1/4 gal, 1.75 = 1 3/4 gal, 5 = 5 gal




Harvest must be recorded as you are actively shrimping on your paper permit. Final reports of each individual set made, and associated harvest, must be submitted online by October 15.



Enforcement Information:	
Valdez AWT*	835-4307
Cordova AWT*	424-3184
Whittier AWT*	352-5401
*If you lose gear contact Alaska Wildlife Trooper (AWT) immediately.	

APPENDIX B: REPORTING REMINDERS

Appendix B1.—Example of Prince William Sound noncommercial shrimp permit harvest first reminder postcard.

STATE OF ALASKA DEPARTMENT OF FISH & GAME		<div>PRESORTED STANDARD U.S. Postage PAID Anchorage, AK Permit No. xxx</div>	 <div>Alaska Department of Fish & Game 202X Prince William Sound Shrimp Permit</div>
			Reporting Reminder #1
			October 5, 202X
			Hello First Name Last Name,
			Our records show you received a 202X Prince William Sound Shrimp (Sport or Subsistence) Permit #XXXX but have not submitted your harvest report online . Reports are due by October 15, 202X. All PWS shrimp permit holders must submit their harvest report online , through the ADF&G Online Harvest Reporting webpage at https://www.adfg.alaska.gov/Harvest/ . You are legally required to report even if you did not go, or if you went but did not catch anything. Your harvest and participation information are vital to sustainable management of this stock. Please take a few minutes to report your harvest online today.
			To report online, enter the first and last name on the permit, date of birth, and drivers license number, and hit the Search Permit button. Select the 2022 Prince William Sound Shrimp Permit, and Add Harvest Record(s) or mark as not fished (if you did not fish this year). You may also go into the Manual Permit Lookup option and type in your last name, permit number, and permit type (202X Prince William Sound Shrimp Permit). Online reporting is required regardless of whether you obtained a PWS permit through the ADF&G online store or through a vendor, and whether you went shrimping or not. Returning permits by mail or hand-delivery is no longer an acceptable means to report. If you have questions about online harvest reporting or need assistance, please contact your local ADF&G office.
			If you do not report by the deadline you will be placed on the Failure to Report list and you will be ineligible to receive a Prince William Sound Shrimp Permit for the 202X+1 season if you do not submit a written appeal along with your harvest report. Please do not delay in getting your harvest report submitted online so you can avoid having to go through an appeal process. If you have questions you can email dfg.dsfpws.shrimp@alaska.gov or call 907-267-2186.
<div>202X Prince William Sound Shrimp Permit participation and harvest reports are due October 15, 202X.</div> <div>Report online now at: https://www.adfg.alaska.gov/Harvest/</div> <div></div> <div>You must report even if you did not fish, or if you went fishing and did not catch anything.</div>		<div> 1*1*1*****SCH 5-DIGIT 99502</div> <div>FIRST NAME LAST NAME STREET ADDRESS CITY STATE, ZIP CODE</div>	

Appendix B2.—Example of Prince William Sound noncommercial shrimp permit harvest second reminder postcard.

STATE OF ALASKA
DEPARTMENT OF FISH & GAME

PRESORTED
STANDARD
U.S. Postage
PAID
Anchorage, AK
Permit No. 531

202X Prince William Sound Shrimp
Permit participation and harvest reports
were **due October 15, 202X.**

Report online now at:
<https://www.adfg.alaska.gov/Harvest/>



You must report even if you did not fish, or
if you went fishing and did not catch
anything.



1 *1 *134*****ALL FOR AADC 995

FIRST NAME LAST NAME
STREET ADDRESS
CITY STATE, ZIP CODE



Alaska Department of Fish & Game
202X Prince William Sound Shrimp Permit

Reporting Reminder #2

November 1, 202X

Hello First Name Last Name,

Our records show you received a 202X Prince William Sound Shrimp (Sport or Subsistence) Permit #XXXX, but have not submitted your harvest report online. Reports were due by October 15, 202X.

To be eligible for a permit in 202X+1, you must **submit your harvest report online**, through the ADF&G Online Harvest Reporting website: <https://www.adfg.alaska.gov/Harvest/> and **submit an appeal letter** to dfg.dsf.pws.shrimp.alaska.gov. Your written appeal must reference your permit #XXXX and explain why the report was not submitted online by the October 15th deadline. **You are legally required to report even if you did not go, or if you went but did not catch anything.** Your harvest and participation information are vital to the sustainable management of this stock.

To report online, visit the website above and enter the permit holder's first and last name, date of birth, and driver's license number, and hit the Search Permit button. Select the 202X Prince William Sound Shrimp Permit and Add Harvest Record(s) or mark as not fished (if you did not fish this year). You may also go into the Manual Permit Lookup option and type in your last name, permit number, and permit type (202X Prince William Sound Shrimp Permit). Returning permits by mail-in or hand delivery is no longer an acceptable means to report.

Sound Permit holders who fail to report their shrimp harvest and submit an appeal letter by November 15, 202X may be ineligible to receive a Prince William Sound Shrimp Permit for the 202X+1 season.

Questions? Contact us by email at dfg.dsf.pws.shrimp@alaska.gov or by phone at 907-267-2186.