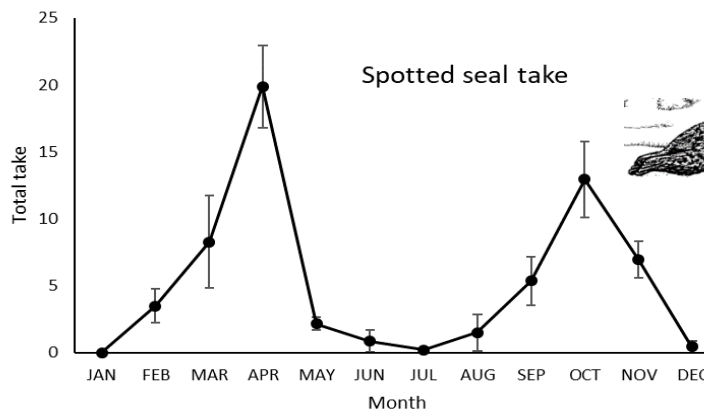
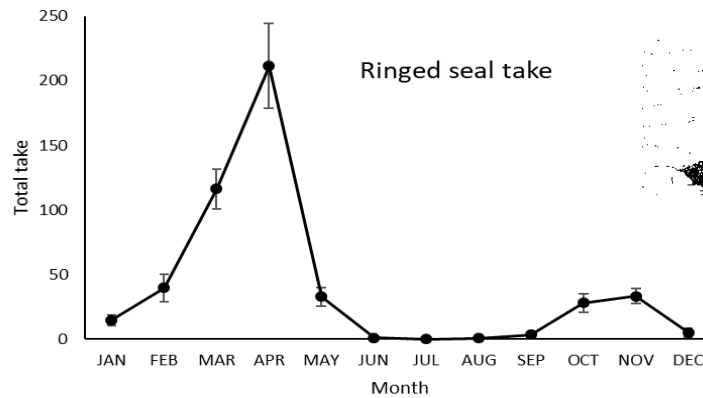
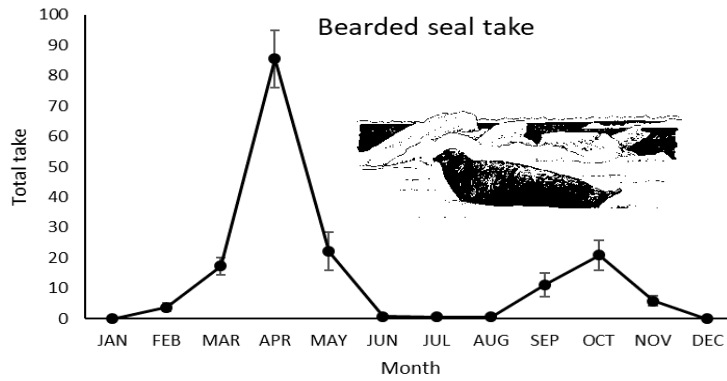


# Hooper Bay Ice Seal Harvest Report

## 2008 to 2018 Summary



# **Hooper Bay Ice Seal Harvest Report 2008 to 2018 Summary**

Final Report Approved Spring 2020

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## Use of harvest data

Due to high variability in seal harvest numbers (among years, within communities, among communities, and within regions), harvest data presented here should not be extrapolated to other communities or regions at this time. For example, during 2014-2018, only 1 (Hooper Bay) of the 64 coastal communities that harvest ice seals has been surveyed in two consecutive years or more. In addition, hunter concerns regarding the misuse of harvest data make extrapolation of harvest numbers inappropriate at this time. Please contact the Ice Seal Committee for guidance prior to using these harvest data.

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## Introduction

Bearded (maklak, *Erignathus barbatus*), ringed (nayiq, *Pusa hispida*), spotted (issuriq, *Phoca largha*), and ribbon seals (qasruliq, *Histiophoca fasciata*) are the species of Alaska's seals collectively called ice seals because of their association with sea ice and their dependence on it for feeding, resting, and pupping. Ice seals are an important component in maintaining Alaska Native subsistence culture because seals are a source of food; skins are used for clothes, boats, and crafts. Hunting, processing, using, and sharing seals is an important part of Alaska Native culture and heritage. To document subsistence needs and to show that harvests are sustainable, the number of seals used by a community should be determined and reported annually. Reporting subsistence seal harvest information by community shows how important seals are to communities and how many are needed. This information is especially important now because climate change or other factors may change the number of seals in a population or change when they are available to hunters. Concerns over how climate change may affect their populations in the future have led to bearded and ringed seals being listed as "Threatened" under the Endangered Species Act. Although the National Marine Fisheries Service (NMFS) has said limiting harvest is not a management action they are pursuing in response to this listing, there is still great concern among subsistence users that harvest will be restricted. However, in situations where no harvest data are available more restrictive decisions are often made to protect the resource than would be necessary if good harvest data were available. Learning more about the current level of subsistence harvest of ice seals, which is thought to be sustainable, could also provide valuable information about the size of seal populations where little information is available.

## Methods

### *Project Approval*

Hooper Bay and two other communities (Tununak and Quinhagak) were chosen as communities for the harvest monitoring pilot project in 2008 because of their willingness to participate in the project. Hooper Bay and Quinhagak had also participated in a harvest survey project by the Alaska Department of Fish and Game (ADFG) Division of Subsistence during 1997–1999. Having a previous study to compare our results with was important. The Ice Seal Committee (ISC), the Association of Village Council Presidents (AVCP), the Hooper Bay Traditional Council, and the Native Village of Paimiut were presented with the project goals and all agreed that the project was necessary to show the importance of seals for subsistence needs. The Hooper Bay Traditional Council approved the project before surveys were conducted in their community.

### *Survey Instrument*

Based on pilot studies, the most preferred harvest collection method is a household survey. A household survey consists of a survey technician, preferably locally hired, surveying a predetermined number of households in a community. Survey questions are related to the number of seals harvested

by a household. The level of detail varies; some surveys record only the number of each species per year, while others record the number of individuals by sex, month of harvest, struck but lost, and age. The more detailed information is more useful but it makes the surveys take longer and cost more. Ice seals are used for subsistence in five different regions of Alaska, and each region has unique needs, concerns, and desires of the people in that region that should be considered when planning a survey. Sometimes a harvest calendar is provided prior to the survey for people to keep track of their harvest before being surveyed. A household list is used by the surveyor to keep track of which households have been surveyed but is kept confidential so there is no way to associate the harvest reported to an individual hunter or household.

### *Survey timing*

In Hooper Bay, most hunters start hunting when the ice breaks up in the spring and are busy hunting or fishing until after the ocean freezes in the late fall. Therefore, the best time to conduct household surveys is during the winter before the spring breakup. The goal is to begin the surveys after the first of January, to record harvest for the previous calendar year, and have them completed by mid-April. For example, this survey, conducted in March of 2019, collected information about seals harvested during the calendar year (Jan–Dec) 2018.

### *Data Analysis*

The completed household survey forms were sent to Justin Olnes at Alaska Department of Fish and Game (ADFG) in Fairbanks. The surveys were counted and checked for completeness, and then the surveyor was paid based on the number of surveys completed. Information from the surveys was entered into a Microsoft Access database and checked for accuracy and duplication. The number of completed household surveys was compared against the total number of households in the community to determine the percentage of households surveyed. The percent surveyed is used to estimate the number of seals harvested by households not surveyed to get a harvest estimate for the entire community. The information is always presented as community estimates and never by household to protect the privacy of individual hunters and households.

The information recorded on the household survey forms is the reported harvest and struck but lost. This information is used to calculate estimated harvest and estimated struck but lost for the entire community. We must estimate for the entire community because the surveys do not cover every household in the community and this is how we account for the number of seals harvested and struck but lost by the households not surveyed. The estimated harvest and the estimated struck but lost are the numbers that are presented in reports because they represent the subsistence needs for the entire community. The total number of seals by species removed from the seal population for subsistence during a particular year is the estimated harvest plus the estimated struck but lost and together is called the “take”. **So “take” as presented in this report refers to the estimated harvest plus the estimated struck but lost.** The formula for estimating the number of seals harvested in the entire community is:

$$e = \frac{R}{\%S}$$

Where “e” is the estimated number of seals harvested, “R” is the reported number of seals harvested, and “%S” is the percentage of households surveyed. For example, during 2018 we surveyed 79% of the households in Hooper Bay, %S = 0.79, and they reported harvesting 443 ringed seals (R) then the estimated number harvested would be:

$$e = \frac{R}{\%S} = \frac{443}{0.79} = 561 \text{ ringed seals.}$$

The estimated number of seals harvested is then added to the estimated number of seals struck but lost to determine a total “take” for the community. After obtaining an estimate of total take for several individual years, we can then calculate the average annual take across years and our level of certainty around this estimate. A 95% confidence interval provides a range of numbers within which the actual number of seals taken by the community lies. The more households that are surveyed and the more years that surveys are conducted, the closer the estimate is to the actual number of seals taken by the community or the more precise the estimate is. The confidence interval is calculated by using the formula:

$$CI (\pm) = t_{\alpha/2} \times SE \times FPC$$

where CI stands for confidence interval, “ $t_{\alpha/2}$ ” is the measure of precision you want to use (we will use 95%), “SE” is the standard error of our estimated take, and “FPC” is the Finite Population Correction. The “SE” is calculated by the formula:

$$SE = \frac{SD}{\sqrt{n}}$$

Where “SD” is the standard deviation around our estimate of the take, and “n” is the size of our sample. The standard deviation (SD) is calculated as:

$$SD = \sqrt{\frac{\sum(e_i - \bar{e})^2}{n}}$$

where “ $e_i$ ” is each year’s estimated seal take and “ $\bar{e}$ ” is the average seal take across years. The “FPC” is calculated by the formula

$$FPC = \sqrt{\frac{H-h}{H-1}}$$

where “H” is the total number of households in the community pooled over the years being considered and “h” is the pooled number of households surveyed during those years. The FPC is a way to account for the number of households that were surveyed where the more you survey the narrower your confidence interval becomes (meaning the better your estimate). If the survey contacted every household in the community the FPC would go to zero and the confidence interval would then be equal to the number of seals harvested, meaning that you are 100% positive the number is correct because you surveyed all households and are not estimating for households not surveyed.

The number of seals per person, called *per capita*, is a way to show how many seals were taken per person living in the community during that year. The number of people living in the community changes so to compare current harvest to past harvest we also present the harvest *per capita*. Larger communities are also likely to take more seals for subsistence than smaller communities, but by looking at seals taken per person the level of use by community can be compared. Number of seals *per capita* is calculated by dividing the number of seals by the number of people living in the community. For example, the number of ringed seals taken *per capita* during 2016 equals: 546 (ringed seals taken) divided by 1180 (Alaska Native people living in Hooper Bay during 2016) = 0.46. This means that Hooper Bay took 0.46 ringed seals for every person living in Hooper Bay during 2016, or Hooper Bay took 1 ringed seal for every 2 people.

The information is presented to the communities by reports, posters, and oral presentations at tribal and community meetings. The numbers must be approved by the community in which they were collected before they can be shared. Once approved, the numbers are included in the annual ice seal harvest report (ISC 2019) that is presented annually to the ISC.

## Results

### *Households surveyed*

The number of households surveyed in Hooper Bay ranged from 101 during 2009 to 217 during 2012 (Table 1). The number of households in the community increased from 227 in 2008 to 256 in 2011, according to Hooper Bay Tribal records and the U.S. Census Bureau records. The current number of households is estimated at 249. Only active households (people living in them) were counted toward the total. The “percent surveyed” from each year is used to extrapolate the reported harvest to the entire community (estimated harvest, estimated struck but lost, and total take). Due to past law enforcement actions in the region related to migratory bird hunting, some people are afraid to talk about the resources that they subsist on for fear of facing prosecution, which likely has reduced participation in the surveys. Since 2010, however, 77–85% of all households in Hooper Bay were surveyed annually, possibly indicating improved trust and the recognized importance of the seal harvest information.

**Table 1.** Population of Hooper Bay from 2008–2018, number of households surveyed, total number of households, and the percent of households surveyed. Population data is from the U. S. Census Bureau.

Year	Population	Number of households		
		Surveyed	Total	Percent surveyed
2008	1101	103	227	45%
2009	1112	101	227	44%
2010	1094	194	227	85%
2011	1121	210	256	82%
2012	1144	217	256	85%
2013	1144	210	256	82%
2014	1173	197	256	77%
2015	1193	198	256	77%
2016	1180	200	256	78%
2017	1208	201	240	84%
2018	1225	196	249	79%

### Sharing seals

Households that use seals far outnumber households that hunt seals indicating the importance of seals for the subsistence of the entire community (Table 2). In some communities, a few hunters harvest most of the seals and share them with the community. For example, in 2018 only 31% of households reported hunting ringed seals, but 82% of households reported using them (Table 2).

**Table 2.** Percent of households using and actively hunting seals by species. ‘Use’ is the percentage of households hunting or receiving seals. ‘Hunt’ is the percentage of households that reported hunting seals.

	Bearded seal		Ringed seal		Spotted Seal	
	Use	Hunt	Use	Hunt	Use	Hunt
2008	88%	43%	83%	44%	22%	18%
2009	92%	50%	88%	61%	28%	23%
2010	91%	26%	93%	29%	14%	9%
2011	93%	26%	94%	33%	17%	13%
2012	89%	40%	84%	38%	14%	10%
2013	76%	36%	81%	35%	15%	10%
2014	57%	17%	67%	26%	12%	7%
2015	74%	39%	78%	37%	14%	10%
2016	72%	38%	66%	26%	13%	11%
2017	71%	26%	73%	31%	19%	14%
2018	42%	20%	82%	31%	13%	5%
Average	77%	33%	81%	36%	16%	12%

### *Bearded Seals*

The total take of bearded seals ranged from 64 in 2014 to 332 in 2009 and averaged 177 ( $\pm 22$ ) seals per year for the eleven-year period (Table 3). In 2018, the total take of 159 was near the 11-year average. The estimated struck but lost ranged from 4% in 2018 to 21% in 2015 and averaged 13% (Table 3).

### *Ringed Seals*

The total take of ringed seals ranged from 158 in 2014 to 889 in 2009 and averaged 489 ( $\pm 70$ ) per year for the eleven-year period (Table 3). In 2018, the total take of 560 was slightly greater than the eleven-year average. The estimated struck but lost ranged from 1% in 2012, 2016, and 2018, to 6% in 2017 and averaged 3% (Table 3).

### *Spotted Seals*

The total take of spotted seals ranged from 27 in 2014 to 144 in 2009 and averaged 63 ( $\pm 10$ ) for the eleven-year period (Table 3). In 2018, the total take of 29 was half the eleven-year average. The estimated struck but lost ranged from 0% in 2011, 2014, and 2015 to 15% in 2008 and averaged 7% (Table 3).

### *Ribbon Seals*

No ribbon seals were reported taken during the periods of 2008-2011, 2013–2015, and 2017–2018 (Table 3). Four ribbon seals were taken during 2012 and five ribbon seals were taken during 2016 of which none were reported as struck and lost. (Table 3).



**Table 3.** Estimated harvest, estimated struck but lost, percent struck but lost, total take, and per capita seal take for each species of ice seal from 2008 to 2018. The bottom line shows the average from all eleven years and ( $\pm$ number) represents the 95% confidence interval for the eleven-year average.

Bearded Seals						Ringed Seals					
					<i>Per capita</i>						<i>Per capita</i>
	Harvested	Struck but Lost		Total Take	Total Take	2008	Harvested	Struck but Lost	Total Take	Total Take	2008
2008	160	33	17%	194	0.18	2008	387	9	2%	396	0.36
2009	286	45	14%	332	0.30	2009	869	20	2%	889	0.80
2010	129	19	13%	147	0.13	2010	447	11	2%	457	0.42
2011	177	33	16%	210	0.19	2011	650	24	4%	674	0.60
2012	198	15	7%	212	0.19	2012	643	8	1%	651	0.57
2013	158	13	8%	171	0.15	2013	654	13	2%	667	0.58
2014	55	9	14%	64	0.05	2014	153	5	3%	158	0.13
2015	117	31	21%	148	0.12	2015	178	7	4%	185	0.16
2016	102	16	14%	118	0.10	2016	540	6	1%	546	0.46
2017	99	15	13%	114	0.08	2017	181	12	6%	193	0.13
2018	153	6	4%	159	0.13	2018	554	6	1%	560	0.46
Average	149	21	13%	177 ( $\pm$ 22)	0.15	Average	478	11	3%	489 ( $\pm$ 70)	0.43
Spotted Seals						Ribbon Seals					
					<i>Per capita</i>						<i>Per capita</i>
	Harvested	Struck but Lost		Total Take	Total Take	2008	Harvested	Struck but Lost	Total Take	Total Take	2008
2008	89	16	15%	104	0.09	2008	0	0	0%	0	0.00
2009	130	14	10%	144	0.13	2009	0	0	0%	0	0.00
2010	67	5	7%	71	0.07	2010	0	0	0%	0	0.00
2011	57	0	0%	57	0.05	2011	0	0	0%	0	0.00
2012	44	1	2%	46	0.04	2012	4	0	0%	4	0.00
2013	57	4	7%	61	0.05	2013	0	0	0%	0	0.00
2014	27	0	0%	27	0.02	2014	0	0	0%	0	0.00
2015	32	0	0%	32	0.03	2015	0	0	0%	0	0.00
2016	63	9	13%	72	0.06	2016	5	0	0%	5	0.00
2017	46	4	7%	50	0.03	2017	0	0	0%	0	0.00
2018	25	4	14%	29	0.02	2018	0	0	0%	0	0.00
Average	58	5	7%	63 ( $\pm$ 10)	0.05	Average	1	0	0%	1 ( $\pm$ 0)	0.00

### Seasonality

Most bearded, ringed, and spotted seal hunting occurs during the spring (March–May), however some are also harvested in the fall (September to November). Very little hunting occurs during the winter and summer months. Spotted seals are occasionally taken during the summer months and ringed seals are occasionally taken during winter months as weather and ice allow. Below are tables and figures of how many seals were taken for each species (estimated harvest + estimated struck but lost) during each month. The table shows the total take for each month and the average of that month for the eleven years with a 95% confidence interval. The figures show the average number of seals taken each month with a 95% confidence interval.

**Table 4.** The number of bearded seals taken (estimated harvest + estimated struck but lost) by Hooper Bay each month during 2008–2018, including the average from those eleven years with a 95% confidence interval. Total take values with \* indicate seals were taken in which the month of harvest is unknown.

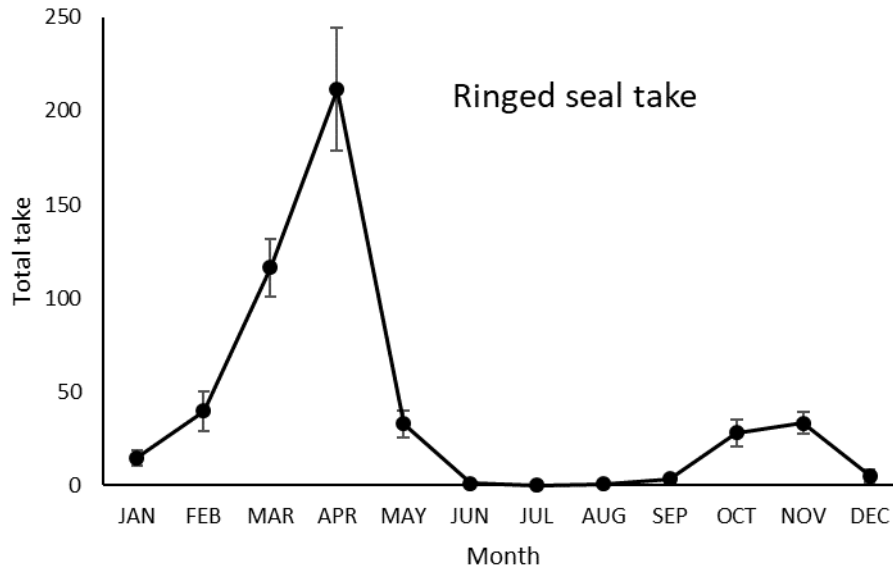
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
2008	0	2	28	60	13	0	2	2	22	48	16	0	194
2009	0	15	26	106	69	8	0	0	46	46	15	0	332
2010	0	1	3	62	44	0	1	0	7	20	9	0	147
2011	0	9	10	109	40	0	0	2	15	18	7	0	210
2012	0	3	10	123	34	0	0	0	6	32	4	0	212
2013	0	5	8	110	7	1	0	0	6	32	2	0	171
2014	0	0	32	21	0	0	0	0	4	6	0	0	63
2015	0	0	12	108	9	0	0	2	5	11	2	0	148
2016	0	3	21	73	13	0	0	0	9	0	0	0	118
2017	0	1	18	58	4	0	0	0	4	11	4	0	114*
2018	0	1	23	111	10	0	3	0	0	5	5	0	159*
AVERAGE 2008-18	0	4 (±1)	17 (±3)	85 (±10)	22 (±6)	1 (±1)	1 (±0)	1 (±0)	11 (±4)	21 (±5)	6 (±2)	0	177 (±22)



**Figure 1.** Average bearded seal take for each month by Hooper Bay during 2008–2018 with a 95% confidence interval.

**Table 5.** The number of ringed seals taken (estimated harvest + estimated struck but lost) by Hooper Bay each month during 2008–2018, including the average from those eleven years with a 95% confidence interval. Total take values with a \* indicate seals were taken in which the month of harvest is unknown.

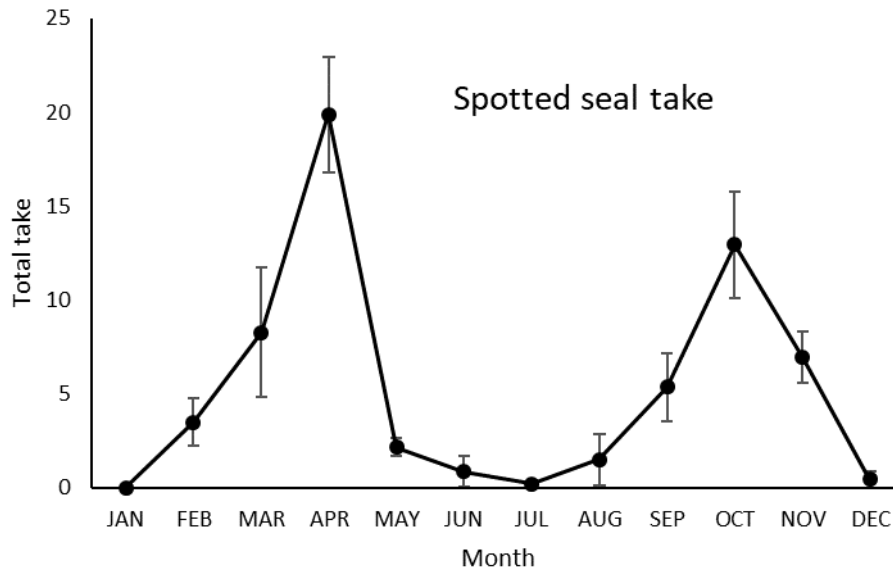
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
2008	24	29	73	138	18	0	0	9	18	47	20	20	396
2009	35	130	141	361	65	12	0	0	0	28	81	37	889
2010	10	45	123	171	60	0	0	0	0	23	25	0	457
2011	0	35	202	305	52	0	0	0	2	26	51	0	674
2012	18	46	138	277	62	0	0	0	10	66	34	0	651
2013	34	56	172	259	39	0	0	0	4	76	27	0	667
2014	4	8	53	69	5	0	0	0	0	7	12	1	159
2015	3	5	57	92	4	0	0	0	0	4	20	0	185
2016	25	58	160	230	13	0	0	1	4	8	48	0	546
2017	4	11	54	64	6	1	0	0	2	14	25	0	193*
2018	6	14	104	358	38	1	0	0	0	11	24	0	560*
AVERAGE 2008-18	15 (±4)	40 (±10)	116 (±15)	211 (±33)	33 (±7)	1 (±1)	0	1 (±1)	4 (±2)	38 (±7)	33 (±6)	5 (±4)	489 (±70)



**Figure 2.** Average ringed seal take for each month by Hooper Bay from 2008-2018 with a 95% confidence interval.

**Table 6.** The number of spotted seals taken (estimated harvest + estimated struck but lost) by Hooper Bay each month from 2008–2018, including the average from those eleven years with a 95% confidence interval. Total take values with a \* indicate seals were taken in which the month of harvest is unknown.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
2008	0	9	2	7	2	0	2	16	20	36	11	0	104
2009	0	10	41	34	2	10	0	0	5	24	14	5	144
2010	0	11	13	23	0	0	0	0	6	13	6	0	71
2011	0	2	1	24	1	0	0	0	12	12	4	0	57
2012	0	0	0	23	5	0	0	1	4	13	0	0	46
2013	0	0	1	34	1	0	0	0	2	14	3	0	61
2014	0	0	4	4	4	0	0	0	5	7	4	0	27
2015	0	1	5	13	1	0	0	0	0	5	6	0	32
2016	0	0	13	26	3	0	0	0	4	10	15	0	72
2017	0	1	6	21	0	0	0	0	0	10	8	0	50*
2018	0	4	5	9	4	0	0	0	0	0	5	0	29*
AVERAGE 2008-18	0	3 (±1)	8 (±3)	20 (±3)	2 (±0)	1 (±1)	0 (±0)	2 (±1)	5 (±2)	13 (±3)	7 (±1)	0 (±0)	63 (±10)



**Figure 3.** Average spotted seal take for each month by Hooper Bay from 2008–2018 with a 95% confidence interval.

### *Hunt Frequency*

In all years except 2010, supplemental questions regarding the amount of time spent hunting were included in the survey (Table 7). Very few households reported hunting more than in the past, a wide variety of reasons were given for hunting less (e.g., less time due to family or work, higher gas prices, bad weather). In 2018, Most hunters (87%) reported hunting less now than in the past (Table 7).

**Table 7.** *How often do you hunt now? Of households that hunt, the percent reporting whether they hunt more, same, or less in Hooper Bay.*

	Do you hunt more or less often?		
	More	Same	Less
2008	8%	19%	73%
2009	7%	49%	44%
2010	N/A	N/A	N/A
2011	1%	43%	56%
2012	1%	42%	57%
2013	0%	42%	58%
2014	0%	42%	57%
2015	1%	44%	55%
2016	0%	50%	50%
2017	0%	39%	61%
2018	4%	9%	87%
Average	2%	38%	60%

### *Seal health*

Subsistence hunters and processors have extensive experience handling seals and know when an animal looks sick or unhealthy. A supplemental question was added in 2011 to collect information on the number of unhealthy seals a household encountered. During 2011, all households that responded to this question reported that all seals they encountered were healthy. During 2012, all households reported that spotted and bearded seals were healthy, but one percent (1%) reported that ringed and ribbon seals were unhealthy. Since 2012, households will occasionally comment about the health of seals, but this has never been more than 2% of the households interviewed (2013 = 2%, 2014 = 0%, 2015 = 1.5%, 2016 = 0%, 2017 = 1%, 2018 = 1%). This suggests that very few seals that are harvested are considered unhealthy by the subsistence households. It is worth noting that during 2011 there was an Unusual Mortality Event (UME) where numerous ringed seals were found to be sick with symptoms including hair loss and sores around the eyes, nose and flippers. Many of these seals were found on the beach and unafraid of people. In 2019, another UME was declared for ice seals in the Bering and Chukchi Seas due to a higher number of dead seals than normal, found in early summer, on some beaches. Cause

of death has not been determined but hair loss, sores, and unafraid behavior are not symptoms of the recent UME. More information about this can be found at the NOAA website <https://www.fisheries.noaa.gov/alaska/marine-life-distress/2018-2019-ice-seal-unusual-mortality-event-alaska>.

## Discussion

### *Sea ice and weather*

Changes in the total take from year to year are mostly due to sea ice and weather conditions. This variability increases the confidence interval around our estimate of the average annual take. The highest harvest year for all species was 2009 when sea ice persisted near Hooper Bay into early summer, according to the National Snow and Ice Data Center (NSIDC). The lowest harvest year for all species was 2014, which had a very rapid retreat of ice in the spring. Years in which the spring ice stays longer provides more opportunity to hunt seals, especially bearded and ringed seals. Once the ice moves offshore and recedes to the north ringed and bearded seals tend to move with it, decreasing their availability to hunters. When the sea ice breaks up quickly, the spring hunt is shortened, and if bad weather (e.g., wind, waves, fog, or snow) also occurs, hunters may have little opportunity to hunt. During fall, as freeze-up occurs there can be bigger storms and bad weather, but there is also more time to wait for better weather than in spring.

### *Comparing to past harvest surveys*

The Alaska Department of Fish and Game, Division of Subsistence conducted a seal and sea lion harvest survey in three communities (Hooper Bay, Emmonak, and Quinhagak) in the Yukon Kuskokwim Delta region during 1997–1998 and 1998–1999 (Coffing *et al.* 1998, Coffing *et al.* 1999). The reported harvest and reported struck but lost was estimated for the entire community and from that estimate total take for each species was calculated. However, these surveys used 1 March to 28 February as the definition of the year making direct comparison of survey results more difficult. This is an example of why comparing information between surveys conducted using different methods needs to be done with caution.

### *Bounty Data*

Prior to 1973, the State of Alaska implemented a bounty on seals in some areas of the state (Table 8). The bounty was implemented to reduce harbor seal numbers to protect commercial fish stocks in the Gulf of Alaska from predation and, although there was no commercial fishing farther north, the bounty was implemented anyway on ice seals and provided the first ice seal harvest data. Comparing the current levels of take to data collected during the bounty years could provide insights to the overall change in seal numbers taken over the last 40 or 50 years. The information collected during the bounty was rarely reported by species and more often reported as the total number of seals turned in for bounty per year by community. Comparing bounty data to harvest survey data has some possible

problems because the information was collected in different ways with different objectives (Nelson 2017). For example, the approximately \$3 bounty amount may have been an incentive to take more seals than normal for the money. However, by keeping these differences in mind we may be able to determine if changes in harvest numbers are due to changes in seal availability, subsistence needs, hunter effort, sea ice, weather, or something else.

**Table 8.** Number of people, survey method and quality rating, total take (estimated take + estimated struck but lost) for each species, total take for all species combined, and the per capita total take (total take / number of people) for all years with available data in Hooper Bay, Alaska. The 1962-1972 data are from ADFG marine mammal reports (Burns et al. 1964, Burns 1966-1970, 1972,1973), the 1997-1999 data are from ADFG Division of Subsistence (Coffing et al. 1998, 1999) and the 2008-2018 data are from this study.

Year	People	Method		Number of Seals				Total Take	Per capita Take
		Type	Rating	Bearded	Ringed	Spotted	Ribbon		
1962	460	bounty	good	-	-	-	-	1114	2.42
1965	460	bounty	good	200	646	200	0	1046	2.27
1966	460	bounty	good	-	-	-	-	686	1.49
1967	490	bounty	good	-	-	-	-	683	1.39
1968	490	bounty	poor	-	-	-	-	662	1.35
1969	575	bounty	good	-	-	-	-	1200	2.09
1970	575	bounty	good	-	-	-	-	1800	3.13
1971	575	bounty	good	-	-	-	-	1400	2.43
1972	575	bounty	good	-	-	-	-	1200	2.09
1998	1012	household	good	146	409	78	4	637	0.63
1999	1039	household	good	59	370	48	2	479	0.46
2008	1101	household	good	193	396	104	0	693	0.63
2009	1112	household	good	332	889	144	0	1365	1.23
2010	1094	household	good	148	458	71	0	677	0.62
2011	1121	household	good	210	674	57	0	941	0.84
2012	1144	household	good	212	651	46	4	913	0.80
2013	1144	household	good	171	667	61	0	899	0.79
2014	1173	household	good	64	158	27	0	249	0.21
2015	1193	household	good	148	185	32	0	365	0.31
2016	1180	household	good	118	546	72	5	741	0.63
2017	1208	household	good	114	193	50	0	357	0.29
2018	1225	household	good	159	560	29	0	748	0.61

## Conclusion

The overall number of seals taken by Hooper Bay hunters has declined in recent years even though the number of people living in Hooper Bay has nearly tripled (Table 8). As a result, the number of seals taken per person (the *per capita* take) has decreased from that of the bounty period (annual average of 2.1 seals per person in 1962–1972 to 0.62 seals per person in 2008–2018, Table 8). Reasons for the decrease may include jobs, gas prices, and weather and ice conditions. Many 2018 survey respondents (22%) said they were too busy working to hunt seals. We should continue to monitor the number of ice



seals needed for subsistence to accurately document the needs of each community and to monitor whether climate change and other factors affect the availability of ice seals for hunters.

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