

# The subsistence harvest of ringed, bearded, spotted, and ribbon seals in Alaska is currently sustainable

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## Introduction

The subsistence harvest of ice seals (ringed, bearded, spotted, and ribbon) provides thousands of pounds of edible meat and oil annually and is a significant source of food for coastal people in at least 54 villages in Alaska. Documenting the magnitude of the harvest and struck-and-lost by species is a basic management requirement and important for understanding subsistence needs. Concerns over how ice seals will adapt to climate warming, especially less sea ice, have led to consideration of all four species for listing under the U. S. Endangered Species Act. Stock assessment reports and status reviews noted that the level of subsistence harvest was sustainable for all four species, but a lack of harvest data and reliable seal population estimates precluded a detailed evaluation. We compiled removal (harvest plus struck-and-lost) data from 54 ice seal hunting communities between 1992 and 2012 to estimate how many seals are taken for subsistence including struck-and-lost seals. The National Marine Fisheries Service (NMFS) uses Potential Biological Removal (PBR) to determine the sustainability of a marine mammal population subjected to human take. For each species, we compared our statewide removal estimates with PBR to determine sustainability.

## Methods

### Removal Estimates

- Household survey results from 1992-2012 are used to estimate average and liberal annual removal (harvest plus struck-and-lost).
- Average – All removal estimates were averaged for each community per capita, extrapolated to the 2012 community size, and extrapolated to regional annual estimates.
- Liberal – The highest removal estimate per capita for each community, extrapolated to the 2012 community size, and extrapolated to regional annual estimates.
- The five regional estimates were combined for the 2012 statewide estimate of removal.

### Seal Population Estimates

- Minimum estimates are from the NMFS status reviews, stock assessment reports, and results from recent NMFS population surveys (Boveng et al. 2008, Boveng et al. 2009, Allen and Angliss 2010, Cameron et al. 2010, Kelly et al. 2010, Allen and Angliss 2013, Conn et al. 2014).
- Survey coverage and timeliness determine the **best**, minimum estimate of population size in Alaska (stock).

### Potential Biological Removal

- PBR is "...the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population" (Barlow et al. 1995, and NMFS 2005).
- The equation is:  $PBR = (\text{minimum population estimate}) * (0.5 * \text{maximum rate of increase}) * (\text{recovery factor})$
- For ice seals, PBR is 3% of the minimum population estimate.

## Limitations of our data

- Surveys are available for 36 of the 54 (67%) communities (Figure 1), but only 14 of 54 (26%) communities have more than 2 during this period.
- More frequent surveys over consecutive years are necessary to better understand annual variability and trends in harvest and struck-and-lost rates.

## Results

Table 1. The average and liberal estimated annual removal (harvest plus struck-and-lost) for each region and combined for statewide estimates. "Lost" is the percentage struck-and-lost for each species by region.

Region	Ringed seals			Bearded seals			Spotted seals			Ribbon seals		
	Average	Liberal	Lost	Average	Liberal	Lost	Average	Liberal	Lost	Average	Liberal	Lost
NSB	1191	2282	8%	855	1283	10%	62	191	10%	0	0	0
Maniilaq	285	491	9%	937	1043	10%	579	800	11%	7	15	13%
Kawerak	2280	3851	8%	3171	4586	10%	2854	4047	10%	120	210	6%
AVCP	3208	4417	5%	1202	1853	12%	1233	1808	11%	30	58	14%
BBNA	24	42	8%	33	58	20%	267	773	17%	0	0	0
Total	6989	11083		6198	8823		4995	7619		157	283	

Table 2. The average and liberal estimate of removal is divided by the best, minimum population estimate (**bold**) to calculate the level of removal for each species. The removal estimate for all species is below PBR (3%) even when considering the liberal estimate (**circled**).

Ringed seals ( <i>Pusa hispida</i> )			Bearded seals ( <i>Erigonathus barbatus</i> )			
Population estimate	Average removal	Liberal removal	Population estimate	Average removal	Liberal removal	
N/A	-	-	NOAA aerial surveys	<b>300,000*</b>	2.1%	<b>2.9%</b>
300,000	2.3%	3.7%	Stock assessment report	155,150	4.0%	5.7%
<b>1,000,000</b>	0.7%	<b>1.1%</b>	Status review	155,150	4.0%	5.7%

Spotted seals ( <i>Phoca largha</i> )			Ribbon seals ( <i>Histiophoca fasciata</i> )			
Population estimate	Average removal	Liberal removal	Population estimate	Average removal	Liberal removal	
<b>460,000</b>	1.1%	<b>1.7%</b>	NOAA aerial surveys	<b>184,000</b>	0.1%	<b>0.2%</b>
141,479	3.5%	5.4%	Stock assessment report	90,000	0.2%	0.3%
101,568	4.9%	7.5%	Status review	143,000	0.1%	0.2%

\*The best population estimate for bearded seals includes only the Bering Sea, not the Chukchi or Beaufort seas thus is a partial estimate.

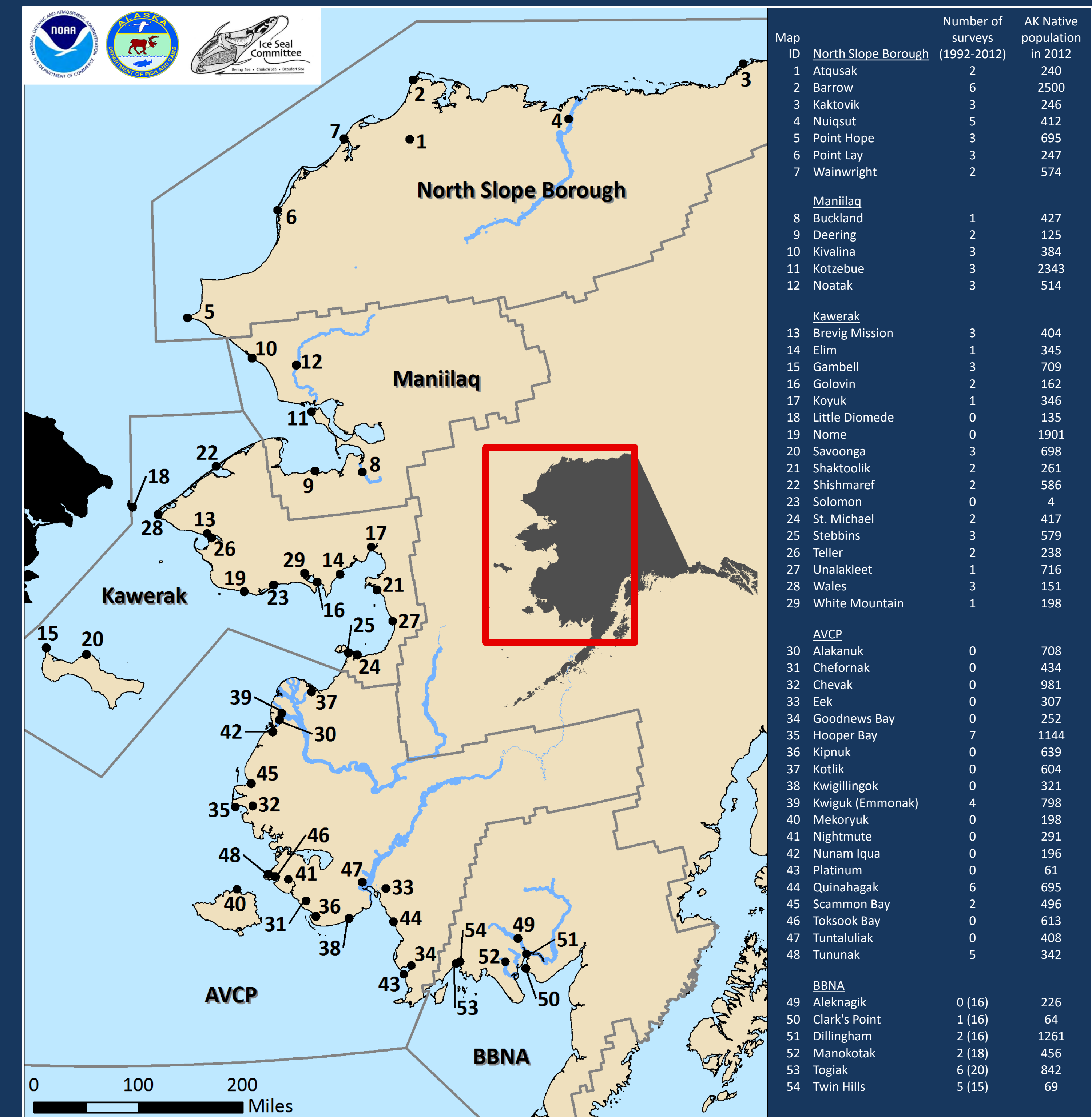


Figure 1. Map of study area and seal hunting communities. The community number matches the legend at right which also includes the number of household surveys that included all species (some surveys in BBNA only collected spotted seal data and are in parenthesis) conducted and the Alaska Native population during 2012.

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## Discussion

- PBR was designed to assess the effects of commercial fishing takes on marine mammal populations.
- PBR was not intended for assessing subsistence harvest because it is too conservative.
- We chose to use PBR knowing that it was overly conservative.

## Conclusion

By:

- overestimating removal,
- underestimating population size, and
- conservatively estimating allowable removal (PBR)

**We are comfortable concluding the subsistence harvest of all four species is currently sustainable.**