

Spotted seal productivity in Alaska using harvest-based monitoring, 1960s, 1970s, and 2000s



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Introduction

Spotted seals (*Phoca largha*) are an ice associated pinniped that forage on pelagic fish and use sea ice to rest, give birth, nurse, and molt. Arctic sea ice is declining in extent, thickness, and duration. These declines are predicted to continue and may affect the distribution, availability, or nutritional quality of fish important to spotted seals. If prey availability or quality decline, spotted seal productivity could be affected, thus monitoring productivity is important. Currently there are no estimates of spotted seal abundance or trend in Alaska that can be used to track productivity. However, the Alaska Department of Fish and Game has worked with Alaska Native hunters since the 1960s to collect data from subsistence harvested spotted seals that can be used as an index to population health and status.

We have previously reported the age at maturity and pregnancy rates for spotted seals collected between the 1960s and 2008 (Quakenbush et al. 2009). Here we update results for 2000–2016 with reproductive tracts from more than 400 spotted seals, including more than 80 mature females.

Methods

We sampled spotted seals from subsistence harvests at 9 villages in Alaska along the Bering, Chukchi, and Beaufort sea coasts from 2000–2016. Female reproductive tracts and canine teeth were collected. These data were compared to data previously collected from seals in the same region during 1964–1979. Data are broken down by decade 1960s (1964–1969), 1970s (1970–1979), 2000s (2000–2009) and 2010s (2010–2016). We examined reproductive tracts for sexual maturity and reproductive condition. Age of seals was determined by counting annuli in the dentine and cementum layers of sectioned teeth.

Age of Maturity

- Seals that had ovulated at least once were classified as mature.
- We estimated average age of maturity as the age at which 50% of females were mature (DeMaster 1978) using a probit regression in SAS (PROC PROBIT).

Pregnancy Rate

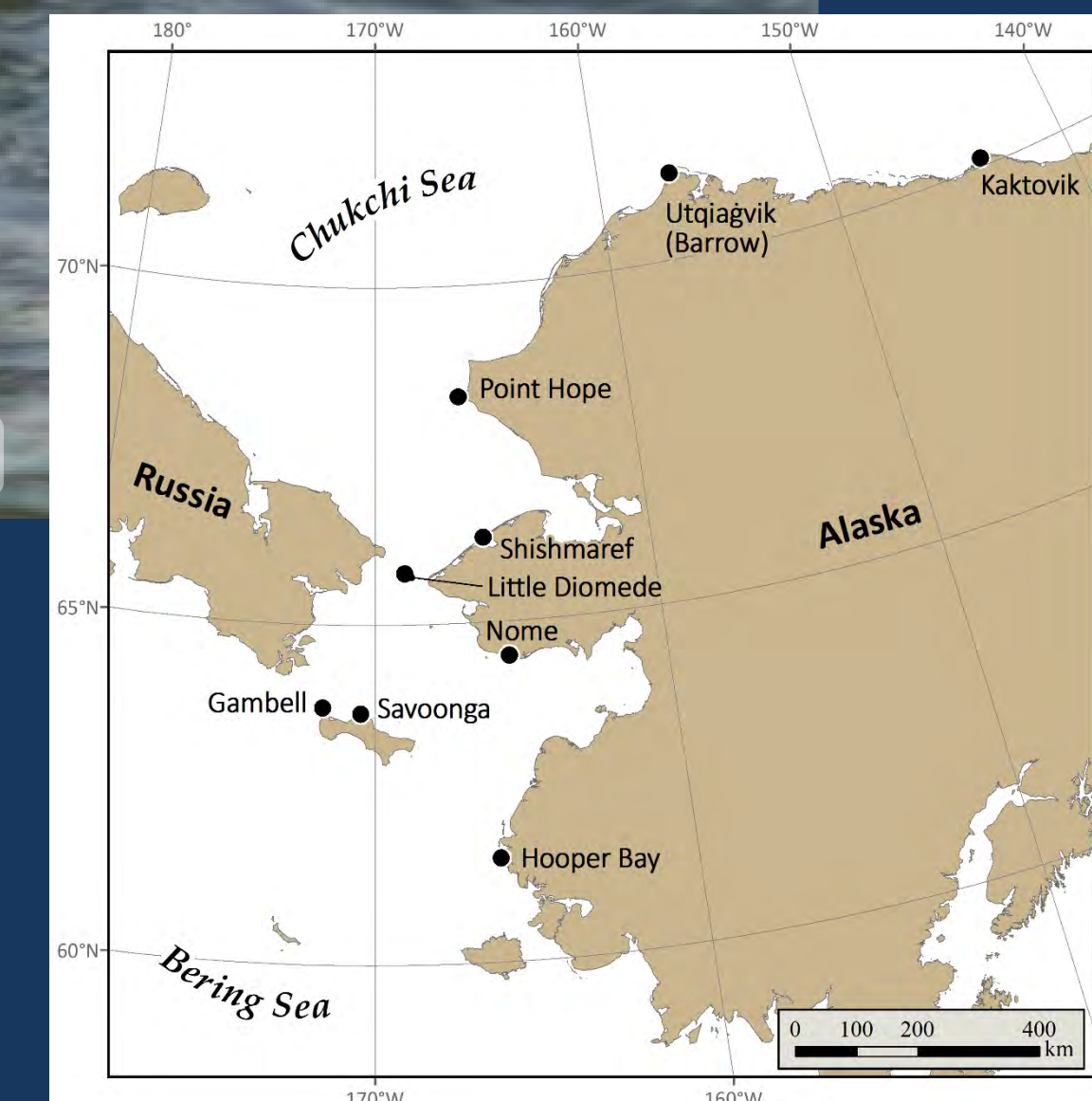
- We defined pregnancy rate as the proportion of mature females that were pregnant when harvested.
- We estimated average pregnancy rate and evaluated differences among periods using a logistic regression model in SAS (PROC LOGISTIC).

Proportion of Pups Harvested

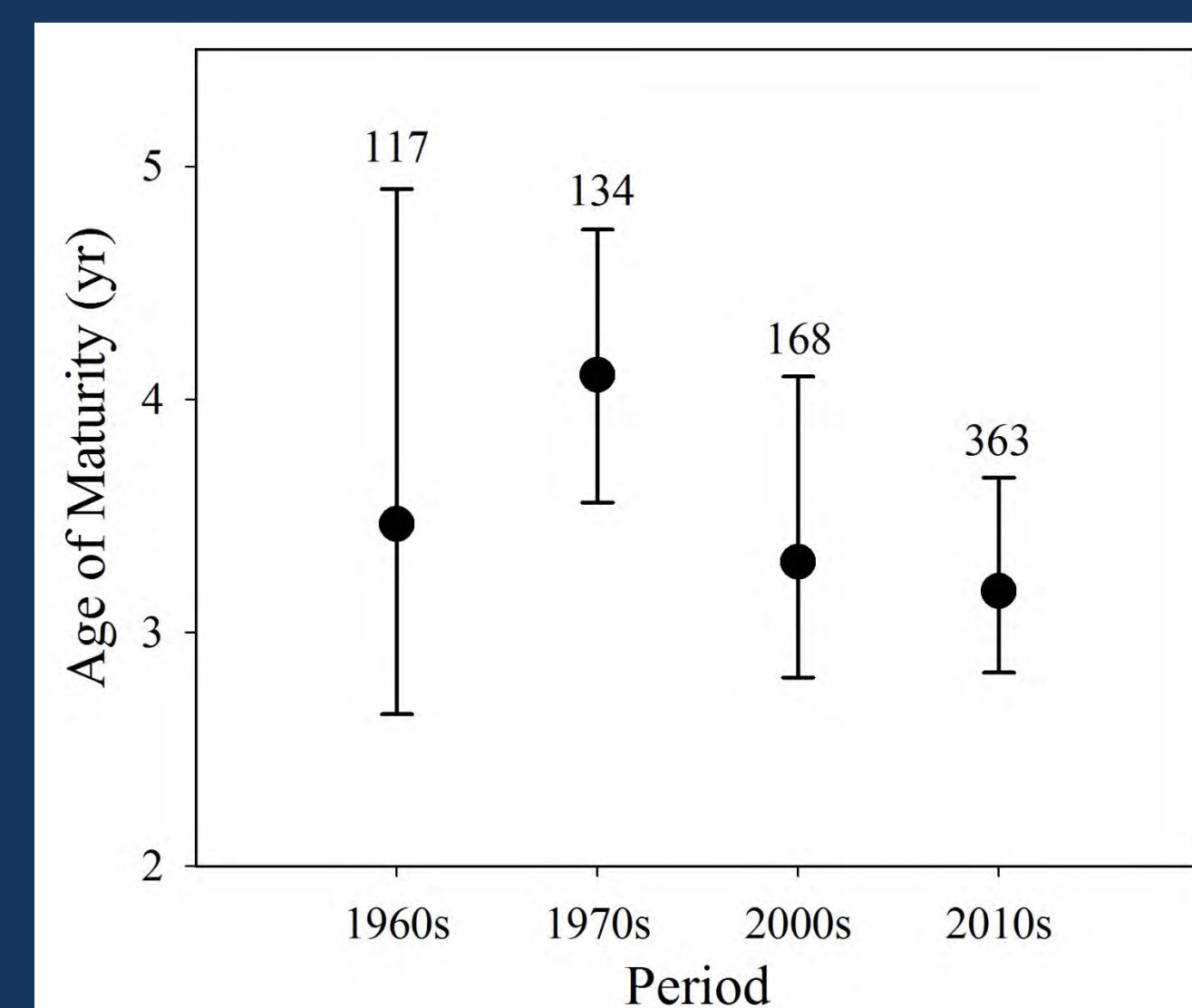
- The proportion of pups (<1 year of age) in the sampled harvest is representative of their presence in the population. If pups were not surviving past weaning, their presence in the harvest would decrease.
- We evaluated differences in the proportion of pups harvested during each period using SAS (PROC FREQ).



Villages in the Bering and Chukchi seas where harvested spotted seals were sampled (2000–2016).



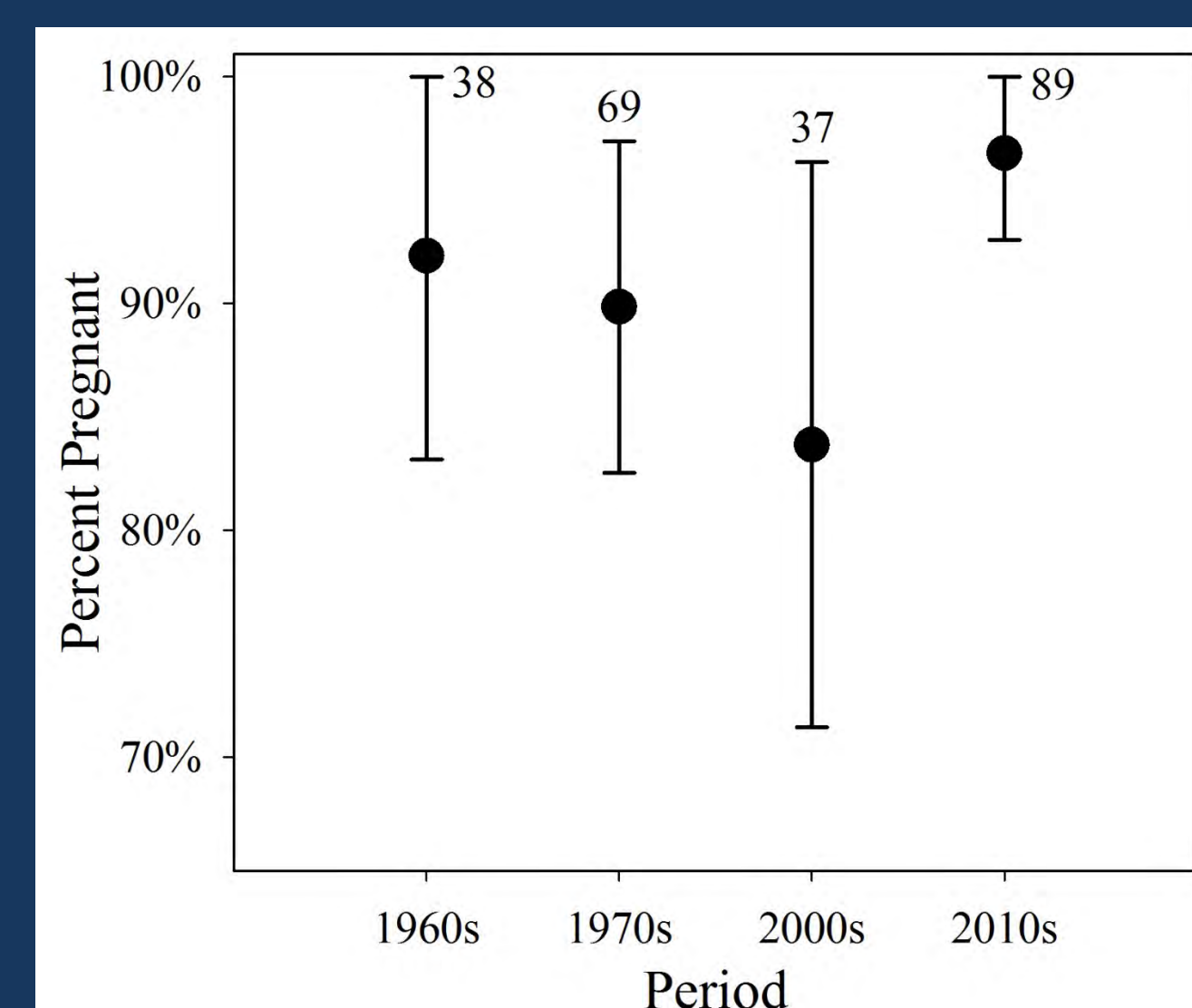
Age of Maturity



Average age of maturity by time period.

- Average age of maturity has been significantly younger since 2000 than in the 1970s, and more similar to the 1960s.

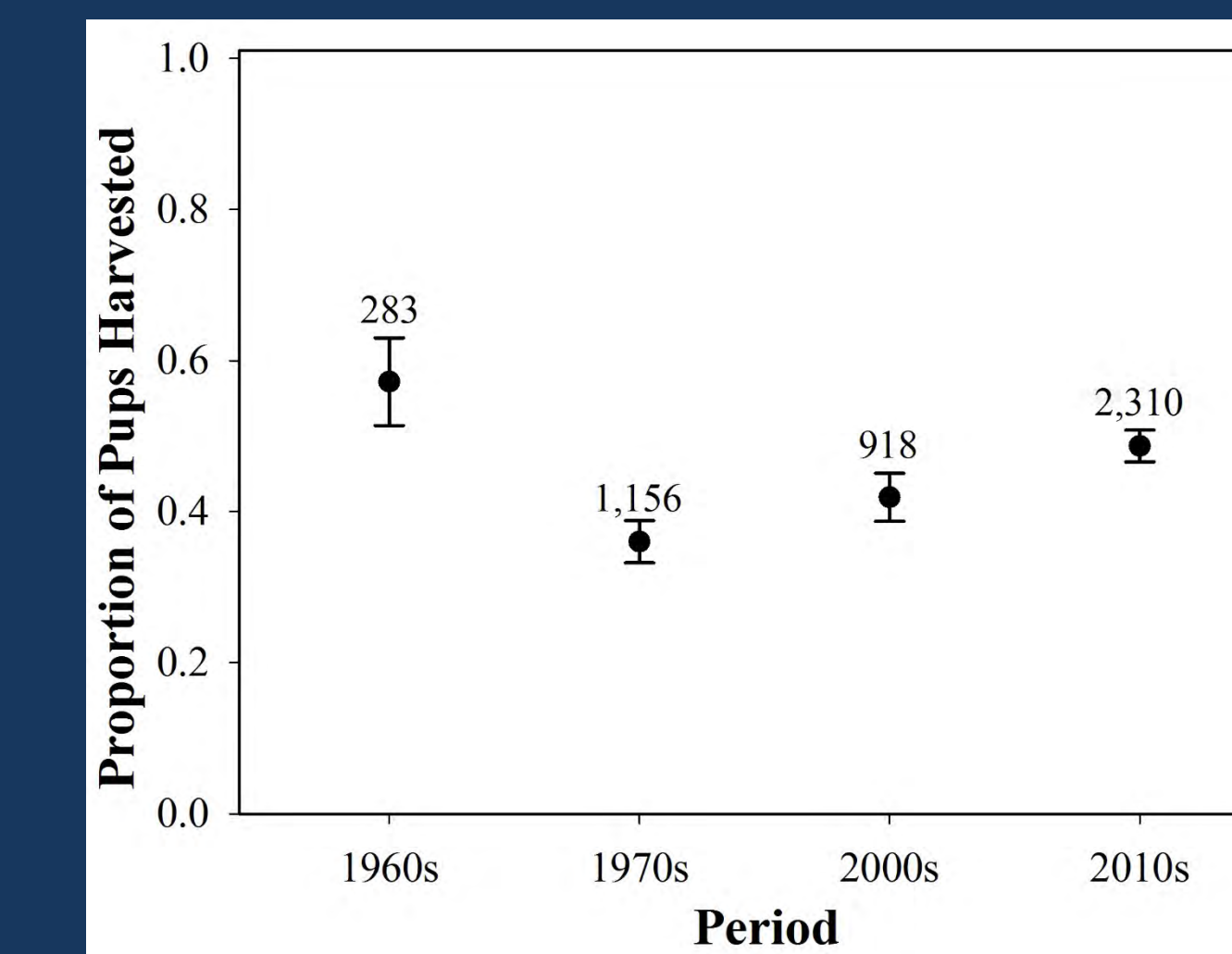
Pregnancy Rate



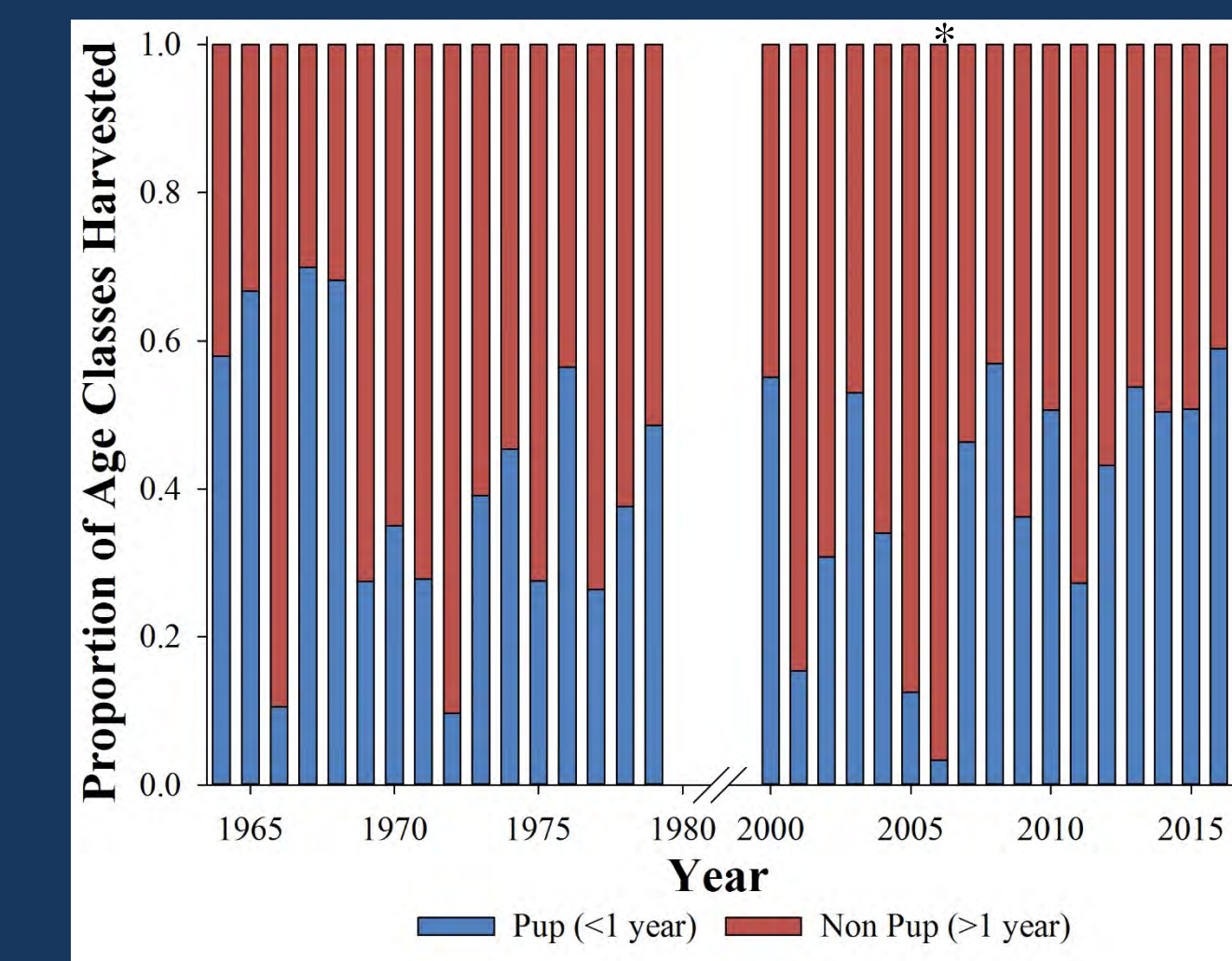
Average pregnancy rate by time period.

- Pregnancy rate did not change among periods, except for the 2000s which was significantly lower than the 2010s.
- Reproductive tracts from 31 females harvested in Oct.-Dec. (when a fetus should be present), had a corpora luteum, but no fetus. These may indicate unsuccessful pregnancy's and were not included.

Proportion of Pups Harvested



Proportion of pups harvested by time period. The number of seals harvested is listed above the error bars for each time period.



Annual proportions of age classes harvested. *In 2006, one of 30 seals was a pup.

- The proportion of spotted seal pups harvested was lowest in the 1970s. The proportion has increased in the 2000s and 2010s.

Conclusions

- **Indices of productivity and weaning success have not declined in recent years.**
 - Age of maturity remains younger since 2000 than during the 1970s.
 - Pregnancy rates remain high, despite a dip in the 2000s.
 - Proportion of pups harvested was lowest in the 1970s.
- **Continued monitoring is important as conditions continue to change.**

Acknowledgements

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