

Are Gray Seals Displacing Harbor Seals at Haulout Sites in Southern Massachusetts?

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INTRODUCTION

Harbor seals (*Phoca vitulina*) are distributed widely in the North Atlantic while gray seals (*Halichoerus grypus*) were rare since the 17th century on the Northeast coast of the United States, but have re-established a pupping site on Muskeget Island, Nantucket Sound (Fig. 1), in the early 1990's. Both gray seals and harbor seals predictably appear at haulout sites along Southern New England shores (Barlas, 1999; Payne and Selzer 1989). Abundance of these two species has been increasing, especially gray seals, where the pup number on Muskeget Island has increased by 10-40% annually since the late 1990's (Fig. 2a). From satellite tagging studies (Williamson, 1993-2012), 21 harbor seals and 14 gray seals were tagged and released at various sites in New England. Out of those tagged seals, 11 harbor seals and 7 gray seals spent time in Nantucket Sound.

We present data from aerial survey that were collected for three haulout sites, Gull Island, Chatham Harbor and Nomans Land Island, Massachusetts (Fig. 1), from October to April of 2005-2011. Surveys of other haulout sites such as Monomoy Island, have indicated that gray seals have tended to displace harbor seals in the use of these sites (Fig.2b) (DiGiovanni et al. 2011).

We hypothesized that at these three haulout sites there will be a displacement of harbor seals by gray seals due to the rapid increase in pup production on Muskeget Island, resulting in a decline in harbor seal numbers at these sites.



Figure 1: Map of the study sites in Massachusetts. Yellow stars indicate aerial survey sites, and pale blue stars indicate pupping (Muskeget) and displacement (Monomoy) sites.

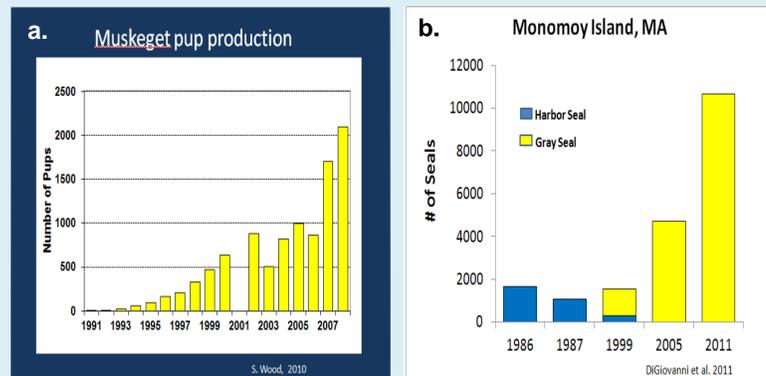


Figure 2: **a.** The minimum estimate of pup numbers on Muskeget Island from 1991- 2008. The pup production has been increasing since 1991 with highest pup count (n=2095) in 2008 (Wood, 2010). Pup counts in 2003, 2004 and 2006 was affected by survey dates and photo quality; **b.** The number of harbor and gray seals at a haulout site on Monomoy Island. Data are from aerial surveys flown in March of years indicated. At this site gray seals have increased rapidly and have displaced harbor seals since 1999.

MATERIALS & METHODS

- Three surveyed haulout sites, Gull Island, Chatham Harbor and Nomans Land Island, were studied from October to April of 2005-2011.
- Oblique aerial photographs were taken using a 300mm lens at 213 m altitude (Fig. 3 c, d).
- Gray, harbor and unidentifiable seals (Fig. 3c) were counted using Corel Paint Shop Pro from the photographs. Morphological characters were used for identification: relative head size, eye set, forelimb length, overall size, body position (Fig. 3 a, b).
- Gull Island was counted first, and used for training. 10.8% of 195 images of this site were double counted. 49.2% of the unidentified individuals on the 1st set of counts were identified to species in the 2nd set, which was retained as the final set.



Figure 3: **a.** Gray Seal; **b.** Harbor Seal; **c.** Species identification from an aerial photograph on Gull Island, 31 October 2010; **d.** Aerial photograph of a mixed species were identified at haul out site, Gull Island, 7 March 2009.

RESULTS

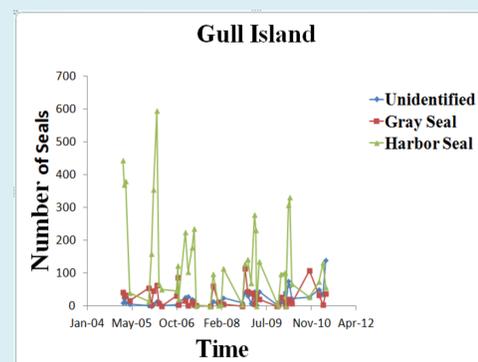


Figure 4: The number of harbor and gray seals on Gull Island from 2005-2011. Harbor seals are the most abundant, with seasonal peaks in spring, especially from February to April, but with no evidence of increase through the study period. Gray seals remain at low abundance with no constant seasonal pattern.

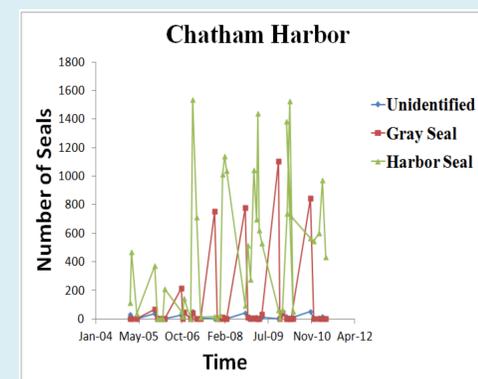


Figure 5: The number of harbor and gray seals at Chatham Harbor. Both species are common with clear seasonal peaks in abundance but at different times of the year. Gray seal are mostly found in fall, especially in October, while harbor seals are extremely abundant in spring, February to March. There is also evidence of an early increase (2005-2006) in numbers for both species.

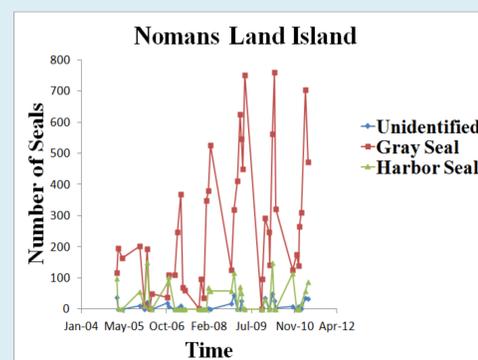


Figure 6: The number of harbor and gray seals on Nomans Land Island. On this site, gray seals make up most of the counts and are most abundant in spring, especially in March. Gray seal numbers increase almost four-fold during the survey period, but counts of harbor seals remain low.

DISCUSSION & CONCLUSIONS

•The variety in occupancy across haulout sites depicts localized interactions and persistence of harbor seals despite dramatic increases in gray seal numbers. Although both species were found at all three haulout sites, abundance and seasonality were specific to each site.

•Only the Nomans Land Island site shows a large increase in gray seals in spring. This may result from influx of recently weaned pups from Muskeget Island. Pupping season lasts from December to February, with pups weaned and having moved off Muskeget in March. We predict that gray seals will eventually displace harbor seals at this site, as was found more typically at other sites such as Monomoy Island.

•In contrast, the Chatham Harbor haulout site is characterized by a “timeshare” pattern of occurrence with high use by each species at different times of the year. This unexpected annual cycle in use of the site shows an alternative outcome of species interactions to displacement. In this alternative mode, both species locally coexist through temporal separation of haulout space use. We expect that both species will continue this “timeshare” pattern at this site.

•On Gull Island, there are no indications of increase in either species. Although gray seals have no stable pattern, they still remain at this site with low abundance while harbor seals are most abundant in spring. We predict a “timeshare” pattern may develop on this island, as at Chatham Harbor.

ACKNOWLEDGMENTS

Special thanks to NOAA Right Whale Aerial Survey Team and Elizabeth Josephson.

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