Population Survey of Male Adult and Subadult NES at the Piedras Blancas Rookery during the 2016 Breeding Season

By Melissa Voisinet BS, Gulce Ozturk BS, and Bill Goodger DVM, PhD

Abstract

This study aims to document the population distribution of male NES along nine beaches within the Piedras Blancas rookery. The majority of NES population studies focus on females and pups, so a survey of the adult and SAM populations is important for a complete understanding of colony health and dynamics. Adult and SAM seals were counted during the 2015 and 2016 breeding seasons, with three counts for each at two week intervals. These counts were compared to the 2014 and 2015 molting season survey counts. It was observed that the number of adult males remained constant throughout the 2015 and 2016 breeding seasons, despite variation between the subsequent molting seasons. It was also observed that for six of the nine beaches surveyed, the number of adult males remained constant between the 2015 and 2016 breeding seasons. This suggests that not only do NES return to the same rookery to breed, but may even return to the same beach within a rookery. Lastly, it was observed that the SAM population during the first portion of the 2016 breeding season was nearly twice as high as the previous breeding season, highlighting the variability of when the SAMs haul out during the breeding seasons. This data was collected as the second year of a three year study in order to identify significant trends within the population.

Introduction

This study aimed to provide another chapter in a three year survey studying where, when, and how many adult and subadult male (SAM) northern elephant seals (NES) haul out along all the beaches in the Piedras Blancas rookery. The counts obtained in this paper reflect the second year of the study and are compared to the 2015 breeding survey counts to make more solid conclusions in regards to the normal population numbers and migration movement for the various age categories of male NES. Age categorization was determined based on Año Nuevo's age category field identification system [1].

This paper follows a prior study conducted by Zach Hoffmann and Bill Goodger in which they determined male NES populations at nine beaches along the Piedras Blancas rookery during the molting season from June through August of 2015 [2]. This breeding survey is a natural follow up study to the molting season survey to compare and contrast population numbers of male NES. In addition to comparing population numbers between the molting and breeding season, two other objectives of this survey were to determine how many adult males are available to breed the large number of females and whether the counts of adult males and SAMs on each beach are approximately the same in the molting season as found in the breeding season.

Materials and Methods

This survey of the breeding season population numbers was completed in January and February of 2016. In order to obtain a complete survey of male NES at the Piedras Blancas Rookery during the breeding season, this study incorporated the range of beaches between Arroyo Laguna and Arroyo de la Cruz (Fig 1). Unique to this breeding season, two additional beaches (Arroyo de la Cruz and north of the motel at Arroyo del Corral) were added to the locations where the population counts were performed, as births have been recorded at these locations in the past two years [4]. Arroyo Laguna was not omitted as it was in the molting survey when there were no seals present.

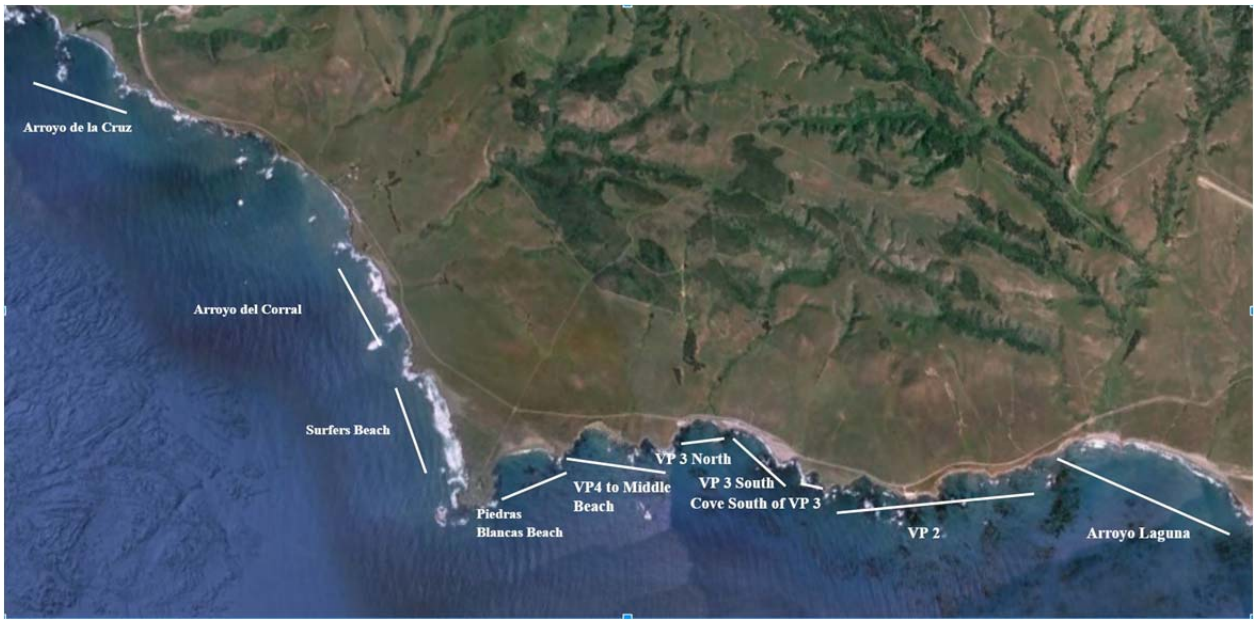

Figure 1. Beaches surveyed throughout the Piedras Blancas rookery.

SAM and adult male NES were categorized using Año Nuevo's field classification system [5]. At each of the beaches in the rookery, the males were separated into two categories: SAMs and adult males. SAMs were identified by the size of the chest shield and length of the proboscis. The chest shield of a SAM extended partially up the neck but was not above the eye-line, and the proboscis either had a slight droop, a droop similar to an adult, or resembled that of an adult. In the instances that the chest shield and proboscis were difficult to view, body size assisted in identification as SAMs are generally smaller in stature than the adults. Unlike the molting survey, SAMs were not further categorized between the four levels of SAMs. Adults were identified as having a full-sized proboscis that touched the sand and a chest shield at or above the eye line.

Counts were obtained using a non-invasive approach in which investigators used binoculars to categorize seals from different designated public viewing areas. A permit was obtained to perform counts from the bluff overlooking the beach for south beach-VP-3. Once the individual counts were completed, the investigators (2 or 3) compared their final numbers. Each investigator's counts of adults and SAMs had to be within 5% of one another in order to determine the final number of males. If there was a discrepancy greater than 5%, the beach was recounted. Once each of the investigators were within 5% of one another, the final numbers were averaged. The average value was used as the data point for further analysis.

Due to the utilization of a non-invasive approach, crowded beaches often proved categorization to be difficult, and in the instance that neither size, chest shield, nor proboscis length could be determined, seals were reported as unclassified and entered in the database. Females were differentiated from males based on size and the presence of a pup; however, differentiation between SAMs and females without a pup often proved to be difficult due to similarity in size and were recorded as unclassified. The unclassified counts became part of the analysis. Investigators also often relied on body size or vocalization to differentiate between gender and age. It was determined that elephant seals in the water were most likely males. Juveniles were few but appeared to be a similar size as a weaner.

Results

There was a similar number of adult males in the 2014 molting season (241 individuals) and 2015 breeding season (246 individuals), with a decrease in the number of adult males present for the 2015 molting season (207 individuals) (Fig 3). The adult male breeding season count in 2016 (244), was consistent with the 2015 count (246) (Fig 3). A comparison of the four adult male counts shows that the 15% decrease during the 2015 molt was statistically significant. (One-way ANOVA, F-statistic=5.1687, df=11, a=0.05, p-value=.0281).

The average peak counts of adult males between the 2015 and 2016 breeding seasons remained very similar at six of the nine beaches surveyed (Fig 4). These beaches include Arroyo del Corral, Piedras Blancas, Surfers, Arroyo Laguna, the cove south of VP- 3, and VP-4 to Middle Beach (Fig 4). There was an increase in the number of adult males at VP-3 North, and a decrease in the number of adult males at VP-2 and VP-3 South (Fig 4).

There were almost twice as many SAMs in the first count of the 2016 breeding season (166) as in the first count of the 2015 breeding season (85) (Fig 5). As the breeding season progressed, the second and third counts for each breeding season remained fairly similar between 2015 and 2016 (Fig 5). A two-way ANOVA showed that the variation at the first count was not statistically significant (F-statistic=2.039, df=5, α=0.05, p-value=0.3889).

The 2016 breeding season survey was expanded to Arroyo de la Cruz and the beach north of the motel at Arroyo del Corral. There were 4 adults and 1 SAM at the former beach and 1 adult and 24 SAMs at the latter at the 2/9/2016 count. (Table 1).

Male NES peak numbers for the 2015 molting and the 2016 breeding seasons for each beach are compared in Figure 6. No adult or SAM elephant seals were present during the 2015 molting season at Arroyo Laguna or Surfers Beach, which are both beaches open to the public during molting seasons. However, adult males returned to both beaches during the 2016 breeding season when the beach was closed to public access. When comparing VP-3 South and VP-3 North, there are more adult males at VP-3 South during the 2016 breeding season than there are during the 2015 molting season (Fig 6). During the 2015 molting season, more males chose to haul out at VP-3 North than VP-3 South (Fig 6).

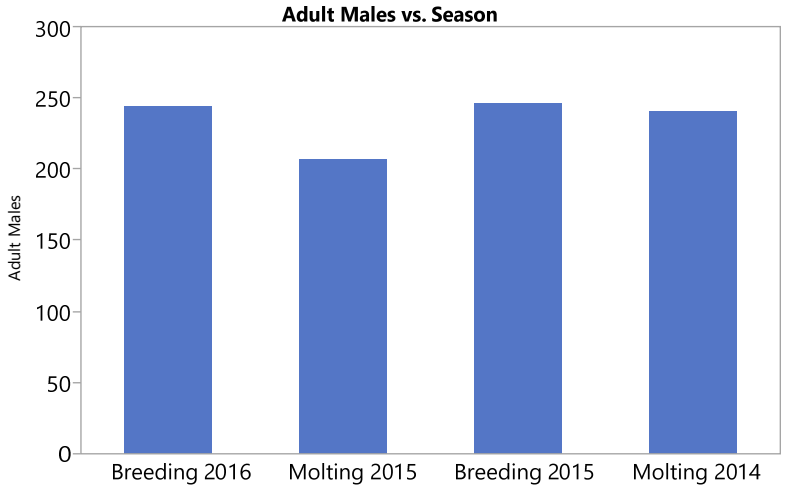

Figure 3. Bar graph comparing total adult male peak counts between the 2014 molting, 2015 breeding, 2015 molting, and 2016 breeding seasons.

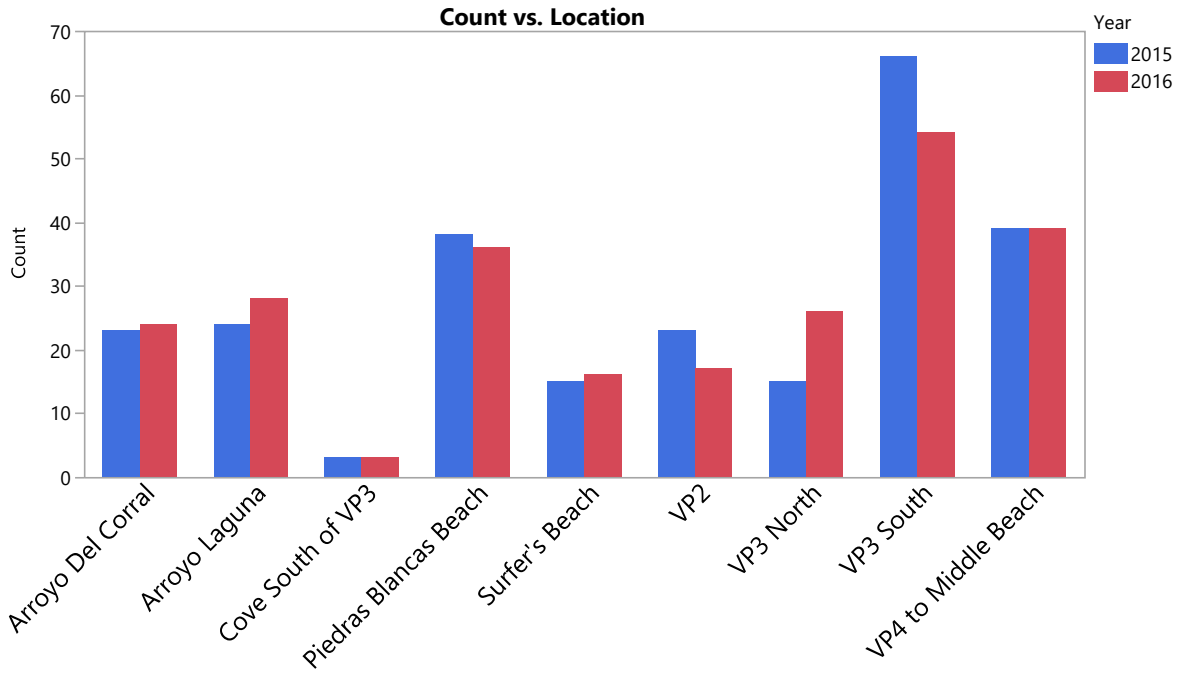

Figure 4. Bar graph comparing peak adult male population counts for the 2015 (blue) and 2016 (red) breeding seasons.

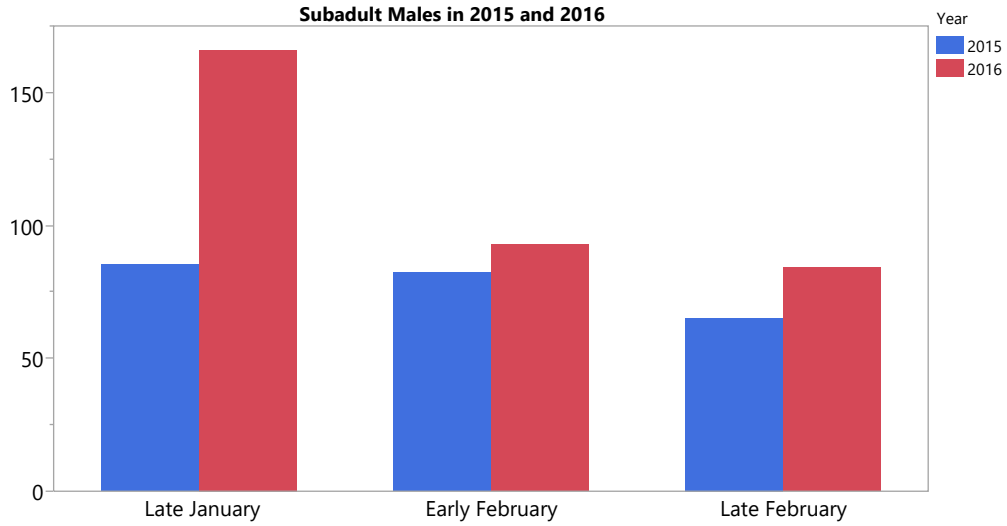

Figure 5. Bar graph comparing SAM population counts for three time periods (late January, early February, and late February) during the 2015 (blue) and 2016 (red) breeding seasons.

Table 1. Adult and SAM population peak counts(2/9/2016) at the expanded survey sites, Arroyo de la Cruz and north of the motel at Arroyo del Corral, during the 2016 breeding season.

Location	Subadult	Adult
Arroyo del Corral (north of motel)	1	4
Arroyo de la Cruz (Inc Pt Sierra Nevada)	24	1

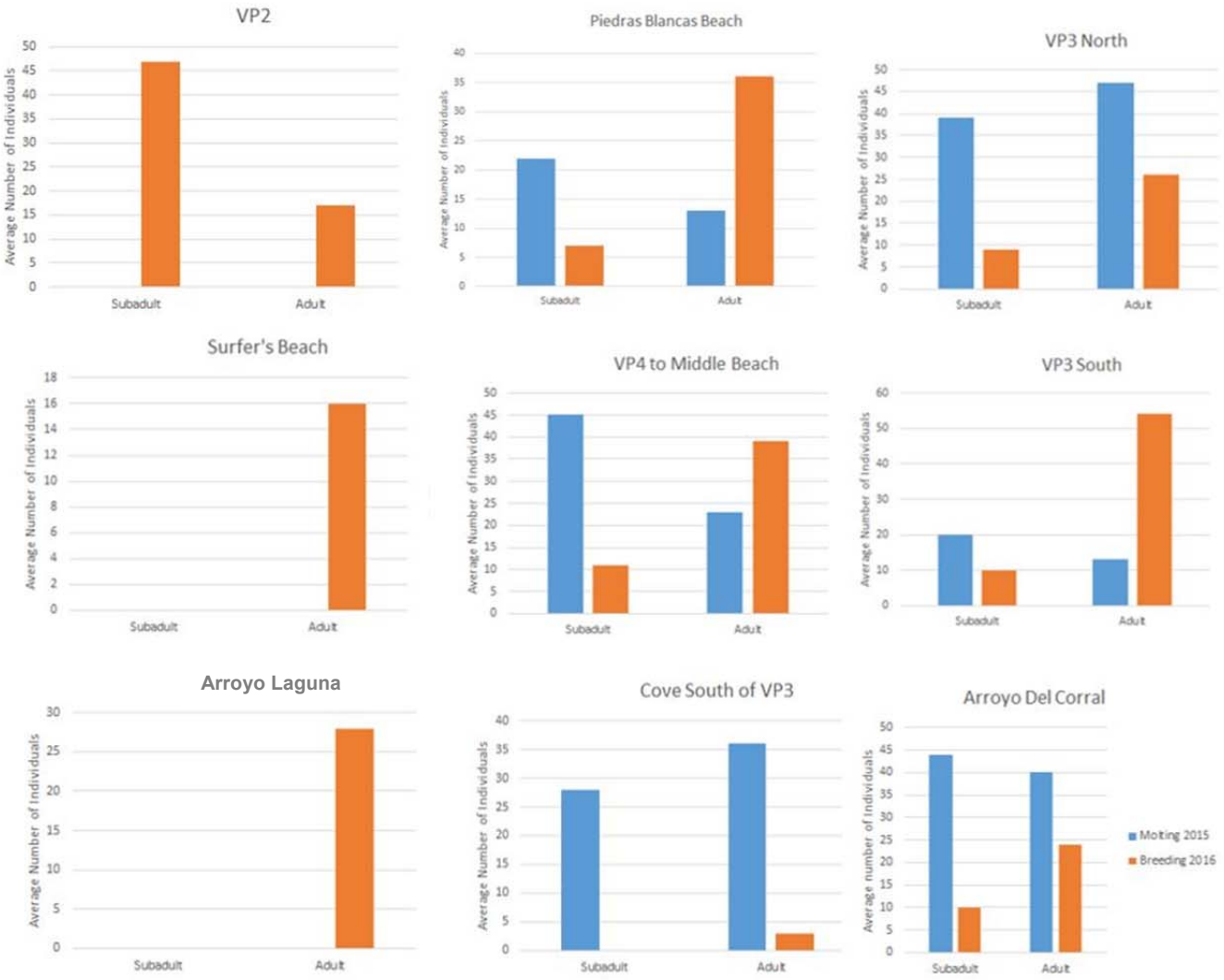

Figure 6. Comparison of male NES peak numbers between the 2015 molting (blue) and 2016 breeding (orange) season by beach.

Discussion

Adult male NES numbers were maintained between the 2015 and 2016 breeding seasons to breed the large number of females at the rookery (Fig 3). While the number observed during the 2014 molting and 2015 breeding season were quite comparable, there were 15% fewer adult males in the 2015 molting season when compared with the 2016 breeding season. This decrease was statistically significant (p=.0281). This suggests that even if there are fewer adult males present during the molting season, the number of adult males during the breeding season continued to be adequate to breed the large number of females. This may be due to the male NES molting at other rookeries, but this may not be the case as Le Boeuf states that mature males molt at the same beach where they were breed [3]. Also, although not significant (p=0.3889), there was a larger number of SAMs surveyed during the first count of the 2016 breeding season (Fig 5). This highlights the variability of when the SAMs return from their ocean migration during the breeding season.

Six of the nine beaches surveyed had very similar adult male counts between the 2015 and 2016 breeding seasons (Fig 4). This raises the question of whether the adult males haul out at the same beach they migrated from after each migration or possibly at the beach they were born. This is difficult to prove unless they were tagged as we do not know if they are the same seals as they may have been SAMs the previous year and now are adult males. Also, there are few other rookeries that have as many individual beaches within the rookery as Piedras Blancas, therefore limiting the ability to research this trend in other rookeries.

The survey was expanded to Arroyo de la Cruz and north of the motel at Arroyo del Corral for the 2016 breeding season due the fact that 5 births were recorded at Arroyo de la Cruz and for the 3rd consecutive year pups were born north of the motel in 2015[4]. However, in 2016 there were only 2 births recorded at Arroyo de la Cruz, indicating no current northern expansion of the colony's breeding range and the number of males were miniscule at these locations during the breeding season.

Another interesting result was the comparison of male NES peak numbers at each beach between the 2015 molting and 2016 breeding season (figure 6). These results resembled the trends observed during the 2014 molting and 2015 breeding season population surveys.[5] For instance, the comparison of counts at Arroyo Laguna and the surfer's beach indicated no adults or SEM elephant seals were present at either location when the beach was open to public access during the molting season. This allowed surfers access to the beach area to get to the water which sets up the potential for harassment. However, adults and SEM elephant seals returned to both beaches during the breeding season when both beaches are closed to public access (figure 6). On one hand, these results may have occurred during the molting season because no females were available for the males to follow as in the breeding season.[6] On the other hand, this behavior maybe due to the concept of flight zone. An animal's flight zone is similar to personal space being the distance that a person must maintain for the animal to be comfortable. In addition, during the 2015 molting season more males chose to haul out at the VP-3 North beach. One explanation for this given the number of visitors which have public access to this beach may lie in the flight zone concept. Animals instinctively get used to people after a long period of repetitive exposures, in this case animals feeling comfortable with the public on a boardwalk (non-harassment setting) somewhat distant from them [7, 8, and 9].

References

1. "Año Nuevo State Park Interpretive Guide." *Friends of the Elephant Seals*. Web. <http://www.elephantseal.org/_docs/interpretive-guide-for-docents.pdf>.
2. Hoffman, Z. Goodger, W. 2015. *Population Survey of Male Northern Elephant Seals at the Piedras Blancas Rookery during the Molting Season: Year Two.* http://www.elephantseal.org/fordocents.html, FES and Ano Nuevo Research Reports. pp 1-10.
3. Le Boeuf, B., Ainley, David G., and T.J. Lewis. 1974 Elephant Seals on the Farallones: Population Structure of an Incipient Breeding Colony. Journal of Mammalogy, Vol. 55, No. 2; pp. 370-385.
4. Hatfield, Brian (2016). Unpublished Data.
5. Hannah, S. Wolfer, K. and Goodger, W. 2015. *Population Survey of Male Northern Elephant Seals at the Piedras Blancas Rookery during the Breeding Season.* http://www.elephantseal.org/fordocents.html, FES and Ano Nuevo Research Reports. pp 1-11.
6. Le Boeuf, B, Condit, R, Morris, P, & Reiter, J. (2011) The Northern Elephant Seal (Mirounga angustirostris) Rookery at Ano Nuevo: A Case Study in Colonization. Aquatic Mammals, 37(4) pp 486-501.
7. Bentrup, G. 2008 Flight initiation distance buffers. USDA National Agroforestry Center.
8. What is a cow's flight zone ? March 2012. Ag Safety and health.
9. Grandin, T. Dec 2015. Understanding Flight zone and point of balance for low stress handling of Cattle, Sheep, and Pigs. ProWay Livestock Equipment.