

# Population Survey of Male Northern Elephant Seals at the Piedras Blancas Rookery during the Molting Season

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## Abstract

This study aimed to perform the first comprehensive survey of male northern elephant seals at the Piedras Blancas rookery and surrounding beaches during the molting season. The application of a non-invasive method for counting seals from the bluff was explored in order to minimize impact upon the seals, and allow for surveys to be conducted in the presence of the public. While this study should be considered a preliminary investigation into types and numbers of male elephant seals in the population during the molt, the use of the non-invasive approach appears to be an effective means of accurately surveying all beaches in and around the rookery. The changes in age class demographics observed throughout the study correspond well with the known migratory patterns for male northern elephant seals at other rookeries, and shed some light on male beach preference during the molt.

When compared with data from previous years, counts from this survey supported similar migratory patterns for subadult and adult males, but differed in the number of males returning to the beaches. Previous counts done at VP3 reported considerably lower numbers of adult males, with an average monthly count of 5.8 in 2008 as compared to 45.5 in 2014. It is possible that this difference may be a result of the increase in the population of seals in the rookery, but alternatively, it could stem from different parameters for categorizing subadult and adult males, but further seasons of study are required to verify this.

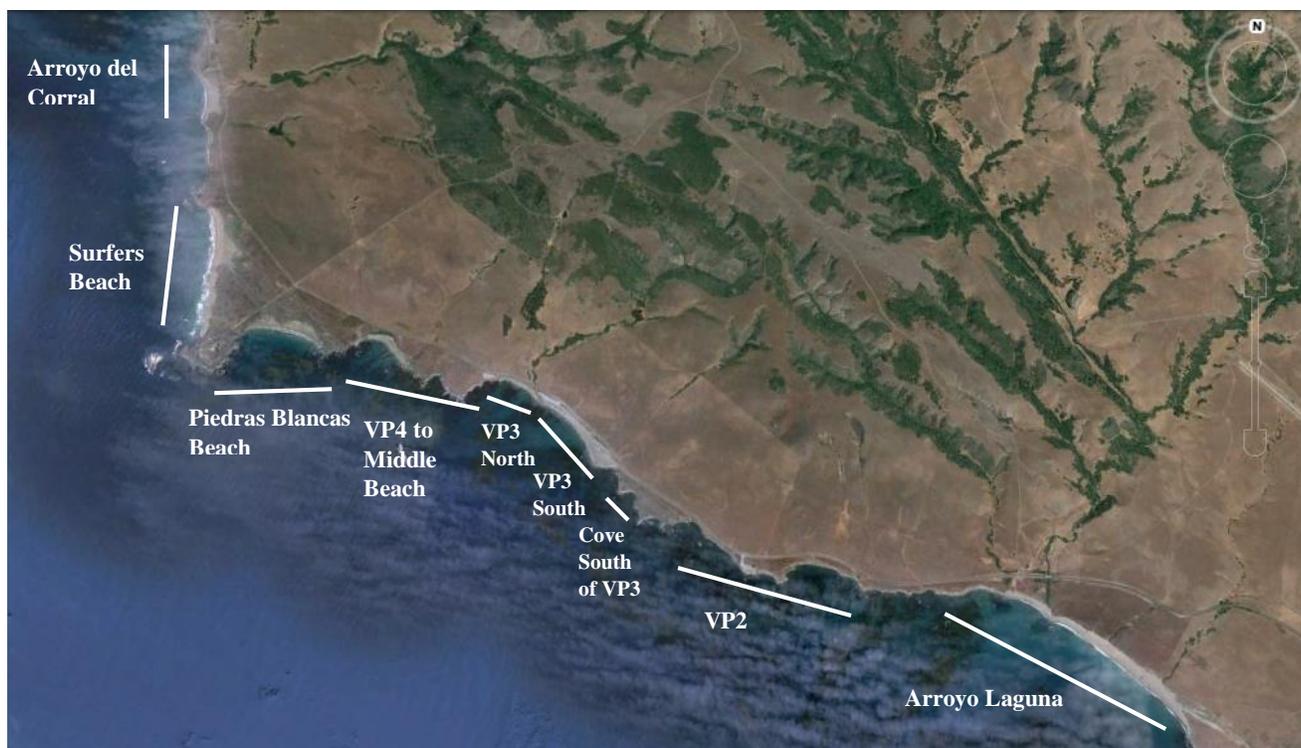
## Intro

Up until now, all reports on the number of subadult and adult northern elephant seals returning to the Piedras Blancas rookery during the summer molt have been estimates based upon numbers from other rookeries such as Año Nuevo, or from a small sample of the Piedras Blancas population. This study aimed to provide a comprehensive survey of all beaches in and around the rookery where males haul out in order to obtain a better understanding of male population movements and numbers at the Piedras Blancas Rookery during the molting season. Counting individuals and dividing them into age classes could yield important insights into the number of males available for mating during the breeding season.

Another focus of the study was to explore the efficacy of a noninvasive approach using purely visual observation to obtain data. This has the dual benefit of minimizing disturbance of the elephant seals, and allowing for data collection in locations where the public is allowed to be present.

## Materials and Methods

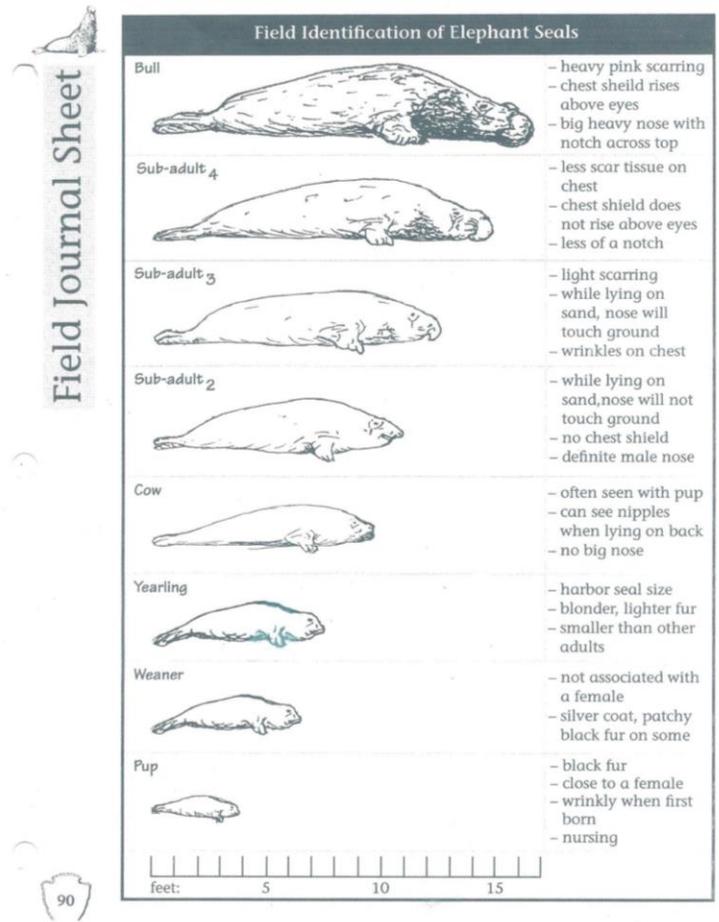
The time horizon for this survey was June through August, termed the summer male molt. In order to obtain a complete survey of male northern elephant seals at the Piedras Blancas Rookery during the molt, this study incorporated the range of beaches between Arroyo Laguna and the old Piedras Blancas Motel (Fig. 1). The southernmost beach, Arroyo Laguna (35.652°N, 121.223°W to 35.648°N, 121.214°W) remained uninhabited throughout the study, and was therefore omitted. The next beach, Vista Point 2 (35.655°N, 121.249°W to 35.652°N, 121.227°W) consists of the rocky shoreline stretching north and south of the cypress tree parking lot. The cove south of Vista Point 3 (VP3) (35.658°N, 121.253°W) is a small, sheltered beach just south of the southernmost region of the rookery. VP3 is divided into North Beach and South Beach, with each beach corresponding to the area viewable from the north and south boardwalks with docents present. VP-3 south (35.659°N, 121.254°W to 35.662°N, 121.256°W) and VP-3 north (35.664°N, 121.262°W to 35.663°N, 121.259°W). Vista Point 4 and Middle Beach (35.665°N, 121.275°W to 35.664°N, 121.262°W) consists of the rocky shoreline and beaches observable from the Vista Point 4 trail, including the long stretch of sandy beach that extends to South Point. Piedras Blancas Beach (35.665°N, 121.280°W) ranges from South Point to Point Piedras Blancas. Surfer's Beach (35.667°N, 121.284°W to 35.675°N, 121.286°W) is the stretch of beach north of Point Piedras Blancas. Arroyo del Corral beach (35.683°N, 121.286°W to 35.688°N, 121.289°W) is the beach south of the old Piedras Blancas Motel and also included the shallow beach found just around the point, behind the motel.



**Figure 1.** Beaches where population counts were performed.

After personal communication with Richard Condit (Smithsonian Tropical Research Institute) and Patrick Robinson (Año Nuevo Island Reserve Director), classification of male elephant seal subadult and adult categories were accomplished using Año Nuevo's field identification system (Fig. 2) with a few minor alterations. Seals of subadult categories 1 and 2 (ages 4-6) were combined to make a single category, defined as having either no nose droop or slight hanging nose droop, but with no development of a chest shield. Subadult category 3 (ages 5-7) seals have a nose droop almost like an adult, but only a partial neck shield. Subadult category 4 (age 7 and above) seals have a full size nose and a chest shield that extends halfway up the neck, but not above the eye-line. Adult (ages 8 and above) seals were identified as having a full size nose and a shield that extends above the eye-line. These categories are designed to provide an estimated age range rather than a specific age for individuals, as noted above. There is slight overlap between categories because of the somewhat subjective nature of the category ID system, as it is possible for seals of similar age to exhibit different physical characteristics, resulting in different classification. It should be mentioned that nose growth is known to begin between 4 and 6 years of age and physical maturity is typically reached by the age of 9 (Sanvito et. al., 2007). Specific ages could be defined if counted seals were individuals that had been tagged at birth so that their birth date and information were known. Unfortunately, creating a situation in which every seal returning to the rookery is tagged is unrealistic, so the category ID system is a helpful alternative.

Counts were made from on top of the bluffs using binoculars and a Celestron spotting scope as a means of noninvasive investigation that could be performed within full view of the public, without raising concerns about disturbance of the seals. This approach came with some difficulties as ideal viewing angles could not always be accomplished, and the thigmotactic behavior of the elephant seals made identification in large groups challenging. As a result, it was sometimes necessary to use body size as a best estimate for age class when neither chest shield nor nose were visible. If neither body size nor identifying characteristics could be determined, seals were counted as unclassified. Initially, a few females remained on the beaches, so unidentified individuals were termed unknown, indicating that they could either be females or

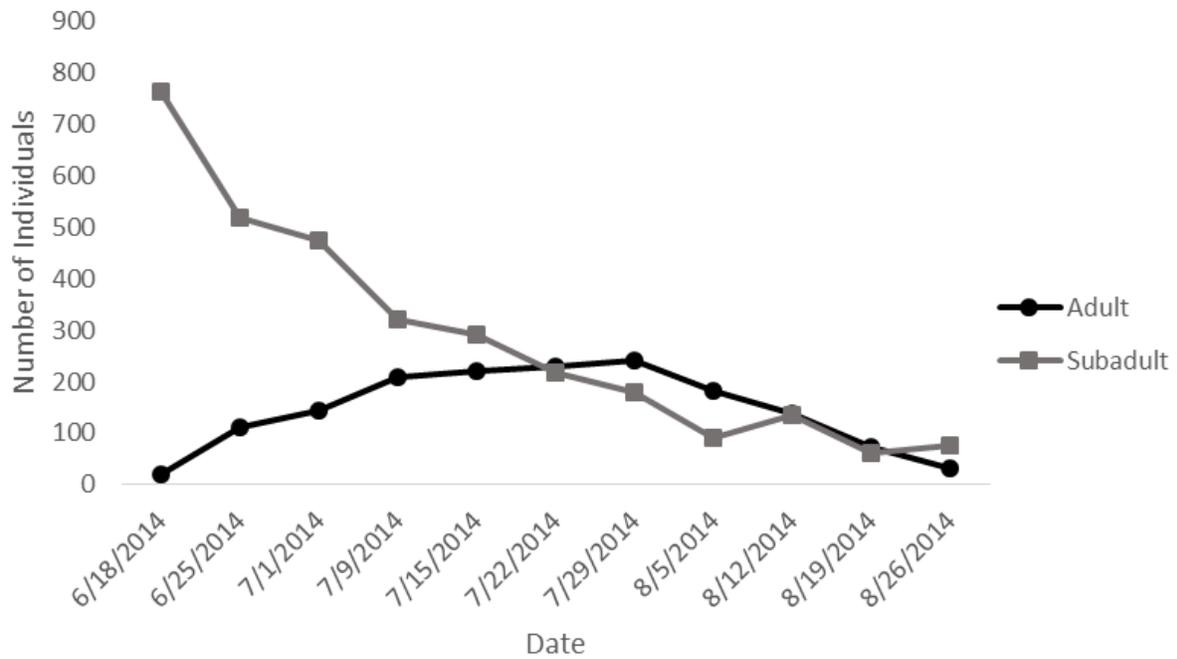


**Fig. 2.** Año Nuevo's age category field identification system. (Obtained from Año Nuevo Interpretive Guide for Docents, 2013)

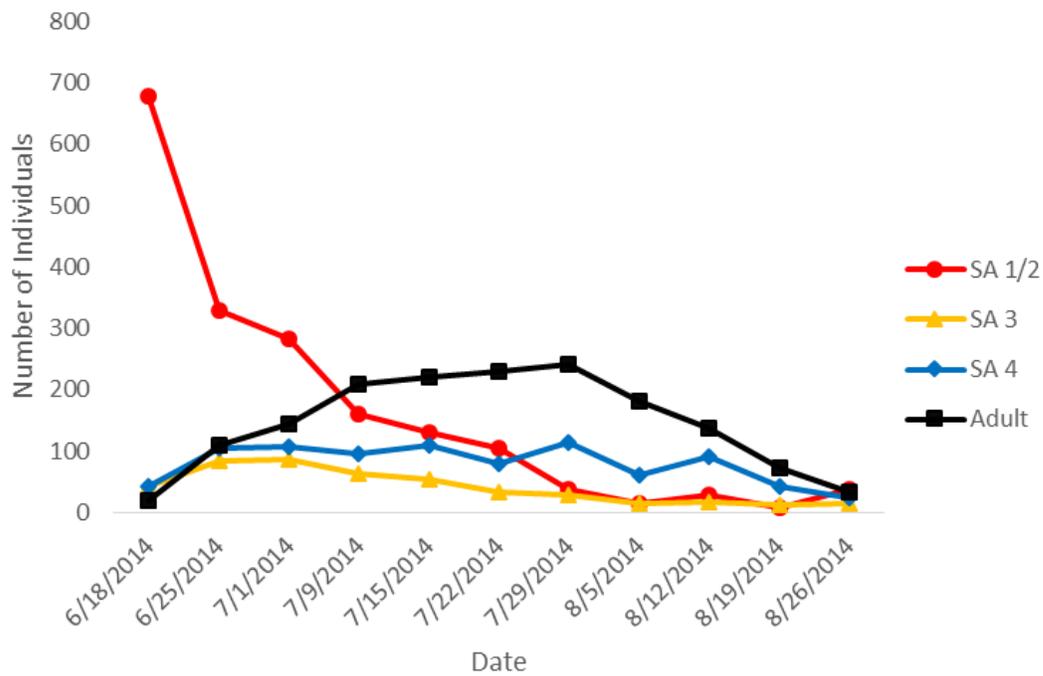
males of unknown age class. As the study progressed, sightings of females became very rare, so unidentified individuals were termed unclassified, implying that they were of an unknown age class, but very likely male. Instances where seals could not be classified were minimized by performing counts early in the morning when the majority of the seals were far up the beach and facing towards the bluff, resulting in a sharp decline in the percent of unclassified individuals after June 18. Counts were made individually by two observers and then compared; if the number of total seals differed by more than 5%, counts were rejected and performed again. If the observer's recounts differed by less than 5%, they were retained. Each beach was surveyed weekly, beginning on June 18<sup>th</sup> and ending on August 26<sup>th</sup>, except in the case of Piedras Blancas Beach, where in coordination with Piedras Blancas Light Station, counts were reduced to bimonthly surveys in order to minimize disturbances. The Celestron spotting scope was not utilized during the first count, so the southernmost portion of the VP3 South beach was not accessible until June 25<sup>th</sup>, after which it was included in the VP3 South count. The Cove South of VP3 was not surveyed until the second count, so counts at this location also began June 25<sup>th</sup>. Seals were found at the cove behind the old Piedras Blancas Motel and incorporated into the Arroyo del Corral count as of July 29<sup>th</sup>.

## **Results**

The number of subadult males inhabiting the beaches decreased throughout the molting season, hitting a low point at the beginning of August and then leveling out (Fig. 3). This was because subadult 1&2's arrive for the summer molt in late May in fairly high numbers which skew the data somewhat. The adult male population increased over time, with a high point at the end of July before decreasing throughout August. Within the subadult group, subadult 1&2's decreased throughout the molting season (Fig. 4). Subadult 3's increased slightly at the beginning of the season, and then decreased throughout the rest of the study. Subadult 4's followed a pattern more similar to the adult males, increasing slightly until the end of July, and then decreasing throughout August (Fig. 4).



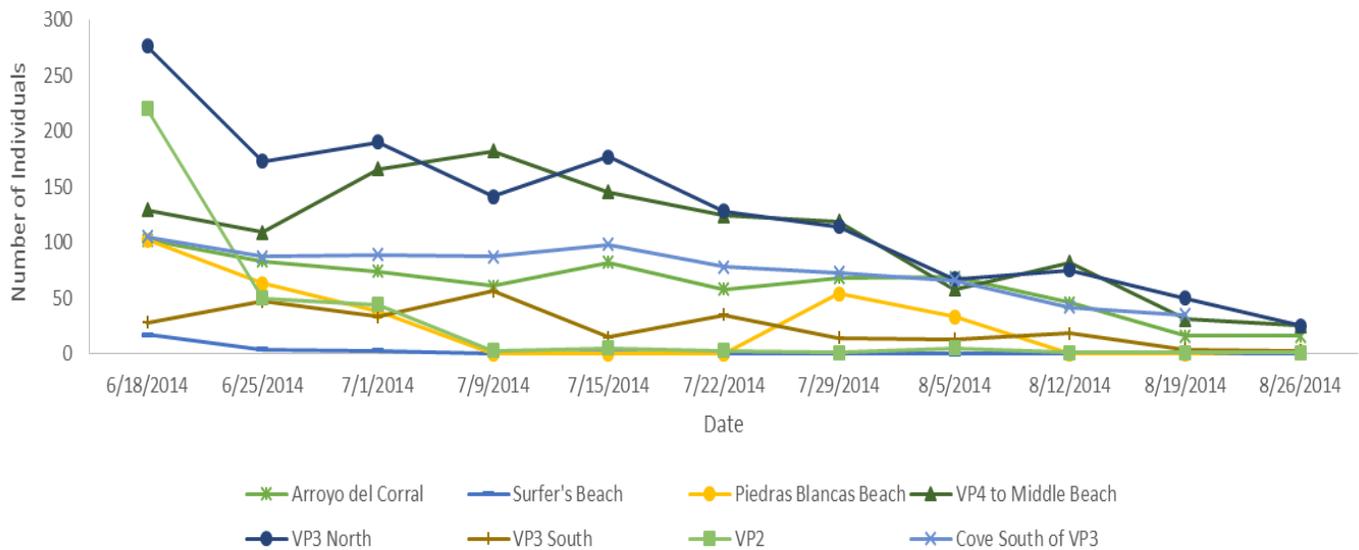
**Fig. 3.** Number of subadult and adult elephant seals throughout the molting season.



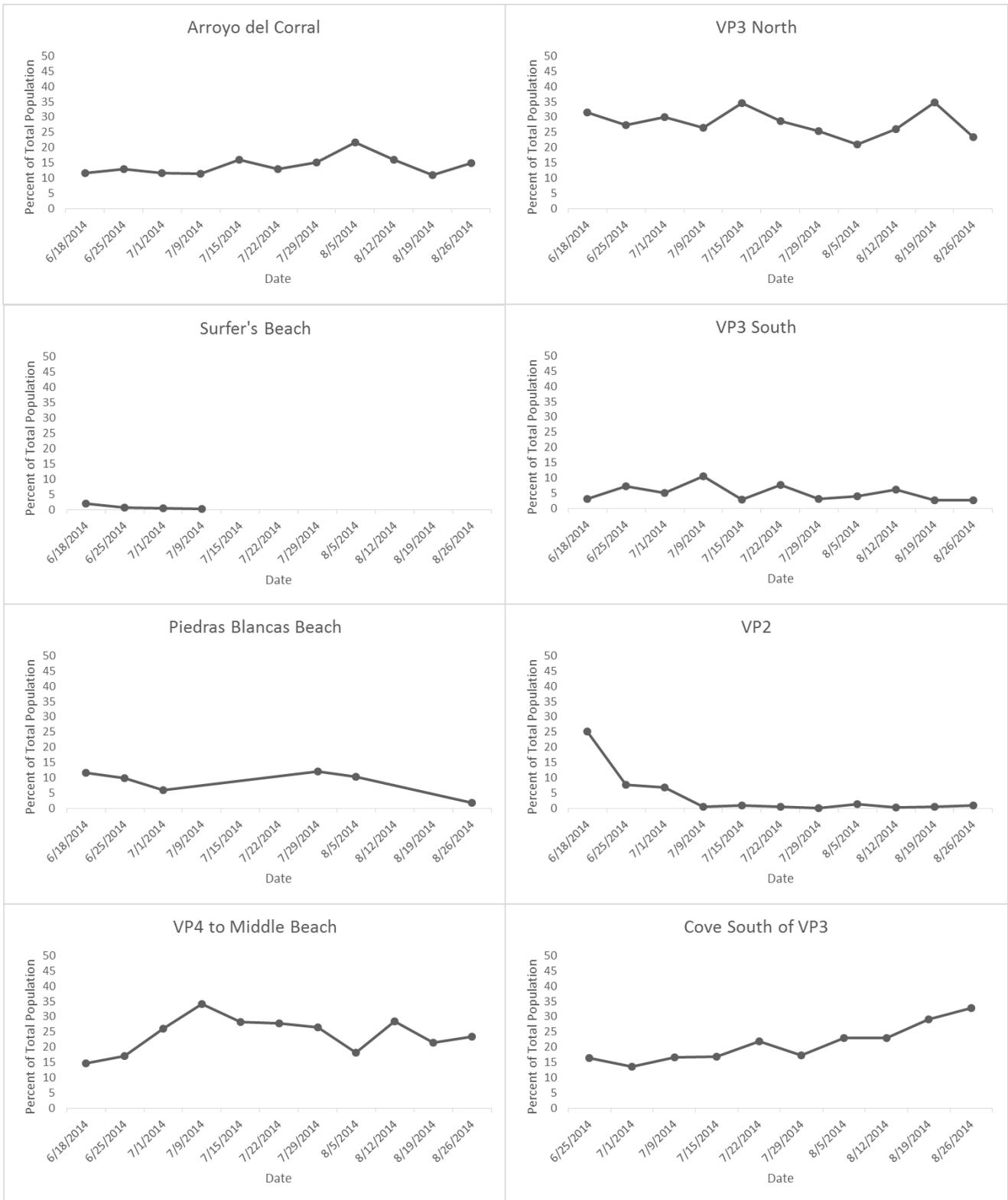
**Fig. 4.** Number of individuals within each age class throughout the molting season.

VP3 North remained the most populated beach for the majority of the season, but was surpassed once in July by VP4 to Middle Beach (Fig. 5). Surfer's Beach was by far the least inhabited of the beaches, with a few seals at the start of the study, and few to none after June. A gradual decrease in the total number of seals was observed at all beaches throughout the molt season (Fig. 5). Most followed the subadult and adult trends mentioned above, but VP2 and Surfer's beach were anomalous, dropping sharply to only a small number of seals (Fig. 5). Adult males appeared to prefer the Cove South of VP3, VP3 North, VP4 to Middle Beach, Piedras Blancas, and Arroyo del Corral beaches (Fig. 7). With the exception of the two anomalous beaches, VP3 South was the only beach where adult males were regularly outnumbered by subadult males most of which were 1 and 2's throughout the entire season.

When compared to previous data (unpublished) for subadult and adult male elephant seals at VP3, counts from this season were somewhat elevated for subadults, but much higher for adults (Table 1). The average monthly total for subadults was higher than in previous years, but when looked at individually, some months had fewer subadult seals than in previous years. Adult male counts were substantially higher, both for the average monthly total and the individual month approach.



**Fig. 5.** Elephant seal use of different beaches throughout the molting season.



**Fig. 6.** Percent of total seals found on each beach throughout the molting season. Counts at Piedras Blancas Beach were only performed twice monthly due to the agreement with the Piedras Blancas Light House, which is why there are only 6 counts.



**Table 1.** Comparison of average monthly (June-August) subadult and adult population counts between years at Vista Point 3 (both North and South). Obtained from unpublished data.

<b>VP3 Molting Season Average Monthly Total</b>					
Previous Years			2014 Molt		
Date	Adult	SA	Date	Adult	SA
<b>2004</b>	0.5	32.5	<b>2014</b>	45.5	115.95
<b>2005</b>	1.3	65.9			
<b>2006</b>	2	75.3			
<b>2007</b>	0.8	60.9			
<b>2008</b>	5.8	80.8			

## Discussion

The observed changes in age class composition throughout the molting season correspond well with the known migratory patterns for male northern elephant seals (Le Boeuf, Burney, and Laws, 1994). By early June, the majority of females and juveniles have returned to the ocean. Subadult male 1&2's begin arriving in late May and during June in large numbers and begin to gradually decrease in the early part of July as they near completion of their 30 day annual molt as the subadult 3 and 4's begin to arrive and increase. Adults begin to increase gradually beginning in June, reaching a maximum in late July. By the end of August, most seals have left, marking the end of the molt season (Fig. 4).

One interesting insight from the study is that less than half of the seals were located within the recognized rookery. Of the peripheral beaches, VP4 to Middle beach typically contained the greatest number of seals, followed by the Cove South of VP3, and Arroyo del Corral beach (Fig. 6). These beaches all have the common features of being both south facing and sandy (In Arroyo del Corral's case, 'south facing' refers only to the northernmost portion of the beach, which was the only portion used by the seals), and it is possible that the high proportion of seals found on these beaches may be due to the comfortable and sheltered conditions offered by these settings. If these beaches were facing north rather than south, they would be vulnerable to storm surges from the north which could result in high mortality for nursing pups during the breeding season. While Surfer's Beach and Arroyo Laguna were also large and sand covered, they housed little to no seals throughout the entire survey. This may have been due to the slightly less sheltered conditions of the beaches, or might have been a result of increased human traffic, as both are known surfing locations. It should be noted that seals use Arroyo Laguna extensively during the breeding season, when human access to the beach is strictly limited, which may provide some support for the human traffic hypothesis. VP2

consisted of mostly rocky shoreline, and saw a sharp drop in seals around the end of June, remaining relatively vacant for the rest of the season. Before the drop, only subadult 1&2's were found on the beach (Fig. 7), possibly indicating that this was an unfavorable location inhabited by younger seals that could not find space at the other beaches. The juvenile molt is known to begin around mid-March, with most juveniles leaving by June, whereas the subadult/adult male haul out doesn't begin until June (Le Boeuf, Burney, and Laws, 1994), so the fact that most of the subadult 1&2's at the beach left part way through June might indicate that they may be transitioning between the juvenile and adult male haul out schedules as they finish their 30 day molting period. It's possible that had subadult 1&2's been separated into two distinct categories, subadult 2's would have been seen to peak later, around mid-June. It could have been that subadult 1's constituted the majority of the subadult 1&2's identified at the beginning of June. In order to evaluate this, the next season of study will need to consider both beginning earlier and separating subadults 1's and 2's into their own categories.

When compared with data (unpublished) from previous years, counts from this study supported similar migratory patterns for subadult and adult males, but differed in the number of males returning to the beaches. Previous counts performed at VP3 yielded considerably lower numbers of adult males, with an average monthly count of 5.8 in 2008 as compared to 45.5 this year (Table 1). While the population of the Piedras Blancas rookery is known to be increasing (Condit et. al., 2014), such a stark difference in the number of adults hauling out during the molt season may not be simply due to an increase in population size, as no data could be found on the number of males hauling out to molt between 2008 and 2013 with which to identify such a significant increase. It possibly could stem from different parameters for categorizing subadult and adult males. Sources for the parameters used for previous collection of data have not been referenced, so the results from this season should be considered preliminary until corroborated by further seasons of study. Another result that will require further inquiry is the fact that subadult 4 counts were consistently higher than subadult 3 counts. This is a counterintuitive finding as the number of individuals within each category would be expected to decrease from the younger categories to the older ones, due to predatory and environmental challenges preventing all individuals from making it to adulthood. This finding could have been the result of miss-categorization as the difference between subadult 3's and subadult 4's is only the degree of chest shield present which can be relatively subjective when viewed from a distance. Further seasons of study will be required to assess this.

Looking forward, counts of subadult and adult males are planned for the breeding season, beginning in December 2014. It will be interesting to compare the number of adult males between molting and breeding seasons to assess if all males return in comparable numbers for both haul outs. Beaches used solely for molting but not breeding have been identified on Vancouver Island, Cape Arago, and Cape St. George (Stewart et. al., 1994), so it is possible that some of the seals don't return to Piedras Blancas for the molting season. The same noninvasive method for counts will be utilized for the breeding season as its application in this study has been deemed a success. The means of counting appears to be a reliable process as the instances where recounts were required were relatively few. All beaches around the rookery have accessible bluffs from which counts could be performed, and the difficulties posed by the thigmotactic behavior of the seals will be diminished due to the territoriality of the males during the breeding

season. The ability to perform these counts in the presence of the public will prove even more essential as the number of tourists will be greater during the breeding season, and the ability to make the counts without disturbing the seals will be critical while pups are present.

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