

Mark, Tag, Weigh Weaners: Research Explanation and Assessment

- Stand in for Heather Liwanag
- Have 40 yrs of field research experience with both domestic and wild land animals
- Pilot not done yet so will not be able to answer all questions
- Questions
- PP change

Preface

Piedras Blancas (PB) site of **largest** mainland colony of northern elephant seals (NES)

- Colony **center** of NES distribution yet no formal population monitoring system
- PB colony represents a **void of data** for NES population patterns, migratory behavior and breeding which is being collected at other NES sites in Cal., Oregon, & Mexico.
- This study will establish a **known sub-pop** of NES at PB over 3 years following a pilot study in 2018 doing marking, flipper tagging, and weighing of young-of-the-year.
- Working with animals primarily during the **breeding season** (December - March) and periodically during the remainder of the year.
- In addition, the plan is to conduct work at the new NES rookery at **Vandenberg**

Background

- Project leader: **Heather Liwanag** Prof Cal Poly w/15 yrs. of experience with pinnipeds. National Science foundation grant winner. Currently working with Weddell seals in Antarctica.
- Direct collaboration **w/Pat Robinson** Año Nuevo (AN)
- Study will use well-established **methods developed** and implemented at AN
- Data from this study will contribute to the Richard Condit-Smithsonian **dataset** which covers 6 rookeries.
- All research activities will occur at **remote beaches** where the public is not present

Permits and Accountability

- All permitted research will be **reported to local** NOAA authorities as per permit
- Accountability and Oversight are part of both NOAA and State Park **permits**-violations can result in fines and jail time.
- Research, as always with animals, there will be handling of seals and all procedures were developed at AN **under the supervision of NOAA and UCSC(Santa Cruz)** with the goal of minimal discomfort to the seals.
- Also IACUC (Institutional Animal Care and Use Committee) permit where Cal Poly will also provide **oversight and accountability** for this research by Cal Poly researchers/students off-campus.

Pilot Phase (this winter)

- A pilot study is a **small** scale version of the full scale study.
- Even though procedures are completely **vetted** in previous trials they will be working with **wild** animals in a new setting. The pilot will especially assist in understanding seal behaviour, handling, and response to outlined procedures.
- The pilot allows **training** for graduate students who will be involved in the full scale study. This leads to better results and more comfortable seals.
- The pilot aims to setup a monitoring program for a sub-population of NES pups born at the PB colony over three winters, 2019, 2020 & 2021. The **numbers of weaners to tag** and weigh each year will be estimated once the methods are worked out in the pilot study this winter.

Time Line

- **Schedule:**
- 10/11/17-10/20/17-**classroom** training at Cal Poly.
- 10/22/17-12/2/17-**Resight training** at Arroyo Tortuga, Arroyo Laguna, and the Middle Beach.
- Late Dec- thru Jan: begin marking newborn pups (hair dye) to track them until they have been weaned. Pups will **not** be weighed or tagged until they are weaned.
- Late Jan-thru Feb: begin **tagging** newly weaned pups. As soon as **practical**, begin weighing, measuring and 2nd tagging newly weaned pups. Two tags indicate the weaner has been weighed and measured; it will not be disturbed again. Also the second tag can be a backup in case one tag is lost in later years.

Marking and Tagging

Background info

- Pups are marked during nursing period so they can be resighted at a distance. Personnel can tell whether the pup is still with the mom which will allow us to **estimate** the weaning date of the pup (usually plus or minus 1 day). This allows us to be **better prepared** to weigh/tag the weaner.
- ID marks are hand-applied to the fur of the pup with a wooden-marking stick. The pup is **not handled** during this procedure.
- The mom is probably more responsive than her pup to the marking but e-seals are not like harbor seals in that it would be **highly unusual** for them to abandon their pups.
- **Non-restraint** procedures are used to mark newborns fur with dye and to apply the first roto tag to weaners.
- Usually the weaner is tagged while **sleeping** and the tag is inserted before it wakes up. Personnel move away before the weaner notices its wearing a new tag.

Marking

- Minimal disturbance
- Easy to resight
- Not permanent



Weighing and Measuring

Background info

- Newly weaned pups of either sex will be identified by daily resight from time of pup marking. Some will be tagged in the **left flipper** and a smaller subset **double tagged** indicating they have been restrained, weighed, measured and released.
- The difference between non-restraint and the weaner being restrained is a **towel** over their eyes.
- Pups **do not usually molt** the lanugo coat prior to weaning.
- If on resight a marked pup is without its mother, that allows planning to occur for tagging and weighing **before the mark** is shed in the molt.
- Weaned pups will be weighed in **specially designed restraint bags** which will be suspended from a carbon fiber tripod.
- This has been a **standard method** for weighing pups since 1980 without incident.

“Weaner” weighing

- Baseline info
- Sex and weight
- Morphometrics
- Second flipper tag



How do we do research in general

- Scientists need to take a large enough **sample** of the “normal” pop in order in this case to id seal pop behavior, migratory patterns & breeding as a whole.
- Also compare sample data with others who have done similar collections of data in similar settings such as e-seal beaches and this leads to **more confident** results if they are similar.
- And if they are different this can lead to more **directed** research which is a better way to answer new questions.
- Having a database at different sites over time allows one to follow **ocean changes** due to global warming such as upwelling, prey moving or reduced, and ocean sea levels increasing based on seal behavior.

Research findings at PB that are both new and potentially different from Año Nuevo:

- It is **unusual for one site** to provide all the research on a species because the behavior, migration patterns and breeding of e-seals are probably not the same at all rookery sites.
- 1. At Piedras Blancas we have a **sub adult 1** category which was not found at Año Nuevo (3 year male survey, Goodger, et.al.)
- 2. At Piedras Blancas the sub adult 1's molt **overlaps** with the juveniles and females (3 year male survey, Goodger, et.al.)
- 3. At Piedras Blancas some of our sub adult 3's have the beginning of a **notch** in their proboscis (3 year male survey, Goodger, and et.al.) not noted in Año Nuevo's classification system. (3 year male survey, Goodger, et.al.)

Research findings at PB that are both new and potentially different from Año Nuevo continued:

- 4. At Piedras Blancas it appears that there are significantly less adult males based on 2015 and 2016 molting season counts when compared to the previous breeding season counts for those years. This raises the question whether some adult males **molt at different beaches** which could only be verified by a more aggressive tagging program. (3 year male survey, Goodger, et.al.)
- 5. The availability of adult males to breed the increasing number of adult females remained constant as a testament to the **health** of our population. The average over 3 years 2015-2017 was 237 with a small variation year to year. (3 year male survey, Goodger, et.al.)
- 6. This is in spite of the fact that based on Año Nuevo's survivability data we should have **twice** as many adult males than were counted over the last 3 years with the average being 240.
- 7. Adult males **do not leave** until the last female has left during the breeding season. For example in 2017, Feb 15 there were 231 and on March 1 232 adult males present. (3 year male survey, Goodger, et.al.)
- 8. Sarah Kienle's study which showed that females have a much **wider migration pattern** than was thought from Año Nuevo's studies. In fact on sea turtle.com Judy May and myself were tracking 2 females from Año Nuevo that went up the continental shelf and returned to Año Nuevo recently.

Research findings at PB that are both new and potentially different from Año Nuevo continued:

- 9. In Jenni Rind's apnea study last summer she had similar results to the Blackwell study in the 1990's which was the pivotal study on elephant seal apnea in that it was found that adult males had **shorter apnea times** (Blackwell mean 7.4 min winter and Rind 6.3 min summer) than subadults.
- Blackwell's study took place during the **birthing/breeding** season, and Rind's in the **molting** season.
- Blackwell and Le Boeuf suggested apneas of adult males would be longer if the males were not on the alert and competing, but just relaxing as during molting. Ms. Rind's results suggest we need to take a closer look as it appears that the level of **aggression does not influence** the length of apnea in relation to age.

Research findings at PB that are both new and potentially different from Año Nuevo continued:

- 10. Since we started the tagging program data base in Oct 2010 we have resighted 430 seals. One notable finding which contradicts Año Nuevo's premise that when females chose a different beach because of not having enough space to nurse their pup they go north to find a new beach because the **4th most resighted tag** is from Año Nuevo and they are almost 10% of the tags sighted
- 11. Males may come back to **same beach** to molt based on 5 beaches of the 11 in the Piedras Blancas rookery had average counts that differed by 5 animals or fewer over the 3 years of the male survey. (3 year male survey, Goodger, et.al.).

Research findings at PB that are both new and potentially different from Año Nuevo continued:

- 12. Based on data from dead pups from Brian Hatfield during the breeding season the average mortality was **9%** since 2000 and the range was (3%-24 % 2008).
- 13. We were able to calculate the number of seals on the beach at **Arroyo del Corral** during both the breeding season and the molting season(appendix) for the State Parks MND (mitigated negative declaration). This was done because of Brian Hatfield's female and pup counts from 1991-2017 and my male counts from 2014-2017.

What we hope this study will find out

- Field research is **not controlled** like a vaccine expt where 1 grp gets the vaccine and the other doesn't.
- Sometimes in field research the study will find out information we **did not anticipate**, sometimes it will provide insights we **were anticipating**, and sometimes as in this case because of doing the study with 6 other rookeries **new insights** will emerge.
- So to try to be specific and say how the research will benefit the seals and us is **not realistic**.
- So we go ahead and use techniques other have done and we have a database with other sites to compare to along with our own developing database which **prepares us** for both anticipated and not anticipated results.

What we hope this study will find out:

- 1. Establish a baseline population to setup a monitoring program. This study will establish a sub-population of seals at PB for which **we know the birthing beach, sex, body measurements/wgt. at weaning, and days of age at weaning**. It will be possible for researchers or even our docents to follow these seals throughout their lives.
- An example would be by having weaners tagged and resighted over time we will be able to assess the **movement** of juveniles and young sub adults from the **fall haul out** to the breeding season.
- 2. Data in the database will be shared with Año Nuevo database, setting up the possibility to compare the **PB and Año Nuevo's** migration patterns or even seals from **Guadalupe, San Miguel, or San Nicolas** (they are part of the database). This could help us know where elephant seals born at all these rookeries **haul out possibly at different beaches/rookeries**. Gathering additional information can help scientists predict how a population of seals might fare as the climate changes.

What we hope this study will find out:

- 3. Following up tagged weaners using resight methods in the **Fall Haul out** and **molting seasons** to better understand the timing of their migratory patterns. The resight will be done by trained individuals which will improve our ability to **follow up on the weaners**.
- 4. The baseline population will contribute to better estimates of weight and length of weaners but additionally long term assessment of colony health, and reproductive success. **Colony health** in this case could be the number of cases of scabby molt of a weaner of the current year vs weathered skin of a yearling. **Reproductive success** in this case could be when the female yearling has their first pup? Is it on average at 4yrs of age or is there a percentage that have their first pup at 3 (Año Nuevo data is 15% at 3 years of age and 75% by 4yrs of age and that females are sexually mature at 2 years of age) Weight and length dimensions of weaners is from Año Nuevo and this study will allow us to tag and monitor their weight and length as they return.

What we hope this study will find out:

- 5. With tags and good resight we can get a better handle on the **ages of males** especially the sub adults.
- 6. Cal Poly research will be shared with **FES-google account** on a daily basis. Already FES shared resight tag database with Cal Poly which is available to Brian Hatfield, docents, and the research committee. In turn Cal Poly will provide resight tags #'s not from their project adding to our database.
- 7. Development of **young scientists** is at core of this program in that their now is a course at Cal Poly to instruct students in all the techniques to do this research which include: Public communication; resighting, seal safety, marking, tagging, and weighing weaners. This mimics the internship program which has produced already 5 research specialists; 3 vet techs, and 1 veterinarian out of a total of 11 (1 is still in school and the other is interviewing).
- 8. Continuing to increase our education to visitors by using these current research results from this project will help visitors to have the awareness to support and protect the seals which is our mission. **This is what we always have done as without research there is no narrative for the visitors.**

Conclusion using some material from our own docent manual- Tagging of elephant seals:

- Tagging of Pacific Predators (TOPP) began in 2000 as one of 17 projects of the Census of Marine Life, an ambitious 10-year, 80-nation endeavor to assess and **explain the diversity and abundance of life in the oceans**, and where that life has lived, is living, and will live.
- Elephant seals are an excellent species to study because they travel across the oceans allowing researchers to learn about a wide variety of oceanic ecosystems, and they **usually return to the same rookeries**, making it easy to resight and maintain a population database on them.
- **Finally, The Cal Poly research team has all the permits to have the research monitored by NOAA, State parks, and Cal Poly, they are using Ano Nuevo techniques (Pat Robinson, Richard Condit, and Daniel Costa) which have been approved for years, they are doing their due diligence to prepare and practice safety techniques, they are joining PB with a database from Ano Nuevo, San Miguel, San Nicolas, and Guadalupe, and they are willing to share all their data daily with us using a google account they will setup. We need to understand the elephant seal population to protect it.**

Appendices

- My Background
- Safety Procedures
- How research on seals helps us to solve manifestations of disease in people.
- Procedural Training procedures
- Live Pup and Weaner Counts at Arroyo del Corral (1996-2017)
- 2017 breeding and molting season population at Arroyo Del Corral

My background

- Veterinarian for 47 years-area of expertise, field research
- Taught/done research at UC Davis-15yrs; UW-Madison 20 years
- 5 degrees-BS/DVM; Masters Preventive Med; Masters Economics; PhD Epidemiology (study of animal diseases humans can contract)
- Worked for 20 years for United Nations expert in Dairy Cattle Repro and Production-50 missions in 30 countries.
- Written 150 refereed papers using field research techniques
- Lot of experience working with the interaction between animals and people.
- Did rescues for TMMC for 5 years

Example of Safety Training: Resights

- Main Concerns:
 - - Animals approaching you on the rookery (trampling and biting)
 - - Variable terrain and weather conditions.
- Mitigations:
 - - Training on animal behaviour and appropriate conduct on the rookery (the field training this weekend)
 - - Always work in partners, with at least one person continuously scanning for potential threats.
 - - Come prepared with suggested gear (listed on field gear list in lab), and be aware of potential terrain and weather danger (thunder storms, rattle snakes, poison oak, etc.)

Safety: Marking

- Main Concerns:
 - - Same concerns as resights, but the risk of contact with animals increases because marking requires you to be closer to the animal.
- Mitigations:
 - - Following all the same suggestions as resights, but also:
 - - Practicing the correct form of marking before attempting on a live animal.
 - - Practicing hand gestures to represent instructions during the marking process.
 - - Creating and following the plan created by the team before marking.
 - - All team members observing the animal and other animals for potential threats.
 - - Following the instruction of your field leaders, but also using your best Judgement. *If you feel uncomfortable at any time let us know immediately*

Safety: Tagging

- Main Concerns:
 - - Same concerns as resights and marking, but the risk of contact with animals increases because tagging requires you be even closer to the animal.
- Mitigations:
 - - Following all the same suggestions as resights and marking, but also:
 - - Practicing the correct form of both restraining and tagging before attempting on a live animal.
 - - Once again, *if you feel uncomfortable at any time let us know immediately!*

Safety: Weaner Weighing

- Main Concerns:
 - - Same concerns as resights, marking, and tagging, but the risk of contact with animals increases because tagging requires you to place the animal in the canvas bag.
 - - Added dangers from using weaner weighing equipment.
- Mitigations:
 - - Following the same suggestions as resights, marking, and tagging, but also:
 - - Practicing the correct form of placing the animal in the canvas bag before attempting on a live animal.
 - - Practicing proper use and care for equipment for use in the field.
 - - Once again, *if you feel uncomfortable at any time let us know immediately!*

How research on seals helps us to solve manifestations of diseases in people. A few examples:

- Elephant seals when fasting are type 2 diabetics with total insulin resistance and lots of blood sugar in their blood stream. For some reason their condition doesn't develop into Diabetic ketoacidosis which can put humans into a coma. We would have never known without a blood sample. Diabetic research centers around the U.S.A. are considering how to understand how this works in elephant seals in order to develop drug approaches which could control type 2 diabetes.
- Elephant seals don't have a problem re-expanding their lungs after surfacing from a dive because they have a mucus layer in their pleural cavity called surfactant which allows them to expand their lungs. This is now being used in people with end stage pleural disease. Another research finding because a researcher decided to do an ultrasound on an elephant seals chest.
- Finally because elephant seals have the lowest level of oxygen in their blood stream after a dive of any land mammal including humans. NASA has been doing some studies on elephant seals because of the oxygen issues in space. Another case of taking a blood sample. Stay tuned on carbon monoxide.

Examples of Procedural Training-Weaner Weighing

- Weaner Weighing Step 1: Restraining
- 1. Step one assess the safety of your surroundings
- 2. Locate a weaner that is a safe distance from other animals on the beach
- 3. Make sure that the weaner only has one tag in the left flipper, which indicates that the weaner has not yet been weighted
- 4. Once the weaner is secured in the canvas bag>>>>>>> (DONE BY THE
- FIELD LEADER) We need help making sure that the weaner is all the way in
- the bag: Being careful around the head region
- a. One person then restrains the animal
- b. We will show you the proper techniques in class

Weaner weighing Step 2 Measurements

- Taking Measurements
- 1. We need a length measurement
- a. The person restraining must say when they are set, by making
- sure the end of the measuring tape is right at the tip of the nose
- b. The rope goes through the person's legs (Person who is
- restraining)
- Reminder DON'T PUT TOO MUCH WEIGHT on animal
- c. We are also going to take a girth measurement (how wide the seal
- is).

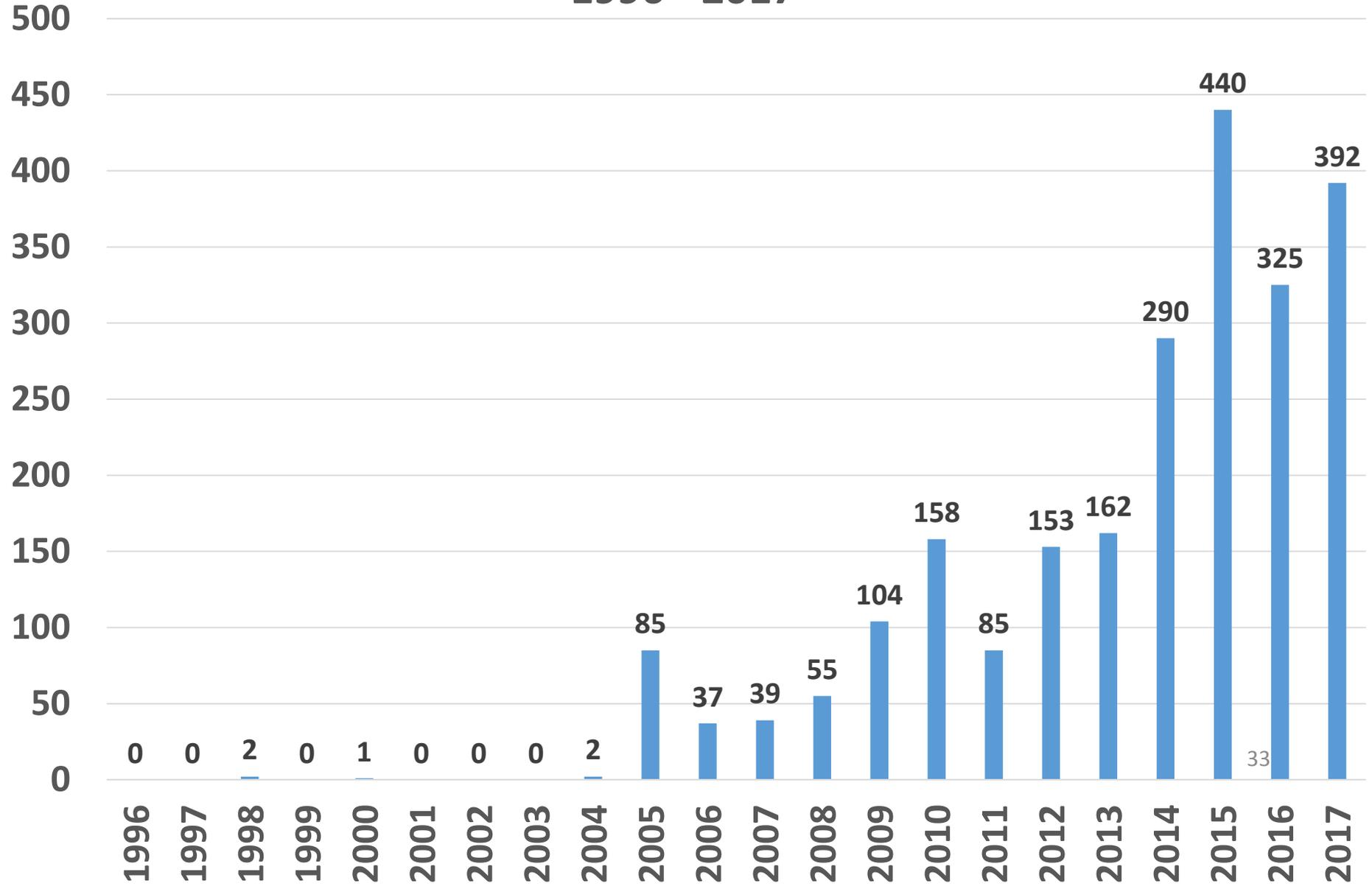
Weaner Weighing: Step 3 Tagging

- IMPORTANT to be safe: watch everything around you always
- ONE PERSON will always be recording the data
- Once we have taken the measurements:
 - 1. Our next step is flipper tagging
 - 2. Most important thing is to let the person who is restraining the animal know that you are going to be tagging YELL IT OUT
 - 3. When you tag make sure that you write down the correct position of the new tag that you put out.
- VERY IMPORTANT STEP

Weaner weighing: step 4 TRIPOD

- Once all the measurements have been taken and the flipper tag is in then we need one person to hold the animal and the other three need to get the tripod.
- ONE person on each of the legs of the tripod
- Then we need to make sure that the scale is zeroed out BEFORE we lift the tripod up around the seal.
- Once the tripod is up around the seal, dig the bottom of the tripod into the sand and then we are going to crank the scale up and lift the weaner off of the ground gently and someone will read off the value on the scale.

Live Pup and Weaner Counts at Arroyo del Corral 1996 - 2017



2017 breeding and molting season population at Arroyo Del Corral

Subadult males	44
Adult males	34
Females	425
Pups/weaners	425
Total	928

Subadult males	252
Adult males	47
Juveniles	700
Females	440
Total	1439