

Project: Tracking of Guanay cormorants at Punta San Juan, Peru



Report for Pacific Seabird Group's Craig S. Harrison Conservation Fund

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BACKGROUND

Punta San Juan (PSJ) is one of 33 sites of the recently created Marine Protected Area system on the Peruvian coast. PSJ, a 54 hectares peninsula and former guano-bird reserve, is home to tens of thousands of Guanay Cormorants (*Phalacrocorax bougainvilli*) and other breeding seabirds and marine mammals. PSJ is located near a small artisanal fishermen village in Marcona, Ica, and flanked by very productive upwelling waters of the Humboldt Current. It is the only MPA that counts with a biological research station administered by the Punta San Juan Program as part of the Center for Environmental Sustainability (CSA) of Cayetano Heredia University (UPCH). A team of researchers, students and volunteers are committed year around to monitor wildlife populations, conduct new research, build local community awareness and provide technical information to government parties for conservation and sustainable use of marine resources.

Guanay cormorants are the most abundant seabirds on the Peruvian coast. They feed mainly on forage fish such as the Peruvian anchovy (*Engraulis ringens*), the most abundant fish commercially harvested for fishmeal production. Guanay cormorants are three-dimensional foragers and they can travel up to 80 km and dive up to 70 m depth during reproduction at PSJ. They are also relatively easy to capture and recapture for instrumentation making them a suitable species for monitoring changes in ocean conditions and prey availability.

In 2016 and 2017, a team led by Dr. Rosana Paredes collected foraging and diving data from seabirds as part of a multi-species tracking study to provide scientific basis for marine protection of the foraging grounds of Peruvian seabirds. Monthly differences in trip distances of Guanay cormorants were observed between January and February 2017 suggesting differences in prey distribution.

Our goal was to replicate this study in 2018 to determine the inter-annual variation in Guanay cormorant foraging behavior and assess its use as a bioindicator of ocean conditions. Unfortunately the colony abandoned their nests during the 2018 season for bad food/weather conditions and we had to postpone this project until the 2019 season.

This study adds a temporal component to previous seabird-tracking studies at PSJ and other protected areas. Altogether, it will serve to provide critical information to government authorities in charge of MPA management plans including the boundary reassessment and/or strategies to enforce foraging grounds.

This report refers to the activities supported by the Pacific Seabird Group's Craig S. Harrison Conservation Fund for the project "Tracking of Guanay cormorants at Punta San Juan, Peru", part of the efforts of the Punta San Juan Program.

The proposal was submitted and accepted to be funded with US\$1880 in February 2018, the field activities and sample analysis were developed between 2019 and 2020.

1. PROPOSED OBJECTIVES

- Determine the foraging ranges, diving behavior and identify critical feeding areas of Guanay cormorants during the chick-rearing period at Punta San Juan.
- Compare results with data collected in 2017 to determine annual differences.



Figure 1. Aerial view from the Guanay colony (yellow arrow) during the moment of capturing cormorants using a portable blind (orange circle) that allows access to the colony without disturbing breeding birds.

2. PROPOSED ACTIVITIES AND ACTIONS

- Deploy GPS data loggers with pressure sensor on breeding adults of Guanay cormorant at Punta San Juan de Marcona, Ica, Peru.
- Compare the foraging ranges, diving behavior and feeding areas between 2017 and 2019 and between sexes.
- Collect spontaneous regurgitations from Guanay cormorants to determine diets and relate prey to foraging areas.

3. ACTUAL ACTIVITIES AND ACTIONS

- ***Capture and deployment of GPS in 2019 season***

We deployed GPS on 40 Guanay cormorants in January 2019. Fieldwork was done in the early hours of the morning before the guanay adults leave on their first feeding trip and a portable blind was used to be able to get close enough to the avian population (Figure 1A). We selected pairs or nests with small chicks that had a “safe location” being these 3 or 4 rows from the border of the colony to prevent predation or exposure. Prior to capture, we looked for “good parents” that were not scared by the approaching noose pole. We chose the adults that did not move from the nest and did not show skittish behavior.

The adult selected from the pair was captured with a nylon sliding noose and inserted into the portable blind (Figure 2A). Each adult was equipped inside the blind and released in less than 10 minutes (Figure 2B). For the recapture each one was marked with a cattle marker on the chest and with white corrector pen on the head and sides of the neck to facilitate its recognition (Figure 2C).



Figure 2. A) Capture of selected adults, B) Instrumentation with GPS, C) Released adults with temporal marks.

- **Comparison of the foraging ranges, diving behavior and feeding areas between 2017 and 2019**

Table 1. Number of birds captured and tracked at Punta San Juan in 2017 and 2019

Guanay Cormorant	2017	2019
GPS deployed	57	40
GPS recovered	51	40
GPS with Data	42	35

Foraging ranges

The maximum straight distance from the colony was 49.6 km in 2017 and 84 km in 2019. The average of the number of foraging trips from the colony for each adult was 2.2 trips in 2017 and 1.8 trips in 2019.

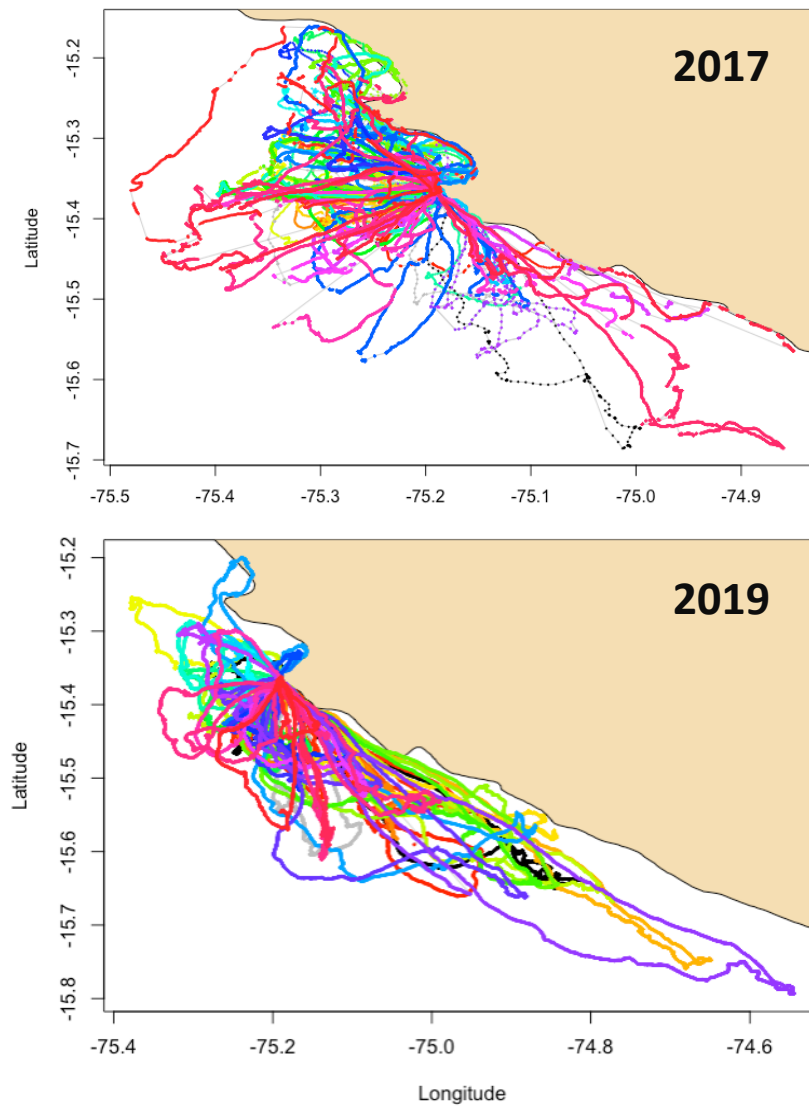


Figure 3. Tracks coloured by adult ID in 2017 and 2019.

Diving behavior

The maximum dive depth was 63.6 m in 2017 and 68.9 67.3 m in 2019.

The mean maximum dive depth did not differ between years: 10.3 ± 9.4 m in 2017 and 11.5 ± 10.9 m in 2019. Dives were very similar in both years and all dives took place during the daytime.

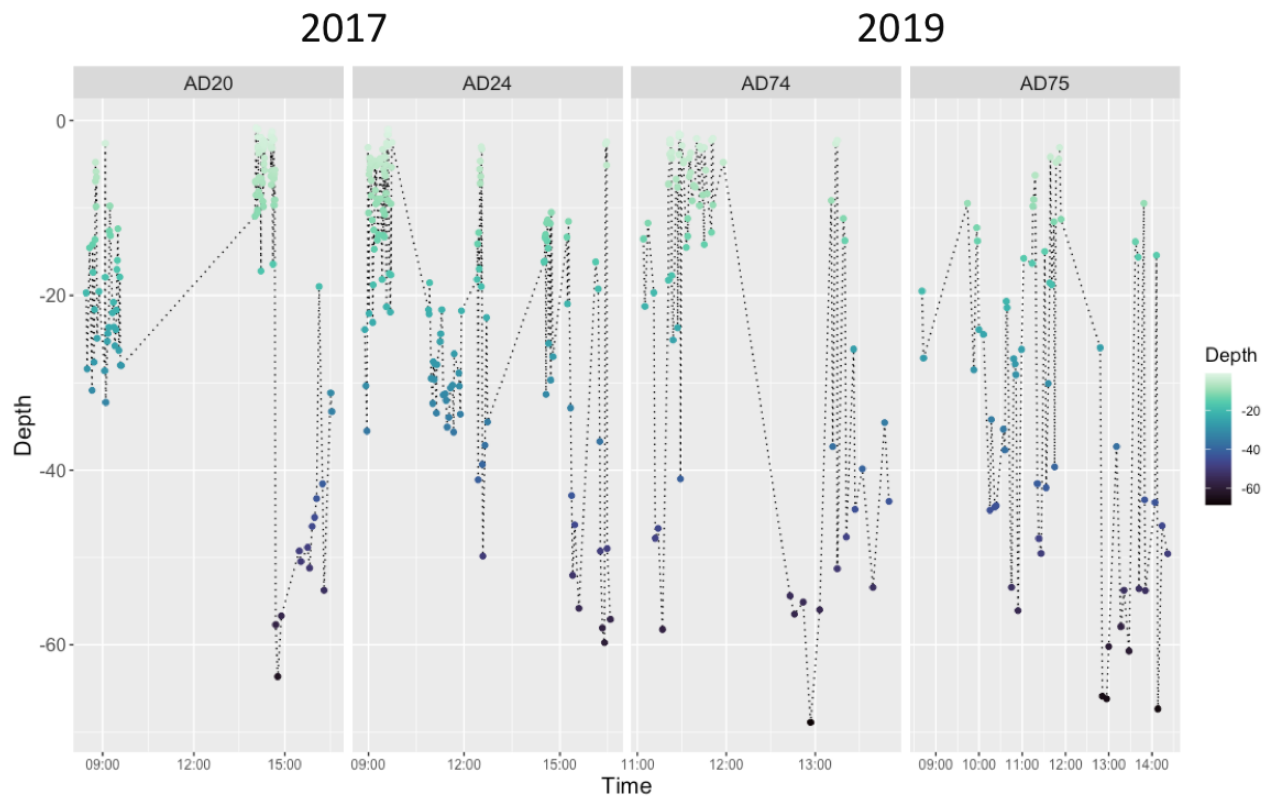


Figure 4. Dives of the adults with the records of maximum dive depth in 2017 and 2019.

Feeding areas

We analyzed the Home Range Area with the Minimum convex polygon area between years. The complete home range was similar between both years with 1854 km² in 2017 and 1830 km² in 2019.

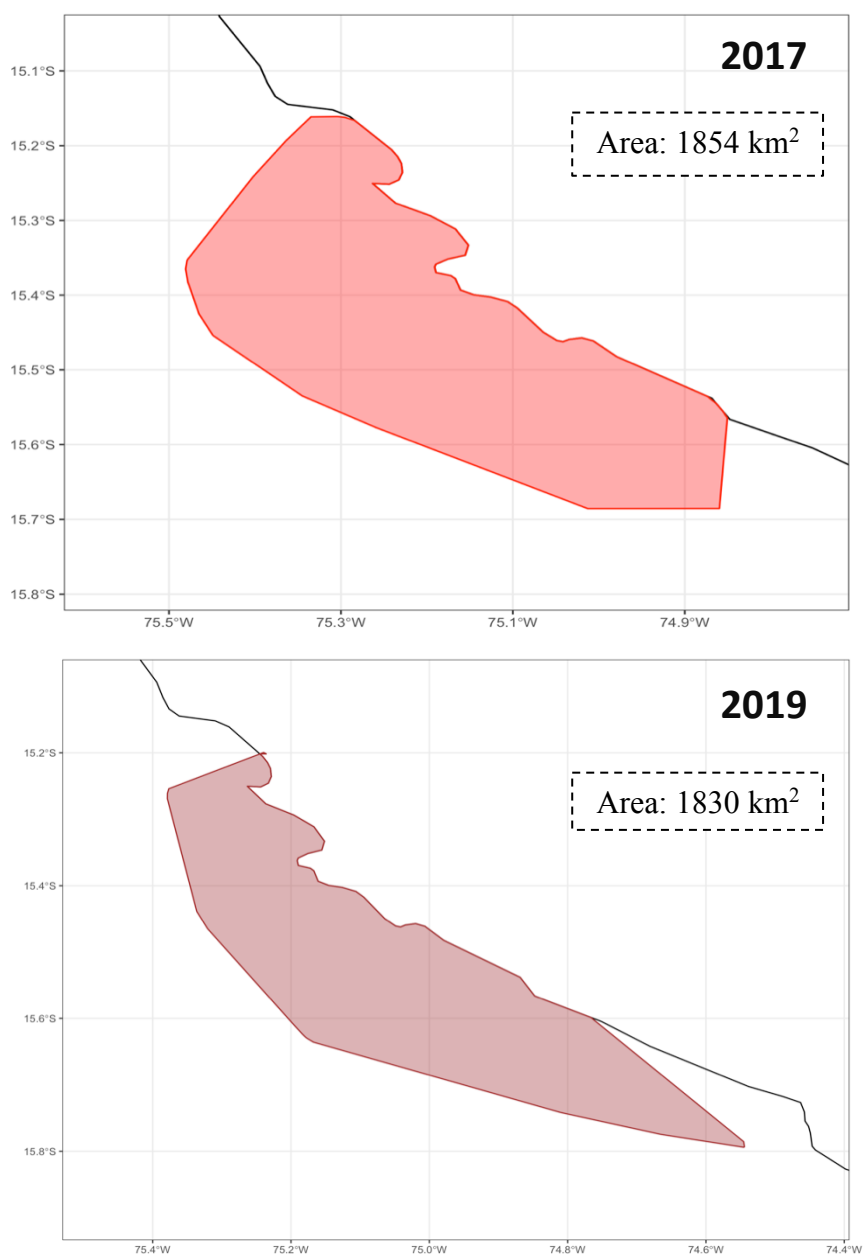


Figure 5. Home range - Minimum Convex Polygon Area in 2017 and 2019.

- **Compare the foraging ranges and diving behavior between sexes**

Feather sample collection for sexing the study adults

Between 3-4 feathers were collected to determine their sex by the Peruvian Biolinks laboratory (<https://biolinksperu.com/sexado-de-aves/>).

Tabla 2. Females and Males in 2017 and 2019

Guanay Cormorant	2017	2019
<i>Females</i>	20	15
<i>Males</i>	22	20

Dive depth and distance according to sex for both years

The maximum dive depth was 68.9m on females and 67.3m on males respectively. The maximum straight distance from the colony was 84 km for females and 71.9 km for males. On average there were no differences between the sexes (females: 26.8 ± 15.2 km; males: 22.9 ± 14.1 km).

- **Collection of spontaneous regurgitations from Guanay cormorants to relate prey to foraging areas**

Guanay cormorants fed mainly on Peruvian anchovy (*Engraulis ringens*) in 2017 (96.7%) and in 2019 (100%). In addition to anchovy, adults in 2017 also fed in other four fish species: Chilean silverside (*Odonthestes regia*), Cabinza grunt (*Isacia conceptionis*), Mote sculpin (*Normanichthys crockery*) and Coquito sergeant (*Nexilosus latifrons*).

Tabla 3. Prey items on the diet of Guanay cormorant in 2017 and 2019

Year	Total Samples	# Species	% Peruvian anchovy	% Chilean silverside	% Cabinza grunt	% Mote sculpin	% Coquito sergeant
2017	30	6	96.7%	3.3%	3.3%	3.3%	3.3%
2019	6	1	100%	0%	0%	5.5%	0%

4. SUBJECTIVE / OBJECTIVE EVALUATION OF THE EFFECTIVENESS OF YOUR ACTIONS IN CONSERVING SEABIRDS

- 1) Our project is limited by the variation of the Guanay cormorant breeding colony. Their numbers vary from year to year, depending on the availability of food in relation to the El Niño Southern Oscillation (ENSO). El Niño periodically causes reproductive losses and mass dispersal. This event postponed our project till 2019.
- 2) In 2019 we could collect the data again and continue with the tracking of the Guanay cormorant. We had a very successful season. We recaptured all the GPS that we deployed. We found the maximum distances were further in 2019 than 2017. Despite the large number of breeding Guanay cormorant in 2019; our results suggest home ranges may be limited by energetic constraints (chick rearing) and annual variation in environmental conditions
- 3) Based on previous success with fieldwork; we continue the data collection in 2020 and 2021. This was possible thanks to the collaboration with the Unidad de Investigación de Ecosistemas Marinos – Grupo Aves Marinas (UCSUR) led by Dr. Carlos Zavalaga. They provided us with the majority of the GPS used in these last 3 seasons.

5. COMPARED PROPOSED AND ACTUAL EXPENDITURES

Proposed Expenses	US\$
Salary Lyanne Ampuero	800
Bus transportation to Punta San Juan 2 persons (L. Ampuero and assistant)	140
Local transportation (L. Ampuero)	40
Food costs (\$15/per day – L. Ampuero and assistant)	420
Sex determination analysis (\$ 10 per sample)	300
Loctite glue for GPS deployment	80
Shrink tubing and cable ties	50
Tesa tape	50
Total	\$1,880

Actual Expenses	US\$
International banks operations	89
Salary Lyanne Ampuero	800
Bus transportation to Punta San Juan 2 persons (L. Ampuero and assistant)	140
Local transportation (L. Ampuero)	40
Food costs (\$15/per day – L. Ampuero and assistant)	420
Sex determination analysis (\$ 6.3 per sample)	250
Loctite glue for GPS deployment	80
Shrink tubing and cable ties	50
Tesa tape	50
Total	\$1,919

*The total amount received was \$ 1791 because of the international operations in the banks.

6. SUGGESTIONS FOR FURTHER WORK OR IMPROVEMENTS TO THE COMPLETED PROJECT DESIGN

- 1) Some of the GPS malfunctions were caused by their system or battery problems. We plan to look for more funding to buy more instruments and balance the number of GPS between us and our collaborators.
- 2) We are still in the process of analyzing the data of the last two years. We think that sexual segregation may increase in years with lower abundance / accessibility to anchovy. This should be further explored with more study years.
- 3) To continue tracking other breeding seabirds at Punta San Juan to increase the sample size of species that were instrumented in the past and also include other species that haven't been instrumented. This can provide a complete perspective of multi-species usage of marine habitats in the Humboldt Current ecosystem.

ATTACHED ITEM

1. Video of the project "Monitoring of Seabirds to help the operation of Marine Protected Areas in Peru" carried out in Punta San Juan by researchers Rosana Paredes, Lyanne Pierina Ampuero Merino, Susana Cárdenas Alayza and Antje Chiu. This video shows part of the field work and results of the data collection in Guanay Cormorant.

World of Seabirds: Punta San Juan, Peru.

<https://www.youtube.com/watch?v=BhhbzRMw8u0>