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2015 Final Report on the Western Snowy Plovers

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Data Availability

The data associated with this publication are available upon request.

2015 Final Report on the Western Snowy Plovers

Coal Oil Point Reserve
University of California
Santa Barbara, CA

Prepared by:
Cristina Sandoval and Jessica Nielsen

Prepared on December 28, 2015
Updated on October 6, 2017



Site: Sand's Beach, Coal Oil Point Reserve (COPR)

Location: RU5, Santa Barbara, CA

Lat-Long: 34 25 00 N, 119 52 30 W

USGS maps: Goleta 7.5, Dos Pueblos Canyon 7.5, Goleta 15

Jurisdiction: Owned and managed by the University of California Santa Barbara.

Climate: Avg precip 14-21 in/year, avg min temp 42 F, avg max temp 75 F

Total linear beach length: 1,200 m

Protected linear beach length: 300-400 m during Winter and fall and 800 m during the breeding season

Protected area during breeding season: 30,700 sq meters or 7.6 acres

Docent program? Yes, all year, most daylight hours

Interpretive and regulatory signs? Yes, at beach entrances and fences

Management Plan? Yes

Enforcement? Docents request compliance with leash law and restricted areas. Officers are called when problem is not solved.

Monitoring: Yes, weekly in the winter and fall and daily in the spring and summer.

Predator management: Crow deterrence, fencing to prevent skunk, predator control.

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ABSTRACT

In 2015, we continued with the monitoring of the WSP population at Coal Oil Point Reserve as in previous years. This year's chick fledge count was higher than average. Nest predation by skunks was a problem until predator control was initiated in early May. The rate of infertile eggs was higher than average. Nesting activity on the mudflats was the lowest it has been since 2007.

INTRODUCTION

Sands beach at Coal Oil Point Reserve (COPR) has a wintering population of about 250 individuals and a breeding population of about 20 pairs of the Western Snowy Plover. The beach is open to the public all year, but a portion of the dry sandy beach, where plovers concentrate while resting, has been protected since Spring 2001.

METHODS AND RESULTS

In 2015, we continued with the same management practices established in the 2004 Snowy Plover Management Plan (Sandoval, 2004). Figure 1 shows the location of the plover habitat and the maximum extent of the symbolic fences. The exact location of the fences varies based on tides and season, and whether the slough mouth is open. When the slough mouth is open, a portion of the fencing is removed to prevent it from being washed away.

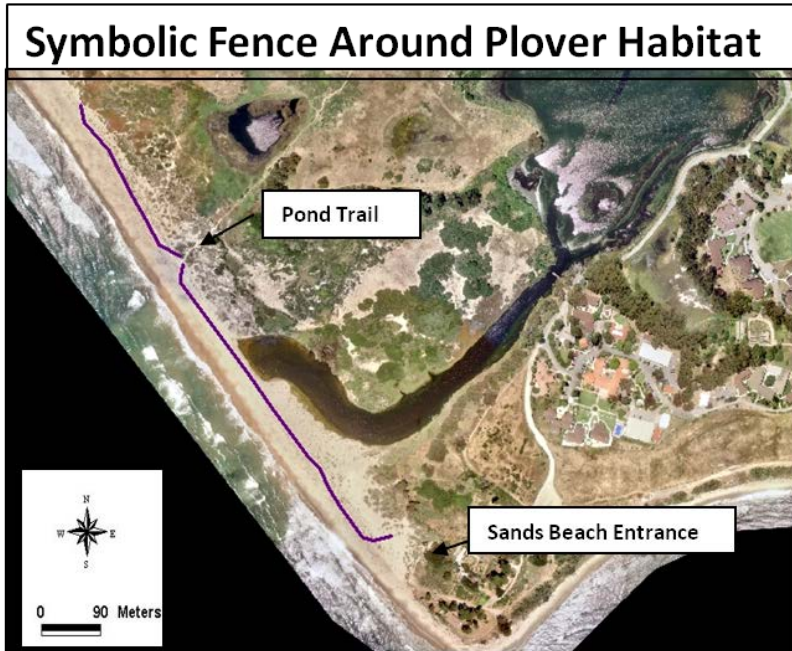


Figure 1. Location of the habitat protected for the Western Snowy Plovers (year round) on Sands beach at Coal Oil Point Reserve. The mudflats not shown in this photo area also protected. The fence is shown in purple.

Wintering Population

To count individuals of the WSP, we walked along the wet sand from the eastern boundary of Sands beach to the western boundary of the Reserve and observed all individuals with binoculars. On the way back, we stopped at groups of individuals to look for color bands on the legs. During the 2015 winter window survey, we counted 130 WSP. The number of wintering plovers at the reserve has been lower than average for the last 6 years (Figure 2). We do not know what accounts for this trend.

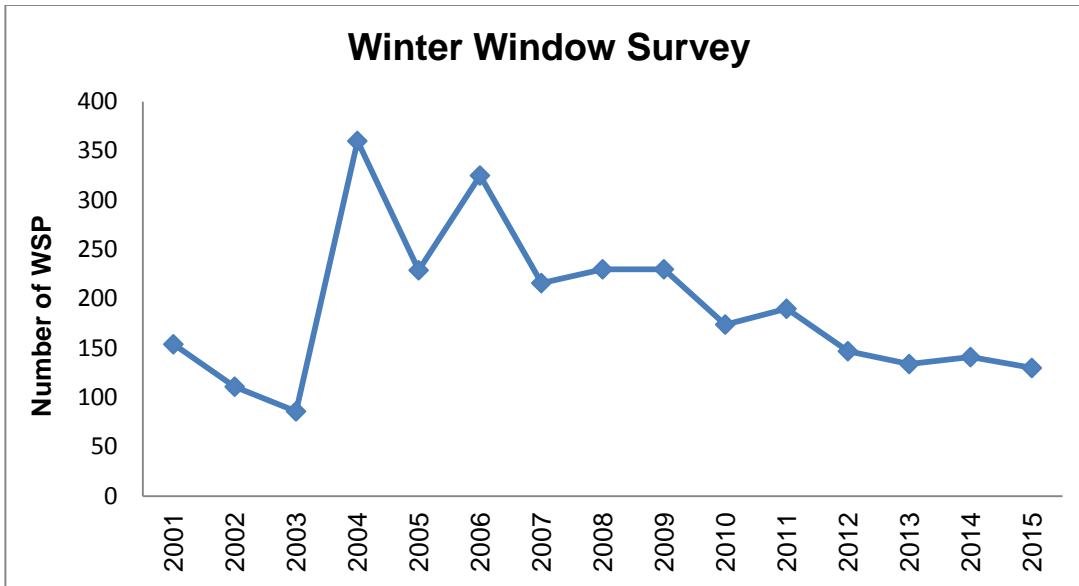


Figure 2. Winter window surveys of Snowy Plovers at Coal Oil Point Reserve

Breeding Population

We surveyed the breeding population in the same way as the wintering population. We counted 34 WSP during the 2015 breeding window survey. The graph also shows that the number of adults increased right after the implementation of the management plan in 2001 and has reached a mean of about 32 adults since 2003 (Figure 3).

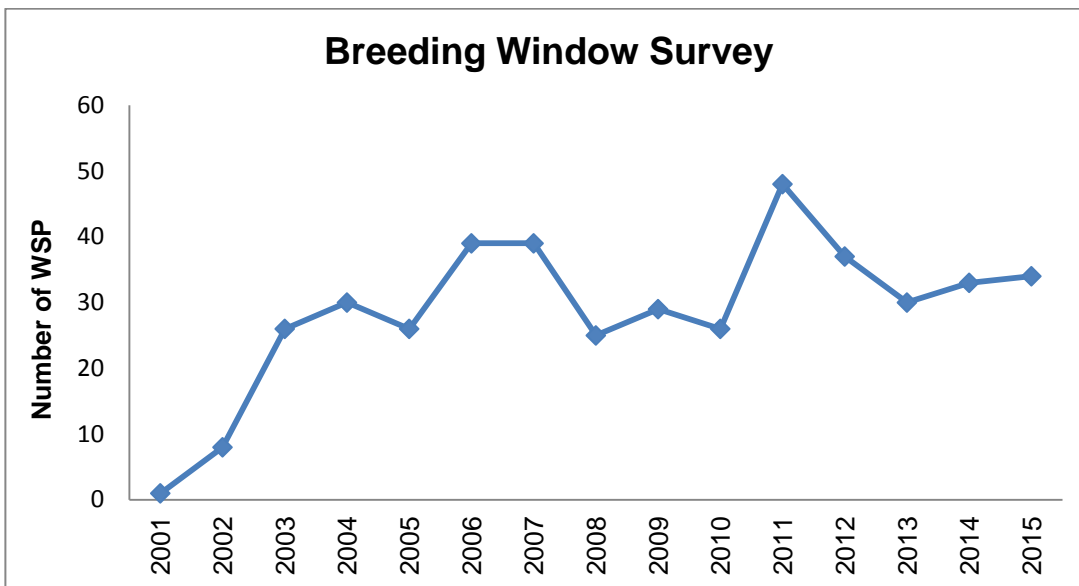


Figure 3. Winter window surveys of Snowy Plovers at Coal Oil Point Reserve

Nesting

During the nesting season in 2015, the numbers and locations of adult plovers, nests, and chicks were counted 6 times per week by Cristina Sandoval, Jessica Nielsen, and Pat Walker. Table 1, below, summarizes the results of observations each year. The number of males for the estimation of fledged chicks/male is calculated based on half of the adult number counted in the breeding window survey. Because males can move around within a season, the number of males may be underestimated.

Detailed discussion of nest and chick fate follow below.

Year	Breeding Population	# Nests	# Nests Hatched	Hatching Rate (nests hatched/#nests*100)	# Chicks Fledged	# Fledges Per Male	Fledging Rate (nests that fledged /nests that hatched *100)
1970-2000	few	~2-4/30yr	none	0	none	none	none
2001	1	1	1	100%	1	1	100%
2002	8	9	6	67%	14	2.8	83%
2003	26	24	16	67%	40	3.3	94%
2004	30	51	20	39%	27	1.9	67%
2005	26	64	16	25%	30	2.3	81%
2006	39	43	24	56%	48	2.5	96%
2007	39	66	20	30%	17	0.9	50%
2008	25	57	22	38%	39	2.8	100%
2009	29	64	39	60%	61	4.2	74%
2010	26	74	42	57%	19	1.5	26%
2011	48	84	35	42%	9	0.4	14%
2012	37	73	34	47%	22	1.2	44%
2013	30	65	36	55%	30	2.0	41%
2014	33	77	21	27%	26	1.6	67%
2015	34	62	34	55%	45	2.7	78%

Table 1. Changes in breeding measurements at Coal Oil Point Reserve since 2001.

Nest Fate

In 2015, 62 WSP nests were laid at COPR and 34 of the nests hatched. Figure 5 shows the number of nests laid and the number of nests hatched between 2001-2015. This year, COPR had an above-average hatching rate of 55% (Figure 6).

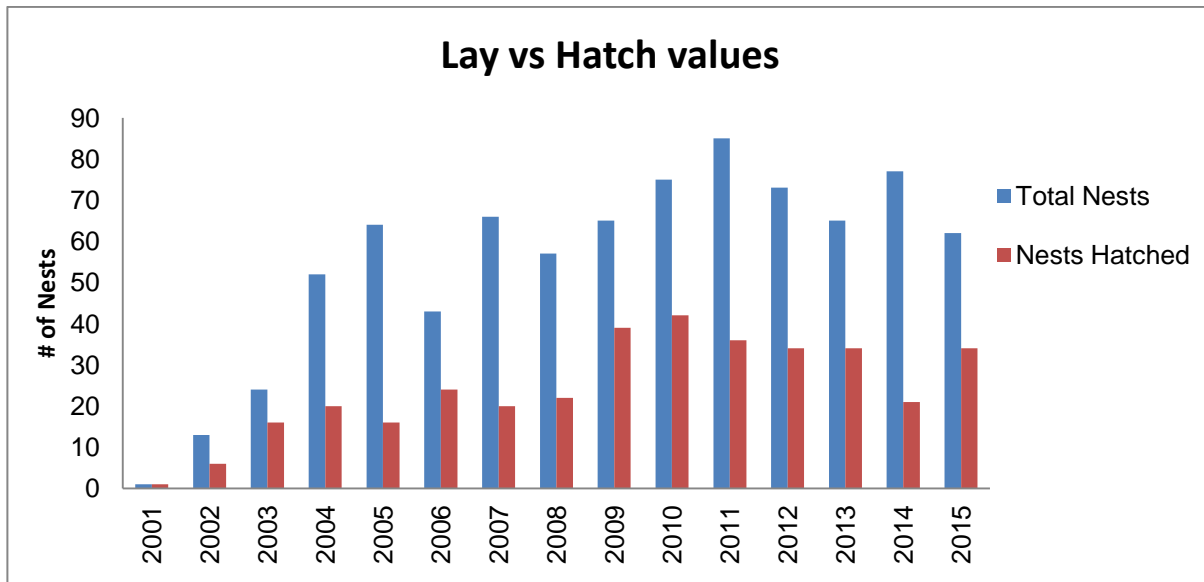


Figure 5. Lay vs hatch values by year (total number of nests that had at least one egg vs. total number of nests that hatched at least one chick).

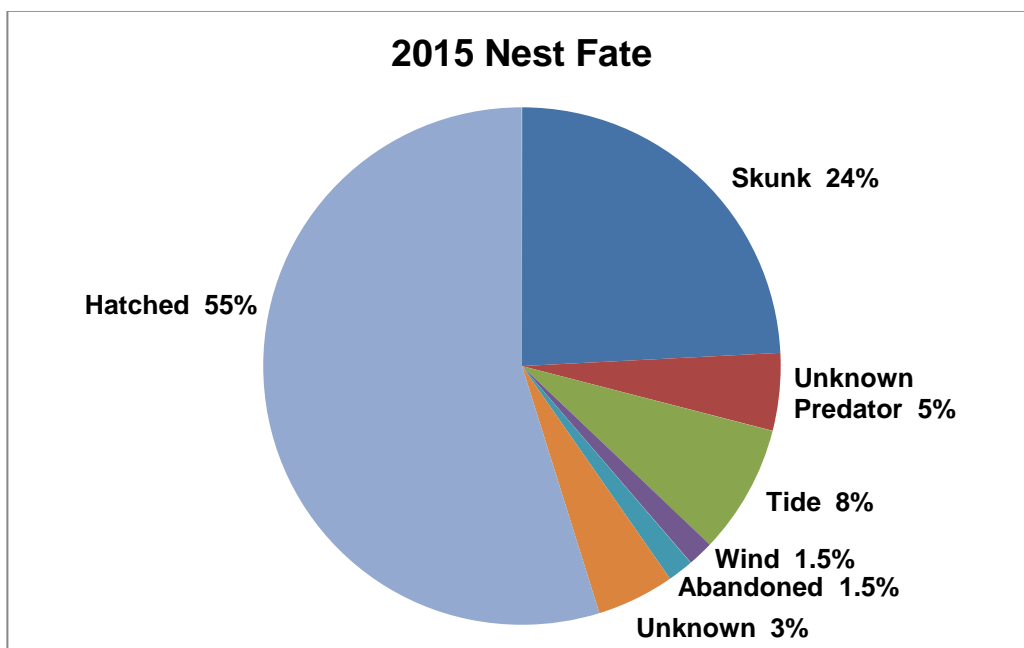


Figure 6. Nest fate at COPR in 2015.

Table 2, below, shows a complete representation of nest fate over the years.

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total nests	9	24	51	64	43	66	57	64	74	84	73	65	77	62
Hatched	6	17	20	16	25	30	22	39	42	35	34	34	21	34
Skunk	0	0	10	18	2	19	18	10	0	0	0	4	10	15
Crow	2	4	8	3	0	0	0	1	1	0	0	0	0	0
Wind	1	3	2	6	1	1	2	5	2	10	2	0	0	1
Tide	0	0	5	5	2	0	7	1	5	12	16	6	3	5
Abandoned	0	0	0	9	3	0	0	1	3	5	3	4	9	1
Abandoned Owl	0	0	0	0	6	0	0	0	0	0	0	0	0	0
Flooded	0	0	0	3	0	0	0	0	4	3	0	0	0	0
Raccoon	0	0	2	1	0	0	0	1	0	0	2	2	4	0
Whimbrel	0	0	1	0	0	0	0	0	0	1	0	0	0	0
Gull	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Opossum	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Unknown cause	0	0	0	1	3	11	0	0	15	8	11	0	21	3
Unk pred	0	0	0	1	1	1	0	4	0	10	5	15	9	3
Unk fate	0	0	0	0	0	4	4	2	0	0	0	0	0	0

Table 2. Number of nests lost by fate from 2002-2015.

Predation

Note that there was an increase in nest survival (nests hatched) between 2008 and 2009 (Figure 5), which coincides with the initiation of our predator control program (USDA appendix). Historically, crows and skunks have been the most significant nest predators at COPR. However, since the implementation of crow harassment in 2005 and 2006, crow predation on nests has only been observed twice at COPR. In 2009, levels of skunk predation on nests dropped significantly after the initiation of a USDA predator control program (Figure 6).

In 2015, there were 15 documented nest failures due to skunk predation; the highest number since the initiation of predator control program (Figure 7). Within one week in late April, we lost 9 nests to predation by skunks. In late May, another 5 nests were lost over a single night. Immediate implementation of skunk trapping and repairs to the skunk fence resolved this issue. For the remainder of the breeding season, we lost one more nest to a skunk. Thus, it is crucial to begin predator control early on in the season and to maintain the skunk fence.

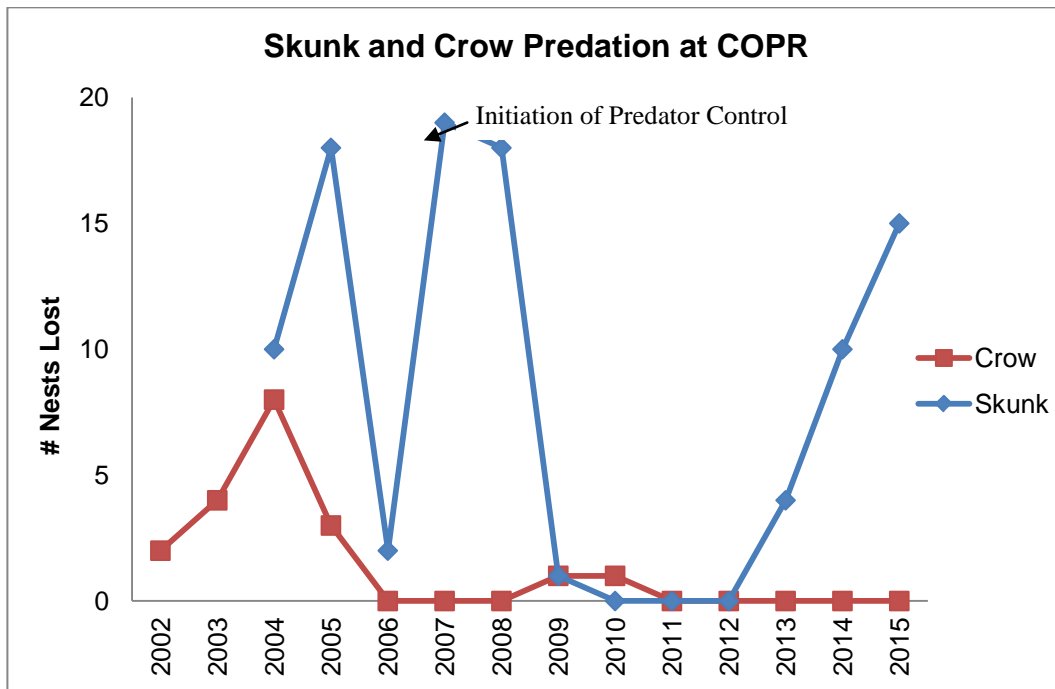


Figure 7. Crow and skunk predation by year

Infertility

Of the eggs that didn't hatch, 1 was a dead embryo and 6 were infertile. The rate of infertile eggs fluctuates from year to year. At 3.2%, the egg infertility rate in 2015 was higher than average (Figure 8). During the oil spill clean up response, one infertile egg was sent to Fish and Wildlife Service for toxicity testing. The results are still pending.

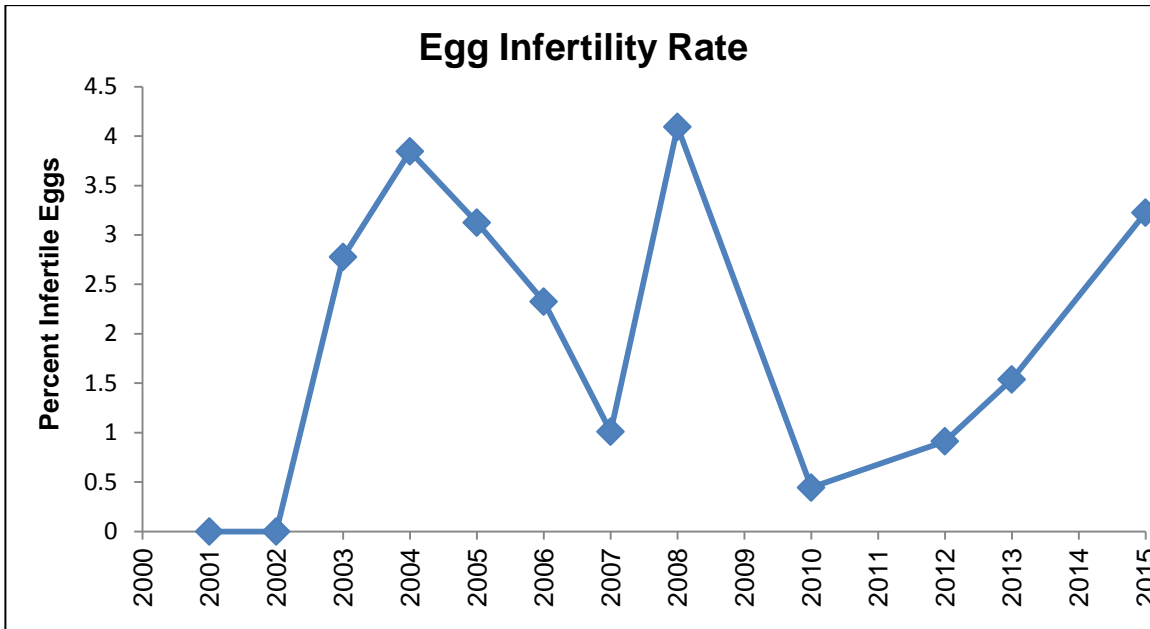


Figure 8. Percentage of infertile eggs by year (# infertile eggs/# total eggs *100)

Chick Survival

The average number of WSP chicks fledged each year at COPR since 2001 is 30 and have varied between one individual in 2001 (beginning of the WSP management program) and 61 in 2009 (Figure 9). In 2015, 45 WSP chicks fledged at COPR. The fledging rate (nests that fledged at least one chick/total nests that hatched at least one chick) was 78%, the highest that it has been since 2009 (Figure 9). This year, COPR had 2.7 chicks fledged per male (Table 1).

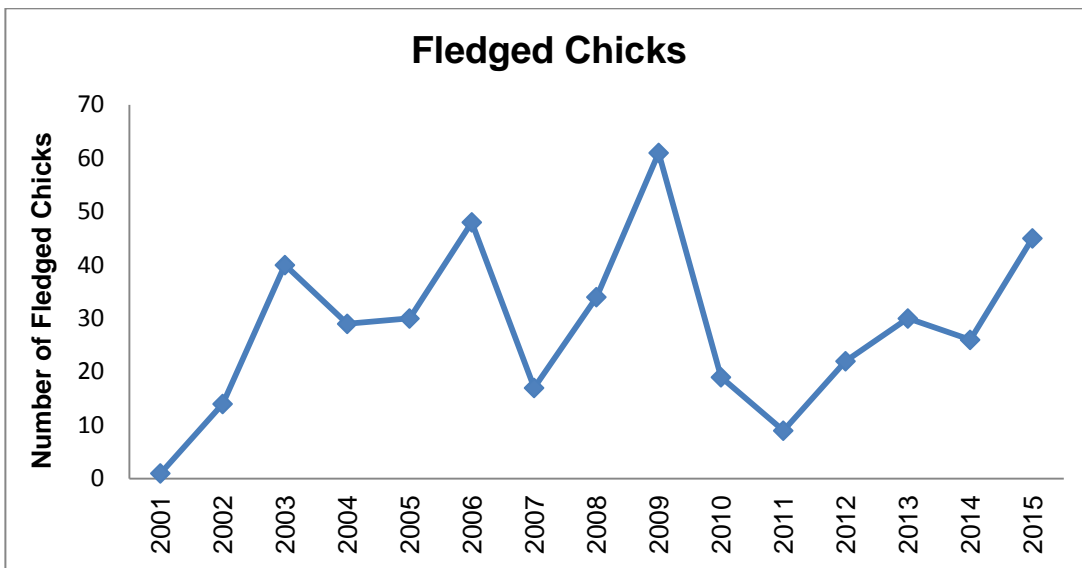


Figure 8. Number of chicks fledged by year

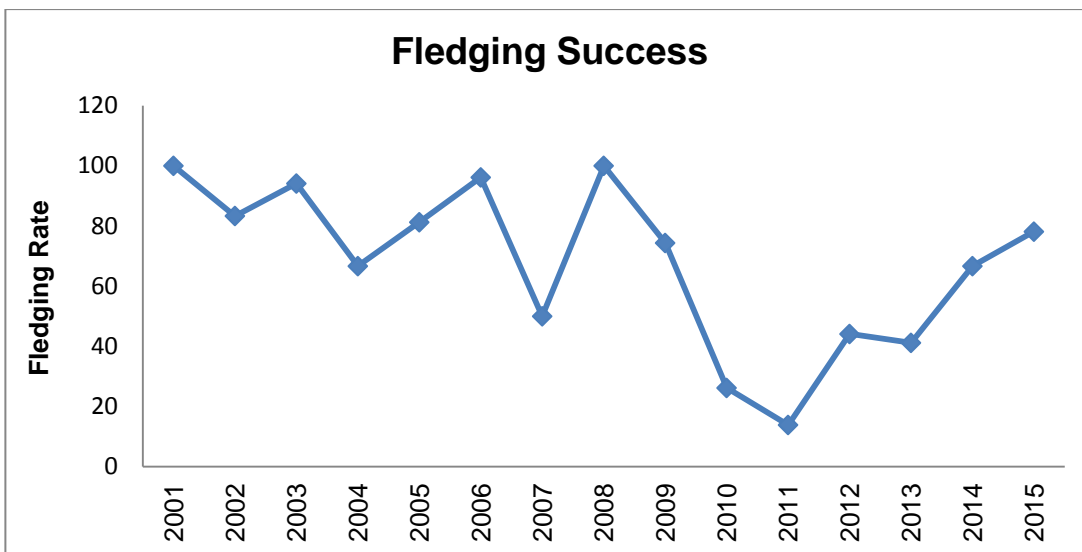


Figure 9. Fledging rate by year (# nests that fledge one chick/# total nests *100)

Timing of Nests

In 2015, the first nest was initiated on March 21st and the last chick fledged on August 19th for a total breeding season length of 151 days (Table 3). The length of this year's breeding season was only 3 days less than the average over the last ten years. The dates of all nesting events in 2015 fell within the range of previous years' dates (Figure 10).

2015 Nesting Event	Date
First Nest Initiation	3/21/15
Last Nest Initiation	7/4/15
First Hatch	4/12/15
Last Hatch	7/22/15
First Fledge	5/10/15
Last Fledge	8/19/15

Table 3. Dates of nesting events in 2015

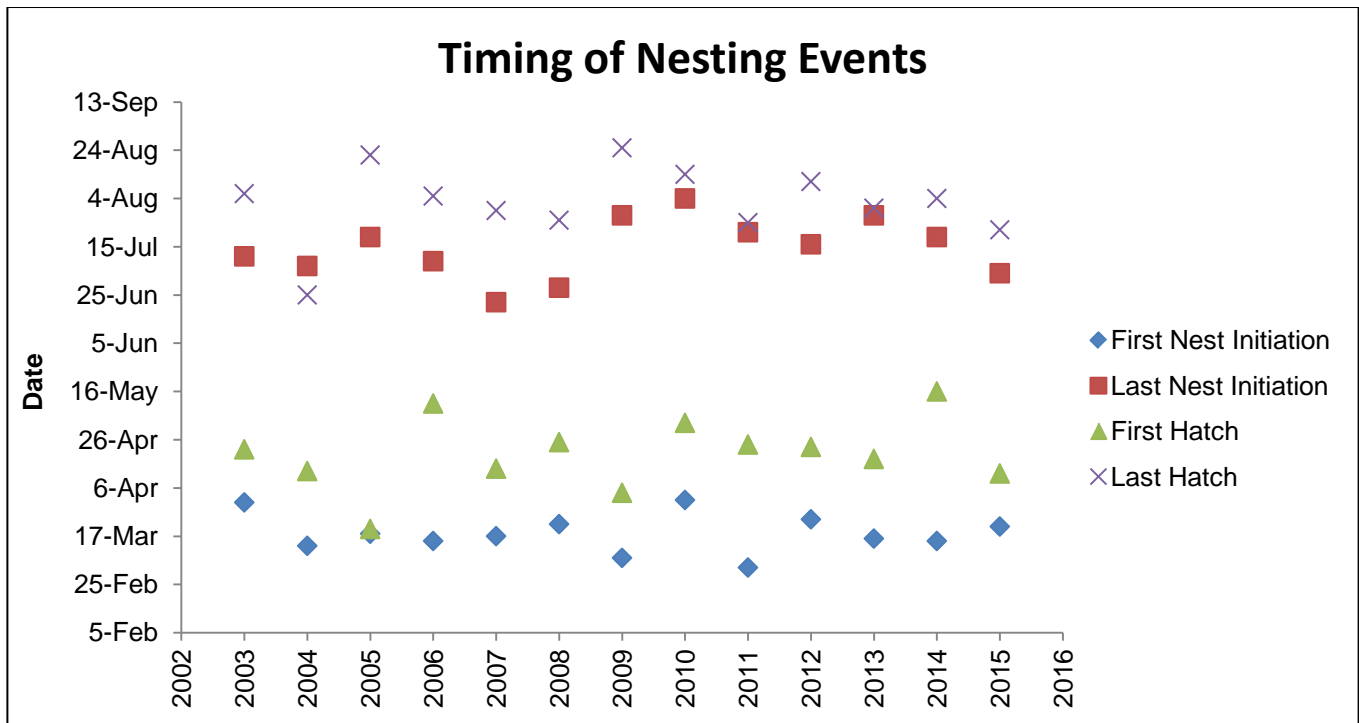


Figure 10. Timing of nest events by year

Location of Nests

GPS coordinates were taken for all of the WSP nests. For monitoring purposes, the nest locations were estimated using the numbered posts along the beach. For the nest on the mudflats (delta), we used a detailed description to identify location for monitoring purposes. We used the mapping data to look for spatial patterns in hatching and fledging success. The majority of the nests on the beach were concentrated on the wide sandy beach at the slough mouth. The map of nest location and fate on the beach and on the mudflats is shown below (Figure 11).



Figure 11. Map of nest fate on beach and mudflats

In 2015, there was much lower nesting activity on the delta than in previous years (Figure 11). Only 1.6% of the nests were on the delta as compared to the 8-year average of 18.6%. This is likely due to the limited amount of dry area on the mudflats this season. The single nest on the delta wasn't initiated until late in the season when the mudflats started to dry. Overall this year, there was more suitable nesting habitat available on the beach compared to the delta and this was reflected in the nest locations (Figure 12).

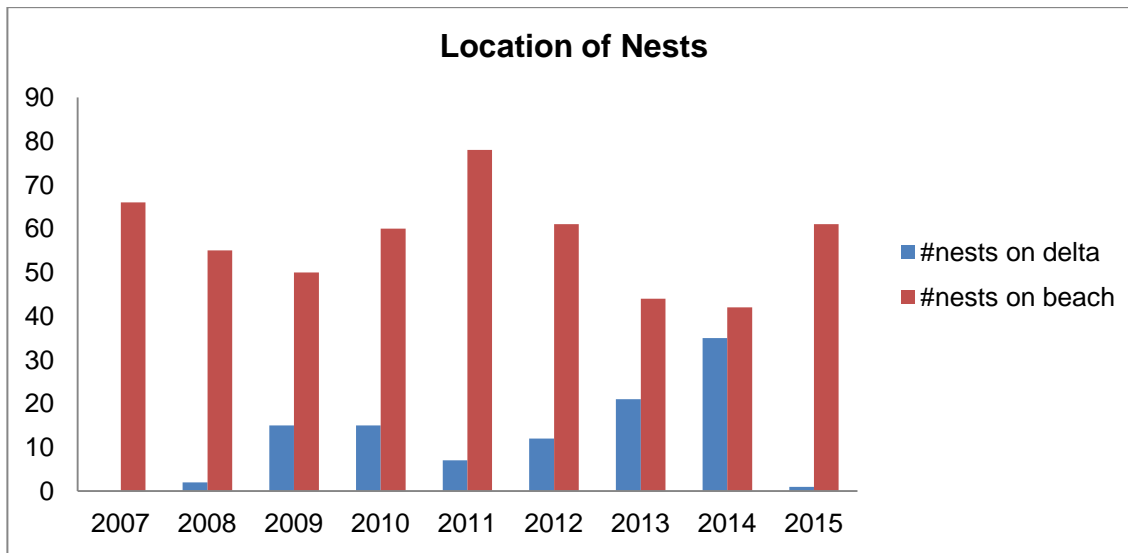


Figure 12 Nesting on the beach and delta between 2007-2014

Rehabilitation

On April 19, 2015, Cristina Sandoval and Jessica Nielsen discovered an egg from an abandoned WSP nest that had been washed out by the high tide. The egg hatched on its expected hatch date the morning of May 15, 2015. For the first 2.5 weeks, the chick was cared for by COPR staff. The chick was kept in an open-top plastic terrarium with a heat lamp. Staff at COPR collected live beach hoppers from the kelp wrack at Sands Beach and fed the chick every 1-2 hours during the day. On June 2, the chick was transferred to the Santa Barbara Wildlife Care Network. Staff at SBWCN fed the chick a diet of beach hoppers, calcium-dusted mealworms, and crickets. Special care was taken to keep the bird from imprinting on humans; curtains were placed around the terrarium at most times. On June 17, plover biologist Doug George, from PRBO, banded the chick as PA:BB.

At 2 months old, the chick had not reached the minimum weight required by USFWS release criteria (32 grams), but was maintaining a stable weight between 28 and 29 grams. Aside from being underweight,

the plover appeared very healthy and flew well around his cage. Concerned that the chick would lose his ability to acclimate with other plovers if in captivity for too long, Jessica Nielsen contacted USFWS to request permission to release the chick. USFWS agreed that it was best to grant an exception to the release criteria in order to increase the chick's chance of survival.

The chick was released on July 14, 2015 at 13:15 outside of any current nest or brood territories (~100 m west of the start of plover fence). Once released, the chick immediately took flight over the dunes towards the start of the plover fence. The chick was seen 2 hours after the release in very close proximity to people laying on the beach. Cristina Sandoval attempted to guide the chick towards the slough mouth where there are less people (~275 m west of the start of plover fence). The chick did not appear to be fearful of humans and allowed Cristina Sandoval to pick him up and physically relocate him to the slough mouth near a group wintering WSP that were not territorial. Once relocated, the chick remained hunkered down near the other plovers between the fence and the slough. Cristina Sandoval and Jessica Nielsen monitored the chick for 45 minutes following his relocation. They did not observe any unusual behavior aside from a preference for standing on the right leg.

Staff at COPR have looked for PA:BB a minimum of three times a week during monitoring surveys, but have not seen him since his release date.

Refugio Oil Spill

On May 19, in the middle of WSP breeding season, there was a large oil spill at Refugio State Beach, approximately 10 miles up the coast from our site at Coal Oil Point Reserve. A few days after the spill, we started to see a significant amount of oil on Sands beach, prompting the initiation of cleanup efforts on May 24. On the first day of cleanup, there were 12 active nests on the beach and 7 chicks.

We did not observe any plovers that were oiled significantly enough that they needed to be rescued, but we were concerned about how the disturbance of oil spill cleanup would affect the breeding population. We advised several modifications to the proposed cleanup response in order to minimize impact on the nesting plovers. The most important was to not deploy booms on the nesting area to prevent the oil from going into the slough. We felt that the booms would disturb the plovers and there was no danger of the oil washing into the slough as the sand barrier was above the maximum high tide. We spread the group of

20 crew members in smaller groups of 5 along 100 m sections of the beach. There was a reserve staff member or volunteer monitoring each group during the clean up. During the first 6 days of cleaning in May, reserve staff and volunteers observed nesting plovers and asked the crew to move to a new section of beach if the females incubating the nest left the nest for more than 5 minutes. We also requested that cleanup crew only remove kelp wrack that was oiled so that remaining un-oiled kelp could be available for shorebirds to feed.

During the last 3 cleanup days in June, Cris Sandoval and Jessica Nielsen did not interfere with the cleanup efforts, and instead studied how the cleanup activities affected the nesting disturbance and behavior budget of Snowy Plovers.

Enforcement

Officers enforce the leash law and other pertinent ordinances at COPR when they are called by the docents-.

Docent program

The docent program continues to be crucial to the success of Western Snowy Plover recovery at Coal Oil Point. This year, docent coverage averaged approximately 42 hours per week which is 7 hours per week more than the weekly average in 2014. The docents have been instrumental in reducing the impact of beach users to the Snowy Plovers. The docents' main duties include educating people about the plovers, requesting compliance to the leash law, requesting people to stay away from the symbolic fence, requesting people to move around the plover flock, scaring away crows, and informing the staff of birds of prey observed around the nesting area.

CONCLUSION

The plover population at COPR appears to have recovered since the implementation of a management plan in 2001. The control of skunks has become a management priority to improve hatching success. Because the density of nests is relatively high compared to other beaches, a nest predator can cause a large impact in a single night. In previous years we concluded that we cannot use hatching success as a predictor of fledging success, thus we will continue to count the number of chicks until fledging age. The wintering population at the reserve is in a downward trend and we do not have an explanation for this pattern. The docent program continues to be an effective way to reduce human impact on the plovers. The impacts of the Refugio Oil Spill on the beach brought to our attention the need to monitor and mitigate potential ecological effects of oil cleanup on WSP.

RECOMMENDATIONS

- The USDA trapping program worked well and should be continued.
- The mudflats should be included as part of the plover nesting habitat and be regularly monitored.
- Predator monitoring should be increased during the breeding season. Docents should watch for predators, both from the beach and potentially from blinds.
- A designated Ranger would be useful in enforcement of the dog leash law at COPR and Ellwood.

ACKNOWLEDGEMENTS

Jessica Nielsen, the docent coordinator, managed the docent program. We are very thankful to Pat Walker who helped count plovers, locate nests and determine their fate and constructed and maintained the fences. Steve Ferry also continued to assist with fence maintenance. Rick Fellows donated over 160 hours towards the Snowy Plover Docent Program this year, in addition to countless additional hours spent maintaining the Reserve. The docents, nearly 70 volunteers over the course of 2015, kept a presence at the beach every day of the year.

California Least Terns

No pairs were observed at COPR in 2015.

Bibliography of other Snowy Plover studies at COPR:

Lafferty, K.D. 2000. **Status, trends and conservation of the western snowy plover with a focus on the Devereux Slough population at Coal Oil Point Reserve, Santa Barbara County, CA**, Museum of Systematics and Ecology, University of California, Santa Barbara, Santa Barbara, CA.

Lafferty, K.D. 2001a. **Birds at a southern California beach: seasonality, habitat use and disturbance by human activity**. Biodiversity and Conservation 10: 1-14.

Lafferty, K.D. 2001b. **Disturbance to wintering western snowy plovers**. Biological Conservation 101: 315-325.

Kevin D. Lafferty, Darcie Goodman and Cristina P. Sandoval 2005. **Restoration of breeding by snowy plovers following protection from disturbance**. Biodiversity and Conservation. Online at: <http://www.kluweronline.com/issn/0960-3115>

APPENDIX 1. Band sightings banding at the reserve

Date	Band Sighting
3/29/2015	silver band on left leg (male)
4/19/2015	AY:RW
4/19/2015	GG:GG
4/22/2015	AT:RU
5/1/2015	silver band on left leg (male)
5/2/2015	GG:GG
5/7/2015	?O:OG
5/9/2015	OO:OG
5/9/2015	GG:GG
5/23/2015	GA:OY
5/23/2015	BB:OA
5/23/2015	GG:GG
5/23/2015	OT:OG
6/3/2015	GG:GG
6/6/2015	GG:GG
6/6/2015	AN:RW
6/13/2015	AN:RW
6/13/2015	GG:GG
7/19/2015	GG:GG
7/17/2015	BO:YO
7/17/2015	AN:AG
7/25/2015	GG:GG
7/25/2015	AN:AG
7/25/2015	YY:Y(R or O)
7/25/2015	WR:AO
7/25/2015	AW:RY
7/29/2015	GG:GG
7/30/2015	OO:AY
8/1/2015	GG:GG
11/17/2015	AY:RW
12/1/2015	GG:GG
12/8/2015	GA:YR
12/8/2015	PV:YG

APPENDIX 2. USDA Report from 2014

Eric Covington
Kevin Estrada
USDA Wildlife Services
San Luis District
PO Box 957
Taft, CA 93268

Cristina Sandoval
Director, Coal Oil Point Reserve
Marine Science Institute
University of California
Santa Barbara, CA 93106

24 December 2015

Report of Predator removal for Coal Oil Point Reserve:

Predator management activities were conducted on the Coal Oil Point Reserve in an effort to protect the threatened Western Snowy Plover against predation by mammalian predators during the 2015 nesting season. Predator removal began on 6 April 2015 and ended 1 May 2015. WS ceased predator removal in May this season due to the oil spill that prevented effective trapping.

Striped skunks and raccoons were the target predators during the 2015 snowy plover nesting season. Trapping was the method used to remove the predators. Traps used to capture mammalian predators were Victor #1½ padded jaw traps and 10" X 12" X 32" Tomahawk cage traps. All target mammals captured in traps were given an injection of sodium pentobarbital as a means of euthanasia. A total of four striped skunks were captured in padded leg-hold traps and euthanized. All euthanasia of wildlife conducted by Wildlife Services is done in accordance with the American Veterinary Medical Association's Guidelines for the Euthanasia of Animals: 2013 Edition. These guidelines can be found at <https://www.avma.org/KB/Policies/Documents/euthanasia.pdf>.

Wildlife Services spent 52 hours on predator removal activities, carcass disposal, and associated administrative duties at Coal Oil Point Reserve during the 2015 season. A total of fifty six padded leg-hold trap nights and fifty six cage trap nights were spent trapping and removing predators. A trap night is where one trap is set for one night. Two traps set for one night would be two trap nights, etc.

Wildlife Services recommends beginning predator removal activities prior to pairing and breeding season in 2016. Each year the cost of conducting predator removal increases. Coal Oil Point Reserve should consider this and secure sufficient funding to conduct the desired amount of predator removal.

Spotlight and scent station surveys should be conducted during the non-nesting season to identify predator species that inhabit the nesting area.

Predator management should be continued each year to help ensure fledging success of the threatened Western Snowy Plover.

Feel free to contact Kevin or myself if you have any questions.

**United States
Department of
Agriculture**

Animal and
Plant Health
Inspection
Service

Wildlife Services

San Luis District

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CDFW SEABIRD NECROPSY REPORT



California Department of Fish and Wildlife
Office of Spill Prevention and Response
Marine Wildlife Veterinary Care and Research
Center
1451 Shaffer Road
Santa Cruz, CA 95060
(831) 469-1719

MWVCRC#: 16-0080

UCD PATH#:

Report Date: 2/11/16

CASEPROFILE

Band#: Not banded

Necropsy Date: 2/9/2016

Postmortem Interval (days): ~130

Condition: Fresh Frozen

Sex: Female

Age Class: Immature

Date Found: 8/1/2015

Estimated Age: 1

Date Collected: 8/1/2015

Location: Coal Oil Point Reserve

Condition Found: Fresh

Live Strand: No

Lat.: 34.409777

Long.: -119.881425

Euthanized: No

County: Santa Barbara

Date Died: 8/1/2015

Weight (g): 39

Reviewing Pathologist: Melissa Miller

Nutritional State:

Necropsy Lead: Jessie Beck

SQ Fat: 2=Moderate

Food in Gut: 2=Moderate

Histo Taken: No

Histopathologist: N/A

Full or Partial: N/A

CASEBACKGROUND

Found by docents at Coal Oil Pt. Reserve. Chest wound looked fresh at the time of collection. Dead plover not seen by docent between 7am and 9am, so death likely occurred between 9 am-10:30. Both legs were broken at time of collection. Bird was collected at the high tide line between SNPL habitat and the ocean.

CASESUMMARY

This immature Snowy Plover was recovered dead at Coal Oil Point Reserve in Santa Barbara with a large chest wound and compound fractures on both legs and the left wing. Bird was found on 8/1/2015.

Gross lesions were compatible with death due to acute, severe trauma of unknown cause, affecting the breast, left wing, and both legs. Skin lacerations were documented on a 35x10mm lateral area across the chest and dorsally on both thighs. Lacerations were mostly subcutaneous with a small area on the sternum that was ~3mm deep. Both liver lobes were ruptured and sections of gastrointestinal organs were herniated, indicating trauma. Lungs exhibited hemorrhage at edges.

No tooth marks were seen, although extent of lacerations made it difficult to discern origin and type of laceration.

The animal died as a consequence of a traumatic event that resulted in of severe, multifocal internal hemorrhage, organ rupture, intestinal herniation, and fractures to legs and the left wing.

COMPLETED TESTS/ PROCEDURES:

- 1.) Gross photographs
- 2.) Radiographs

CASE HIGHLIGHTS:

Severe acute trauma case

RECOMMENDEDNEXTSTEPS

None

FINALDIAGNOSES

- 1.) Severe, acute trauma, characterized by:
 - Severe acute open compound fractures, right tibiotarsus and left humerus, and acute luxation of tarsometatarsal joint (PHOTO and radiograph)
 - Subcutaneous lacerations across chest (35x10mm) and dorsal surface of both thighs (PHOTO)
 - Ruptured liver lobes (both left and right, PHOTO)
 - Herniated portions of gastrointestinal tract
- 2.) Possible bilateral pulmonary hemorrhage

OTHER NOTABLE CASE FINDINGS

None

INCIDENTALFINDINGS

- 1) Ventriculus full of sand, small stones, invertebrate legs, and pieces of white shells
- 2) Small sand compaction above cloaca in gastrointestinal tract

GROSSDIAGNOSES

3.) Severe, acute trauma, characterized by:

- Severe acute open compound fractures, right tibiotarsus and left humerus, and acute luxation of tarsometatarsal joint (PHOTO and radiograph)
- Subcutaneous lacerations across chest (35x10mm) and dorsal surface of both thighs (PHOTO)
- Ruptured liver lobes (both left and right, PHOTO)
- Herniated portions of gastrointestinal tract

4.) Possible bilateral pulmonary hemorrhage

GROSSSUMMARY

See case summary.

No pending tests

HISTOPATHDIAGNOSES

N/A

HISTOPATHSUMMARY

N/A



Fig. 1: Dorsal view of Snowy plover. Note visible fractures on both legs, lacerations on thighs and breast.

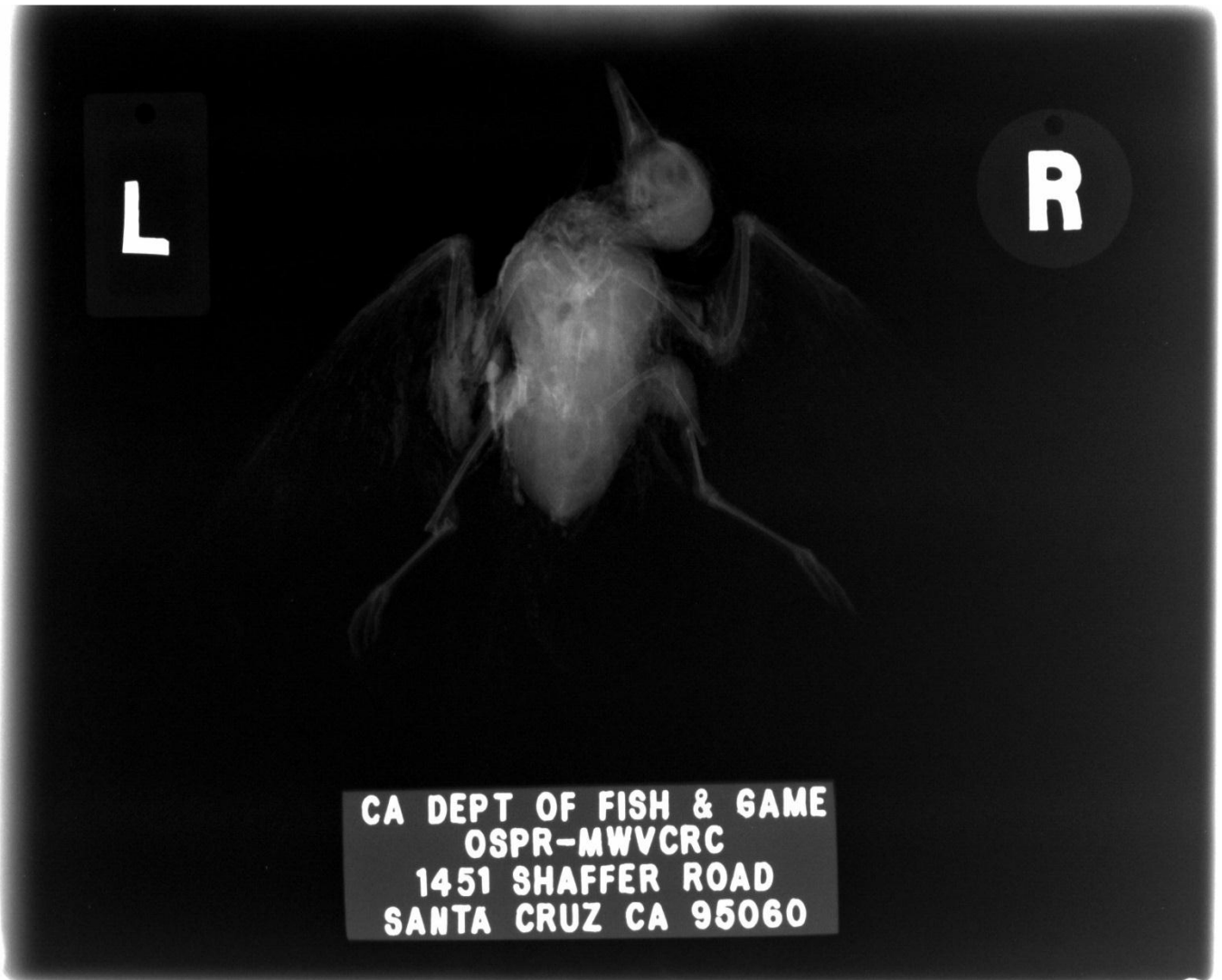


Fig. 2: Radiograph of Snowy Plover 16-0080. A compound fracture can be seen on the right leg and a luxation of less clearly on the left distal leg.

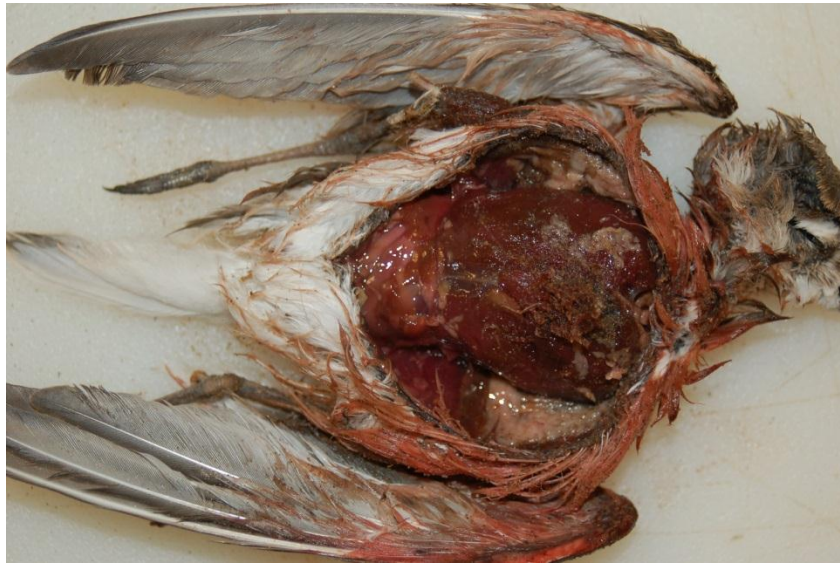


Fig. 3: Pectoral muscle and subcutaneous fat reserves of bird. Sandy section of breast is the location of the laceration, with one segment of the muscle raised.



Fig. 4: Ruptured liver lobes.



Fig. 5: Ventriculus contents consisting of sand, small pebbles, invertebrate legs, and shell pieces.