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Population Size and Reproductive Success of California Gulls at Mono Lake, California in 2007

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January 2008

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PRBO Contribution # 1612

Abstract

An estimated 43,398 adult California Gulls (*Larus californicus*) nested at Mono Lake in 2007. This total was the fifth lowest in 25 years of monitoring, and was below the 1983-2006 average of 48,276 ± 1543. Roughly 76% of the gulls nested on the Negit Islets, 21% on the Paoha Islets, 3% on Old Marina Islet, and only 0.3% on Negit Island. Twain Islet remained the most populous, holding 47% of the lakewide total, followed by Coyote A and Little Tahiti Islets, each with 14%, and Pancake Islet with 7%. Old Marina Islet contained 723 nests in 2007, by far the largest number tallied there since nesting was discovered in 2002. Following a rapid increase from 1999-2004, the number of nests on Negit Island continued to decline sharply for the third year in a row; only 63 nests were tallied there in 2007. Lakewide reproductive success of 1.05 ± 0.11 chicks fledged per nest was slightly above the1983-2006 average of 0.97 ± 0.07. An estimated 22793 ± 2520 chicks fledged from the Mono Lake islands in 2007. For the 719 chicks banded in early July, weight at banding was significantly greater for those that survived to fledging than for those that did not. Also, overall mortality of banded chicks did not differ significantly between chicks with and without infestations of the endemic bird tick *Argas monolakensis*.

INTRODUCTION

The long-term monitoring of population size and reproductive success of California Gulls (*Larus californicus*) at Mono Lake, California, by PRBO Conservation Science was continued in 2007. The objectives of this ongoing study are to measure the year-to-year variation in population size and reproductive success as they relate to changing lake levels and other environmental conditions.

The effects of changes in the Mono Lake ecosystem have been of special interest to biologists (Patten et al. 1987, Botkin et al. 1988) and to agencies charged with protecting the lake's valuable natural and scenic resources (Jones and Stokes 1993). Because court-mandated protection of the Mono Lake ecosystem will allow the lake's surface elevation to rise to 1948.3 m (6392.1 ft) and certain habitats damaged by water diversions be restored (SCWRCB 1994, Mono Lake Committee 1996), there is a need to monitor the

lake's resources, including nesting gulls, to document their response to changing conditions. In 2014 the State Water Board will assess Mono Lake's progress toward the targeted lake level of 1948.3 m (www.monolake.org/restoration/status.htm). This will be a particularly important time to review trends and status of Mono Lake ecology, including the California Gull population.

STUDY AREA

The study area has previously been described in detail (Shuford et al. 1984, Shuford 1985, www.monolake.org/naturalhistory). Here we provide summaries relative to the 2007 field season.

Lake Level

The winter of 2006-2007 was extremely dry; the lake dropped approximately 0.49 m from the fall of 2006 to the fall of 2007. The lake level was approximately 1946.0 m (6384.7 ft.) in May 2007. The meromictic period that began in early 2006 ended by November 2007 (G. Reis, pers. comm.) For more information and definition of meromixis see the "Population Dynamics and Meromixis" in the Results section below. Lake level data from Los Angeles Dept. Water and Power are available at www.monolake.org/live/lakelevel/yearly.htm.

METHODS

Nest Counts

In 2007, we counted nests on Negit Island, the Negit Islets, and the Paoha Islets from 23-26 May, and on Old Marina Islet on 26 May. Field workers walked through all the colonies tallying each nest and marking them with a small dab of water soluble paint to avoid duplicate counts. For some small, steep-sided islets, incubating adults were counted from a small motor boat. We kept separate subtotals for nests within seven 10 x 20 m fenced plots on three of the Negit Islets (four plots on Twain, two on Little Tahiti, one on Little Norway) and four fenced plots of various sizes (described in Jehl 2001) on two of the Paoha Islets (two on Coyote A, two on Piglet Islet). We also used these detailed counts to estimate average clutch size and reproductive success.

Since 2003 data from the Little Norway plot has been excluded in estimating average clutch size and reproductive success for the lakewide population. Apparently a large tick outbreak limited to Little Norway led to the extreme chick mortality there and sharp declines in nesting occupation that has not been observed on other islets (see Hite et al. 2003). Excluding data from the Little Norway plot provides a more reasonable estimate of reproductive success for the lakewide population. We continue to annually monitor the Little Norway plot and tick load its chicks.

Chick Counts and Reproductive Success

From 30 June to3 July 2007, we banded all chicks within the 10 fenced plots on the Negit and Paoha islets. From 31 August to 2 September 2007, we searched the nesting islands to determine the number of banded nestlings that died before fledging. With the data from the nest, chick, and mortality counts, we estimated the fledging rate for each plot in which data was collected, and, using the average fledging rate for the entire population, the total number of gulls successfully fledged from Mono Lake in 2007. We calculated the fledging rate for each plot **(f_{plot})** as:

$$f_{plot} = (C_b - C_d) / N_p$$

where **C_b** is the number of chicks banded in that plot in July, **C_d** is the number of chicks from that plot found dead in August and September, and **N_p** is the number of nests counted in that plot in May. We calculated the total number of gulls successfully fledged **(F)** from Mono Lake as:

$$F = (N/P) \sum_{i=1}^{P} f_i$$

where **N** is the total number of nests on Mono Lake, **P** is the number of plots, and **fi** is the number of young fledged per nest in each of the Negit Islet fenced plots. Clutch size was calculated similarly; however **fi** is the number of eggs per nest for each plot.

We analyzed results using a nonparametric test (Wilcoxon/Kruskal-Wallis) with Stata 8.0 (Stata Corp. 2003).

All estimates in this report are presented plus or minus one standard error.

Tick Infestations

Because of its potential effect on gull reproductive success, during banding we recorded the presence and abundance of the bird tick *Argas monolakensis* for all 719 chicks banded. Each bird received a score of 0-3 based on the approximate proportion of the fleshy part of the legs covered by tick larvae: 0 no ticks; 1, up to one third covered; 2, up to two-thirds covered; and 3, more than two-thirds covered. For more information on the life cycle of this endemic tick, see Schwan et al. 1992, or Nelson et al. 2006.

Chick Mass at Banding

We used hand-held Pesola scales to weigh the chicks that were banded.

RESULTS AND DISCUSSION

Number of Nests and Breeding Adults

In 2007, late May nest counts recorded a lakewide total of 21,699 California Gull nests for an estimate of 43,398 nesting adults. The number of nests and breeding adults in 2007 is 10% below the long-term average, but 2% higher from last year. Of the total, 76% were nesting on the Negit Islets, 21% on the Paoha Islets, 3% on Old Marina Islet, and only 0.3% on Negit Island (Appendix 1). Considering all the islands/islets, Twain Islet held 47% of the total, followed by Coyote A and Little Tahiti each with 14%, and Pancake with 7%. Collectively, the remaining 14 island/islets inhabited by gulls in 2007 held 17% of the total.

Nesting Occupation Changes Among Islands and Islets

There was a noticeable decline in nesting occupation and overall surface area size of low, "flat" islets in 2007 compared to 2006 (K. Nelson, pers. obs.) due to increased lake level. Although the winter of 2006-2007 was very dry and Mono Lake dropped 0.37 m over the course of the 2007 breeding season, the lake was 0.46 m higher during the May 2007 nest count than the May 2006 nest count, due to the tremendous amount of runoff that occurred between late May and August of 2006 (lake level information from www.monolake.org/live/lakelevel/yearly.htm). Therefore, the 2006 nest count occurred

before numerous shoreline nests were lost in 2006 due to the rising lake level, and most of these losses were not counted until 2007.

Negit Islets: Overall, nest numbers among the Negit Islets were similar to last year but slightly higher (Appendix 1). The exception was pancake islet, which had 22% fewer nests than 2006. We observed remarkable shrinkage due to rising lake level in this islet in 2006. Pancake's "flatness" made it much more prone to shrinkage than the other Negit islets which have greater topographical rise at the shoreline.

Paoha Islets: The number of nests on the Paoha Islets was down almost 4% from 2006. Like Pancake Islet, the Paoha Islets have little topographical rise, and increasing lake level has a greater impact on volume loss for them than most of the Negit Islets. Coyote B Islet was reduced to a very small size and had no nesting gulls, a first since PRBO began monitoring these islets. Coyote A and Brown Islet had significant drops in nesting numbers from 2006, but numbers of nests on Piglet were similar to those in 2006 (Appendix 1). When Mono Lake reaches the court-mandated level of 1948.3 m, the Paoha Islets are expected to be submerged (G. Reis, pers. comm.).

Negit Island: Only 63 nests were counted on Negit Island in 2007, continuing the sharp decline of about 50% observed annually since 2004. During 1999-2004 Negit Island experienced a rapid increase in nesting numbers.

Little Norway: Little Norway continued to slowly grow with a 4% increase from 2006. It experienced a precipitous decline in the number of nests from 2000 to 2005, most likely due to extreme tick infestation there (Hite et al. 2003).

Old Marina Islet: This islet, located near the shoreline, has had large population fluctuations in recent years following near abandonment in 2005 in response to predation. In 2007 the number of nests on Old Marina Islet rose to 723. The approximate 0.8 m gain in the lake level by 2007 compared to when the islet was predated in 2004 likely hinders accessibility of the islet to terrestrial predators. Yet as demonstrated by coyotes gaining access by swimming to such locations as Twain Islet and Negit Island in the early 1990's, predation is still a significant risk factor for that population due to its close proximity to the mainland. A small, unnamed islet roughly .5km south of Old Maria Islet near the shoreline contained no nests in 2007, although several old nests were present. Nesting was never previously documented for this islet although undoubtedly occurred.

Phenology

Four nests contained newly hatched chicks out of the total of 21,699 nests counted during 23-27 May 2007, which is roughly average. During early July chick banding, however, a large proportion of nests still contained eggs or newly hatched chicks, indicating the 2007 nesting season was protracted. Within the 10 fenced plots in early July, 14.9% of all nests contained eggs or tiny chicks, which varied 0-34% by plot (Table 1). Reasons for this are not fully understood, but these data indicate that we were recording second nesting attempts because the first clutch or brood failed. Predation by other California Gulls has been the major reason for early failed nesting attempts at Mono Lake (Hite et al. 2005), which in turn may be related to availability of brine shrimp (*Artemia monica)* other food sources in early spring. Since the lake was meromictic (experiencing persistent salinity stratification) in the summer of 2007, shrimp availability in the spring may have been reduced. During our late May survey efforts, the shrimp observed near the surface looked smaller and less abundant than in recent years. No unfledged chicks were detected during mortality count 30 August – 2 September 2007.

Clutch Size

In 2007, average clutch size at Mono Lake was 1.91 ± 0.42 eggs/nest (range = 1-3 eggs, *n* = 584 nests). Twenty-six percent of the nests contained one egg, 58% had two, and 17% had three. Winkler (1983) reported the average clutch size at Mono Lake in 1983 was approximately 1.8 eggs/nest, which is similar to the averages which have been calculated since 2002 (Hite et al. 2003, Hite et al 2004, Nelson et al. 2006), with the exception of 2004, when the average clutch size was 2.35 (Hite et al. 2005).

Fledging Rates

The six fenced plots on the Negit Islets held an average of 66.8 ± 10.1 nests and fledged an average of 1.10 ± 0.12 chicks per nest in 2007 (Table 2). The four fenced plots on the Paoha Islets held an average of 45.7 ± 4.1 nests and had an average fledge rate of 0.98 ± 0.23 chicks per nest. Combined, the 10 plots held an average of 58.4 ± 7.0 nests and

fledged an average of 1.05 ± 0.11 chicks per nest. The total fledging rate at Mono Lake in 2007 was slightly above the 1983-2005 average of 0.97 ± 0.07 chicks fledged per nest.

Table 1. Number of nests with eggs or tiny chicks by plot in July 2007

Plot	total nests	chicks banded	# Nests w/ eggs	# nests w/ downies	Total % w/ eggs/downies
Piglet West	39	61	4	2	**15.4**
Piglet East	39	47	11	1	**30.8**
Coyote Hilltop	49	55	2	4	**12.2**
Coyote Cove	56	19	18	1	**33.9**
L. Tahiti West	90	150	0	0	**0**
L. Tahiti East	38	39	2	2	**10.5**
Twain West	69	108	0	1	**1.4**
Twain North	64	66	5	2	**10.9**
Twain South	99	132	0	7	**7.1**
Twain New	41	38	11	0	**26.8**
Total:	**584**	**715**	**53**	**20**	**14.9**

Overall Reproductive Success

Based on the total of 21,699 California Gull nests on Mono Lake and an average of 1.05 ± 0.11 chicks fledged per nest; an estimated 22,784 ± 2387 chicks fledged at Mono Lake in 2007. The 2007 fledging rate was slightly above the long-term average of 0.97 ± 0.07 chicks per nest.

Mass at Banding

The average mass of the 719 chicks banded in 2007 was 485 ± 5 g. The average mass for chicks that survived to fledging (498 ± 5 g) was significantly higher than the average mass for chicks that did not survive to fledging (396 ± 15 g, X^2= 44.1, df = 1, p =0.0001). This pattern has been consistent through all years in which chicks were weighed (Hite et al 2003, Hite et al 2004, Hite et al 2005).

Table 2. Summary of Nest Counts, Chick Banding, and Mortality Counts on the Negit and Paoha Islets in 2007.

Site	Nests per Plot 23 – 26 May	Chicks per Nest 30 June – 3 July	Chicks Banded (chicks found dead)	Chicks Fledged/Nest
Little Norway	18	0.22	n/a	n/a
Little Tahiti East	38	1.08	39 (6)	0.87
Little Tahiti West	90	1.67	150 (19)	1.46
Twain North	64	1.06	66 (11)	0.86
Twain South	99	1.40	132 (21)	1.12
Twain West	69	1.58	108 (8)	1.45
Twain New	41	0.93	38 (4)	0.83
Negit Islet Totals: [a]				
Totals =	**419**	**-**	**533 (69)**	**-**
Average =	**59.8**	**1.29**	**-**	**1.10**
SD =		**0.39**	**-**	**0.29**
SE =	**10.14**	**0.12**	**-**	**0.12**
Coyote A Cove	56	0.36	19 (1)	0.32
Coyote A Hilltop	49	1.20	55 (3)	1.06
Paoha Islet East	39	1.23	47 (2)	1.15
Paoha Islet West	39	1.61	61 (7)	1.38
Paoha Islet Totals:				
Totals =	**183**	**-**	**182 (13)**	
Average =	**45.75**	**1.10**	**-**	**0.98**
SD =		**0.39**	**-**	**0.46**
SE =	**6.96**	**0.12**	**-**	**0.23**
Mono Lake Totals:				
Totals [a] **=**	**584**	**-**		**-**
Average [a] **=**	**58.4**	**1.21**	**-**	**1.05**
SD [a] **=**	**22.00**	**0.39**	**-**	**0.35**
SE [a] **=**	**6.96**	**0.12**	**-**	**0.11**

[a] Calculated excluding data from LN plot for reasons discussed in the Methods.

Tick Infestation

The presence and relative abundance of larval ticks found on gull chicks varied among plots. Of the chicks banded, 92.2% had a tick score of 0. Of those that had ticks, 86% had a tick score of 1, 9% had a tick score of 2, and 5% had a tick score of 3. At 4 plots (Twain North, Piglet West, Piglet East, Coyote Cove) ticks have not been detected since 2005.

Five of the seven remaining plots in which ticks were detected – Coyote Hilltop, Twain New, Twain South, Twain West, Little Tahiti West - all the chicks had a tick score of 1. The Little Tahiti East and Little Norway plots contained the only detections of tick scores greater than one. Within Little Tahiti East, 20% had a tick score of 0, 69% had a tick score of 1, 10% had a tick score of 2, and none had a tick score of 3. This plot has had similar or greater rates of tick detection in the past (Hite et al. 2005, Hite et al. 2004). The Little Norway plot experienced extreme rates of tick infestation in recent years (Hite et al. 2003, Hite et al. 2004, Hite et al. 2005). In 2007 only 4 surviving chicks were present but all of these had infestation rates >1 (one chick had a tick score of 2, and 3 chicks had a tick score of 3). Overall mortality of banded chicks did not differ significantly between chicks with and without ticks, although the vast majority of chicks with ticks had relatively low infestation rates.

Gull Predators

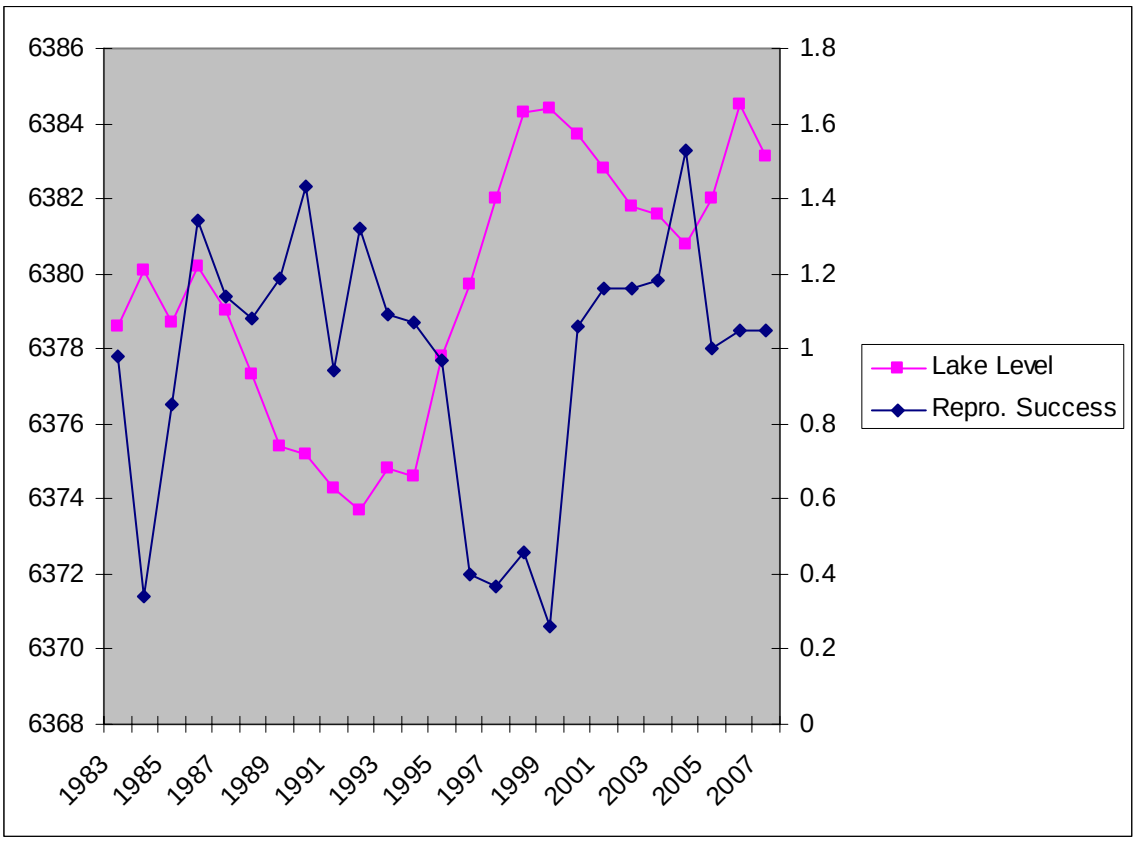
Few potential gull predators were detected in 2007. Avian predators seen or heard regularly throughout the season were the Black-crowned Night-Heron (*Nycticorax nycticorax*) (an unlikely but potential nest predator), Great-Horned Owl (*Bubo virginianus*), Golden Eagle (*Aquila chrysaetos*), Peregrine Falcon (*Falco peregrinus*), and Common Raven *(Corvus corax*). Ospreys (*Pandion haliaetus*), unlikely but potential predators (one was observed taking a gull egg in 2003; Hite et al. 2004), were detected regularly, and several pairs were nesting in various areas around the shore of Mono Lake, and an unsuccessful nesting attempt was made on the Negit islet La Paz for a second year in a row.

Gull Population Dynamics and Meromixis

Mono Lake's water level and limnology influences Mono Lake's gull population. During increased lake levels, nesting habitat availability may become limited due to shrinking surface area of the islets. Additionally, the complex relationships between lake level, meromixis and primary productivity appear to influence the gull population tremendously. Meromixis is a persistent salinity stratification that occurs on Mono Lake when large amounts of fresh water inflow fail to mix with the denser, saltier water of the

lake (the monolimnion), and creates a fresher surface water layer, known as the mixolimnion. During meromixis, food availability may be limited due to lowered primary productivity in the lake and delayed shrimp phenology (Jellsion and Melack 1993, Jellison and Melack 1999). Delayed shrimp phenology results in reduced springtime shrimp concentration, which Wrege et al. (2006) found to have a strong, negative effect on the size of the nesting gull population. There appears to be an inverse relationship between lake level and gull reproductive success (fig. 1).

Figure 1. Lake Level and Reproductive Success at Mono Lake 1983-2007



Other Species Nesting on Mono Lake Islets

In addition to California Gulls, the only other species found nesting on the Mono Lake islets in 2007 was the Black-crowned Night-Heron. The night-heron population increased from 76 nests in 2005 to 91 nests in 2006, and dropped to only 57 in 2007. Thirty-five nests were on Twain Islet and 22 on Little Tahiti. No Caspian Tern (*Sterna caspia*) nests

were found on the Mono Lake islets in 2007. This species has nested nearly annually on the Mono Lake islets since at least the mid-1970's (Jehl 1986). Due primarily to frequent predation by California Gulls, the Mono Lake population has never flourished, and has fluctuated greatly (Jehl 1986, Nelson et al. 2006).

OVERVIEW

Multiple factors contribute to the year-to-year variation in numbers of breeding gulls at Mono Lake. Wrege et al. (2006) found that four variables accounted for >80% of the variation in the number of breeding gulls at Mono Lake between 1987 and 2003. Two factors reflecting immediate local conditions - the density of brine shrimp at the time of egg-laying and the mean temperature in the month before egg laying began – had the greatest direct effect on the numbers of breeding gulls. Additionally the potential number of four-year-old gulls returning to the lake to breed for the first time (reflected in reproductive success 4 years earlier) and winter coastal conditions associated with the Pacific Decadal Oscillation were also important.

During the tenure of this long-term monitoring program, low reproduction by gulls has been associated with the early years of each of two extended meromictic periods. During these episodes, the primary productivity of Mono Lake has been reduced, and brine shrimp phenology has been delayed (Jellison et al. 1998, Jellison and Melack 1993, Jellison and Melack 1999). Delayed shrimp phenology results in reduced springtime shrimp concentrations, which has a strong, negative effect on the size of Mono Lake's gull population (Wrege et al. 2006), and likely on reproductive success as well (fig. 1). Over the course of these meromictic periods, gull productivity slowly increased as meromictic conditions weakened. As meromixis weakened, adult shrimp become available in the water column three to four weeks earlier than in preceding years, and shrimp population density increased more rapidly during the gulls' early chick hatching period (R. Jellison pers. comm., P. Wrege unpubl. data).

Demonstrating the apparent link between meromixis and gull productivity, following the near breakdown of meromixis in 2003, primary productivity in Mono Lake rose to the highest recorded level there, which was almost twice that following the breakdown in

1989, and may even represent the highest level of primary productivity to be recorded in the limnological literature (R. Jellison pers. comm.). Perhaps in response to this unprecedented productivity in the lake, the following breeding season (2004) was outstandingly successful for the gulls for all population parameters measured – clutch size, chick weight, and reproductive success (Hite et al. 2005; fig. 1).

Although a third meromictic period began early in 2006, overall gull reproductive success did not drop below average as in the start of previous meromictic periods. The dry winter of 2006-2007 weakened the meromictic conditions considerably, and the lake was fully mixed by November 2007 (G. Reis, pers. comm.) - thus this meromictic period was not particularly strong and was short-lived. However, the proportion of small chicks and nests with eggs in July 2007 was much higher than in recent years, and similar to years with poor gull productivity

Acknowledgements

The Mono Lake Committee provided the financial support for this monitoring effort. We are grateful to the individuals who volunteered their time to assist with field work – without dedicated volunteers like these, this long-term effort would not have been possible. We are greatly appreciative of the fantastic editing and review process that Tom Gardali of PRBO Conservation Science gave. Special thanks to John Frederickson of the June Lake Marina for servicing the motor, as well as his abundant enthusiasm and well wishes. The Mono Basin National Forest Scenic Area gave us permission to work on the nesting islands. This is PRBO Contribution Number 1612.

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Appendix 1. Nest counts on Negit Island and the Negit and Paoha islets from 1983 to 2007. Data from the Paoha Islets in all years but 2002 to 2006 from J. R. Jehl, Jr.

Negit Islets	1983	1984	1985	1986	1987	1988	1989	1990
Twain	3808	7372	9309	11985	12422	11057	10573	15045
L. Tahiti	5260	7051	6572	5763	4261	3692	2983	4218
L. Norway	2218	1956	1407	810	360	254	269	432
Steamboat	997	1016	721	722	467	359	314	704
Java	143	396	195	400	439	458	543	789
Spot	505	358	296	311	248	247	231	309
Tie	511	231	196	150	84	87	95	167
Krakatoa	319	272	178	173	185	197	174	283
Hat	146	109	73	56	14	18	10	19
La Paz	105	58	43	30	22	21	23	46
Geographic	140	0	0	0	0	0	2	4
Muir	170	0	0	0	0	1	10	61
Saddle	175	46	41	29	14	13	10	18
Midget	5	3	3	4	4	2	3	3
Siren	51	0	1	0	0	0	1	7
Comma	2	1	1	1	0	0	0	0
Castle Rocks	2	3	4	3	4	6	5	4
Pancake	0	0	0	7	570	1216	1395	651
Java Rocks	0	0	0	0	4	3	0	4
No name	0	0	0	0	0	0	0	1
Negit Islets Total:	**14557**	**18872**	**19040**	**20444**	**19098**	**17631**	**16641**	**22765**
Paoha Islets								
Coyote A	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Coyote B	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Browne	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Piglet Islet[b]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Paoha Islets Total:	**8001**	**3546**	**3153**	**3694**	**3208**	**2833**	**2682**	**5145**
Negit Island	--	--	92	636	1502	2037	2765	2827
Mono Lake Grand Total	**22558**	**22418**	**22285**	**24778**	**23808**	**22501**	**22088**	**30737**
Nesting Adults:	**45116**	**44836**	**44570**	**49556**	**47616**	**45002**	**44176**	**61474**

[a] Data published elsewhere by J. R. Jehl, Jr.

b Numbers of nests intermittently attributed to Piglet Islet are from a piece of land adjacent to the other Paoha Islets, which in past years of lower water levels has been partially or completely connected to the Paoha mainland via a landbridge. Formally known as "Paoha Islet" (Jehl 2001, Hite et al. 2004) it was changed to "Piglet Islet" to avoid confusion with Paoha Island.

Appendix 1. Continued.

Negit Islets	1991	1992	1993	1994	1995	1996	1997	1998
Twain	10883	15896	15431	15792	11035	12690	13140	9488
L. Tahiti	3205	3810	3616	4505	4021	4570	4092	3846
L. Norway	355	473	428	533	493	766	794	606
Steamboat	671	862	958	1217	981	459	505	405
Java	586	1040	399	199	4	70	41	65
Spot	311	335	356	449	422	399	341	191
Tie	160	220	210	320	264	267	194	81
Krakatoa	181	209	146	175	116	57	33	16
Hat	10	21	21	14	19	41	58	47
La Paz	49	70	77	57	55	44	30	17
Geographic	10	68	84	69	51	0	0	0
Muir	84	139	131	116	87	4	0	0
Saddle	8	14	10	11	21	31	13	1
Midget	2	2	3	2	2	2	3	0
Siren	7	19	20	14	16	10	0	0
Comma	1	1	1	0	0	1	0	0
Castle Rocks	5	5	3	3	3	4	4	3
Pancake	0	0	0	0	0	0	1	13
Java Rocks	2	13	15	9	5	1	0	0
No name	0	3	3	3	1	0	0	0
Negit Islets Total:	**16530**	**23200**	**21912**	**23488**	**17596**	**19416**	**19429**	**14779**
Paoha Islets								
Coyote A	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Coyote B	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Browne	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Piglet Islet[b]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Paoha Islets Total:	**4442**	**9284**	**8498**	**8182**	**7331**	**4334**	**5708**	**2678**
Negit Isl.	788	4	12	0	9	0	0	0[c]
Mono Lake Grand Total	**21760**	**32488**	**30422**	**31670**	**24927**	**23750**	**24957**	**17466**
Nesting Adults:	**43520**	**64976**	**60844**	**63340**	**49854**	**47500**	**49914**	**34932**

c No nesting gulls were seen on Negit Island in late May 1998, but a nearshore boat survey on 8 July found five adults apparently incubating, and one pre-fledged chick (J. R. Jehl, Jr. pers. comm.).

Appendix 1 Continued

Negit Islets	1999	2000	2001	2002	2003	2004	2005	2006	2007
Twain	10728	11856	11773	10772	9288	11480	9582	9900	10138
L. Tahiti	5108	5076	4309	3831	2632	3303	2511	2700	3102
L. Norway	732	887	665	357	249	213	126	165	172
Steamboat	381	477	570	621	575	635	621	583	631
Java	149	480	611	706	718	915	779	710	648
Spot	27	29	36	42	70	98	127	75	9
Tie	5	16	23	24	38	49	50	33	0
Krakatoa	76	120	141	129	113	181	184	131	119
Hat	43	29	23	9	7	9	3	5	10
La Paz	0	0	0	0	0	1	2	0	0
Geographic	0	0	0	0	0	0	0	0	0
Muir	0	0	0	0	0	0	0	0	0
Saddle	2	1	1	0	0	0	0	1	1
Midget	3	2	0	0	0	1	1	0	0
Siren	0	0	0	0	0	0	0	0	0
Comma	0	0	0	0	0	0	0	0	0
Castle Rocks	3	1	1	1	0	0	0	0	0
Pancake	1136	2098	2145	2085	1847	2837	2530	2059	1602
Java Rocks	0	0	0	0	0	0	0	0	0
No name	0	0	0	0	0	0	0	0	0
Negit Islets Total	**18393**	**21072**	**20298**	**18577**	**15537**	**19722**	**16516**	**16362**	**16432**
Paoha Islets									
Coyote A	[a]	[a]	2237	2612	2480	3244	3174	3181	3094
Coyote B	[a]	[a]	22	26	34	55	63	40	0
Browne	[a]	[a]	279	261	224	283	253	225	118
Piglet [b]	[a]	[a]	776	991	1010	1552	1649	1218	1269
Paoha Islet Total:	**1858**	**3478**	**3314**	**3890**	**3748**	**5134**	**5139**	**4664**	**4481**
Negit Island:	14	100	271	391	452	587	285	120	63
Old Marina	0	0	0	[d]	178[e]	511	1	94	723
Mono Lake Total:	**20265**	**24650**	**23883**	**22858**	**19915**	**25954**	**21941**	**21240**	**21699**
Nesting Adults	**40530**	**49300**	**47766**	**45716**	**39830**	**51908**	**43882**	**42480**	**43398**

d Number of nests on Old Marina Islet in 2002 (and years before) is uncertain. Nesting activity was not discovered until 5 July 2002, making a standardized nest count impossible; pre-fledged chicks were observed with a spotting scope from shore, but nests were concentrated on an area obscured from view from shoreline. A minimum of five pairs of gulls initiated nests but this is likely an underestimate.

e Nests were not counted with water soluble paint which typically serve as a counting aid, and counters believe 178 they recorded is an underestimate.