

POPULATION SIZE AND REPRODUCTIVE SUCCESS
OF CALIFORNIA GULLS AT MONO LAKE, CALIFORNIA, IN 1996,
WITH EMPHASIS ON THE NEGIT ISLETS

W. David Shuford, David M. Calleri, and Tricia Wilson

Report of
Point Reyes Bird Observatory
4990 Shoreline Highway
Stinson Beach, CA 94970

October 1996

Contribution No. 721 of Point Reyes Bird Observatory

ACKNOWLEDGMENTS

The following individuals and organizations contributed significantly to fieldwork or logistics at Mono Lake: Bob Baez, Doris Beckwith, Kristen Drake, Larry Ford, Dennis Frieborn, Fiona Harrison, Don Jackson, Jennifer Jones, Paul Levine, Martha Mallery, Doug Moberg, the Mono Lake Committee, Matt Moule, Shannon Nelson, Matt Newman, Tammy Philliater, Jim Pyacek, Barbara Rerber, Wendy Stanford, Shawn Stevens, Jackie Stroud, Ted and Linda Toren, Mark and Jenny Winters, and Don Yellen. Thanks to Tim Hansen of the High Sierra Shrimp Plant for providing boat storage and launching facilities. John Frederickson and his co-workers at the June Lake Marina were extremely helpful in lending us a boat and servicing our outboard motor. The Mono Basin National Forest Scenic Area via Roger Porter gave us permission to work on the nesting islands. Dr. Joseph R. Jehl, Jr. kindly provided gull census data for the Paoha Islets, and David Allen of the Los Angeles Department of Water and Power provided lake level data. This study was funded in 1996 by the Mono Lake Committee and contributions to Point Reyes Bird Observatory.

ABSTRACT

In 1996, nest counts estimated about 47,500 adult California Gulls were nesting in late May. The Negit Islets supported 82% of Mono Lake's breeding gulls, versus 18% on the Paoha Islets. Twain Islet remained the most important nesting island by holding 53% of Mono Lake's entire breeding gull population. The fledging rate on the Negit Islets of 0.40 chicks per nest was the second lowest since our studies began in 1983. An estimated 9196 young fledged from all the lake's nesting islands in 1996. Although the causes of low reproductive success in 1996 are unknown, there is a need to investigate the relationship of changes in productivity and timing of peak occurrence of brine shrimp, brought on by meromictic conditions in the lake, to reproductive success of the gulls. Although the lake level continued to rise and cover the landbridge, gulls began to recolonize only one of three reisolated nesting islets. A coyote was found on Negit Island in July and on Twain Islet in August, at a lake level 6.5 ft higher than when coyotes first reached Twain in 1982. Future research will be necessary to document the length of time needed for the gulls to fully recolonize abandoned islands.

INTRODUCTION

In 1996 Point Reyes Bird Observatory (PRBO) completed the fourteenth year of a study of the California Gull (*Larus californicus*) at Mono Lake, California. The objectives of our ongoing study are to measure year-to-year variation in population size and reproductive success and to determine their relationship to changing lake levels. This report focuses on the Negit Islets, which currently support most of the lake's nesting gulls, and on Negit Island, which supported the majority until the gulls abandoned it in 1979. Negit Island was recolonized in 1985 and was abandoned again in 1991.

The effects of recent changes in the Mono Lake ecosystem are of special interest to biologists (Patten et al. 1987, Botkin et al. 1988) and to public agencies vested with protecting the lake's valuable natural and scenic resources (Jones and Stokes 1993). Despite a recent decision that protects the Mono Lake ecosystem by allowing the lake level eventually to rise to 6392 feet (SCWRCB 1994), there is a continuing need to monitor the lake's resources, including nesting gulls, to document their response to the changing conditions.

Since 1941, the lake has dropped almost 45 vertical feet and nearly doubled in salinity because of water diversions of its inflowing streams. Wet winters in the early and mid-1980s caused a temporary reversal of the downward trend. The winters of 1986-87 through 1993-94 averaged very dry, and lake level had

fallen to 6374.5 feet by May 1992. Wet winters returned in 1994-95 (record precipitation) and 1995-96, and lake level had risen to 6379.3 feet in May 1996 and 6380.1 feet in August 1996 (D. Allen in litt.). Consequently, the channel that reformed between Negit Island and the landbridge in 1995 continued to widen in 1996.

STUDY AREA AND METHODS

The study area at Mono Lake has previously been described in Shuford (1985) and Shuford et al. (1984, 1985).

Nest Counts

We counted nests on the Negit Islets from 20 to 25 May. Field workers walked through all the colonies tallying each nest and marking them with a dab of spray paint to avoid duplicate counts. For some small, steep-sided islets brooding adults were counted from a small motorboat to estimate the number of nests present; none of these islets had more than 10 apparent nests. Nest totals for the Negit Islets were added to those for the Paoha Islets provided by Joseph R. Jehl, Jr., and the number of adult gulls breeding at Mono Lake was estimated as twice the total number of nests at the lake.

Separate subtotals were compiled for nests within eight 10 X 20 m fenced plots on four islands (Twain, Little Tahiti, Little Norway, and Spot islets) which were monitored to determine chick production.

Chick Counts

From 1 to 4 July, we counted and banded chicks within the eight fenced plots on the Negit Islets. The numbers of chicks produced in these plots were used to estimate total chick numbers on all the Negit Islets combined and on all of Mono Lake's nesting islands (see below).

Count of Dead Chicks

To assess survivorship from banding to fledging, on 9 and 10 August observers made a thorough search for dead banded chicks on islets on which chicks had been banded.

Reproductive Success

In 1996 we used the fenced plot method to estimate reproductive success:

Combined Fenced Plot Method. In this method the number of fledged chicks on the Negit Islets (**F**) is calculated as:

$(N/8) \sum_{i=1}^8 f_i$ where **N** is the total number of nests on the Negit Islets

and **f_i** is the number of young fledged per nest in the eight Negit Islet fenced plots. As in prior years, all newly hatched (unbanded) chicks in July were assumed not to have fledged.

Estimates of the number of young fledged on the Paoha Islets, based also on fenced plots (J. R. Jehl, Jr. in litt.), were added to the Negit Islet totals to provide an estimate of the total number of young produced at Mono Lake in 1996.

RESULTS AND DISCUSSION

Phenology

In 1996 we found a gull nest in the process of hatching on 21 May and five nests with chicks on 23 May, indicating that egg laying and chick hatching began about the same time as in most other years of our study. Observations from 1 to 4 July of a number of eggs (in and out of plots) suggested that egg laying was more protracted than in some years of our study.

Coyote Observations

On a 4 July 1996 visit to Negit Island we saw an adult coyote and many canid tracks. Subsequent visits to Negit Island on 10 and 11 August revealed that canid tracks and scat were widespread, and tracks were concentrated around a small brackish lake on the north side of the island upslope from the channel between the island and the landbridge. A water sample taken from this small lake contained alkali fly (*Ephedra hians*) larvae and had a salinity similar to Mono Lake water (D. Herbst pers. comm.), indicating it was not suitable for sustaining coyotes on Negit. On 10 August canid tracks and scat were also observed on Twain Islet, but not on Java Islet, the islet closest to Negit Island. The lake level at this time was about 6380.1 feet, about 6.5 feet higher than when coyotes first reached Twain in 1982 and about 6 feet higher than the lake level that was previously thought to provide this island with adequate protection from coyotes (SCWRCB 1994).

Number of Breeding Adults in 1996

Nest counts from 20-25 May enabled us to estimate that 38,832 adult gulls nested on the Negit Islets (Table 1). At least 8668 nested on the Paoha Islets; J. R. Jehl, Jr. (in litt.) estimated that perhaps an additional 10% initiated nesting after the nest counts were taken. The lakewide estimate of 47,500 nesting adults in 1996 is much lower than the 61,000 to 65,000 recorded in 4 of 5 years between 1990 and 1994 but very similar to the 45,000 to 50,000 recorded in all other years of the study since 1983.

In 1996, the Negit Islets supported 82% of Mono Lake's breeding gulls versus 18% on the Paoha Islets. Twain remained the most important colony by holding 53% of the entire Mono Lake breeding population. Nesting gull numbers increased from 1995 to 1996 on the larger islands -- Twain, Little Tahiti, and Little Norway -- which comprised 93% of the population on the Negit Islets as a whole. Trends of nesting numbers over the two-year period were mixed on other islets, though numbers decreased on some very small islets (Krakatoa, Geographic, Muir) where nesting substrate was inundated by the rising lake level. During this same period, numbers of breeding adults increased from 8 to 140 on Java islet, as birds appeared to begin to recolonize this islet after the rising lake reisolated it and lessened the probability of coyote predation. Despite seemingly adequate water barriers created by the rising lake level, gulls did not recolonize Negit Island or Pancake islet. Our observation of an adult coyote on Negit Island on 4 July suggests a compelling

reason for the lack of nesting there in 1996.

Table 1. Nest counts on the Negit Islets from 1983 to 1996. Data for the Paoha Islets from Jehl (in litt. and previous reports).

NEGIT ISLETS	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Twain	3808	7372	9309	11985	12422	11057	10573	15045	10883	15896	15431	15792	110352	12690
L. Tahiti	5260	7051	6572	5763	4261	3692	2983	4218	3205	3810	3616	4505	4021	4570
L. Norway	2218	1956	1407	810	360	254	269	432	355	473	428	533	493	766
Steamboat	997	1016	721	722	467	359	314	704	671	862	958	1217	981	459
Java	143	396	195	400	439	458	543	789	586	1040	399	199	4	70
Spot	505	358	296	311	248	247	231	309	311	335	356	449	422	399
Tie	511	231	196	150	84	87	95	167	160	220	210	320	264	267
Krakatoa	319	272	178	173	185	197	174	283	181	209	146	175	116	57
Hat	146	109	73	56	14	18	10	19	10	21	21	14	19	41
La Paz	105	58	43	30	22	21	23	46	49	70	77	57	55	44
Geographic	140	0	0	0	0	0	2	4	10	68	84	69	51	0
Muir	170	0	0	0	0	1	10	61	84	139	131	116	87	4
Saddle	175	46	41	29	14	13	10	18	8	14	10	11	21	31
Midget	5	3	3	4	4	2	3	3	2	2	3	2	2	2
Siren	51	0	1	0	0	0	1	7	7	19	20	14	16	10
Comma	2	1	1	1	0	0	0	0	1	1	1	0	0	1
Castle Rocks	2	3	4	3	4	6	5	4	5	5	3	3	3	4
Pancake	0	0	0	7	570	1216	1395	651	0	0	0	0	0	0
Java Rocks	0	0	0	0	4	3	0	4	2	13	15	9	5	1
No name	0	0	0	0	0	0	0	1	0	3	3	3	1	0
<hr/>														
Negit Islet														
Totals:	14557	18872	19040	20444	19098	17631	16641	22765	16530	23200	21912	23488	17596	19416
<hr/>														
Paoha Islet														
Totals:	8001	3546	3151	3596	3208	2833	2682	5145	4442	9283	8498	8182	7331	4334
<hr/>														
Negit Island:	--	--	92	636	1502	2037	2765	2827	788	4	12	0	0	0
<hr/>														
Paoha Island:	--	--	2	102	0	0	0	0	0	1	0	0	0	0
<hr/>														
Mono Lake														
Totals:	22558	22418	22285	24778	23808	22501	22088	30737	21760	32488	30422	31670	24927	23750
<hr/>														
Nesting														
Adults:	45116	44836	44570	49556	47616	45002	44176	61474	43520	64976	60844	63340	49854	47,500

Fledging Rate in the Fenced Plots

The eight fenced plots held an average of 76.50 (SE = 8.00) nests and fledged an average of 0.40 (SE = 0.05) chicks per nest (Table 2). The fledging rate in 1996 was the second lowest recorded since our studies began and, hence, was well below the average of 1.02 (SE = 0.08) chicks per nest for the Negit Islets for the last 13 years, 1983 to 1995.

Table 2. Reproductive success of gulls in eight fenced plots in 1996.

PLOTS	NESTS PER PER PLOT	CHICKS PER NEST 1-4 JULY	CHICKS FLEDGED PER NEST
Little Norway	43	0.70	.35
Spot	72	0.68	.50
Little Tahiti West	92	0.78	.37
Little Tahiti East	50	0.42	.18
Twain North	86	0.45	.35
Twain South	76	0.86	.51
Twain Northeast	114	0.60	.32
Twain West	79	0.82	.59
	<hr/>	<hr/>	<hr/>
$\bar{x} =$	76.50	0.66	.40
SD =	22.64	0.16	.13
SE =	8.00	0.06	.05

Reproductive Success

Based on the average number of young fledged per nest in eight fenced plots on the Negit Islets (Table 2) and the total number of nests there (Table 1), an estimated 7766 young fledged from the Negit Islets in 1996. Combining this total with the approximately 1430 young estimated to have fledged from the Paoha Islets (J. R. Jehl, Jr. in litt.) gives an estimate of about 9196 young fledged from Mono Lake in 1996.

Conclusions

There was no clear explanation for the low reproductive success in 1996. After two years of above average precipitation and runoff, 1996 saw a return to meromictic conditions in the lake similar to those in a prior meromictic event that lowered algal productivity (Jellison and Melack 1993). Brine shrimp (*Artemia monica*) abundance reached a peak later in 1996 than in other recent non-meromictic years (B. Jellison pers. comm.), suggesting that this important gull food may have been in lower than average abundance during the early chick rearing period. No studies, however, were conducted to explore the relationship, if any, between food availability and gull reproductive success.

Despite a rising lake level, breeding gulls in 1996 began to recolonize only one of three reisolated former nesting islands.

This low recolonization rate appeared to reflect the presence of a coyote on Negit Island, the gulls' memory of prior invasions of these islands by coyotes, and an ample amount of nesting area on other islands. That coyotes reached Twain at this lake level suggests they have learned that this island provides a food resource (gull chicks) that they are willing to expend increasing effort to reach as the lake rises. Research is needed in coming years during the anticipated continuing rise in lake level to document the period of time needed for the gulls to fully recolonize abandoned islands.

LITERATURE CITED

- Botkin, D., W. S. Broecker, L. G. Everett, J. S. Shapiro, and J. A. Wiens. 1988. The future of Mono Lake. University of California Water Resources Center Report 68.
- Jellison, R. and J. M. Melack. 1993. Algal photosynthetic activity and its response to meromixis in hypersaline Mono Lake, California. *Limnol. Oceanogr.* 38:818-837.
- Jones and Stokes Associates. 1993. Environmental impact report for the review of Mono Basin water rights of the City of Los Angeles. Draft. May. (JSA 90-171). Sacramento, Calif. Prepared for California State Water Resources Control Board, Div. of Water Rights, Sacramento.
- Patten, D. T. et al. 1987. The Mono Basin ecosystem: Effects of changing lake level. National Academy Press, Washington, DC.
- Shuford, W. D. 1985. Reproductive success and ecology of California Gulls at Mono Lake, California in 1985, with special reference to the Negit Islets: An overview of three years of research. Point Reyes Bird Observatory Report, Contribution No. 318.
- Shuford, W. D., E. Strauss, and R. Hogan. 1984. Population size and breeding success of California Gulls at Mono Lake, California in 1983. Final report for contract #14-16-0009-83-922 to the U.S. Fish and Wildlife Service.
- Shuford, W. D., P. Super, and S. Johnston. 1985. Population size and breeding success of California Gulls at Mono Lake, California in 1984. Point Reyes Bird Observatory Report, Contribution No. 294.
- State of California Water Resources Control Board. 1994. Mono Lake Basin water right decision 1631. State Water Resources Control Board, Division of Water Rights, 901 P St., 3rd Floor, Sacramento, CA 95814.