

# California Gull Research Continues On

*Research Still Extremely Relevant to Mono Lake's Recovering Health*

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Every year turns up new and interesting results when studying Mono's California Gulls, and 2003 was no exception. Beginning in late 2002 and continuing through the spring of 2003, the entire lake ecosystem experienced a dramatic change as it got close to emerging from a seven-year period of meromixis.

## **Meromixis and Monomixis**

Meromixis is a state in which the lake water is chemically stratified between a lighter, less salty layer overlying a deeper, saltier layer. Meromixis happens when there is a large and fast influx of fresh water into Mono's salty water, and a chemocline, or chemical stratification develops. The lake's most recent period of meromixis began in 1996. Although meromixis continues, there was substantial mixing of the lake last year.

During Mono's normal mixing regime, called monomixis, nutrients that settle down to the bottom of the lake are mixed throughout the entire water column. Monomixis is the result of the breaking down of the thermocline, or temperature stratification, each fall. It is quite similar to how meromixis works—only it's based on water temperature instead of water chemistry. During the summer months surface waters warm up and become separated from the colder, deeper waters, and nutrients and detritus settle down into the lower layer. In the fall the surface water begins to cool, eventually reaching the same temperature as the lower layer, the thermocline breaks down, and the waters mix—cycling the nutrients throughout the lake.

During periods of meromixis, this annual cycle of mixing is absent, and the nutrients on the lake bottom are unavailable to the biotic community. As a result, the species that depend on those nutrients suffer.

## **Meromixis Breakdown**

During the 2002–2003 winter months, meromixis was rapidly breaking down after several consecutive dry winters had succeeded in driving the chemocline down deeper in the water column and returning vast stores of nutrients to the rest of the lake. Meromixis did not completely break down during the 2002–2003 winter—the chemocline remained intact,

though at a much greater depth—but the mixing that did occur led to the highest levels of primary productivity ever recorded in Mono Lake. The lake took on a thick green color as algal populations exploded. These algae are a major source of food for the lake's brine shrimp, whose population also did remarkably well in 2003. The response of the gull population, however, was more complex and difficult to interpret.

## **Gull Research Results**

Nest counts indicate that only 39,830 adult California Gulls were nesting at Mono Lake in late May 2003—the second lowest count in the 21 years of this study. In recent years, the number of nesting gulls has been declining each year at a constant rate since a recent high of 49,300 gulls in 2000.

Although this may seem alarming at first, the decline could have a relatively simple explanation, and the trend will likely soon be reversed. During the early years of meromixis, from 1996 to 1999, gull reproductive success (measured as an estimate of the average number of chicks fledged per nest) was extremely low—ranging between 0.26 and 0.4 chicks fledged per nest. Starting around 2000, as meromixis began to weaken, reproductive success rose to more than 1.1 chicks fledged per nest from 2000 through 2003 (it was 1.18 in 2003).

California Gulls take four years to reach reproductive age, and therefore it seems likely that the declining number of nests in recent years can be explained, at least in part, by the exceptionally low reproductive success of the late 1990s. In addition, the much higher reproductive success starting in 2000 should translate to higher nesting numbers in the years ahead.

## **The Mysterious Long-legged Fly**

From 2000–2002 long-legged flies made up 10–20% of gull chicks' diets. Interestingly, almost no long-legged flies were fed to chicks in 2003. Additionally, full-sized larvae (the gulls only feed on the larvae) were difficult to find in high densities along shorelines where they had been hugely abundant from 1999–2002.

In sandy places where they were most abundant from 1999–2002, upwards of 200 full-sized larvae (~1cm in length) per sample were collected. Throughout the 2003



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*Banding chicks helps researchers measure gull reproductive success*

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summer, however, never more than 30 full-sized larvae were collected in a sample, but these samples did host thousands of tiny larvae (1–2mm in length). These tiny larvae persisted in the sands all summer, never growing en masse to full size.

Prior to 1999, research scientist Dave Herbst had not observed long-legged flies in the lake since the previous meromictic event (1983–1989), indicating that they are less salt tolerant than alkali flies. This leads one to wonder: has the slowly-dropping lake level just caused the salinity to reach a threshold the long-legged flies can no longer tolerate, or could all the salts returned to the mixolimnion (the upper layer) last winter have pushed them beyond their threshold?

While brine shrimp and alkali flies are the main prey items fed to gull chicks under most circumstances, long-legged fly larvae dominate the diets fed to chicks on windy days. Wind churns up larvae from the sandy beaches where they gather to pupate, and often thousands of gulls can be seen standing side by side along sandy shorelines on windy afternoons taking advantage of wind and waves to easily capture these larvae.

The disappearance of these flies may not affect the gulls too drastically (after all, the gulls seemed to do well during the last decades when the waters were not meromictic and the long-legged flies were not abundant), but foraging adults will have to focus their attention on other prey when Mono's winds are howling. It will be interesting to see the findings in the 2004 long-legged fly season.

### State Park Rangers – from page 11

State Historic Park, the Forest Service Scenic Area, and the Mono Lake Committee. They watched the evolution of the Mono Basin Scenic Area. They participated in the court cases and the 1994 State Water Resources Control Board's hearings that ultimately limited the amount of water being diverted from the Mono Basin by the Los Angeles Department of Water and Power. "After the 1994 SWRCB decision, we were able to incorporate Mono Lake's success story into our interpretive tours." More and more school groups were



Janet and Dave with sons Ryan and Nick (holding faithful friend Doggy) Christmas 1986.

### A Tenuous Safe Haven for Gulls

There were many wild and wonderful wildlife sightings in the 2003 season, not the least of which was a single coyote spotted on Gaines Island on August 23rd. Gaines Island is a remnant of the land bridge that once connected Negit Island—which at the time was home to two thirds of Mono's gulls—to the mainland. Rising lake levels have since isolated Gaines Island from both Negit and the mainland, and eventually the island will be completely covered with water when the lake reaches the target of 6392 feet above sea level.

As longtime Mono Lake Committee members are well aware, when the land bridge first emerged in the early 1980s, coyotes proved perfectly willing to sate themselves on gull eggs and they will likely do the same if given another opportunity. As the lake level has slowly declined these past few seasons the strait between the mainland and Gaines Island has narrowed, and this lone coyote managed to swim its way out there.

The strait on the other side of Gaines Island separating it from Negit and its islets—where the gulls currently breed—is wider, and this will hopefully grant the gulls sufficient safety. Keeping the channels between the islands and the mainland wide is essential to keeping the gull colony safe from predators, and the population recovery on track. ❖

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visiting the State Reserve, so the Carles developed educational programs to meet the needs of teachers and children who wanted to know where their water was coming from. "Working with school groups created some of our most satisfying memories."

The years at Mono Lake inspired David to become a writer, now with five published books on the environment to his credit. Janet has impressed Mono Lake visitors with her innovative interpretation skills. She invented a highly entertaining demonstration of a volcanic eruption, using the damp pumice sands along the shores of Mono Lake, and her intriguing song, "Bats Eat Bugs, They Don't Eat People" has delighted thousands of children as well as adults. They created the Moonlight Halloween Walk—an event complete with talking tufa towers, alkali flies and brine shrimp—a favorite of local Mono Basin residents and visitors.

David and Janet witnessed the re-flooding of the Negit Island land bridge in 1983. They constructed the first boardwalk across the marsh below the Mono Lake County Park. They were among the 320 people at South Tufa for David Gaines' Memorial Service in 1988. They watched Mono Lake rise while Lee Vining and Rush Creek were reborn. Today, you can often find Dave and Janet walking the shores of Mono Lake or hiking along the creeks, keeping a finger on the pulse of the thriving and vibrant State Reserve that they helped to create. ❖