FORAGING SITES OF WHITE PELICANS NESTING AT PYRAMID LAKE, NEVADA

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The food habits of White Pelicans (*Pelecanus erythrorhynchos*) have been surveyed repeatedly at Pyramid Lake, Nevada (Hall 1925, Bond 1940, Alcorn 1943, Marshall and Giles 1953, Woodbury 1966). Those surveys, based on fish regurgitated by chicks, showed that pelicans captured predominantly Tui Chubs (*Gila bicolor*) and Carp (*Cyprinus carpio*). The chub is an abundant fish indigenous to the lake, whereas the Carp occurs in low numbers. Pelicans were believed to capture Carp at surrounding wetlands.

White Pelicans traditionally nest on Anaho Island in Pyramid Lake. Although the island is now a national wildlife refuge for the species, the relevance of the lake fishery or the fisheries of surrounding wetlands to continued use of that site is poorly understood. The objectives of this study were to determine where pelicans forage in the Pyramid Lake region and to document chronological patterns in their use of the wetlands.

METHODS

Previous authors (op. cit.) speculated that pelicans foraged at five wetlands within 100 km of Pyramid Lake (Figure 1). We counted pelicans at the lake and each of those wetlands during 20 aerial surveys 28 April through 15 July 1976 and 25 March through 28 October 1977. Pelicans were discovered foraging at Honey Lake, California, 30 June 1976 and that site was included in subsequent surveys. Each survey commenced at 0900 and terminated about 1200. Pelicans on nests or loafing at breeding colonies on Anaho Island and Honey Lake (Tait et al. 1978) were not included in the counts.

Since pelicans forage at depths of less than a meter from the surface (Palmer 1962) and since Tui Chubs are deep-water fish that breed in shallow water, we monitored the availability of chubs to pelicans by sampling littoral zones of the lake during the first 2 weeks of each month, April through August, in 1976 and 1977. Netting operations, designed to estimate relative abundance, employed six overnight sets each of 16 m experimental gill nets and standard fyke nets. The design was similar to that described by Powell et al. (1971) and Walberg (1969).

RESULTS

Flocks of pelicans were observed flying between Pyramid Lake and other sites during each of our aerial surveys.

Pelicans were most numerous at the Humboldt River sinks and nearby Stillwater Wildlife Management Area (WMA) during the April and May 1976 surveys (Table 1). Few pelicans were seen foraging at Pyramid Lake or other areas. During June, numbers of pelicans increased dramatically at Pyramid Lake and declined at the Humboldt and Stillwater sites.

On the 17 June 1976 survey almost twice as many pelicans were counted at all sites as on the 7 June survey, and we suspected pelicans were foraging at one or more additional locations around Pyramid Lake. On 30 June we expanded our surveys and located pelicans at Honey Lake, California. Pelicans were also at Honey Lake during the 15 July survey. A total of only 93 pelicans were observed at Carson Lake, Lahontan Reservoir and Washoe Lake in 1976.

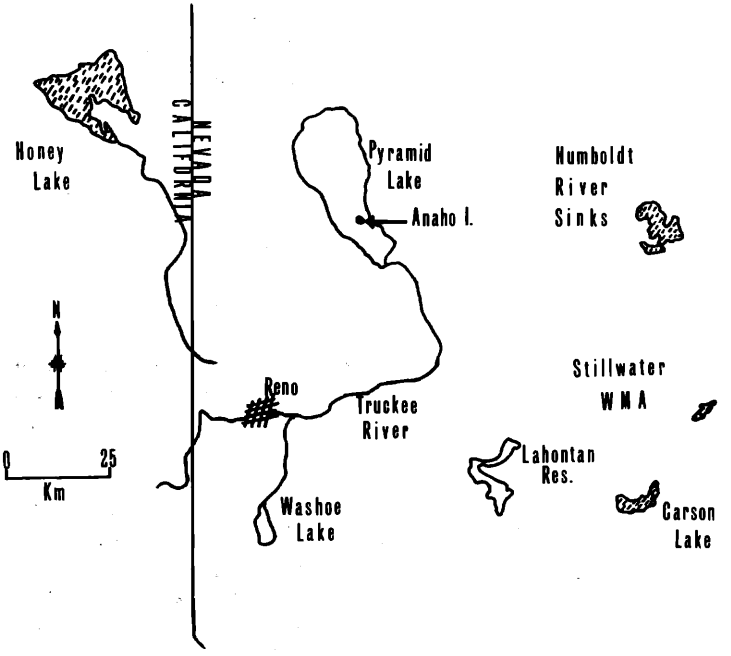

Figure 1. Location of Pyramid Lake and surrounding wetlands used by White Pelicans in western Nevada.

Table 1. Number of White Pelicans observed during aerial surveys of Pyramid Lake, Nevada, and the most heavily used surrounding wetlands, 1976 and 1977.

	Pyramid Lake	Humboldt River Sinks	Stillwater WMA	Honey Lake
1976				
28 Apr	109	2,050	326	—
20 May	243	940	1,095	—
7 Jun	1,535	72	81	—
17 Jun	2,991	178	149	—
30 Jun	398	327	179	2,790
15 Jul	364	462	97	3,422
1977				
25 Mar	15	72	86	1,318
7 Apr	260	223	553	1,480
21 Apr	500	115	1,350	0
10 May	2	268	505	0
2 Jun	1,951	535	0	0
15 Jun	2,932	1	7	0
23 Jun	3,331	1	47	0
8 Jul	719	1,285	38	0
15 Jul	567	960	217	0
3 Aug	493	1,157	423	0
17 Aug	5	1,480	593	0
27 Aug	7	1,350	550	0
12 Sep	147	950	500	0
28 Oct	0	0	0	0

Pelicans again used the Humboldt River sinks and Stillwater WMA sites April - May 1977, but also were observed at Honey Lake. They foraged predominantly at Pyramid Lake during June, then returned to the Humboldt and Stillwater areas July - September. Only seven pelicans were seen at other sites during 1977.

Foraging activity of pelicans on Pyramid Lake commenced with the appearance of Tui Chubs in littoral zones (Figure 2). The chubs occurred in relatively low numbers inshore most of the year, but moved into shallow areas in large schools to spawn in June. Although the chubs remained inshore into early August annually, pelicans discontinued foraging on the lake in late June.

DISCUSSION

In the Pyramid Lake region, White Pelicans selected food items most available within a meter of the water surface. Each spring pelicans foraged heavily in the shallow marshlands of the Humboldt River sinks and Stillwater WMA. Carp were the predominant fish at these sites.

The pelicans switched foraging sites to Pyramid Lake as large schools of Tui Chubs moved into shallow water to spawn. The pelicans' abandonment of this food source in late June suggests they were responding to something besides the mere presence of chubs in shallows.

We suspect that pelicans cued on spawning behaviors of chubs which occurred only in June. Spawning chubs move with quick jerking motions, often rolling on their sides and occasionally breaking the surface of the water. The spawning behavior, from the air, appears similar to the movements of fish foraging or trapped in shallow water at surrounding wetlands.

During late 1976 and early 1977, pelicans foraged in greatest numbers at Honey Lake. During this period water levels of that lake were dropping rapidly, stranding many fish (mostly Carp) in shallow

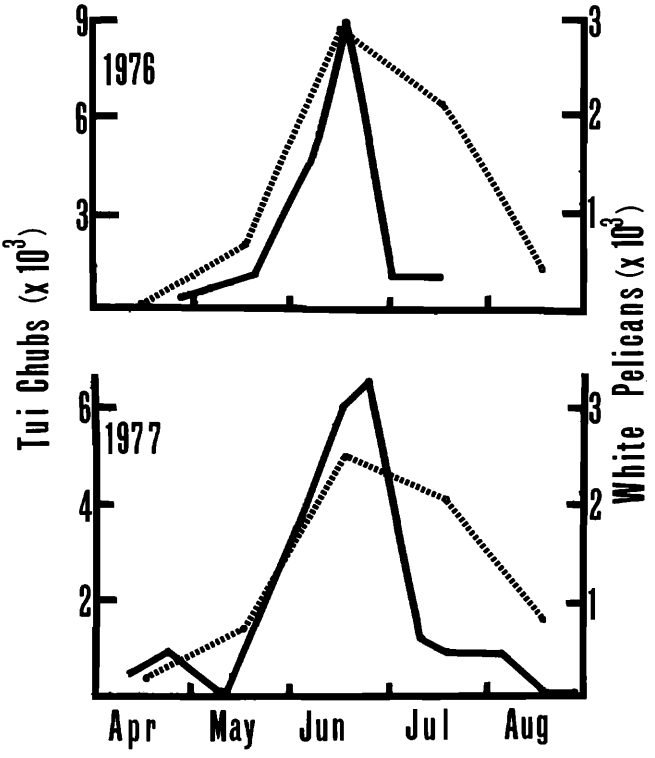

Figure 2. Numbers of Tui Chubs captured in littoral zones (dashed line) and White Pelicans counted on Pyramid Lake (solid line), April through August in 1976 and 1977.

water. The lake was dry by late spring 1977. Similarly, pelicans utilized the Humboldt River sinks intensively in summer 1977 as its water levels were dropping rapidly.

The White Pelican is opportunistic in selecting foraging sites where fish are most readily available. The dramatic switching of sites by most of the population two to three times during the nesting season does not appear tied to the reproductive cycle. Pelicans foraged at marshlands during the periods of mating, egg laying and incubation. They switched to Pyramid Lake (certainly the most energy-efficient site because of its proximity to the nests) when most nests contained small chicks. When chicks were largest, and energetic demands of reproduction were greatest for adults, the pelicans again began foraging at the most distant sites.

Historically, continental White Pelican populations have declined dramatically. These declines were believed due to human disturbance at nesting colonies and draining of marshlands where pelicans forage (Lies and Behle 1966). Many of the islands where pelicans nest, as Anaho Island, are now protected as wildlife refuges. This study indicates, however, that maintenance of wetlands within 100 km of those islands is equally as essential as reduced human disturbance to continued use of a site by pelicans.

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White Pelicans *(Pelecanus erythrorhynchos)*, 3 May 1974, Lower Klamath NWR, Siskiyou County, California. Nikon 400 mm lens, f/5.6 at 1/500 sec., K-64 film.

Photo by Ray Ekstrom