A SEARCH FOR THE TYPE LOCALITY OF SPEYERIA NOKOMIS APACHEANA

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The first specimens of Speyeria nokomis apacheana (Skinner) were brought back by the Wheeler Expedition of 1871, and were collected by Ferdinand Bischoff, a naturalist attached to the Expedition as a hospital orderly. The section of the Survey containing Bischoff spent much of the field season of 1871 in Nevada and east-central California. A careful analysis of Bischoff's itinerary (Brown, 1957) during this period shows that the collector's residence at Fort Independence in the Owens Valley of California from the 18th of July to the 10th of August corresponds to the flight period of apacheana in present-day Inyo County. Since Bischoff probably was limited in his explorations by a combination of the summer heat and the limited transportation at his disposal—walking or horseback, and the fact that Bischoff did not encounter the Round Valley colonies of apacheana further north, it has been assumed by Brown (1957).
that the type locality for *apacheana* lies in the mountains and valleys west of Camp Independence.

During the flight period of *apacheana* in the summer of 1966, Sam Johnson and I made a thorough survey of the area within a 40-mile radius of old Fort Independence in search of existing colonies of *apacheana* or indications of old spots where the butterfly may have once occurred, in an attempt to determine the original type locality. The purpose of this paper is to present the details of this search, and analyze its result.

In my experience with *nokomis* in Colorado, Utah, and in the Round Valley area of California, I have discovered that the conditions for the maintenance of a *nokomis* colony are remarkably similar in a number of localities. The primary factor necessary is an abundant and constant source of water, below 7000 feet in altitude, such as that provided by a large spring that can withstand a prolonged drought. With this surface water, a marshy meadow is formed containing a growth of sedge grass, scrub willows, cottonwoods, reeds, *Phragmites communis* (Trin.), purple thistles or burdock, and violets. The meadow can be quite small, but must support a substantial population of food-plant violets. It was for this specialized environment that we searched in the area of Fort Independence.

In the rain shadow of the Sierra Nevada range, the Owens Valley receives very little moisture in the form of precipitation. The little water reaching the floor of the Valley is contained by the few streams that run out from the higher peaks, and a series of springs that break out at the foot of the mountains. The alluvium on the floor of the Valley is so uniform in its deposition that little water emerges along spring lines, and practically none wells to the surface to form meadows. An exception is Round Valley north of Bishop, the metropolis of *apacheana*, where a tremendous quantity of water comes to the surface to make a marshy area several miles square. The Owens River, originating on the Mono Plateau north of Bishop, flows south through the Valley to nearly dead Owens Lake south of Lone Pine. Providing an important water source for the City of Los Angeles, the Owens has been enclosed in an aqueduct and diverted away from its original bed. The Inyo Mountains bounding the east side of the Valley are extremely dry, and there appears to be only one permanent stream in the whole range. The soil of the Valley is sandy, and vegetation sparse in dry areas. Because of this general scarcity of water a search for a suitable locality for *apacheana* can immediately be narrowed to the few moist spots in the Valley.

An investigation of wet meadow areas began within a ten-mile radius of old Camp Independence. This restricted area would be about the possible range that Ferdinand Bischoff could cover in a day's outing.
There are only four permanent streams that apply to this radius that emerge from the nearby Sierra Nevada. These are Symmes Creek, Independence Creek, Oak Creek, and Thibaut Creek. All these water sources are precipitous, juvenile streams that drop so rapidly that there is no side cutting or deposition of alluvial material until an alluvial fan is reached on the valley floor. The streams are constantly shifting their beds across their alluvial fans, and stream banks are covered with boulders. As a result, no stream marshes or meadows are formed on the upper reaches of these water courses. As the streams terminate on the valley floor, they are channeled directly to the aqueduct or are impounded as trout rearing ponds. With the lack of success along the streams, attention was turned to the springs in the area.

In the vicinity of Independence there are two types of springs. One group emerges along a line between 6000' and 6400' at the base of the Sierra Nevada. The other group wells to the surface on the floor of the Valley on a line at 3840'. Many of the springs at higher elevations are fed by only enough water to support a small area of sparse grass, a clump of reeds, and one or more live oaks. Others, such as Grays Meadow on the Onion Valley road about five miles west of Independence; Tub Springs, about 5½ miles directly west of Independence; and Scotty Springs, about five miles southwest of Aberdeen, put out sufficient water to support a small lush area of sedge grass, willows, and a small grove of oaks *Quercus kelloggii* (Newb.). At Lower Grays Meadow Campground there is a small sedge marsh about fifty feet wide by a hundred feet long on the north side of Independence Creek that is fed by a small spring line. There are extensive willow patches, and an area of extremely wet sedge grass. Because of the abundance of water, and the long-standing existence of the marsh, this locality appeared to me to be a perfect environment for *nokomis*. However a careful search in grass clumps and under willow thickets revealed no foodplant violets, and thus there appears to be no possibility for the occurrence of *apacheana* or any other *Speyeria* in this locality. Of particular interest was Tub Springs, which forms a long narrow marsh with an extensive growth of willows, sedge grass, oaks, and most important, numerous clumps of violets. The violet species found in Tub Springs did not appear to be of the type found in the Round Valley locality, being a smaller plant with a much smaller leaf size. *S. apacheana* was not found during repeated investigations of the springs. The only *Speyeria* seen in the area was *Speyeria zerene malcomii* (Comstock), which ranges from 6400' at Tub Springs up to about 8400' in adjacent Oak Creek. The only other spring at a comparable elevation with a large volume of water is Scotty Springs. However, the original configuration of this area has been altered by the
diversion of these springs for electric power. The springs on the floor of the Valley have all nearly dried up, or have been utilized for human purposes. According to an old map circa 1900, Black Rock Springs, about seven miles north of Old Camp Independence, formed numerous marshes and small ponds. Presently, this water source has been made into trout rearing ponds, and other smaller springs are channeled into the Los Angeles aqueduct or have been made into stock ponds. Hines Spring near Aberdeen no longer reaches the surface, and only a line of old cottonwoods marks the bed where it once flowed. There are numerous dry lakes over the floor of the Valley that appear to contain water only in wet seasons. The only active spring found on the floor of the Valley, about 4 miles directly east of Fort Independence, contained a large stand of _Phragmites communis_ and other grasses, but no violets.

In 1913 the Owens River was diverted into the Los Angeles Aqueduct just east of Aberdeen. Therefore, none of the original river flows into a ten-mile radius of Fort Independence. The river above its point of diversion meanders in entrenched banks, with very few backwaters. The country through which the river flows between Bishop and Independence is quite alkaline, with _Atriplex_ (Chenopodiaceae), _Chrysothamnus_ (Compositae), salt grass, and other arid growth occurring on the river banks. Because of this harsh environment for violets, the possibilities for colonies of _Speyeria nokomis_ along the Owens River in the central part of the Owens Valley seem quite remote.

The vicinity of Fort Independence itself is quite green in terms of the surrounding country, but this lushness seems to be primarily due to irrigation water from Oak Creek, which provides sustenance for the fields of the Fort Independence Indian Reservation. The Reservation has been under continual irrigation since the time of Bischoff’s visit to Fort Independence, and it is difficult to determine the original configuration of its water supply during this early period. Some of the willow trees in the windrows separating hayfields are very old, but whether they were growing in wet areas before the advent of irrigation, I would not venture to say. Any present concentration of water appears to be channeled irrigation water. No violets of any sort were discovered, even in the dampest and most undisturbed areas of the Reservation.

With the failure to discover _apacheana_ in the Independence area, we decided to determine the southern limits of its distribution in the Owens Valley. The first large stream north of a ten-mile radius of Independence is Big Pine Creek that flows through the town of Big Pine. A fault scarp formed by an earthquake in 1872 forms a long spring line in the west part of town. This wet area and stream marshes on Big Pine Creek were investigated thoroughly, but neither specimens of _apacheana_ nor violets
were seen. Keough Hot Springs between Big Pine and Bishop have been diverted for human use. The last major water source before reaching Round Valley is Bishop Creek. This stream is highly disseminated by irrigation as it reaches the town of Bishop. Although water is abundant, natural undisturbed marshes are difficult to find. The southernmost colony of nokomis discovered in the Owens Valley was in an extensive undisturbed sedge meadow two miles west of the Bishop city limits near the Izaak Walton fish ponds. A fresh male of apacheana was observed, and violets were found down in the grass in a wet spot in the meadow.

The results of this investigation indicate that there are at present no colonies of apacheana south of the city limits of Bishop, 40 miles north of the proposed type locality. However there are localities within the range of Bischoff’s wanderings that may have once held populations of apacheana. The following are hypotheses that may explain the disappearance of this insect from the Independence area in the last hundred years.

The best explanation for the absence of violets of the proper species, and the elimination of apacheana from the Independence area is a general warming and drying of the Owens Valley. Mean annual temperatures from climatological data issued by the U.S. Weather Bureau indicate that from the second to the sixth decade of the current century the valley appears to have warmed about 2° F. Thus the Fort Independence area may be as much as 4° warmer than it was when Bischoff was there. Precipitation data are more complete for Camp Independence than are temperature data. The three decades that have been arbitrarily selected and the mean annual precipitation for each are: 1866–1875, 6.75 inches; 1906–1915, 5.93 inches; 1951–1960, 4.52 inches. This desiccation may have been a factor in the elimination of apacheana from the vicinity of Camp Independence if Bischoff collected it there. Local conditions seem to bear out these statistics. The Palisade Glacier above Big Pine has been retreating in recent years. A decrease in size of a spring line directly east of Independence near the Owens River appears to be taking place. This is indicated by extensive dark spring soil deposits at some distance away from the present boundary of the marshy area. The general scarcity of large cottonwoods and willows away from irrigated areas near Independence indicates that the central part of the Owens Valley has not been wet for some time. The Bishop vicinity, presently containing colonies of apacheana, appears to be appreciably cooler and wetter than Independence further south. Maximum temperatures are identical at 109°. Minimum temperatures are −15° F. for Bishop and −5° F. for Independence. Average January temperature for Bishop is 37.6° and for Independence 39.0°. Average July temperature for Bishop is 73.1° and for Independence 78.3°. The growing season is 152 days at Bishop and
200 days at Independence. The average annual precipitation for Bishop is 7.49 inches and 4.49 inches for Independence. These figures indicate that conditions may no longer be proper for the existence of a colony of *apacheana* on the floor of the Owens Valley as far south as the town of Independence.

Crustal movement may have played a significant part in the exposure of the water table in the Owens Valley. The earthquake in 1872 formed a fault scarp just west of Big Pine. This fracturing is apparently responsible for an extensive spring line that presently exists on this scarp. Other upheavals during this period may have altered the level of the water table sufficiently to destroy existing springs and create new ones.

Because of his peculiar dealings with water in the Owens Valley, man may have played a significant part in determining the fate of colonies of *apacheana* in the proposed type locality. In the early 1900's, the city of Los Angeles bought the water rights to nearly every water source in the Owens Valley. This water was brought away from irrigated farms and diverted directly into the aqueduct that was constructed. This channeling of streams and springs may have destroyed natural wet areas they once supported. Water sources not owned by Los Angeles are under intense human use. Many springs have been enclosed as stock ponds, and marshy areas are cut up by grazing cattle. If the types of *apacheana* were taken in the immediate vicinity of the old Fort, subsequent diversion of surface water and tilling of the soil may have obliterated any natural marshes. Extensive well operations where the water table approaches the surface may have destroyed springs that previously emerged on the surface in the middle of the Valley.

**Conclusions**

No colonies of *Speyeria nokomis apacheana* presently exist in the vicinity of old Camp Independence in the central part of the Owens Valley of Inyo County, California. Therefore, the type locality proposed by Brown (1957) can probably never be absolutely confirmed unless records for *apacheana* are discovered for the Independence area for the period between 1871 and the present. Localities appearing perfect in every respect to me for the occurrence of the species except for violet populations can be found in the immediate area of Fort Independence. This indicates that *apacheana* may have once occurred in this part of the Owens Valley, but was eliminated in the past one hundred years by a multiplicity of factors which cannot be surely defined. The extent of man's influence on the previous existence of *apacheana* cannot be determined by the very vagueness of the exact type locality, but I suspect that climatic conditions have played a much greater part in its extermination.
than the efforts of man to concentrate the water of the entire Owens Valley into one canal. In Round Valley, *apacheana* has survived man's water diversion, spraying of herbicides, and intensive grazing of livestock. It is the tremendous vitality provided by a continuing supply of water that has maintained the proper environment for the foodplant violets for generations of this beautiful butterfly despite these external pressures. Because of the failure to achieve its objective, the results of this search cannot be termed a success. However, the problems encountered in the reconstruction of a past environment, and the changes in this environment over a period of time might be of some interest to the student of historical research on Lepidoptera.

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**Literature Cited**


