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INTRODUCTION

IN THE SUMMER of 1830 a new disease appeared on the banks of the lower Columbia River which rapidly incapacitated most of the white settlers and decimated the native population. In the course of the year 1833 what seems to have been the same malady overtook white man and red man alike in the great Central Valley of California. The origin of this epidemic has been long under discussion, and several conflicting opinions have been expressed concerning its nature. There is little doubt, however, about its significance for it was directly responsible for the destruction of the Sacramento River and Columbia River tribes, thereby facilitating the settlement of these valleys by the Americans. In view of the scattered sources of information about the epidemic and the unsatisfactory state of our knowledge it seems desirable to make a comprehensive survey of the evidence and present those ethnographic and demographic conclusions which appear to be warranted by such evidence.

With regard to the California phase of the epidemic, as we may term it, there have been to my knowledge only two attempts to give it reasonably complete consideration. One of these consists of some comments of my own (Cook, 1943) in connection with a discussion of disease as a demographic factor in the mid-nineteenth century. The other is a short paper by Twitchell (1925), in which some of the available evidence is reviewed from the medical point of view. Neither of these treatments can be regarded as adequate. The Oregon or Columbia phase is covered at some length, although not with specific reference to this epidemic alone, by Scott (1928) in his paper on Indian diseases in the Northwest, and by Stage and Gjullin (1935) in their study of malaria in the Northwest. No publication emphasizes the association between the Columbia and the California phases. Hence in the present article it will be necessary to recapitulate much of the documentary material cited by these authors.

Although many, if not most, matters pertaining to the epidemic of 1830–1833 are closely interrelated, it will be convenient to present the story in three parts or aspects and run the risk of a certain amount of repetition. The first is the nature of the malady, a problem which as yet has not been clearly solved. The second is the origin and territorial course taken by the epidemic. The third is an evaluation of the damage to the native populations, particularly in California.

THE NATURE OF THE MALADY

Of the modern commentators Scott (1928) makes no attempt to ascertain the nature of the diseases which he describes. Stage and Gjullin (1935) entertain no possibility for the Columbia Valley epidemic other than malaria. Twitchell (1925, p. 593), writing in *California and Western Medicine,* vigorously denies malaria

for the California phase ("Malaria is not to be thought of"), but mentions several other possibilities, including smallpox, cholera, typhus, and measles. My own remarks pertaining to Twitchell's discussion (Cook, 1943) may be reviewed briefly. Smallpox can be excluded since everyone in the West a hundred years ago was thoroughly familiar with this disease and could recognize it immediately. Furthermore, John Dunn (1844, p. 115) explicitly states that although smallpox had been on the lower Columbia, "after having enjoyed a considerable respite from this visitation . . . they were again, in 1829, and some subsequent years, attacked by another malady. . . ."

Twitchell says that cholera "might easily enough have swept through a valley with a common water supply. . . ." In addition to the fact that the tribes living along the Sacramento and San Joaquin rivers and their affluents did not have a "common water supply," the white settlers and explorers in both California and Oregon were acquainted with cholera and would have been able to diagnose it. Likewise measles would have been detected; this disease had been common in the missions during the first years of the century and California inhabitants were familiar with it. Thus Alexander Taylor makes a clear distinction (1860–1863, Series 1, folio p. 2). Speaking of the coastal Indians he says: "The small pox, the measles, and the terrible fever and ague which attacked the Indians of the Columbia River, carried off thousands. . . . This fever and ague likewise destroyed immense numbers of the Sacramento and San Joaquin Indians." He was in error about fever and ague on the coast, but correct so far as concerns the Central Valley. Similarly J. J. Warner (in Gilbert, 1879) at the end of his description of the epidemic in the San Joaquin Valley states flatly: "The disease presented none of the symptoms of cholera."

Typhus and plague are highly unlikely. There is no direct documentary evidence that either disease was present to a material extent in California or Oregon at this period. The introduction would have required the mediation of the domestic rat or some other rodent, and for a massive penetration of the interior either a heavy invasion of introduced rats or a very rapid infection of the native rodent population would have been essential. For neither of these contingencies has there ever been any indication. Furthermore, the entry of the epidemic would almost certainly have been from the coastal ports eastward to the interior. That its true course was from the north into the upper Sacramento Valley and thence southward is clearly demonstrated by the discussion in a later section of this study.

We may now examine some of the statements made by contemporary observers, most of which pertain to the Columbia rather than to the California phase of the epidemic. For this purpose it will be desirable to cite verbatim a series of quotations.

Charles Wilkes (1844, vol. 5, p. 148): "The climate throughout Oregon is thought to be salubrious for the white race; and was considered so by the Indians, prior to the year 1830, when the ague and fever, or any disease resembling it, was not known to exist."

Charles Wilkes (*ibid.*, p. 195): He mentions an Indian tribe at the mouth of the Feather River in California ". . . all of whom are said to have died, within a few years, of the tertian fever . . ."

David Douglas (1836): "October 11, 1830 . . . A dreadfully fatal intermittent fever broke out in the lower parts of this river about eleven weeks ago. . . . I am one of the few persons among the Hudson Bay Company's people who have stood it. . . ."

Dr. W. F. Tolmie (1833 ?): "All through the year 1833 intermittent fever was very prevalent . . . All through the Shoshone country and thence throughout the region of the hypothetical river Buenaventura [i.e., the Sacramento River], round Klamath and Pyramid Lakes and along the Willamette and Columbia Rivers the disease raged."

John McLeod (1914) wrote on February 25, 1831: "The intermitting fever which broke out here in August . . ."

D. Lee and J. H. Frost (1844, p. 132): "In the month of August, in the time of harvest, the intermittent fever began to shake its burning, freezing subjects."

D. Lee and J. H. Frost (*ibid,* p. 108): "The epidemic *ague,* which has already been mentioned . . . which has swept away great numbers of the natives, and proved an annual scourge to the white man commenced . . . in 1830 . . ."

George T. Allen (1881): "In the fall of the year 1832, the fever and ague was very prevalent at Vancouver, and at one time we had over 40 men laid up with it. . . . and I well remember my tramps through the men's houses with my pockets lined with vials of quinine . . ."

Nathaniel J. Wyeth (1899, p. 180): ". . . the main disorder is an intermittent fever which has carried off all or nearly all the indians . . ."

Samuel Parker (1846, pp. 191–192): "Since the year 1829, probably seven eighths . . . have been swept away by disease, principally by fever and ague . . . This great mortality extended not only from the vicinity of the Cascades to the shores of the Pacific but far north and south; it is said as far south as California. The fever and ague was never known in this country before the year 1829 . . ."

John Dunn (1844, p. 115): ". . . in 1829 . . . attacked by another malady, equally fatal—fever, attended with ague."

Dr. John McLoughlin (1941, p. 88, letter of October 11, 1830): "The Intermitting Fever (for the first time since the trade of this Department was established) has appeared at this place. . . . at present there are fifty two of our people on the sick list . . ."

Dr. John McLoughlin (1944, p. 280, letter of March 24, 1845): "To prove that this accusation is a mere malicious slander on Mr. Kelly's part, it is sufficient here to state that the fever prevalent here to which he alludes is the intermittent fever, which as is well known is caused by Marsh Miasma . . ."

"Trapper" (n.d.): On the Sacramento River, ". . . It was a fever of the remittent class. . . . We were informed by the Indians that they have no traditions of any similar scourge in past time." He subsequently refers, in the same connection to the "malaria of the marshes."

John Work (1945, p. 2): August 21, 1832, at The Dalles, Oregon, "There are a great many Indians here at present, some few of them have the ague . . ."

John Work (1945, p. 19): December 2, 1832, on the Feather River, regarding Indians seen: "There appears to be some sickness resembling an ague prevailing among them."

J. J. Warner (in Frank T. Gilbert, 1879, p. 12): "This disease . . . appeared, so far as I could judge (and I came near dying from it) to be a most acute and violent type of remittent fever. It attacked members of our party, when we were upon the San Joaquin near the Merced River, and nearly every one of our party suffered from it."

Philip L. Edwards (1837, p. 27): "The intermittent fever sometimes fearfully prevails." Referring to 1833 he says: "This disease seems to have prevailed with like fatality from the Bay of San Francisco to the Columbia River in these fatal times. Previous to 1829 it was unknown in the Columbia. Its greatest mortality seems to have been from about 50 to about 100 miles interior."

Peter S. Ogden (1933, pp. 67–68): "Returning to Fort Vancouver on the Columbia, after a short absence in the autumn of 1830, I found a few of the servants suffering under an attack of intermittent fever . . ."

Peter S. Ogden (1933, p. 71): "To suppose it contagious from personal contact would be very erroneous, since it doubtless proceeds from miasmata prevading the atmosphere."

Hall J. Kelley (1932, p. 141): In the autumn of 1834, after entering Oregon from California, "My party was providentially made to halt at the very moment when the fever and ague contracted, while on the low and pestilential tracts on the southern region of the Sacramento Valley, was having its worst effect on me . . ."

William A. Slacum (1837, p. 16): mentions "fever and ague" on the Willamette and says it began on the Columbia in 1829.

Nathaniel J. Wyeth (1839, p. 17): "Since 1829 an intermittent fever has carried off vast numbers of these Indians . . . and as it prevails below the California mountains in the salmon season, far less opportunities are offered of trading fish of them than formerly."

Dr. John K. Townsend was a member of the Philadelphia Academy of Natural Science and of the American Philosophical Society. He was a physician and scientist of eminence and distinction. His statements merit complete credence. He says in his *Narrative,* 1905, p. 307: "A disease of a very fatal character is prevalent . . . The symptoms are a general coldness, soreness and stiffness of the limbs and body with violent tertian ague. Its fatal termination is attributable to its tendency to attack the liver, which is generally affected in a few days after the first symptoms are developed."

John K. Townsend (1905, pp. 342 ff.): Here is the account of the treatment of a Kowalitsk Indian child, May 13, 1836. In one of the lodges was "a very pretty little girl sick with intermittent fever." After treatment to no avail by the local medicine man, Townsend offered to help her. "I immediately administered to the child an active cathartic, followed by sulphate of quinine, which checked the disease, and in two days the patient was perfectly restored." He then administered quinine to two other children similarly afflicted, but this exhausted his supply of the drug. However he made a decoction of the bark of the dogwood (*Cornus nuttallii*) which he claimed cured the children. About the latter remedy he says: ". . . I believe if they had used it, they would not have had to mourn the loss of hundreds, or even thousands of their people who have been swept away by the demon of ague and fever."

The foregoing citations, including the testimony of three physicians, Tolmie, McLoughlin, and Townsend, establish beyond reasonable doubt that the epidemic introduced in 1829–1830 along the lower Columbia River was "fever and ague," or "intermittent fever." It is a matter of common medical knowledge that the infection referred to by these terms in the mid-nineteenth century was malaria. Therefore with justification Stage and Gjullin (1935) write the following sentences: "It was therefore with considerable interest that the authors in their mosquito studies of this region discovered numerous accounts of malaria by old residents or visitors. It appears to have been introduced over one hundred years ago, to have been an important factor in the decimation of the Indian tribes of that time, and since to have remained, with varying degrees of intensity, endemic to at least the Willamette Valley, in Oregon." Also: "While there may be uncertainty as to the disease to which early historians refer, it nevertheless seems likely that it must have been malaria. . . ."

Twitchell (1925) denies the existence of malaria on the ground that ". . . it is never so fatal and never comes in such waves. Even races without any acquired immunity do not suffer in such degree." This extraordinary virulence and speed of infection, indeed, has always caused doubt with reference to a malaria theory of the 1830–1833 epidemic. On the other hand there is still further evidence which may be considered.

Regardless of prior events it is unquestioned that malaria was thoroughly established in the Columbia Valley and the Central Valley of California by the year 1850 (Praslow, 1857; Stage and Gjullin, 1935; Jones, 1935; Herms and Gray, 1944; Boyd, 1949). Under certain circumstances during this period the disease reached really epidemic proportions. As an example may be cited the very high incidence in the United States Army among those troops and only those troops stationed in the Sacramento Valley (reference may be made to the extensive data in the report by Coolidge, 1856). In discussing this situation Herms and Gray offer the following explanation: "The observed characteristics of this mosquito (*Anopheles maculipennis*) also explain why malaria was such a scourge of the gold camps . . . though it does not directly explain the terrific epidemics of malaria in the United States army posts. . . . However the outbreak of malaria near Lodi in 1934 and 1936 showed that when large numbers of both infected and noninfected persons camp out in the open under relatively primitive conditions (which occurred in the great depression migration of 1934 to 1937) the transmission of malaria by the available vector anophelines is bound to occur. Probably the conditions in 1852–56 and 1934–36 were similar." To which might be added the similarity of the conditions on the Columbia and the Willamette in 1829–1833.

In the matter of nonimmune, or sensitive populations, L. W. Hackett in Boyd's *Malariology* (1949, pp. 731–732) makes the following remarks: "Intense epidemics occur when an efficient vector achieves an extraordinary multiplication in the midst of a population with little or no immunity." He then mentions the Russian epidemic of 1922 in which many million persons perished. "Fulminant malaria is also produced by the invasion of new territory by an efficient vector. . . ." "These violent and explosive epidemics are characteristic of the cyclic and annual variations of temperate climates. . . ."

A final, although subsidiary point for consideration is the distribution of the 1830 pestilence. Noteworthy is the fact that at least the serious effects were confined to the lowlands of the two great river systems, together with, perhaps, the shores of the larger interior lakes (Tolmie, 1833 ?). The San Francisco Bay area, and the basins of the short coastal streams as far north as central Oregon definitely were not involved. It is significant that this distribution coincides very closely with that of the most important malaria carrier on the Pacific Coast, *Anopheles maculipennis freeborni,* which inhabits the interior strictly, whereas the coastal strip for a distance of perhaps 50 miles inland is exclusively populated by *A. m. occidentalis,* a relatively harmless anopheline (see Aitken, 1945, fig. 1).

From the preceding discussion, and from many more references which might be adduced, it is reasonable to formulate the definite conclusion that a malaria epidemic of unusual severity spread over the low interior valleys of the Pacific Coast in approximately the year 1830. With the weight of historical, entomological, and medical opinion with us we may proceed to examine briefly the course and effects of the epidemic.

THE ORIGIN AND COURSE OF THE EPIDEMIC

According to Douglas (1836) the epidemic became noticeable at Fort Vancouver in mid-July, 1830, and according to McLeod (1914) in August of that year. McLoughlin (1941) first mentions it in his letter of October 11, 1830, at which time the disease had already done considerable damage. The first flare-up thus seems to have occurred in the late summer of 1830.

Various hypotheses were advanced at the time to account for the sudden visitation, some of which were rather absurd. The most popular theory was that the infection was brought in by the crew of the brig *Owyhee* (see Wilkes, 1844, vol. 5, p. 148; Slacum, 1912, p. 189; McLoughlin, 1941; Victor, 1901, p. 39, and many others). McLoughlin says this ship, under Captain Dominis of Boston, arrived at Fort Vancouver in February, 1829, and sailed in July, 1830. In the interval her personnel engaged in the fur trade with the natives. If some of her crew were infected with malaria, there is no reason why the disease might not have been transmitted to the native and the white inhabitants of the area through the local mosquitoes. If the *Owyhee* was responsible, however, we have to assume a latent period in the appearance of the active infection of at least one year, for the summer of 1829 passed without any perceptable, or at least recorded, illness.

It is quite likely, moreover, that the *Owyhee,* being an American ship and a disliked competitor in the fur trade, may have been selected as the responsible agent largely for political reasons. This theory seems to be supported by the acrimonious controversy—irrelevant from the epidemiological point of view—concerning McLoughlin's activities in propagating stories among the natives. There is no more reason to ascribe the origin of the malaria to the *Owyhee* than to the *Dryad,* the *Isabella,* or the *Vancouver,* all British ships which, as set forth by McLoughlin in his letters (1941), dropped anchor in the Columbia during the years 1829 and 1830.

Whether by means of the *Owyhee* or of some other ship, the theory of a seaborne invasion of malaria makes a good deal of sense in view of the prevalence of

the disease in the Hawaiian Islands and other semitropical ports encountered by all these trading ships of the era. Another point in favor of this hypothesis, although by no means proof, is the fact that the first outbreak occurred exactly at Fort Vancouver, among both the white garrison and the immediately adjacent natives. Had the epidemic been derived from overland we would expect to hear of cases along the upper Columbia or in eastern Oregon before the western corner of the state.

Nevertheless the possibility that the infection originated in the East cannot be lightly dismissed, in spite of contrary opinion at the time. The men who had settled at Fort Vancouver, the Hudson's Bay Company traders and trappers, had all reached that point from the plains and Rocky Mountain region. The post was being visited continually by other immigrants who arrived by way of the same general route. Since the upper Mississippi and Missouri basins were at that period suffering heavily from malaria—which in turn had moved up from the southern United States—it would have been really surprising had the disease not penetrated to the Pacific Coast. Hence, although the initial outbreak at Fort Vancouver may have had a maritime origin, it is highly probable that the continuance and territorial extension of the pestilence were facilitated by reinfection and reintroduction by infected hunters and trappers.

At its peak the northern epidemic embraced roughly the lower 200 miles of the Columbia and the lower 100 miles of the Willamette rivers. McLoughlin (1941, p. 233, letter of October 21, 1831) says the mortality was great among the Indians "from Oak Point to the Dalles." Oak Point is on the Washington side, a few miles above the mouth of the river. Parker (1846) says that it extended "from the vicinity of the Cascades to the shores of the Pacific." Parker, and also Wyeth (1899, p. 148), mention the epidemic as particularly destructive on the Wappatoo (or Sauvies) and Deer islands at the mouth of the Willamette. Minto (1900) in his discussion mentions that the malady was still prevalent in 1843 and comments that it apparently was confined to the villages along the large rivers. Stage and Gjullin (1935) quote manuscript sources to show the manner in which the white population on the Willamette was afflicted by malaria.

Just how far beyond the lower river courses the epidemic penetrated is difficult to determine with precision. Ernest C. Faust, writing on "Malaria Incidence in North America" in Boyd's *Malariology* (1949, p. 750) publishes a map depicting malaria distribution in the United States "circa 1850." The occurrence is confined to the lower river counties on both banks: Clatsop, Columbia, and Multnomah in Oregon; and Pacific, Wahkiakum, Cowlitz, Clarke, and Skamania in Washington. His sources of information are not given by Faust, and it is probable that he erred on the side of conservatism. Ogden (1933, p. 71) suggested that the epidemic had come up from the Spanish settlements because it had not gone north of the Columbia, nor is there any other indication that more than the north bank of the river itself was ever affected.

Regarding a southerly extension we have a comment by Townsend (1905, p. 334): "About two hundred miles southward [i.e., at approximately the Umpqua River] the Indians are said to be in a much more flourishing condition . . . They believe that we brought with us the fatal fever which has ravaged this portion of

the country, and the consequence is, that they kill without mercy every white man who trusts himself among them." Together with the preceding quotation may be taken the statement of Talbot (1849, p. 115) that at Celeetz (Siletz) Bay, Oregon, an old Indian said that only two families survived at that locality, ". . . the last lingering remnants of a large population which once dwelt upon these waters. The mortality of 1831, which proved so fatal to the Indians of the northwest coast, it appears extended its ravages this far south." Accepting these two accounts at face value, since there is no reason to question seriously their veracity, we find that the malaria epidemic reached down the coast below the mouth of the Columbia for possibly 100 miles, but died out at that point or just south of it. Whether or not it was truly severe in this area cannot now be determined.

From the Columbia-Willamette basin the malaria took a long jump, in both space and time. It appeared again in the Sacramento and northern San Joaquin valleys in the summer of 1833, three years after its first outbreak in Oregon and 500 airline miles away. If we overlook possible minor infections at Klamath and Pyramid lakes (Tolmie, 1833 ?), the presence of this great gap is quite understandable. With regard to the spatial aspect no infective *Anopheles* mosquitoes were to be found in the intervening region. For the temporal aspect it is clear either that human carriers had to proceed from the Columbia to the Sacramento basin or that new malarial subjects had to enter California from the Rocky Mountain and Great Basin territory.

We have no means of being certain which of these two possible modes of communication was actually responsible for the 1833 fulmination of malaria in California; indeed it is quite probable that both were of significance. Let us bear in mind that the entire white population on the Columbia, almost without exception, suffered from malaria in a more or less acute form in 1830, 1831, and 1832. (There is overwhelming testimony to support this thesis.) Hence any person traveling by foot or horseback from the Columbia outposts to the California valleys had, it may be estimated, a nine out of ten chance of being a malaria carrier. At the same time the beaver trappers, mountain men, and other frontiersmen who started from the Missouri Valley and entered California by any route whatever were heavily infected. The question then becomes: Did enough persons of American and Canadian affiliation enter California from 1829 to 1833 to create a high probability of contaminating the Sacramento Valley mosquito pool with the malaria organism. The answer must be in the affirmative.

The expeditions of the American frontiersmen to California, as well as the activities of the Hudson's Bay trappers, have received exhaustive attention from California historians. It would be superfluous, in the present connection, to undertake any detailed examination of the source material. Nevertheless a few sample citations should be given in order to establish the general magnitude of travel through the central part of the state from 1828 to 1835.

The earliest well-authenticated entries into California from the interior were those of Jedediah Smith and Peter S. Ogden, both probably in 1826 or 1827. Neither of these apparently contributed directly to the introduction of malaria, nor so far as we know were their parties personally afflicted with the disease. After the years mentioned, the incursions from the east and north became frequent. In

his comprehensive work on the Hudson's Bay Company in California, Leader (1928, p. 62) says that from 1828 to 1846, inclusive, Hudson's Bay parties entered California annually, each party consisting of a dozen to a hundred men. Subsequently (p. 78) he quotes John Marsh as saying that for "the last fifteen years" California had been traveled annually by 100 to 200 persons of the Hudson's Bay Company. In his statement to a Congressional committee in 1837, Slacum (1937) claimed that since 1828 Hudson's Bay parties had been going south as far as the 40th parallel (just below Red Bluff) and were cleaning out the beaver "from every stream."

Ogden made an expedition in 1828 or 1829, just before the malaria outbreak on the Columbia. Leader (p. 54) thinks that Ogden may not have reached California on this journey, although he certainly was in Nevada. Nevertheless he quotes from J. J. Warner to the effect that Ogden did trap the Central Valley in 1828 or 1829. Charles L. Camp (1922) describes the expedition of Kit Carson who came up from the south with Ewing Young. Carson mentions meeting Ogden with 60 men trapping in the San Joaquin Valley. Camp (p. 118) expresses the opinion that the Carson-Young group arrived in 1829 and stayed until October, 1830, whereas the Ogden expedition was in the state during 1829. Alice B. Maloney (1940) thinks that Ogden went up the valley from south to north in 1830. Carson, in his own autobiography (edited by Quaife, 1935, pp. 14–15) says that he came with Young from the Colorado River to San Gabriel and thence over the Tehachapi Mountains to the valley in 1830. There he met Ogden with 60 men. They trapped on the San Joaquin and stayed the summer on the lower Sacramento. Ogden himself (1933, p. 67) says: "Returning to Fort Vancouver on the Columbia, after a short absence in the autumn of 1830, I found a few of the servants suffering under an attack of intermittent fever." It is very clear, therefore, that the expeditions of Ogden, Carson, and Young all antedated the initial appearance of malaria on the Columbia. On the other hand, this fact does not necessarily preclude the introduction of the infection in California by these groups, although there is no direct evidence to that effect.

During 1831, parties were no doubt in the field, but we have little specific record of them. For 1832 and 1833 there is a relative wealth of information. Among the documentary sources for those years there is the recently published journal of John Work, edited by Alice B. Maloney in 1945 under the title *Fur Brigade to the Bonaventura.* This journal gives such a clear picture of conditions in the Sacramento Valley during these critical years that a brief synopsis is worth while.

The party under Work left Fort Vancouver August 17, 1832, after malaria had been established on the Columbia for two years. Under date of August 21, there is the first mention of illness at The Dalles: "There are a great many indians here at present, some few of them have the ague. Our sick men are recovering very slowly." By September 2, at least 14 and probably more persons had been taken ill. On September 9, Work mentions "intermittent fever" and says there were patients who had repeated relapses after apparent recovery. From September 3 to December 11, the illness evidently decreased and there were no new cases. On November 29 the party reached Red Bluff. On December 2 he notes regarding the Indians along the Feather River that "there appears to be some sickness resembling an ague prevailing among them."

If Work was correct in the statement last quoted, the important fact is established that the epidemic had made its initial entry no later than the summer of 1832, and in the upper, rather than the lower Sacramento Valley. The great pestilence of 1833 thus could be seen as the intensification of an infection which had already attained a foothold, and which lay dormant over the winter season pending the next summer's crop of mosquitoes.

On December 23 Work had reached the vicinity of the Marysville Buttes and was near two other trapping parties, those of Ewing Young and of LaFramboise, a prominent French-Canadian trapper. Thus the presence of at least three parties in the Sacramento Valley is established for this date.

There is no further mention of fever in Work's journal until April 6, 1833, at which time fever broke out again. On April 10 he notes that aside from "ague" there is a very severe cold among his people. Since further references cease with the entry of April 14 the guess may be hazarded that the April flurry was caused by a nonmalarial organism. Not until July 31 does malaria again enter the narrative. On that date Work notes that the fever has reappeared. In early August the party had returned to the Feather River and now the Indians showed very heavy infestation. Regarding the sickness of his own people he says (August 13): ". . . it appears to be a kind of fever, the patients are attacked with pains in all their bones and a violent headache . . ." By August 15 his sick had reached 30 "less or more." On August 18 he had 51 ill. "Several of them had shaking fits yesterday and today . . ." The party started with 28 men, 22 women, 44 children and 6 Indians, or a total of just 100 persons; on August 24 there were 72 sick, and the party had about come to a halt. Meanwhile Work mentions in the entry that on August 19 the Indians on Battle Creek "don't appear to be sick like those below." He was getting higher, away from the river bottoms, and evidently out of *Anopheles* country. By October 8, after nearly every member of the party had been a patient, and several had died, improvement began. The party had now reached southern Oregon. Recovery progressed as the northward march continued, and by October 31 when Fort Vancouver was reached, nearly all of the survivors were restored to health.

It is not to be maintained that the experience of Work's party was entirely typical. He may well have suffered more than most. On the other hand the probability is very great that the other expeditions, which have left us no such detailed and dramatic record, were afflicted to a measurable extent. Certainly from this time forward no Indian or white man could regard himself as immune to the fever and ague which spread across the plains of the Central Valley.

The frequency with which parties are known to have entered the Sacramento basin from 1828 to 1933, the geographical origin of their numerous personnel, and the conditions recorded by John Work, makes an affirmative answer to the question previously propounded mandatory. The probability is extremely great that malaria was introduced to the Sacramento and San Joaquin valleys by trapping expeditions from the north (or rarely southwest). The individuals comprising these parties had become infected either on the lower Columbia or in the Great Plains region before arrival on the Pacific Coast.

A final clear demonstration that the malaria came down into California from

the north is provided by the following passage taken from the account of the pioneer who called himself "Trapper": "The epidemic of 1833, of which we have the most reliable information, did not commence near the mouth of the river, but at the head of the valley, more than one hundred and fifty miles from the inundated lands [i.e., the delta of the rivers], and travelled down the Sacramento and then up the San Joaquin . . ."

THE DAMAGE TO THE NATIVE POPULATIONS

That the epidemic of 1829–1833 was terribly lethal to the native population has been conceded in principle by nearly every writer who has had occasion to refer to the matter. But whether or not the real magnitude of the disaster to the Indian communities involved has been fully appreciated is somewhat doubtful. Certain accounts, particularly if they indulge in the extravagant rhetoric of the period, create the impression among modern readers of wild exaggeration and fancy unrestrained. Nevertheless these very lurid passages, coming as they do from the pens of unimaginative and utterly practical men, are clear indication of the tremendous impact of the events themselves. Hyperbole and overemphasis, to be sure, are often present, as undoubtedly are local distortions of fact. Yet the general picture cannot be disbelieved.

Because a grasp of what happened to the native tribes of the Sacramento and Columbia during these years depends so completely upon a reading of the testimony of ten or twenty men, it is not only desirable but necessary to set forth this evidence as it has reached us from the documents of the time. In presenting this material, so far as is feasible, all secondary accounts and reviews are omitted and the case rests upon the statements of individuals who were either present as eyewitnesses or who made an attempt to ascertain the facts from those who were in a position to speak from experience. We will consider first the epidemic as it was seen among the Indians along the Columbia and the Willamette.

Dr. John K. Townsend (1905, pp. 332–334), an entirely reputable witness, presents an account which is as conservative as most and more circumstantial than many. The following are excerpts: "The Indians of the Columbia were once a numerous and powerful people; the shore of the river, for scores of miles, was lined with their villages. . . . The spot where once stood the thickly peopled village . . . is now only indicated by a heap of indistinguishable ruins. The depopulation here has been truly fearful [i.e., near Fort Vancouver]. A gentleman told me, that only four years ago [that is, in 1830], as he wandered near what had formerly been a thickly populated village, he counted no less than sixteen dead, men and women, lying unburied and festering in the sun in front of their habitations. Within the houses all were sick; not one escaped the contagion; upwards of a hundred individuals, men, women, and children, were writhing in agony on the floors of the houses, with no one to render them any assistance. Some were in the dying struggle, and clenching with the convulsive grasp of death their disease-worn companions, shrieked and howled in the last sharp agony.

"Probably there does not now exist one, where, five years ago, there were a hundred indians. . . ."

Without the sensationalism of the above passage there remains a solid sub-

stratum of observation: sixteen dead lying in the open, and every survivor ill, at the peak of the epidemic. There is no reason to suppose that either Townsend or his informant was lying, and gross exaggeration is precluded by the exactness of the count.

Samuel Parker (1846, p. 191), a clergyman, and thus presumably not given to mendacity or unwarranted overstatement, was on the Columbia in 1835. He has this to say about the epidemic:

"I have found the Indian population in the lower country, that is, below the falls of the Columbia, far less than I had expected, or what it was when Lewis and Clarke made their tour. Since the year 1829, probably seven-eighths, if not as Dr. McLoughlin believes, nine-tenths, have been swept away by disease, principally by fever and ague. . . . So many and so sudden were the deaths which occurred, that the shores were strewed with the unburied dead. Whole and large villages were depopulated; and some entire tribes have disappeared, but where there were any remaining persons, they united with other tribes. . . ."

John McLoughlin himself (1941, p. 88, letter of October 11, 1830) says that "The intermitting fever . . . has appeared at this place and carried off three-fourths of the Indian population in our vicinity." This was in the early stages of the epidemic, and the cumulative mortality might have reached even higher levels subsequently.

Referring to specific localities Parker (1846, pp. 150 and 152) states that Wappatoo (Sauvies) Island at the confluence of the Multnomah (Willamette) and Columbia rivers had been formerly inhabited by the Multnomah Indians "but they have become as a tribe extinct." . . . Deer Island, 33 miles below Fort Vancouver, ". . . was formerly the residence of many Indians, but they are gone, and nothing is left but the remains of a large village."

The condition of these islands is also mentioned by Nathaniel J. Wyeth (1899, p. 148) who says about Wappatoo Island: ". . . a mortality has carried off to a man its inhabitants and there is nothing to attest that they ever existed except their decaying houses, their graves and their unburied bones, of which they are heaps."

Wyeth also reports on the region of the Cascades, north of Mount Hood. In the journal of his first expedition, under the date of October 26, 1832 (p. 175) he says: ". . . the Indians are all dead only two women are left—a sad remnant of a large number—their houses stripped to their frames are in view and their half buried dead . . ." In the entry for February 5, 1833 (p. 182) he qualifies the above statement to some extent: "There are here two fishing villages both now deserted as the people here say from the inmates being all dead of the fever but I suspect some are dead and the rest and much larger part fright(en)ed away. . . ." Wyeth's suspicion that the mortality at this point was not fully 100 per cent may have been well founded. Nevertheless, that a very large part of the people had succumbed is demonstrated by the "half buried dead." It is also quite possible that the region of the Cascades represents more or less the eastern extremity of the epidemic. If this is true then the death rate and general severity of the disease may have been less than along the lower reaches of the Columbia.

Returning to other testimony we have the following citation (1836, quoted by Stage and Gjullin, 1935) from David Douglas, the botanist for whom the Douglas

fir is named: "October 11, 1830 . . . A dreadfully fatal intermittent fever broke out in the lower parts of this river about eleven weeks ago, which has depopulated the country. Villages which had afforded from one to two hundred effective warriors, are totally gone; not a soul remains!"

George M. Colvocoresses, who, some years later was with Wilkes on his exploring expedition, writes (1852, p. 258): "We saw on both banks many Indian villages, some of which were at the time without inhabitants. This last feature was attributed to the ravages of the fever and ague, and the appearance of burying grounds in the vicinity served to confirm the statement; they were large and thickly studded with graves."

Ogden (1933, pp. 68–69) describes two villages near Fort Vancouver, each of which contained 60 families (about 400 persons) before the epidemic. They were completely annihilated. Ogden says that apparently there were no survivors whatever.

William A. Slacum (1837, p. 16) claimed that from 1830 to 1837, approximately, the "fever and ague" on the Willamette killed 5,000 to 6,000 souls. These figures may well be excessive, but they indicate the order of magnitude of the mortality, at least in the mind of one man.

Charles Wilkes (1844, vol. 5,) gives some very sober data concerning the effects of the epidemic on the Columbia. Thus (p. 149) he says: *"I satisfied myself that the accounts given of the depopulation of this country are not exaggerated* [italics mine] ; for places were pointed out to me where dwelt whole tribes, that have been entirely swept off; and during the time of the greatest mortality, the shores of the river were strewed with the dead and dying." In volume 4, page 338, he mentions the Klackatack tribe at Cowlitz, of which only three Indian women are left. "The mortality which has attacked them of late has made sad ravages; for only a few years since they numbered upwards of a hundred, while now they are said to be less than thirty." On page 387 he cites Dr. Bailey of Willamette Valley, to the effect that in this area one-fourth of the Indians were dying off yearly (during the epidemic). On pages 395 and 396 he tells about Casanove, chief of the Klackatacks near Fort Vancouver. Fifteen years before (about 1827 or 1828) this tribe could muster "four or five hundred warriors; but the fever and ague have, within a short space of time, swept off the whole tribe, and it is said that they all died within three weeks." "Casanove's tribe is not the only one that has suffered in this way: many others have been swept off entirely by this fatal disease, without leaving a single survivor to tell their melancholy tale."

Considering all this testimony in the aggregate, I believe that the general lines of exceedingly severe mortality are established beyond reasonable doubt. Without going so far as to accept without question the implication of the 100 per cent death rate contained in the statements of Wilkes and others, nevertheless the estimate of roughly 75 per cent advanced by Parker and McLoughlin does not appear excessive. It is also quite within the bounds of credibility that many villages, having suffered the loss of three out of four inhabitants, were thereafter deserted by the survivors, thus creating the impression of total extermination. Such a displacement and reorientation is entirely consistent with the stories of empty houses and unburied skeletons. From the ethnographic and the historical point of view the

effect was the same, regardless of the exact proportion of deaths. The Indians as an effective social and biological organism were destroyed in the lower valleys of the Columbia and Willamette rivers. As a result the advancing tide of white settlement met with little or no resistance from the demoralized survivors.

When we pass to the California phase of the malaria epidemic we encounter records of a nature similar to those describing the Columbia phase with destruction perhaps even more widespread. A good introduction is provided by the account given by John Work.

It will be remembered that Work's party, itself heavily infected with malaria, left The Dalles in Oregon on August 21, 1832. The route they followed took them past Klamath Lake and down the Pit River to Red Bluff, which they reached November 29. Here Work noted (1945, p. 18) a "great many" Indians on the Sacramento. Continuing southward slowly, they were on the lower Feather River in the country of the Northwestern and Southern Maidu by January 2, 1833. Here, in a "short" day's journey the party passed 6 villages and camped near another. ". . . the inhabitants of each must amount to some hundreds." The next day (p. 25) they were near the junction of the Feather and Sacramento rivers, and "there are several Indian villages near our camp." The 4th of January they moved back up the Feather and Work mentions that they counted 28 houses in one village, indicating a population of approximately 200. At a later date (page 32) on the Feather below Oroville in one and a half hours march (roughly five miles) they passed 4 villages of 40 to 50 houses each. This means 250 to 300 persons each, or a total of perhaps 1,000 Indians along five miles of river bank.

In the spring of 1833 the party wandered rather aimlessly about the lower Sacramento Valley until in April they made an excursion over to the coast in the vicinity of Fort Ross and northward. Returning by way of Clear Lake the expedition spent June and July in the region of the lower San Joaquin and the delta. Not until early August were they back on the Feather River (p. 69). At the lowest village on this stream they found that "a great many of the indians are sick." Moving up the river they encountered a surprising situation which (p. 70) Work thus describes in his entry for August 6: "Some sickness prevails among the Indians on the feather river. The villages which were so populous and swarming with inhabitants when we passed that way in Jany or Febry last now seem almost deserted & have a desolate appearance. The few wretched Indians who remain . . . are lying apparently scarcely able to move. It is not starvation as they have considerable quantities of their winter stock of acorns still remaining . . ." By August 14 (p. 71) they had gone northwest to the vicinity of Chico. "The natives along here seem even more wretched than those on feather river, the villages seem almost wholly depopulated,—The unhappy wretches are found in ones or twos in little thickets of bushes. . . ." Above Chico, Work mentions no illness among the Indians save the notation, previously mentioned, that the natives on Battle Creek appeared to be in better condition than those below.

If Work's account is accepted as being in the main accurate—and he had no motive for deliberate distortion of fact—then we have to allow a population of several thousand Indians before 1832 in the basin of the lower Feather River between Chico and the junction of the Feather and the Sacramento. These Indians

were badly hit by the epidemic, which very possibly first began to be felt in 1832 and which reached its full intensity in the summer of 1833. Village life was utterly disrupted and the mortality was very great.

Charles Wilkes later saw the Indians at the mouth of the Feather River. He says (1844, p. 195): "At the point of the fork the ground was strewed with the skulls and the bones of an Indian tribe, all of whom are said to have died, within a few years, of the tertian fever, and to have nearly become extinct in consequence. . . ." Wilkes was traveling north from San Francisco Bay, and it is significant that three days after passing the junction of the two rivers they met their *first* living Indians. The lower Feather and adjacent Sacramento rivers must have been sweepingly devastated.

William D. Brackenridge (1945, p. 329) was in the same area in 1841. He says that on October 18 of that year he forded the Feather a quarter-mile above its junction with the Sacramento. "On the bank where we landed was the site of an old Indian town where upwards of 1,500 Indians perished by Fever in one Summer—the bones lay strewed about on the hills in all directions, there not being enough of the Tribe spared—as we were told—to bury the dead."

Conditions in the lower Sacramento Valley are described also by Edwards, by Kelley, and by Hastings. Edwards (1837, p. 27), writing from the vicinity of Red Bluff, says: "The intermittent fever sometimes fearfully prevails. Mr. Young informs me that with a trapping party he passed one summer here without having one man sick, but on his trip to the Columbia three years ago [in 1834] with Mr. R. every one of the company himself excepted had this fever. We have in our party had two or three cases. On every hand we see revolting signs of its fearful ravages. About four years ago [i.e., in 1833] it prevailed with such mortality that the few survivors of a village sometimes fled from their homes leaving the village literally strewn with the dead and dying. Mr. Young says he saw hundreds lying dead in one village forsaken by the few survivors and birds preying upon the uncovered carcasses." Hall J. Kelley traveled up the Sacramento Valley in 1834, the year following the epidemic. He says in his Memoir published in 1839 (p. 53): "Most of the native Indians [in California] have perished. . . . Many tribes are utterly extinct; in places where I was told that, in 1832, there was a population of a thousand or fifteen hundred souls, I found sometimes but one hundred, sometimes not more than fifty and sometimes none . . . But along the Sacrament [*sic*] and elsewhere there is aboundant evidence that, in former times, a teeming and crowded population was spread over that now desolate region."

Some years later L. W. Hastings published his *Emigrants Guide to California and Oregon* (1845), a work written essentially for propaganda purposes and notoriously inaccurate in many respects. Nevertheless, despite his obvious ignorance of the 1833 epidemic, his observations concerning abandoned Indian villages may be taken as substantially reliable. In this matter he can have had no motive for prevarication or exaggeration. Here are two passages from page 116 of his book ". . . whatever the cause of this mortality, might have been, it was, evidently, inflicted upon them, when within their huts, for the earth of the external covering of the huts, having fallen in, was extensively intermixed with skulls, and other human bones." Also: ". . . villages of fifty, or even a hundred of these huts, are

frequently seen, which have the appearance, of having been their ancient haunts, but which, are now abondoned, the ground at, and around which, is covered with human skulls."

This survey of testimony may be closed with two quite famous accounts, both of which have the stamp of veracity. One of these is by Col. J. J. Warner, a prominent early California pioneer who eventually settled in the southern part of the state. His statement may be found in the *History of San Joaquin County, California,* by Frank T. Gilbert (1879), pages 11 and 12. Gilbert simply ascribes the story to "Colonel J. J. Warner now of Los Angeles" under quotation marks, with the possible implication that he got the material directly from Warner. In any case the authenticity of the source need not be seriously questioned since Gilbert, although no historical scholar, has written a reputable book. (It may be noted that Gilbert's entire section dealing with the epidemic was plagiarized word for word in a later book, *An Illustrated History of San Joaquin County,* issued in 1890 by the Lewis Publishing Co., of Chicago.)

Warner was with Ewing Young's expedition of 1832–1833. He is quoted as saying: "In the fall of 1832 there were a number of Indian villages on King's River, between its mouth and the mountains; also on the San Joaquin River from the base of the mountains down to, and some distance below, the great slough. On the Merced River from the mountains to its junction with the San Joaquin, there were no Indian villages; but from about this point on the San Joaquin, as well as on all of its principal tributaries, the Indian villages were numerous; and many of these villages contained from fifty to one hundred dwellings. . . . The banks of the Sacramento River, in its whole course through the valley, were studded with Indian villages. . . .

"On our return, late in the summer of 1833 we found the valleys depopulated. From the head of the Sacramento to the great bend and slough of the San Joaquin, we did not see more than six or eight Indians; while large numbers of their skulls and dead bodies were to be seen under almost every shade-tree near water, where the uninhabited and deserted villages had been converted into graveyards; and, on the San Joaquin River, in the immediate neighborhood of the larger class of villages, which, in the preceding year, were the abodes of a large number of those Indians, we found not only graves, but the vestiges of a funeral pyre. At the mouth of King's River we encountered the first and only village of the stricken race that we had seen after entering the great valley; this village contained a large number of Indians, temporarily stopping at that place."

The second account of these events is signed only by the pen name "Trapper." It evidently was published in a newspaper. The copy seen by me is contained as a newspaper clipping in volume I of the *Hayes Mission Book* in the Bancroft Library, and is entitled *Reminiscences of Early Life in California.* The author was with a party which passed through the San Joaquin Valley in 1832 and then returned, from the north, in 1833. This very probably was the same group, headed by Ewing Young, of which J. J. Warner was a member. Indeed the fact that the same party is concerned, as well as the general similarity in style, makes it possible that "Trapper" was none other than J. J. Warner. If so, we have two accounts by the same witness. Otherwise we can only guess at the author. Among the

more remote possibilities are Ewing Young, although he has left no writings with which I am acquainted, and Peter S. Ogden, who wrote a book under the same nom de plume, "Trapper." Of the three I am inclined to favor Warner, primarily because of the close internal correspondence between the account signed "Trapper" and that clearly ascribed to Warner by Frank T. Gilbert.[1]

"The banks of the Sacramento and San Joaquin, and the numerous tributaries of these rivers, and the Tule Lake [i.e., Tulare Lake], were at this time studded with Indian villages of from one to twelve hundred inhabitants each. The population of this extensive valley was so great that it caused surprise, and required a close investigation into the nature of a country that without cultivation, could afford the means of subsistence to so great a community, and who were such indifferent hunters. . . .

"At the close of the following summer [i.e., 1833] we again entered the valley near Fort Reading. . . .

"From the extreme northern part of the Sacramento valley to the Tulare lake, death had obtained a victory as unequalled, as it was unknown by nearly all, except the recording angel. Here and there, near the mouth of the American river, and along the San Joaquin, the shadowy form, or ghostly figure could be seen, flitting through the forest, as if afraid of its own shadowless appearance. Not one female did we see. The numerous villages which we had left filled with life were converted into Golgothas. The first struck down were buried. But the increasing dead gave not time to the living to thus dispose of their departed fellows. Huge piles of bodies were consumed with fire, and the ashes deposited in tombs near the village. But when no means would stay the destroyer, and strength was not left to thus dispose of the victims, they and the villages were deserted by the living, who fled to the scattered groups of trees, or to the solitary shade and there in families—pairs—or solitary and alone waited the approach of the Tyrant. The decaying bodies compelled us nightly to pitch our tents in the open prairie, until we arrived at King river, where we found the Indians suffering the violence of the disease. . . .

"During the night which we remained near this village, which was encamped on the borders of the lake, more than twenty deaths occurred. . . . A few years subsequent to this event those who had survived having been joined by many that immigrated from the surrounding mountains, were attacked in a similar but less fatal manner."

The size and number of the Indian villages are remarkable, particularly in view of the much smaller apparent population reported by all later observers—settler, soldier, and ethnographer alike. If we review the above citations briefly we note that Work found seven villages in a short day's journey along the Feather River—

[1] Subsequent to the submission of this manuscript to the Press, I happened by chance to come upon an item published in the Los Angeles *Star* for August 23, 1874 (page 2, col. 1). This is an editorial, or rather a lead article, entitled "The Indian Pestilence in 1833," and signed by "J. J. Warner."

The author says he went north in the autumn of 1832 and, "In the latter part of the summer of 1833 we entered the northern extremity of the Sacramento Valley from the Klamath Lake and Pitt River countries." The account continues with the wording very similar to the description ascribed by Gilbert to Warner and to the account signed "Trapper."

There can now be no further doubt that all these texts are different versions of the experiences told in later years by Colonel J. J. Warner.

perhaps ten miles, or let us say fifteen. Each village contained "some hundreds." He found a similar state of affairs below Oroville. Warner, on the lower San Joaquin found "numerous" villages, many of which contained fifty to one hundred dwellings. "Trapper" says the numerous villages held from one to twelve hundred persons each. Ewing Young told Edwards that he had seen "hundreds" of corpses in one village and Hall Kelley "was told" of places with one thousand to fifteen hundred souls. Brackenridge talks of a village at the junction of the Feather and the Sacramento in which fifteen hundred died.

Further confirmation of the presence of very large Indian communities may be secured from the accounts of other and earlier diarists and explorers. Arguello (1821) in his famous trip up the Sacramento found numerous villages which impressed him as being very large, although unfortunately he did not leave us any actual figures. One of these, which he saw October 26, contained five parts which were quite large. The whole complex might have reached one thousand inhabitants. In the delta region Fr. Ramon Abella (1811) says that one tribe, the Cholbones, had three villages with a total of 900 persons. Fr. Narciso Duran (1817), in the same area describes several villages with from 30 to 60 houses each. Other famous cases include Bubal and Chischa in the southern San Joaquin Valley, the population of each of which may be placed at fully 1,000.

If we turn now to later reports we may look at the census prepared by George McKinstry (1846). This is entitled "Names of Part of the Tribes of Indians in the Sacramento Valley and their number November 1846". The names of 28 "tribes" are given. The populations range from 23 to 485 with a total of 2,373 and an average of 85 persons. The area extends from the lower Feather to the mouth of the Mokelumne.

In his paper (1929) on the Valley Nisenan (Southern Maidu) Kroeber gives a list of villages according to an old informant. Excluding the American River, the informant could mention 57 villages on the Sacramento and Feather rivers from the northern boundary of the Patwin on the Sacramento, and from just below Oroville on the Feather, to a point 4 miles below the city of Sacramento. There were on the average 6 or 7 houses per village. These houses were relatively large and could hold perhaps nine persons. The mean population would then have been approximately 60 and the aggregate for the entire area 3,350. Since Kroeber's area was considerably larger than that reported on by McKinstry, the coincidence of the two estimates is very close.

However, if Work's account of his journey of January 2–4, 1833, is even approximately correct, he saw fully ten and probably more villages of about 40 houses each from Oroville to the mouth of the Feather alone. At nine persons per house this represents a minimum population of 3,600 persons. If we allow the same general distribution along the Sacramento as along the Feather River, then the area of the valley Patwin and Nisenan must have held fully 15,000 persons before 1833. From general population figures, therefore, we can find a reduction of 75 per cent between 1833 and 1846.

There are also other methods whereby the mortality can be estimated. For instance, consider the village on the shore of Tulare Lake, mentioned by "Trapper." There is no reason whatever to doubt the validity of his description as an eye-

witness. This village was filled with refugees. Hence, regardless of its original population, at the time the white men saw it there must have been at least 500 persons present. In one night more than twenty died; let us assume only twenty. If the intense phase of the epidemic lasted merely two weeks, or, say fifteen days, then 300 deaths would have been expected. If twenty deaths per night represent the maximum, and the number rose previously, and tapered off subsequently, and the epidemic lasted three weeks, as is implied by some of the accounts from the Columbia River, then the deaths would have reached 200. A mortality of 40 to 60 per cent would thus be the minimum indicated.

Again, consider the figures given by Hall J. Kelley, quoted above. In places where he "was told" that there had been 1,000 to 1,500 persons, he "found" from none to 100 individuals remaining the following year. Taken as given, with an average of 50 people surviving, the mortality would have run from 95 to 98 per cent. This, beyond doubt, is much too high an estimate.

All the actual witnesses testify that after a certain point in the epidemic the survivors of a village vacated the site. Some of these were seen by Work, for example, wandering about the country in twos or threes. "Trapper" remarks upon the small, isolated groups of bones at what were probably local camping spots, representing fugitive families or individuals who had been overtaken by the disease far from their original homes. These deaths must of course be reckoned in with those which occurred in the villages themselves. On the other hand many of the fugitives must have survived, for although in 1833 it may not have been possible to encounter a living soul throughout the valley, nevertheless, later travelers did find Indians in fair number, and they were living in their ancestral habitat.

Following "Trapper's" description, and by implication that of the other witnesses, the dead may be divided into three groups: those who were buried, those who were burnt, those who died in their homes, or close by, and were left without disposal, together with those who died as fugitives after leaving the village. With a sudden, devastating pestilence which attacked every person within a week or two, only the first victims could be buried—at least with full ceremonial. I would estimate not more than five out of every hundred inhabitants. Burnings could account for not much more than an additional 20 per cent, because the survivors, themselves mostly infected, would not be able to accomplish the physical labor. Unburied corpses, in and out of houses, would account for most of the remainder. Travelers had to avoid the abandoned sites because of the odor; on the Columbia sixteen unburied corpses were counted in a village of 100 persons; abandoned huts in the Sacramento Valley were "extensively" mixed with bones; ". . . the bones lay strewed about on the hills in all directions . . ."; "Mr. Young says he saw hundreds lying dead in one village . . ." Allowing for considerable hyperbole, and reducing hundreds to scores, we still may estimate that half the infected population provided the corpses and skeletons seen by subsequent observers.

On the whole our available information gives the impression that the mortality ran somewhere between 40 and 100 per cent. The latter value is undoubtedly excessive, although to be sure, the incidence, as opposed to the mortality, may well have reached that figure. Forty per cent seems too low. At this point it will be remembered that the evidence pertaining to the malaria epidemic on the Columbia River

indicated a mortality among the Indians of approximately 75 per cent. Since all the circumstances were very similar in the two regions being considered, and since what California data we have support rather than disclaim the conclusion, we may set the mortality in California at the same value as for Oregon, that is, 75 per cent. If this is true, then the aboriginal population of the Sacramento and San Joaquin river valleys must have exceeded modern estimates by a factor of 2 or 3.

This is a startling and disturbing result. It means that fully 20,000 natives of the great Central Valley died in 1833; my own opinion is that this figure is too small. It means that three-quarters of the Indians who had resisted seventy years of Spanish and Mexican domination were wiped out in one summer. It means that the red race in the heart of California was so crippled that it could offer but the shadow of opposition to the gold-mining flood which swept over it in 1849. It means that the ethnography of the Sacramento and San Joaquin valleys should be restudied from the standpoint of a far greater population than has ever been conceived as occupying the area.

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