Journal of California and Great Basin Anthropology
Vol. 12, No. 1, pp. 48-59 (1990).

Traditions of Sucker Exploitation in the Pit River System: An Ajumawi Example

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THE avowed significance of riverine-focused cultural adaptations in northeastern California notwithstanding, little is understood regarding the use of specific fish species, the variability in harvest strategies, or the relative dietary values of the resources. Recent ethnographic research on traditional sucker fishing practices among the Ajumawi division of the Pit River Indians provides a specific illustration of a significant resource used in prehistoric times and continuing through historical accommodation to the middle of the twentieth century. The perpetuation of sucker use survives to the present and is attributed in part to historical residence patterns and continuous availability, but also to the dietary significance of this traditional resource.

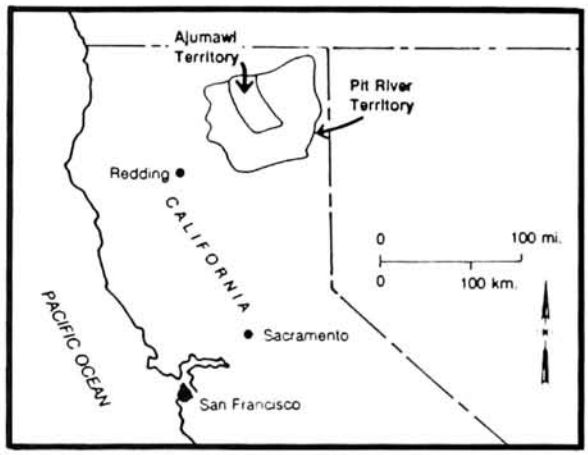

Fig. 1. Pit River Indian territory.

AJUMAWI LAND USE: 1848-1950

The Ajumawi, whose name means "river people" (Olmsted and Stewart 1978), are one of eleven bands constituting small territorial divisions along the Pit River and its tributaries in northeastern California (Fig. 1). Two closely related Palaihnihan (Hokan stock) languages distinguished the nine bands of Achumawi-language speakers and two Atsugewi-speaking bands (Olmsted 1954, 1966). Recognized today as the Pit River Indians, they have shared a similar cultural and settlement orientation to the multiplicity of resources along the Pit River, its tributaries, and adjacent land forms (Voegelin 1974; Garth 1978; Olmsted and Stewart 1978).

The Ajumawi band occupied Fall River Valley, a lush well-watered valley replete with ponds, marshes, and numerous streams tributary to the Pit River. Ajumawi foraging territory (*sensu* Binford 1980) extended well to the north across the vast lava fields (Fig. 1). Winter villages were clustered tightly along the banks of the Pit River and scattered about the edges of Fall and Tule rivers, in Little Hot Springs Valley, and along the shore of Big Lake (also known as Tule Lake) (Kniffen 1928:map 2; Voegelin 1974; Gassaway 1977).

White settlement of Fall River Valley followed quickly upon the opening of Lassen's 1848 and Noble's 1852 emigrant trails to California, both of which coursed along the Pit River through Ajumawi territory (Hoover et al. 1966). When Fort Crook was established near present Fall River Mills in 1857, ensuring the settlers protection from the Indians, the valley rapidly developed agricultural, lumbering, and commercial activities (F. Callison 1965:39; M. Callison 1965:67). The most favorable lands for agriculture were

located adjacent to Fall and Pit rivers, on the south and west sides of the valley (F. Callison 1965:39), so that by the early 1880s, the Ajumawi were restricted from many of their primary winter village sites. Further, this displacement limited their access to important fisheries on Fall and Pit rivers while wheat fields supplanted oak groves and epos (*Perideridia* sp.) root meadows in the valley proper.

In the period between 1860 and 1880, the Ajumawi maintained residence at several traditional village sites at the periphery of the valley on lands unsuitable for agriculture. Settlers' accounts describe large "rancherias" immediately north of the lava beds (Lorenzen 1965:48) and in the vicinity of Big Lake (Tule Lake) including its eastern side and in the marshy area to the south (Kniffen 1928:321; M. Callison 1965:68; Gassaway 1977:5). These accounts further attest to the continued use of native resources such as tule, fish, waterfowl, and roots taken with traditional procurement methods.

Historic Indian residence patterns are further reinforced by the locations of Indian land allotment applications filed under the Indian Land Patents Act of July 4, 1884 (Budy 1990). The 1884 Act permitted Indians to file for up to 160 acres of land, this being held in trust for 25 years, after which the applicant (or his heirs) could apply for fee patent. The intent of the legislation appears to have been to make farmers of the Indians and to engender a sense of private land ownership; however, since good agricultural land already was in the hands of white settlers, California Indians filed mostly on agriculturally marginal, heavily timbered, or arid desert parcels (Kelsey 1906:132-133). By the 1920s, some Ajumawi were employed in wage labor as sheep shearers, hay stackers, and harvesters, and more labored in highway construction and at the Pacific Gas and Electric plants, but most work was intermittent and many families had no able-bodied wage earner (Gillahan and Shaffer 1921).

Budy (1990) identified several allotment clusters (i.e., groups of from 2 to 27 different, but contiguous, allotment parcels) in Ajumawi territory originally listed in the 1880s and 1890s. These clusters were located in the lava at the head of Fall River, north of Eastman Lake, on both sides of the Little Tule River, north and east of Big Lake, and on the slopes of Saddle and Soldier mountains (Fig. 2). Many allotments remain in Ajumawi ownership today, notably those located in the lava to the north and adjacent to important sucker fisheries. Continued Indian residence through the early historical period to this day is one reason that sucker fishing traditions have persisted.

Fishing traditions also have persisted because of the dietary value of this resource during the difficult period of economic transition. The previously abundant and storable resources, particularly acorn and salmon, generally were unavailable to the Ajumawi in any large or predictable quantities after the 1880s. The primary oak groves, located in areas considered essential for agricultural development, were the first areas to be settled (M. Callison 1965). Further, the total array of potential foods was reduced: grass seeds were given up to grazing livestock, roots were plowed into wheat fields, marsh plants and waterfowl were depleted by drainage canals, and salmon were reduced by non-Indian economic development.

Salmon once migrated up the Pit River as far as Pit River Falls, a 65-foot scarp a few miles south of the confluence of the Fall and Pit rivers. Ajumawi access to salmon was limited to this important location on the Pit River where large weirs were constructed across the river below the falls (Kniffen 1928:319; Voegelin 1942:173).

The salmon yield throughout the Sacra-

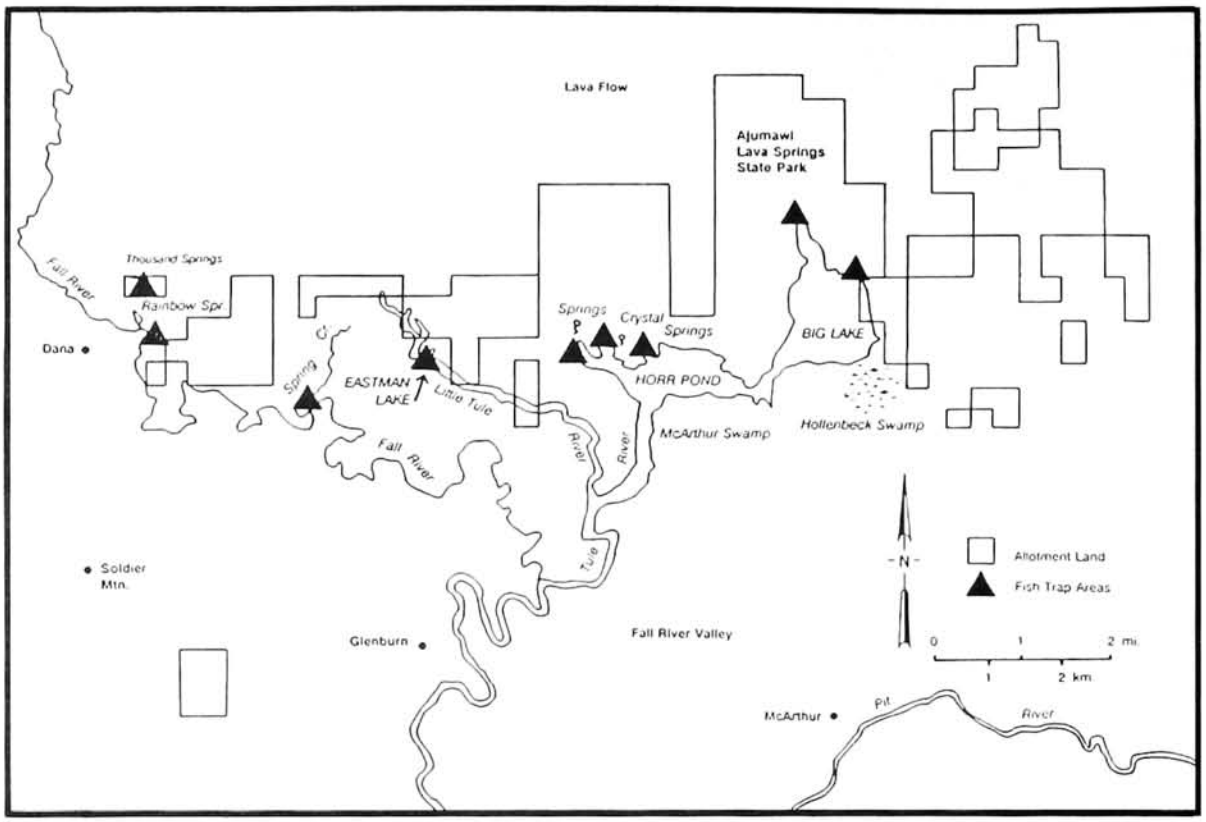

Fig. 2. Ajumawi allotments and fish trap areas. Allotments after Budy (1990).

mento River system began to decline soon after non-Indian settlement. Probably beginning as early as 1860, salmon fisheries were affected by stream pollution from the many lumber mills on tributaries to the Pit River (cf. Gassaway 1977). Artificial salmon propagation for national distribution began at a federal fishery at Baird in 1872, and briefly at Hat Creek, but soon was discontinued. It then resumed in 1888 for local distribution in an attempt to enhance the salmon fishery (Clark 1929). The twenty canneries on the Sacramento River and in the San Francisco Bay area were discontinued by 1919, further evidence that the salmon were rapidly disappearing. By 1929, Clark (1929) estimated that 80% of the salmon spawning grounds had been cut off by power and irrigation dams in the Sacramento-San Joaquin river systems. With the construction of the Pit 1 hydroelectric facility at the Pit River Falls in 1922, the Ajumawi salmon fishery had severely diminished. By 1945, when Shasta Dam was completed, salmon had disappeared from the Pit River system.

Apart from large mammals, for which no data are recorded, the only reliable, seasonally abundant, highly nutritious, and storable faunal resource available to the Ajumawi throughout the historical period was the Sacramento sucker (*Catostomus occidentalis*). In fact, Sacramento suckers were important fare in the Ajumawi diet between 1900 and 1950, and may have been critical to the health of the people (Gillahan and Shaffer 1921). By the early 1950s, most of the elders who previously had organized the communal fishing had become infirm or died, although individuals continued to fish for suckers.

SUCKER HABITAT AND BEHAVIOR

Sacramento suckers are distributed widely throughout the Sacramento-San Joaquin River system, and they are one of the most common species in the Pit River system. Suckers are most abundant in clear, cool streams, although adults prefer large bodies of water such as lakes and reservoirs (Moyle and Daniels 1982). Commonly, suckers occur together with Sacramento squawfish (*Ptychocheilus grandis*), called "pike" by early ethnographers, hardhead (*Mylopharodon conocephalus*), speckled dace (*Rhinichthys osculus*), and Pit sculpin (*Cottus pitensis*). In contrast, rainbow trout (*Oncorhynchus mykiss*) and suckers generally occupy different habitats within the Pit River system. Next to rainbow trout and Pit sculpin, Sacramento suckers and speckled dace are the most abundant species resident in the Pit River system (Moyle and Daniels 1982).

Suckers are bottom-browsers that feed on algae, detritus, and invertebrates. Although they eat continually, they are most active at night. They have a particularly well-developed sense of hearing and fear scents (Moyle 1976:212; Taylor 1987). These characteristics may be related to some Ajumawi nocturnal fishing practices.

Maturity and spawning behavior among suckers may begin between the ages of four and seven years; more commonly it occurs at about six years. Generally, adult suckers range in size from 33 to 58 cm. (13 to 23 in.) fork length with an average weight of 730 g. (Villa 1985). Observations at Big Lake (Taylor 1987) and Hat Creek (Brauer 1971) suggest an older, therefore heavier, resident population in some areas of the Pit River system. Scoppettone (1988) confirmed longer life spans among catostomids than previously supposed, which may increase the average weight.

Suckers spawn in streams, over gravel riffles, and in lakes and reservoirs; the spawning impulse appears to be triggered by a sudden warming of flowing water (Moyle 1976:215). In Ajumawi territory, spawning suckers appear to be attracted to the many springs emerging from the lava scarp and forming the headwaters of Fall and Tule rivers. This may account in part for the striking number of stone fish traps located in this area (M. Callison 1965; Evans 1987; Dreyer 1988).

Sucker spawning generally occurs between late February and June in the Sacramento River system (Moyle 1976). Observations at Thomes Creek (Tehama County) were recorded in December with peak spawning in early March (Villa 1985). At Big Lake in the Fall River Valley, sucker spawning was reported in January, and more frequently in February (Stewart 1954; Evans 1987).

TRADITIONAL SUCKER USE

Sucker exploitation is reported for all the Pit River groups (Kniffen 1928; Voegelin 1942; Garth 1953), but its relative value as compared to other fish species use undoubtedly varied from group to group. The importance of the sucker also is apparent among the Klamath of southeastern Oregon (Voegelin 1942:57). While the Ajumawi procured several species of fish, including salmon, some Ajumawi indicated a preference for suckers over salmon, saying that salmon were less flavorful (Evans 1987).

The prehistoric significance of sucker use in the Pit River area is unknown at present. Archaeological excavations near Lake Britton yielded a small collection of fish remains, comprising less than 9% of the total archeofauna, but fish are thought to have been under-represented due to poor preservation and other factors (Wirth Environmental Services 1987:255). Nonetheless, identifiable cyprinid remains outnumbered salmonid remains at two sites, and were comparable at

another, while some catostomid remains also were identified.

Downriver Achumawi bands, to whom salmon was readily available in spring and fall, may have relied less on suckers, but for groups with limited access to salmon, such as the Ajumawi, suckers most likely comprised a significant proportion of the fish diet. Further, suckers were abundantly available in the critical winter season at a point when stored food supplies might often be depleted. Even the downriver groups had sucker "holes" that they used in winter (Stewart 1954; Wirth Environmental Services 1985:5). At the junction of Hat Creek and the Pit River, Beckwith, in 1857, noted fish traps even though "the salmon season had not arrived" (Voegelin 1974:69).

Ajumawi territory, with its extensive streams, ponds, and marshes, is prime habitat for suckers, and it is likely that suckers composed a significant dietary component throughout Ajumawi prehistory. One indication of the importance of suckers to the Ajumawi is the large number of preserved stone traps in streams, ponds, and springs forming the headwaters of Fall and Tule rivers well beyond the extent of the salmon run (Evans 1987; Dreyer 1988). Although the traps may have functioned for catching other fishes, the more appropriate and traditional method for catching smaller fish was in basketry traps daily placed in the water close to home. Trout frequently were taken as a small percentage of a sucker (spawning) catch, but the low rock walls of the traps do not contain most disturbed trout for long. The primary use of the stone traps in the late historical period was for sucker capture (Evans 1987).

M. Callison (1965:68), a local settler, provided a description of how stone traps were used historically on Fall River:

> Where the waters of Fall River, at its source, emerge in large springs, they form sizeable creeks of rapidly flowing waters, once teeming with fish of many species. . . . In this shallow, swift flowing water, wings of rocks were so placed that the fish coming down stream could be funneled through a narrow opening below which was placed a willow basket from which the fish could not escape. A group of Indians, wading in the water, would drive the fish toward the trap.

The best-documented fish traps are from studies conducted by Dreyer (1988) on the north side of Horr Pond, and the north end of Big Lake within the boundaries of Ahjumawi Lava Springs State Park in Shasta county. Dreyer (1988) recorded ten stone traps (two clusters of four traps each and two isolated traps) along a distance of approximately 7,000 to 8,000 m. of shoreline. His drawings and descriptions indicate considerable variability in size and structural complexity; most match Voegelin's (1942:173) description of the typical Ajumawi trap, "circular 'corral' built of rocks, with single opening in center on downstream side." Other traps recorded by Dreyer (1988) suggest small containment ponds along stream sections or at spring outlets that could have served as individual shore-based spearing stations year round.

Stone traps are located also on the east side of Big Lake, on Eastman Lake and Spring Creek, and at Rainbow Springs and Thousand Springs (Evans 1987). Floyd Buckskin (personal communication 1989) observed 11 traps, three of which were visited by the author, on Lava Creek, which feeds Eastman Lake from the northwest. The proximity of Indian land allotment clusters to these well-preserved stone traps provides further supporting evidence of continued use of traditional fishing stations well into the historical period (Fig. 2). As MacGregor (1939:9) observed for the Pit River Indians:

> Little trained in agriculture and having a strong emotional attachment to the sites where they were raised and their forefathers had lived, they

> often selected as allotments good living sites on high knolls, perhaps near the river or a spring . . . .

In the case of the Ajumawi, good living sites were close to good fishing places.

SUCKER PROCUREMENT STRATEGIES

Data on Ajumawi sucker-fishing strategies, collected during fieldwork from 1986 to 1989, were recorded from individuals who participated in or observed these practices directly (cf. Evans 1987). Little information was available on the use of other fishes, while sucker fishing accounts were numerous and detailed. This bias toward suckers, to the near exclusion of other species, in part relates to the long tradition of communal night fishing for suckers, a practice occurring regularly until as late as 1950. Its significance no doubt was reinforced by the social aspects of the activity. At the same time, however, the perpetuation of a communal resource gathering activity into the recent past relates to the nutritional significance of suckers, notably in the historical adjustment period, but probably in the prehistoric past as well.

For the Ajumawi, the sucker-fishing season was defined as the spawning period, beginning in January and continuing through early March in a dry year, and until late May following sufficient January rain. Winter was the occasion for organizing communal night fishing, while individual fishing was a daytime activity conducted throughout the year. Communal fishing allowed for a rapid harvest of large quantities, usually destined for drying and storage, and available to several families. Individual fishing was considered able to provide a meal or two for a family. Two explanations commonly heard for dependable nocturnal and communal sucker harvest were the preoccupation of suckers with spawning and their attraction to the fishermen's torchlight (Evans 1987).

A sucker-fishing expedition required both leadership and planning. Prior to fishing, plans were developed based on observations of sucker spawning by one or more individuals. Then, on a selected evening, men congregated with their gear, and often their families, at a home convenient to the fishing areas.

Two areas typically were used, one below the Pit 1 Powerhouse on the Pit River, the other at various locations on Horr Pond/Big Lake. In the Horr Pond/Big Lake vicinity, at about 9 or 10 p.m. – well after dark – the men loaded into dugout canoes or slender, homemade flat-bottomed boats and paddled to the shallows edging the lava scarp where the stone traps were built. The men poled the boats, sometimes with spear handles, by the light of pitch-covered wooden torches or flares but more recently a pitch-filled metal mesh box called a "jack" mounted on the boat. Boats were said to be unusable at the Pit 1 Powerhouse because the Pit River was too shallow at this location.

Each fisherman was equipped with one or more wooden-handled spears called *lomi* (cf. Olmsted 1966). The handle or shaft might be made of Buck Mountain lodgepole pine, Soldier Mountain fir, or a commercial fir pole. Spears were of different lengths, as measured with the gig: the 14-16-ft. pole for shore or canoe use, and the 11-12-ft. short pole for the wading fisherman. The short pole was adequate for the shallow Crystal Springs sucker trap at Ahjumawi Lava Springs State Park. The gig portion of the sucker spear could have two or more fixed bone points (Voegelin 1942). Barter (1990) observed a sucker spear from the Hudson collection (ca. 1906), with two willow prongs and bound deer-bone barbs. More recent Achumawi barbed gigs are welded locally or beaten cold from an iron three-tined hay fork (Evans 1987). Most men owned at least two spears and also supplied them for their sons,

and in one case, a daughter. Earlier equipment included blinders, tule sandals, and leggings (Barter 1990), and specialized net bags (Curtis 1924); local whites mention wearing rubber waders. Although the Atsugewi reported using fish poisons on upper Hat Creek, the Ajumawi stated that they never used poison for suckers.

The approach to the stone trap was directed by a male elder who either had trap rights or most familiarity with the trap. This elder placed a board, stored at the site, or less frequently, a canoe prow, into the trap entrance and directed the net arrangement inside the stone enclosure. Required behavior during this process was quiet and orderly, with no conversation or laughter. Once the fishermen were in place and the first sucker struck, most often by the elder, silence no longer was necessary. Numerous tales, some with humor, were recounted about the weather changes, mishaps, and punishments accrued from incorrect behavior at the sucker traps during the approach. One Ajumawi woman said perhaps women were excluded from most sucker expeditions because of their occasional inability to remain quiet (Evans 1987).

Ajumawi agreed that nocturnal and communal sucker fishing primarily was a male activity. Boys were allowed to participate by about 10-12 years of age, their primary responsibility being to carry and load the suckers. After the fishing, if a barbecue was planned, women and smaller children might walk, or arrive by buggy or canoe at the trap with coffee and extra food (Evans 1987).

Sucker fishing at the Pit River, below Pit 1 Powerhouse, could be more spontaneous. It might include women and children since the location was easily accessible by horse-drawn buggy or automobile. They could wade in and gather suckers by hand. An expert female spearer might spear her own suckers at this and other easily accessible locales.

The span of actual fishing time was relatively short; the action was fast and furious. Each fisherman poised his gig underwater and aimed a rapid jab to pierce a sucker behind the gills. Once struck, the sucker was flipped onto the bank for boys to gather, string, and load. In plentiful runs, men, women, and even children jumped into the water and grabbed suckers by hand. Certain Ajumawi were noted for their spearing expertise, but even a novice could spear one or two suckers. A catch of approximately 100 suckers for a small group in a couple of hours reportedly was not unusual. These fishing expeditions might occur two to three times – or up to six times – per season, and camping near the springs for a day or so was common. Sometimes the men closed or boarded the trap entrance, returning the next day to collect the fish.

Processing the fish usually took place after the fishermen returned to the home where they had congregated. Most frequently, the processing was the women's responsibility. Suckers were scaled, gutted, and a portion of the tail removed. The head was cleaned and washed. Women who did not scale suckers were considered novices or lazy. Removing large bones could be done at this time or later, just prior to drying (Evans 1987).

Formerly, drying suckers took place on a stick in the sun, in shade, or in the sweathouse (Voegelin 1942); more recently it was done on a fence, house roof, clothesline, or on a back porch. Children might be responsible for keeping insects away for a week or more of drying time, depending on the weather. Dried suckers were stored indoors. They were edible for several months, until the middle of summer.

Several other fishing techniques were employed year round by an individual or by two persons working together. In the daytime during spawning season, one might visit a

nearby, particularly productive trap, close the entrance, and spear approximately 20 suckers in 30 minutes. Twenty fish of one and one-half to two pounds was the catch an individual could easily carry home when walking. Sometimes a trap would be boarded up one day for collection the next. A small net, four by six feet, also might be left in the trap for several hours.

Another frequently used technique, canoe fishing, required two individuals. A boy or woman might propel the canoe while the man speared suckers along the banks of a small stream or in one of the larger traps. Both dugout canoes and spears often were stored, the former submerged and weighted, near a stone trap.

Less frequently, two kinds of basket traps and dip nets were used for suckers. The bow or tent-shaped basket trap was flat and weighted on the bottom, with the mouth closed by pulling on a handle. This type appears to be similar to the *tamichi* described by Curtis (1924:136). The second type, a conical 4-ft. willow trap with an inner core, was placed with the narrow end pointed downstream (Voegelin 1942:173). One Ajumawi constructed a trap of this sort from chicken wire and used it in Fall River (Floyd Buckskin, personal communication 1989). The dip net, a woven mesh suspended from a hardwood hoop with a V-shaped opening, was used. Often, these strategies procured species including rainbow trout, Sacramento squawfish, introduced German brown trout (*Salmo trutta*), and other, smaller species, but suckers were the most common fish caught. Both men and women used the basket traps and dip nets, women more commonly than men (Floyd Buckskin, personal communication 1989).

For the Ajumawi, suckers, either dried or fresh, were considered not only delicious and nutritious, but also a medicinal remedy. Fresh sucker was barbecued or fried; the roe too was fried. Dried and pounded, then cooked, sucker mixed with water as a juice or soup was administered for colds or pneumonia, particularly to children. Pounded dried suckers mixed with salt and flour as a gravy was served over biscuits or pan bread.

One Ajumawi elder said, "suckers were our winter food." Another, an Ajumawi woman, explained, "What rabbits are for Big Valley people (Atwamsini), suckers are for Ajumawi. It is our special food" (Evans 1987:26). Thus, contemporary Ajumawi attest to the significance of suckers as a traditional resource. Certainly, suckers appear to have served as a critical nutritional resource in the period of historical adjustment (ca. 1848 to 1950). A consideration of the specific sucker food values suggests their prehistoric importance as well.

SUCKER NUTRIENT VALUES

Assessment of sucker nutritional value, as compared to other local fish species, provides one parameter for determining its value as a prehistoric resource. Table 1 (after Sidwell 1981) lists nutritional constituents for five species common in the Pit River system. Data for Sacramento sucker are unavailable, but white sucker (*Castostomus commersoni*) is a similar species (Hubbs and Wallis 1948) and nutrient values should be comparable.

The most significant nutritional difference among these species is in their caloric values; this is largely a product of the relative differences in fat content. Both trout and salmon have much higher caloric values than suckers. Considering that both salmon and trout occurred in great abundance during their respective fall and spring spawning seasons, their significance reported ethnographically is not surprising. Suckers, on the other hand, spawned and were readily available in great abundance in midwinter, most likely an important consideration in the total dietary balance.

Table 1
NUTRITIONAL COMPOSITION OF FISH RESOURCES[a]

Resource[b]	cal./100 g.	Protein	Fat	Water
Roach (*Cyprinae*)	79	16.4	1.1	80.5
Salmon (*Oncorhynchus tshawytscha*)	182	17.9	11.6	68.0
Squawfish (*Ptychocheilus grandes*)	91	17.0	2.5	79.3
Sucker (*Catostomus commersoni*)	84	17.7	1.5	80.0
Trout (*Oncorhynchus mykiss*)	154	20.7	6.8	72.0

[a] Adapted from Sidwell (1981).
[b] 100 g. of raw muscle measured.

Table 2
FISHING RETURNS FROM DIVERSE TECHNIQUES[a]

Technique	Number persons	Hours pursuit	Kilogram catch[b]	Hours processing	Return (cal./hr.)
Line fishing	3	1.2	1.76	.3	2,067
Fish drive	5	2.5	6.3	.5	2,192
Spear fishing	2	1.0	2.6	.3	3,533
Cast netting	1	.12	1.05	.16	3,915
Drag netting	2	1.0	6.97	.20	6,065

[a] Data derived from Raven (1990:253-254).
[b] Catch is expressed in kg. of edible meat after processing.

Table 3
FISHING RETURNS FROM AJUMAWI SUCKER CATCH

Technique	Number persons	Hours pursuit	Kilogram catch	Hours processing	Return (cal./hr.)
Spear fishing[a]	4	1.0	5.48	.50	5,689

[a] Data from nocturnal communal fishing during the winter spawning season.

In prehistoric forager models, developed from evolutionary biology, it is assumed that successful foraging depends on capturing sufficient energy to sustain health, reproduction, and further foraging, and that foraging efficiency reaps competitive rewards (Simms 1985, 1987; Stephens and Krebs 1986; Raven and Elston 1989). Energy capture, measured as caloric food value, is a means by which to ascertain foraging and decision-making efficiency. Caloric food value, when decreased by the costs of pursuit and processing, produces a post-encounter return rate, which is measured in energy units acquired per unit of time (Simms 1987:121-122). By comparing return rates for various plant and animal species, Simms (1985, 1987) derived a ranking of various resource values.

Unfortunately, little cost-energy analysis has been conducted for traditional fish (Susan Lindström, personal communication 1990). The only systematic study reported to date that compares fish return rates from different fishing techniques (mixed saltwater species) is from Raven's (1990) ethnographic work on Boigu Island in the Torres Strait. Raven's (1990:253-254) data, presented in Table 2, although not directly comparable to Ajumawi fishing techniques, provide a range of values for comparison.

As a means of estimating the significance of prehistoric sucker use by the Pit River peoples of northeastern California, the Ajumawi data on communal night-fishing during spawning season were used to factor return rates. An edible meat weight of 75% of live weight was used. It is slightly higher than that used by White (1953) for mammal species, but conservative considering the inclusion of bony material and potential roe (e.g., Lindström MS). An average adult sucker weight is based on the Villa (1985) collection of the Sacramento suckers from Thomes Creek. Caloric values were based on those listed for white sucker (Sidwell 1981). An overall return rate of 5,689 cal./hr. is estimated for an average communal sucker fishing catch (see Table 3). This return is comparable to cast- and drag-netting methods reported by Raven (Table 2).

Relative to other species listed by Simms (1985:122), sucker returns exceed all values listed for plants and birds, and are comparable to some small mammals. Considering its winter availability and high nutrient content, along with moderately high return rates, it is not surprising that sucker use persisted among the Ajumawi for such a long time. At the same time, these data suggest that the prehistoric significance of suckers throughout the Pit River system should not be underestimated.

ACKNOWLEDGEMENTS

This paper grew out of discussions with Pit River Indians concerning the preservation of stone fish traps at Ahjumawi Lava Springs State Park. Extensive interviewing with Pit River people, mostly Ajumawi, was primarily supported by a California Department of Parks and Recreation (DPR) statewide management program, Project No. 5-45-7535-1, designed by Breck Parkman. Floyd Buckskin, cultural resource officer for the Pit River Tribe, was an instrumental field partner. Thomas Taylor, Senior Aquatic Biologist at DPR, Susan Lindström, Archaeologist, and Shelly Raven of Archaeological Research Service provided excellent fishery data. Robert Hicks offered suggestions on cartography, and Dorothea Theodoratus contributed her considerable editing and map-making ability. I thank you all. Special thanks go to Elizabeth Budy for her editing, humor, patience, and especially, her insights.

REFERENCES

Barter, Eloise Richards
1990 Achumawi and Atsugewi Fishing Gear. Journal of California and Great Basin Anthropology 12:37-47.

Binford, Lewis. R.
1980 Willow Smoke and Dogs' Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. American Antiquity 45:4-20.

Brauer, Clifford
1971 A Study of the Western Sucker, *Catostomus occidentalis* Ayres, in Lower Hat Creek, California. Arcata: Humboldt State University.

Budy, Elizabeth E.
1990 Historic Indian Land Allotments in Northeastern California. Report on file at the U.S. Forest Service, Lassen National Forest, Susanville.

Callison, F. M.
1965 Tale of Three Names, One Town; Memories of Glenburn Pioneers. In: Reminiscence of Fort Crook Historical Society, pp. 39-40. Fall River Mills: Fort Crook Museum.

Callison, Merle
1965 Recollections of a Third Generation Pioneer. In: Reminiscence of Fort Crook Historical Society, pp. 67-70. Fall River Mills: Fort Crook Museum.

Clark, G. H.
1929 Sacramento River Salmon Fishery. California Fish and Game 15:1-10.

Curtis, Edward S.
1924 The North American Indian: Being a Series of Volumes Picturing and Describing the Indians of the United States, and Alaska. Frederick W. Hodge, ed., Vol. 13. Norwood, MA: Plimpton Press.

Dreyer, William R.
1988 Archaeological Investigations of Stone Fish Traps at Ahjumawi Lava Springs State Park, Shasta County, California. Report prepared for the California

Department of Parks and Recreation, Interagency Agreement No. 4-100-6377, Sacramento.

Evans, Nancy H.
1987 Traditional Ajumawi Methods of Utilizing Sacramento Suckers at Ahjumawi Lava Springs State Park, Shasta County, California. Limited edition report on file at the Resource Protection Division, California Department of Parks and Recreation, Sacramento.

Garth, Thomas R.
1953 Atsugewi Ethnography. University of California Anthropological Records 14(2).

1978 Atsugewi. In: Handbook of North American Indians, Vol. 8, California, R. F. Heizer, ed., pp. 236-248. Washington: Smithsonian Institution.

Gassaway, Francis A.
1977 Pioneers of Yesteryears. Fall River Mills: Fort Crook Museum.

Gillihan, Allen F., and Alma B. Shaffer
1921 A Survey of the Indians of Northeastern California as Requested by His Excellency, William D. Stephens, Governor. MS on file at the Boggs Collection, Redding Library, Redding, CA.

Hoover, Mildred B., Hero E. Rensch, and Ethel G. Rensch
1966 Historic Spots in California. Third edition. Stanford: Stanford University Press.

Hubbs, Carl L., and O. L. Wallis
1948 The Native Fish Fauna of Yosemite National Park and Its Preservation. Yosemite Nature Notes 27(12):132-144.

Kelsey, C. E.
1906 Report of Special Agent for California Indians. Carlisle, PA: Indian School Print.

Kniffen, Fred B.
1928 Achomawi Geography. University of California Publications in American Archaeology and Ethnology 12(5).

Lindström, Susan
MS Great Basin Fisher People: Optimal Diet Breadth Modeling of the Truckee River Prehistoric Subsistence Fishing. Dissertation in progress, Department of Anthropology, University of California, Davis.

Lorenzen, Phoebe
1965 Little Hot Springs Valley, Known as Day, has Lively, Colorful Past. In: Reminiscence of Fort Crook Historical Society, pp. 48-49. Fall River Mills: Fort Crook Museum.

MacGregor, G.
1939 Report on the Pit River Indians of California. MS on file at the U.S. Forest Service, Lassen National Forest, Susanville.

Moyle, Peter B.
1976 Inland Fishes of California. Berkeley: University of California Press.

Moyle, Peter B., and Robert A. Daniels
1982 Fishes of the Pit River System, McCloud River System, and Surprise Valley Region. In: Distribution and Ecology of Stream Fishes of the Sacramento-San Joaquin Drainage System, California, pp. 1-82. Berkeley: University of California Press.

Olmsted, David L.
1954 Achumawi-Atsugewi Non-reciprocal Intelligibility. International Journal of American Linguistics 20:181-184.

1966 Achumawi Dictionary. University of California Publications in Linguistics 45.

Olmsted, David L., and Omer C. Stewart
1978 Achumawi. In: Handbook of North American Indians, Vol. 8, California, Robert F. Heizer, ed., pp. 225-236. Washington: Smithsonian Institution.

Raven, Christopher, and Robert G. Elston
1989 Prehistoric Human Geography in the Carson Desert, Part I: A Predictive Model of Land Use in the Stillwater Wildlife Management Area. Portland: U.S. Department of the Interior, Fish and Wildlife Service, Region I, Cultural Resource Series No. 3.

Raven, Michelle Mihran
1990 The Point of No Diminishing Returns: Hunting and Resource Decline on Boiju Island, Torres Strait. Ph.D. dissertation, University of California, Davis.

Scoppettone, Gary G.
1988 Growth and Longevity of the Cui-ui and Longevity of Other Catostomids and Cyprinids in Western North America. Transactions of the American Fisheries Society 117:301-307.

Sidwell, Virginia D.
1981 Chemical and Nutritional Composition of Finfishes, Whales, Crustaceans, Mollusks, and Their Products. U.S. Department of Commerce, NOAA Technical Memorandum NMFS F/SEC-11.

Simms, Steven R.
1985 Acquisition Cost and Nutritional Data on Great Basin Resources. Journal of California and Great Basin Anthropology 7:117-126.

1987 Behavioral Ecology and Hunter-Gatherer Foraging. Oxford, England. British Archaeological Reports, BAR International Series No. 341.

Stephens, D. W., and J. R. Krebs
1986 Foraging Theory. Princeton: Princeton University Press.

Stewart, O. C.
1954 Pit River Field Notes ca. 1954. MS on file at Theodoratus Cultural Research, Fair Oaks, CA.

Taylor, Thomas
1987 Sacramento Sucker Age Update. Memo to Mr. Steve Moore, March 30, 1987. On file at the Resource Protection Division, California Department of Parks and Recreation, Sacramento.

Villa, Nick A.
1985 Life History of the Sacramento Sucker, *Catostomus occidentalis*, in Thomes Creek, Tehama County, California. California Fish and Game 71:88-106.

Voegelin, Erminie Wheeler
1942 Culture Element Distributions, XX: Northeast California. University of California Anthropological Records 7:47-252.

1974 Pit River Indians of California. California Indians III, American Indian Ethnohistory. New York: Garland Publishing, Inc.

White, Theodore E.
1953 A Method of Calculating the Dietary Percentage of Various Food Animals Utilized by Aboriginal Peoples. American Antiquity 4:396-398.

Wirth Environmental Services
1985 Ethnographic Report for the Pit 3, 4, 5 Project, Shasta County, California Contract No. 2-16-0044-84. Pacific Gas and Electric Co., San Francisco.

1987 Archaeological Investigations at Lake Britton, California. Pit 3, 4, 5 Project (License No. 233) Archaeological Site Testing. Pacific Gas and Electric Co., San Francisco.