

The California Salmon Fly as a Food Source in Northeastern California

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THE importance and extent of aboriginal use of insect resources in California is poorly understood. Specific data on insect utilization are uncommon in the anthropological literature, although several genera have been discussed in some detail (cf. Fenenga and Fisher 1978; Swezey 1978; Fowler and Walter 1985). The purpose of this paper is to discuss one such possible insect resource, *Pteronarcys californica* Newport (Plecoptera: Pteronarcidae), first noted by Aldrich (1912). This species of stonefly (not a true fly) is commonly known as the California salmon fly, or the willow fly. This stonefly may have been used as food by a number of groups in northeastern California (Fig. 1), a possibility briefly discussed by Essig (1931: 33-35, Figs. 27 and 28) and more fully explored here.

In the early 1900s, while investigating the aboriginal use of Ephydrid flies (Diptera) in the western United States, J. M. Aldrich (an entomologist) sent a letter of inquiry to Indian agencies in the West requesting data on "Koo-chah-bie," the pupae of the shore fly *Hydropyrus hians* (formerly *Ephydra* [Cresson 1934: 216]) in Mono Lake and other lakes in the western Great Basin. From one of the responses, he learned of an insect, almost certainly a stonefly and quite possibly *Pteronarcys californica*, that had been eaten by the Pit River (Achumawi) and Modoc Indians of northeastern California (Aldrich 1912). This information was obtained from statements of

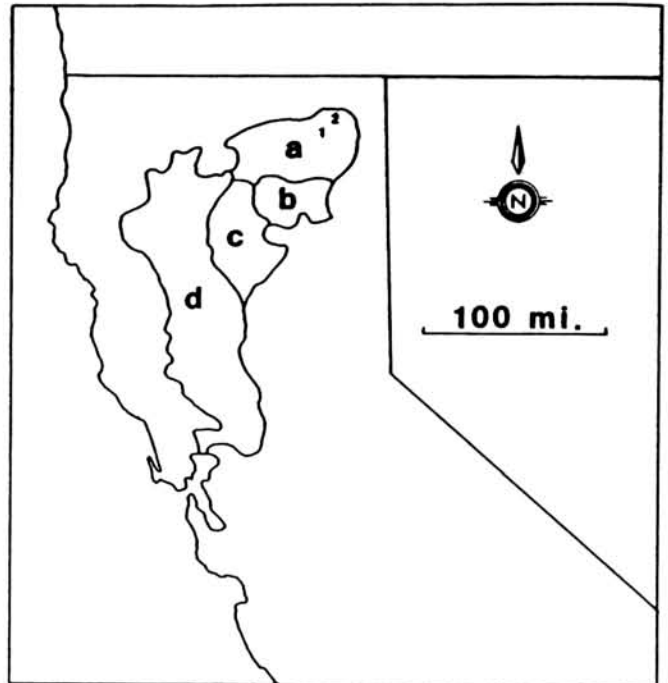


Fig. 1. Some groups which may have used the California salmon fly (*Pteronarcys californica*) (after Kroeber 1925). (A) Achumawi; (B) Atsugewi; (C) Yana; (D) Wintu. (1) Town of Lookout; (2) Town of Canby.

an elderly Modoc, Ben Lawver, and a Pit River (Achumawi) Indian, William Turner Jackson, both then living in Yainax, Oregon. Their statements were transcribed (and no doubt edited) by Joseph Garber, the official in charge of the Yainax subagency, who then forwarded them to Aldrich.

Garber's account of Ben Lawver's description of the processing of the insect was published in full by Aldrich:

About forty years ago when the Indians used the Koo-chah-bie as food, they would go to

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Pitt [sic] River in Modoc County, California, at a point about ten miles down the river from where the little village or town of Canby now is. The time for gathering the flies was some time in the early summer. The Indians would place logs across the river in about the same manner that a present-day log or lumber boom is constructed. They would then go up stream and shake the flies off the willow bushes growing along the banks of the river. The flies falling on the water would float down stream and lodge against the logs in great quantities. As many as a hundred bushels could be gathered this way in a single day. The Indians used a kind of basket to dip the flies from the water and carry them to the place where they were to be prepared for food.

A pit was dug in the ground about 1½ to 2 feet deep and about 2 feet or more square. Then two layers of stones were placed in the bottom of the pit, each layer being about three inches thick. A wood fire was built on these stones and more stones were put around and over the fire. When the fire was burnt out and the stones were hot, all the stones were removed except the bottom layer. Then green tules or green coarse grass was spread out on the bottom layer of rocks. The walls of the pit were lined with hot rocks also, and this inclosure[sic] lined with tules or grass. The oven-like inclosure [sic] was then filled with the flies. These were covered with green coarse grass and the whole covered with more hot stones. Water was then poured on the hot stones of the walls of the pit, the hot stones converting it into steam.

As soon as the water was poured on, dirt was hurriedly thrown over all to a depth of several inches. The flies were allowed to cook in this manner until the heat was pretty well expended. The dirt and grass were then removed from the top and the mass allowed to cool. When sufficiently cooled the product was taken from the oven and was ready for use. In this state it was called by the Modoc and Pitt [sic] River Indians 'Koo-chah-bie.' When cold Koo-chah-bie is about the consistency of head-cheese, having a reddish brown color and can

be cut into slices with a knife [Aldrich 1912: 160].

Additional data on the capture and preparation of this insect were provided to Aldrich by Jackson (also through Garber). He remembered that, during his boyhood, sometime around 1870, large numbers of insects were gathered about eight to ten miles northeast of the town of Lookout.

These flies were gathered there sometime in the month of May, and could be gathered by the tons. The trees, bushes and rocks were covered with them in places to a depth of five or six inches [probably an exaggeration]. Hence it was no trouble to gather them, for they could be scraped off the rocks and trees into great heaps. They would alight on the Indians until they were literally covered with them.

The time of gathering them was in the cool of the morning when they were all settled and too cold to fly. In the heat of the day the air would be so filled with them as to exclude the sun and one could see but a short distance [an unusual occurrence for *P. californica* since they generally don't fly very much]

A large pit was dug in the ground and the same materials used in constructing the oven as those mentioned in the Ben Lawver statement [quoted above]. But before the flies were put into the oven they were dumped into large baskets and mashed up and kneaded like a housewife works her paste when preparing to bake bread. The mass is made into loaves like bread and placed in the oven side by side. There may be a half dozen or more layers of these loaves in one oven with the hot stones between the layers. A great quantity could be cooked or baked in one oven in this manner. When this product was baked and dried it could be sliced from the loaf and used as food.

The food was called at that time and place by the Pitt [sic] Rivers 'Why-hauts.' When the Indians had gotten as much of the

Why-hauts as they needed for winter supply, they carried it away to their places of living. A great deal of this was used as winter food [Aldrich 1912: 161-162].

Although the term "Koo-chah-bie" (referring to the *kutsavi* of Mono Lake, [cf. Heizer 1950]) was mentioned by native consultants several times, its use was most likely the result of the term being supplied to Garber by Aldrich (in his original letter of inquiry) and the fact that Garber (a white) was transcribing the information. He probably just used the native term Aldrich had provided him, despite the fact that it referred to an entirely different insect. This seems even more clear since the Achumawi apparently referred to the processed insect as "Why-hauts" and that *kutsavi* is a Western Numic, not an Achumawi, word.

From the above accounts it appears that the insects were processed away from the main habitation sites, probably close to the gathering areas. If large earthen ovens were utilized as described, they should be observable in the archaeological record. Perhaps some of the pits for which the Pit River was named represent such features, and not deer traps.

Aldrich provisionally identified the insect as a member of the genus *Atherix* (Diptera: Rhagionidae) based on his observations in Utah and Idaho (1912: 162). E. O. Essig visited the Pit River area in May for three years (1927 - 1929) but could not locate any *Atherix* (Essig 1931: 33). Essig surmised that the insect in question was actually the California salmon fly (*Pteronarcys californica*), a giant stonefly that occurs in great numbers in northeastern California (mostly in May), and is now used extensively as bait for trout fishing.

STONEFLY ECOLOGY

There are about 480 described species of stoneflies in North America (Harper 1978)

with varying habits and distributions. It seems unlikely that aboriginal utilization of this type of insect was limited to the California salmon fly. Although the precise distributions of the various species of stoneflies are poorly known, *Pteronarcys* is widely dispersed in California, inhabiting the Kings, Pit, Sacramento, Yuba, Feather, and Mokelumne rivers and Hat Creek in the northeastern part of the state (Richards, Swisher, and Arbona 1980: 54).

Stoneflies generally lay their eggs in large masses in the water of fresh, running streams or, in the case of *P. californica*, in rivers (Elder and Gaufin 1973: 218). The larvae (Fig. 2a) are aquatic and live under stones or other debris as long as three years (Elder and Gaufin 1973: 219). They may prey on other aquatic insects (Jewett 1956: 155), although this has been questioned (Elder and Gaufin 1973: 219). The larvae emerge (probably *en masse*) from the water in the late spring and crawl out onto stones (hence the name). They then ascend nearby vegetation where they emerge as adults (Fig. 2b). They are poor fliers and are usually found on rocks, trees, or other vegetation close to the stream (Essig 1958: 166). Adult stoneflies tend to be nocturnal (Arnett 1985: 109) and some species (not *P. californica*) are available throughout the year (Needham and Claassen 1925: 8). Stoneflies do not take to flight quickly, but can run rapidly to hiding places (Needham and Claassen 1925: 8).

The California salmon fly (*P. californica*) is among the largest of the *Plecoptera*. The adult males average between 33 and 40 mm. in length, the females 41 to 46 mm. (Needham and Claassen 1925: 37). Another, slightly smaller, species, *P. princeps*, also exists in northeastern California, generally emerging during the first two weeks in June (Richards, Swisher, and Arbona 1980: 54). It is possible that this species was also exploited.

The emergence of these insects is depen-

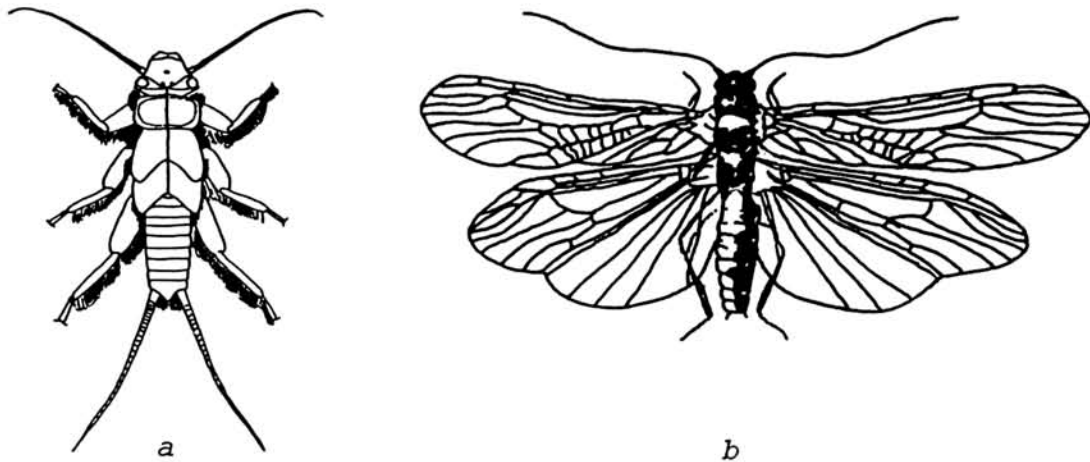


Fig. 2. Larvae and adult California salmon fly (*Pteronarcys californica*) (both actual size). (A) redrawn from Jewett 1956: Fig. 6:3; (B) redrawn from Jewett 1956: Fig. 6:1.

dent on water temperature, with 50-60 degrees (F.) being optimal (Richards, Swisher, and Arbona 1980: 54). This indicates that insects would hatch first in the lower elevations of the southern extent of their range, with the hatch generally moving north and upstream.

The description of the insects given by native consultants seems to fit very well with the habits of the California salmon fly, although the species assignment is not completely certain. There are many genera of stoneflies throughout California and the Great Basin, including the California salmon fly (Needham and Claassen 1925; Richardson and Gaufin 1971; Cather, Stark, and Gaufin 1975; Sheldon 1979), and many of them could have been used for food. Unfortunately, there are currently no specific data indicating that they were.

OTHER ETHNOGRAPHIC DATA

Ethnographic data relating to the use of "salmon flies" are not specific and may refer to species other than *P. californica* (such as *P. princeps*). Salmon flies were noted as being used by the Achumawi (Kniffen 1928: 302; Olmsted and Stewart 1978: 228) but no specifics were given. Harrington (1985) was

told (in 1922) of salmon fly by James Hawkins (born 1901), an Achumawi consultant, although aboriginal use was not discussed. Harrington noted:

lil', salmonfly. These are found along the rivers. A bug 1¼" long [the right size for *P. californica*]. They fly. You can fish with them. They are easy to catch, you can catch them with your hand [Harrington 1985:Rl. 025, Fr. 0064].

Later, in 1931, Rosa Charles, an Achumawi consultant, told Harrington that *lil'* was a "big pink salmonfly" (1985: Rl. 027, Fr. 582). This reported color is similar to the "reddish-brown" color of the processed insects described by Ben Lawver, a Modoc (Aldrich 1912: 160).

Garth (1953: 139) reported that the Atsugewi utilized salmon flies which were

plentiful along Pit River and Lost Creek. They were obtained in the spring, being picked by hand from the banks, in the early morning, before the wind arose. The wings were removed, and the body was boiled and eaten.

Voegelin (1942) recorded the taking of several insects by the Atsugewi, although salmon flies were not specifically identified. However, the description of insects being

“shaken down from trees, or picked off branches” and “hand gathered early in morning” (1942: 53) is reminiscent of other descriptions of salmon-fly harvesting (and of some other insects such as grasshoppers).

DuBois (1935: 15) reported that the Wintu considered the salmon fly a great delicacy.

These insects swarm on the river's edge for a few days in April. They are gathered in the morning before their wings are strong enough to permit flight. They are either boiled, or, if they are plentiful enough, dried for winter use.

The Yana appear to have also utilized salmon flies. Sapir and Spier (1943: 252) reported that

a small crustacean popularly known as “salmon fly” (*tc't'na*) is washed up in great numbers from the river onto the willows along the bank (*'tlau-*, salmon flies are washed to shore), on which they remain stuck. When so found, they are gathered, cooked, and used as food.

The use of the term crustacean is puzzling but the general description of the species' habits seems to indicate a type of stonefly.

DISCUSSION

While the practice of harvesting salmon flies has not been fully demonstrated, there are several points of interest. Christopher Raven (personal communication 1985) pointed to a possible west-to-east harvesting schedule (by the Wintu in April, by the Achumawi near Lookout in May, and at nearby Canby in the “early summer”). This timing correlates with increasing elevation (although the elevations of Lookout and Canby differ only by about 150 ft.) and presumably, to the emergence of the insect, a phenomenon tied to water temperature (Richards, Swisher, and Arbona 1980: 54). The procurement of storable food (including salmon-fly bread?) was begun early in the

gathering season. Salmon-fly procurement may have conflicted with the gathering of other foods such as epos (*Perideridia*), an important winter food also gathered in the spring by the Achumawi (Olmsted and Stewart 1978: 227). The extent and significance of such conflicts are not clear since our understanding of the overall aboriginal economic system is so poor.

The cost/benefit ratio of salmon-fly procurement was probably quite favorable although there are no specific data available. Search and capture time should have been minimal but processing time (oven construction, cooking, etc.) could have been greater. There are no specific nutritional data on salmon flies available. Insect foods, however, are often high-quality resources rich in protein and other important nutrients (cf. Bodenheimer 1951).

The term applied to the insects by native consultants in 1912, *Why-hauts* (transcribed by a non-linguist), appears to be quite similar to *wahaj*, the Achumawi term for bread (Olmsted 1966: 57, 70). An Achumawi cognate for bread, *wa'h'hach*, was noted by Bauman (1979: 73). Although it is possible that these terms refer only to bread and not to insects at all, they may indicate that insect resources formed an important part of the diet.

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