

CALIFORNIA'S TOBACCO FARMERS AND THE PROBLEM OF EXPLAINING THE ABSENCE OF FOOD PRODUCTION

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Explaining food-production origins has been one of archaeology's persisting central questions. California presents a particularly intriguing case, a reversal of the question: explaining the absence of food production when information, access to suitable crops, workable environment and population pressure all were present. The question has been recognized but still is not adequately explained. This paper evaluates several potentially plausible hypotheses in seeking a satisfactory explanation.

One of the most enduring questions in the archaeological literature concerns explaining the origins of food production—one of humanity's most dramatic innovations (e.g. Cowan and Watson 1992). Many hypotheses have been generated and none has stood as a fully supported, sufficient explanation for all cases (e.g. Feder and Park 2001:441-449). Given the ongoing challenge of the problem, California presents an interesting variation, in reverse form, to the question: given the understood adaptive advantages of animal and plant domestication in comparison with hunting and gathering, why did the great majority of prehistoric California societies not undertake food production?

The absence of food production in most of prehistoric California has long been recognized (e.g. Kroeber 1925). The question has been formulated, but cannot be said to have been adequately addressed, much less resolved. It was addressed, for example, by Chartkoff and Chartkoff (1984) and Moratto (1984). The issue was not discussed as a significant research question in today's California archaeological community, however, in the new and substantial overview by Arnold, Walsh and Hollimon (2004).

It should be noted why the matter is of significance. The question, although here centered in California, has a much larger magnitude of significance because it is related to general assumptions about cultural dynamics and processes of change. The problem of explaining the adoption or lack of adoption of this important mode of subsistence is one that has world-wide application. The principles of cultural dynamics involved also are global in significance. The case of California has been discussed in some literature, but it has not been truly explained in terms of general principles that have been supported through testing. The question for California therefore is one of truly global significance, because

the general principles that should account for it would be relevant worldwide.

FORMULATION OF THE QUESTION

Food production can be regarded as a subsistence strategy based on domesticated plants and animals whose products are eaten by humans. Domestication, in turn, involves the management of the life cycles of selected other species by human populations. Such management can vary in actual expression, but in general involves humans providing the domesticated population with necessary nutrients and a managed habitat with living space protection against impingement by rival species. Humans also manage the reproductive activities of the domesticated population, including selection of individuals who can reproduce, selection of qualities to be favored or promoted, and assistance in the activities of biological reproduction.

Given the adaptive advantages associated with the subsistence activity of food production, what explains decisions by communities to decline to adopt it? This pattern is one that occurred in a number of places in the world, of which California is a significant example. How can we explain why Native California groups did not undertake food production? If this question is seen as an opposite to the question calling for the explanation of the origins of food production, then it is possible to consider a series of separate hypotheses to try to answer it. If any hypothesis ends up being supported, or not rejected, by relevant evidence, then it may be possible to raise the hypothesis to the level of a possible general principle and see if it can be applied elsewhere. What follows, then, is a series of hypotheses, each of which potentially could answer the question.

AN IGNORANCE HYPOTHESIS

One possible explanation could be the lack of information about what food production was, what it involved, and what it contributed. Since food production does not seem to result from an inherited human gene, and since there is no universal cultural law requiring that information created or discovered in one society must flow to all societies, it could be possible that California societies were unaware of food production and happened not to discover it. Possibly California societies failed to independently invent food production and were not in the information loop with other societies that did practice it. This ignorance could possibly explain the lack of food production in California.

This hypothesis can be assessed by examining its logical test implications against available evidence. The key test implication of this hypothesis is that evidence should not be found that California cultures knew of, understood, or practiced activities involved in animal or plant domestication.

Based on existing knowledge, however, the hypothesis cannot be supported. A number of researchers have documented the occurrence of dog domestication in essentially all California societies. The widespread practice of tobacco cultivation also has been widely reported (e.g., Heizer 1978; Kroeber 1925). Even though these practices did not involve food production, the principles of animal and plant domestication were clearly understood and practiced. Thus knowledge of principles of domestication existed in those communities, so lack of knowledge cannot account for the absence of food production.

AN ACCESS HYPOTHESIS

Another possible explanation could be that California societies may have understood the principles of domestication, but had no access in their biomes to species appropriate for food production, or capable of being domesticated successfully. All species, after all, are not equally receptive to human intervention in their lives. This hypothesis, however, also cannot be supported, for at least two kinds of reasons.

There is ample documentation that many Native California societies practiced habitat manipulation to foster the abundance of desired wild resources, such as regularly burning the chaparral to regress the ecological succession of the ecosystem and promote the abundance of seed production and populations of deer and rabbits (see, for example, Moratto 1984). These

practices indicate the presence of manageable species in the native habitat.

In addition, there is ample historic and ethnographic evidence, along with archaeological data, indicating that many California societies, especially around the southern California coast, were in direct exchange contact with societies in the Colorado Desert, the Colorado River Basin, and the Southwest, who did practice food production (see, for example, Fagan 2003:297). California cultures therefore had effective access to species, such as maize, beans, and squash, which were widely cultivated elsewhere on the continent. In the case of the Cahuilla, cultivation was taking place within a hundred miles of the Pacific coast (e.g. Bean 1972).

A HOSTILE-HABITAT HYPOTHESIS

Another possible explanation could be that the environments in which most California cultures existed were unreceptive to the successful cultivation of crops grown elsewhere on the continent because of environmental factors. For example, in the California Climate Zone (Csa and Csb in the Köppen-Geiger classification system, Ackerman 1941), most parts of California receive less than 15 inches of precipitation annually, as compared with, say, 40 inches in Michigan (see, for example, Bergman and Renwick 2002: 73-84). In addition, in many parts of California most or all of that rain falls in the period between December and April, when crops would not have been grown.

The fact that California has long been the leading agricultural state in the nation might seem to be evidence against this hypothesis, but it is not necessarily so. California's great agricultural productivity is strongly affected by such factors as large-scale water-control systems, industrial fertilizers and herbicides, and modern farm machinery, all factors that would have had no bearing on possibilities of farming in prehistory. More relevant, as noted previously, was the fact that most Native California cultures grew tobacco, showing that even prehistorically such cultivation was ecologically possible.

Furthermore, when colonists in the early Spanish expansion from Mexico moved into coastal California starting in the late eighteenth century, they began the low-technology cultivation of maize, beans, and other crops that also were cultivated in Arizona and the Colorado Desert, showing that there was no ecological barrier preventing plant cultivation from taking place of the same crops that were Native American food staples farther to the east (e.g. Cook 1976; Rawls 1984). Even in

areas where summer drought was severe, such simple responses as pot irrigation were sufficient to resolve the problem and were achievable by Californians with their existing material technology, as shown by the Cahuilla (Bean 1972).

A SELECTIVE-DISADVANTAGE HYPOTHESIS

This hypothesis argues that food production was deliberately not chosen by most eligible California cultures because to have undertaken it would have proved itself counterproductive or maladaptive, given the other strategies already in place and needed to support populations at the levels to which they had risen. The core of this argument is that California subsistence practices, based on the extraction in seasonal surplus of an array of terrestrial, riparian, and marine resources, depending on location, provided a food base equal to or greater than that provided by food production in communities to the east in terms of food volume, reliability, storability, calories and nutrients yielded, and labor invested.

This argument rests on two central elements. The first is that many of California's particularly rich, diverse, and locally accessible biomes yielded, with appropriate extractive behaviors, a food base that would not have been equalled by substituting garden crops. The second is that the exploitation of those wild resources required markedly high investments in time, labor, energy, and management which, when in operation, could not have been replaced without a breakdown in social organization, a reduction in population levels and densities, and a damaging or collapse of institutions. Thus, it is argued, powerful selective pressures worked against the adoption of strategies that would harm or destroy the system and its carrying capacity, even though it might have worked perfectly well in other circumstances. The collapse of the Late Archaic center at Poverty Point on the Lower Mississippi River may be a case in point, since the breakdown of Poverty Point coincides with the emergence of food-production adaptations in the region (see, for example, Fagan 2000:399-402).

Mark Basgall's 1987 analysis of acorn production in the southern Coast Ranges offers good evidence for the argument of the adaptive value of labor intensification as a response to resource shrinkage (Basgall 1987). The success of such strategies in turn creates increased pressure for maintenance and stability through the generation of larger populations with greater overall caloric yields, even at rising costs. As Brian Fagan (2003) and others have noted, California's prehistory shows a sequence of responses to climatic anomalies

and resource fluctuation with expansion of extraction efforts to new niches while maintaining ones already occupied. In many cases, exploitation of new resource categories involves not just a matter of movement, but also of time management, labor organization, territory maintenance, transportation, storage and redistribution, in ways that can integrate the successful uses of both the old and the new niches. The opening of niches that would conflict with the maintenance of existing needed niches would cause more harm than good, and would therefore be selected against. This hypothesis, it is felt, would fit in with an evolutionary-ecological perspective.

CONCLUSION

Of the four hypotheses considered here, the first three seem to be clearly rejectable. The fourth one, the selective disadvantage hypothesis, appears to be supportable in terms of evidence and principles. A great deal of ethnographic evidence documents the unusually rich productivity of food collection in California. The seed products of the grass and chaparral zones in particular are nutritionally parallel to cultivated seed crops and are richer in some key nutrients. They also are as harvestable in seasonal surpluses and as readily stored. Yield per land unit is harder to assess. The labor and time needed in seed harvesting and processing is much greater for grass and chaparral than for cultivated grains, but the wild species do not require the time and labor put into planting, weeding, watering and other season-long maintenance that garden crops require, so the investment in the exploitation of wild seeds is much less disadvantageous than it may seem initially.

Similar patterns can be seen with nut crops. Acorns, like other nuts, contain the full set of amino acids humans require for protein, so they can serve as a plant-based protein source comparable to the eating of maize and legumes in the same diet. Acorn processing and leaching is very time- and labor-intensive compared with maize grinding, but as with wild seeds, the ongoing labor needed for maize and bean cultivation is not needed for acorn usage (Fagan 2003; Hunt 2004).

In sum, it appears that the argument of selective disadvantage can explain why California communities did not adopt food production. It will be interesting to see if the same argument can be applied to other parts of the continent where food production was not adopted even though the ecology and the knowledge were there available.

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