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The Kumiai traditional food system: Reconnecting nature, food and health through ancestral knowledge

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Traditional foods, once central to the diets of different cultures, are losing relevance as knowledge about food and its natural ecosystem deteriorates. This qualitative study describes the traditional food system of a Kumiai community in Baja California, and the ways in which the Kumiai have continually adapted their use and management of wild food resources to different food culture influences, demographic changes and contemporary food preferences. Present-day Kumiai recognize that their traditional diet was more nutritious and more connected with nature than their current diet, and express concern over transmitting existing knowledge about it to younger generations. We conclude that the characteristics of the Kumiai traditional food system not only strengthen their cultural identity and community economies, but also present potential solutions to the problem of food system sustainability by way of wild food resource management, as well as containing elements of a strategy for improving the health of community members.

KEYWORDS

traditional food systems, sustainable food systems, Kumiai ethnobotany, traditional foods and health, traditional food knowledge, wild foods, Kumiai native group

Introduction

Indigenous food systems are committed to ensuring a balance between communities and their environments, where diets are related to local ecosystems and to a culturally appropriate disposition of ingredients [Nabhan, 2006; Kuhnlein H. V. et al., 2009; Food and Agriculture Organization (FAO), 2020]. Traditional foods from native groups represent culturally significant ecological practices, and often provide significant nutritional value (Joseph and Turner, 2020). Indigenous peoples' original diets were generally well balanced and considered healthy in terms of their composition of proteins,

carbohydrates, fats, vitamins and fiber (Kuhnlein and Humphries, 2017; in Joseph and Turner, 2020, p. 3). It has also been shown that traditional food sources of carbohydrates are more slowly digested and absorbed, thereby protecting against diabetes (Brand and Cherikoff, 1985; Weiss, 1994).

The Food and Agriculture Organization of the United Nations (FAO) maintains the importance of recognizing the links between traditional food systems and indigenous peoples, who they see as knowledgeable guardians of biodiversity [Food and Agriculture Organization (FAO), 2021]. In contrast, most diets are no longer determined by what is produced locally and traditionally, instead reflecting the integration of industrialized foods, a situation that has resulted in several problematic conditions that affect both the environment and the health of the people who consume such food (Gálvez, 2013; Bertrán and Pasquier, 2021). In Mexico, malnutrition and obesity-related diseases affect more than 20% of the population, and constitute a major challenge facing the country's public agenda today (Consejo Nacional de la Política de Desarrollo Social (CONEVAL), 2021). These public health problems are linked to the type and quantity of foods that are present in urban as well as rural environments; this includes the accessibility and consumption of industrialized foods (Bertrán and Pasquier, 2021), which tend to be readily available due to their low cost, and are often seen as more practical (Contreras, 2005). Kuhnlein H. V. et al. (2009), maintain that traditional food systems articulate patterns of living in local ecosystems with food knowledge from the past and present, a situation that contributes to well-being and health, and can influence the implementation of more sustainable food processes that are functional for local environments.

Mexico exhibits a vast biocultural diversity of indigenous peoples who have inhabited and interacted within the territory, characterized by adaptation to different ecosystems as well as by the various ways in which the articulation between the complex field of food and food system knowledge is manifested (Toledo, 2013). We use the triadic relationship "nature-food-knowledge" to refer to this socio-ecosystemic perspective that conceives of human societies as having bidirectional interactions with their ecosystems, and where humans' food knowledge and decisions about food configure and support human nutrition as well as maintain a balance with nature (Galafassi, 2000). Indigenous food systems in Mexico represent ways of reproducing food-transformation practices that make use of resource underutilization strategies that ensure their conservation, such the milpa food system in Mesoamerica [(Comisión Nacional Para el Uso Del Conocimiento y la Biodiversidad (CONABIO), 2013), p. 4]. Recognition of a territory's food biodiversity, its food crops and its connection with traditional knowledge, is key to confronting the homogenization of diets found in industrialized food systems that are based on centralizing diets on a few intensive crops such as corn, wheat and rice (Guzmán-Flores, 2013; Galeana-Pizaña et al., 2018).

The present study was carried out among the Kumiai native group that has inhabited the extreme northwest segment of arid America for ∼5,000 years (Garduño, 2015). In the arid America region, unlike Mesoamerica, there is little recorded information regarding traditional foods of native groups (Cruz, 2015, p. 35). The Kumiai are not historically recognized for agricultural production, since they were traditionally seasonal hunters/fishermen and gatherers (Tapia-Landeros and Grijalva, 2012). The Kumiai in Baja California, Mexico link their existing food and medicinal knowledge to a vast experience in local ecosystems management (Wilken-Robertson, 2018). They developed a semi-nomadic lifestyle defined by season-based settlement in places where water was present and the vegetation contained edible flora and fauna. This case study was carried out among members of one particular Kumiai community, San José de la Zorra. This community is embedded in the wine-production region of the Guadalupe Valley near Ensenada, Baja California, a region that has become highly developed for tourism over the past three decades.

In this article, we outline the historical elements that are connected with current Kumiai knowledge about, and practice of, their traditional food system, much of which demonstrates continued viability in the observable customs and traditions of their present-day cuisine. Theoretically, this analysis provides information to predict future transitions in the Kumiai traditional food system. However, the Kumiai identify a crisis in their ability to maintain the cultural knowledge required to sustain the practices associated with the maintenance of this system. The crisis has to do with the fact that knowledge transmission has always depended on oral tradition, and Kumiai speakers who hold ancestral food knowledge are aging and passing away. We discuss this situation as part of the study results. This article also presents Kumiai perceptions of the value of their traditional food system in terms of its ecological and nutritional significance. Throughout the document we answer the following research questions: (1) How has the Kumiai traditional food system changed in response to historical and contemporary influences? (2) What are some of the attributes of the present-day Kumiai traditional food system that remain functional? (3) How can the value of the present-day Kumiai traditional food system be assessed?

Traditional food systems: Conceptual approach

Traditional food systems represent their broader cultural systems and reflect interactions with various environmental and social contexts (Johns et al., 2013). Kuhnlein and Receveur (1996) define food systems of indigenous peoples as being composed of items from the local, natural environment that are culturally acceptable" (p. 418), including socio-cultural meanings of food acquisition, processing techniques, use, and

nutritional values. Kuhnlein (2000) later added a historical dimension, by considering traditional foods to be those that were introduced in some communities long ago, including those of plant and animal origin, whether produced locally (domesticated or cultivated) or obtained from the wild. Johns et al. (2013) point out that the low productivity of traditional food systems makes the local environment more resilient, and in this sense functions as "a key link between biological and cultural diversity" (p. 3440). Traditional indigenous food systems stand in stark contrast to the prevalent hegemonic and inequitable global food system. The recognition of such systems can provide a path to, in some sense, decolonize the local food culture, thereby contributing to a cultural resurgence that includes the possibility of better health outcomes for its members (Grey and Patel, 2015, p. 719, in Grey and Newman, 2018).

The characterization of cultures according to historical process and meanings of food as traditional or non-traditional, together with their ecosystemic contexts, provides fertile ground for an analysis of the human construction of knowledge about foods that occur in their natural surroundings (Kuhnlein H. et al., 2006; Johns et al., 2013). Hence our use of the term nature-food-knowledge to refer to the way in which a traditional food system is created. Here, nature refers to the ways in which an ecosystem generates and sustains life through its resources and processes that benefit human beings; food corresponds to a vital biological need and the socio-cultural construction of its meaning (Fischler, 1995, p. 14–15); and knowledge results from reasoning regarding the lived experiences of interacting with nature in order to obtain food.

Traditional food system knowledge contains the customs that constitute historical cultural elements related to obtaining/producing, processing and consuming food, and that have been maintained in the present or have been adapted and reconfigured in the context of daily life (Batal et al., 2020). Traditions are non-static, since local cultures undergo constant reconfigurations due to interactions with the global society, and are better understood as dynamic cultural complexes that imply ethnic and ideological landscapes (Appadurai, 1991). We therefore consider traditional food in relation to current knowledge, with its culturally accumulated syncretism recognized by the community, and understanding its role in preserving historical values and renewing the sense of belonging to a group (Amilien and Hegnes, 2013).

So why is it necessary to maintain this knowledge in cultural memory? Such knowledge contains representations that contribute to providing meaning to habits or processes that, in some cases, are at risk of being forgotten and forever lost (Duque, 2020, p. 6). The recognition of traditional foods can serve as an identity response for remembering all that is implicit in knowledge about ingredients and techniques, as well as forms of thought and behaviors related to food practices (De Garine, 1998). Traditional food knowledge can thereby serve to maintain cultural identity and to revitalize the natural resources of local ecosystems [Food and Agriculture Organization (FAO), 2020].

What is considered traditional in Kumiai food culture? Amilien and Hegnes (2013) maintain that it is the collective knowledge and acceptance as typical within a given culture, that validates food as traditional. Therefore, foods introduced by other cultures, as well as foods that connect the population with external and contemporary food practices, may be considered as part of a traditional food system, as long as these foods correspond directly to the territory and cultural adaptation (Villegas, 2019). Such an exchange and assimilation of culinary cultural attributes defines the history of post-contact transitions in the traditional Kumiai food system, resulting in the current Kumiai food culture (Bonilla Cazarín, 2008).

The Kumiai traditional food system did not incorporate cultivation methods until the arrival of missionaries and ranchers, although some authors argue that their management of wild edible species, and of the local landscape, is related to the practice of agriculture (Parrish and Lightfoot, 2009). The first transitional period accompanied the arrival of Spanish missionaries, who recruited native people to live around the missions, incorporating practices such as cattle ranching and agriculture (Magaña and Leon, 2006). Nevertheless, for native people, hunting and gathering practices remained an important way of obtaining food, complementary to the activities of grazing and agriculture (Garduño, 2015). The Kumiai settled into valleys and mountains, gradually disconnecting their food procurement from the coast, and eventually eliminating dietary seafood. A later shift in the traditional Kumiai diet was the incorporation of the modern Mexican food system. Living memories of members of the Kumiai community of San José de la Zorra are vanishing as elders pass on and modernization encroaches. Nevertheless, traditional cultural activities such as collecting, growing and hunting, continue to be practiced, thereby keeping these aspects of the traditional food system alive.

The study community and its context

The Kumiai are an amerindian tribe of indigenous peoples belonging to the Yuman-Cochimi branch of the Hokan language (Garduño, 2014, p. 13), whose original territory spanned a broad area on both sides of what is now the northern border of Baja California in Mexico, and the southern border of California in the United States (Shipek, 1982). Lacking a written language, the communities that became part of the United States adopted the English spelling of "Kumeyaay," and the communities that remained in Mexico use the Spanish spelling of "Kumiai." The Kumeyaay and Kumiai, though originally the same cultural group, have developed differently since their geopolitical division (Wilken-Robertson, 2018). The Kumiai are currently distributed in four native communities in the municipalities of Ensenada and Tecate (Garduño, 2015). The

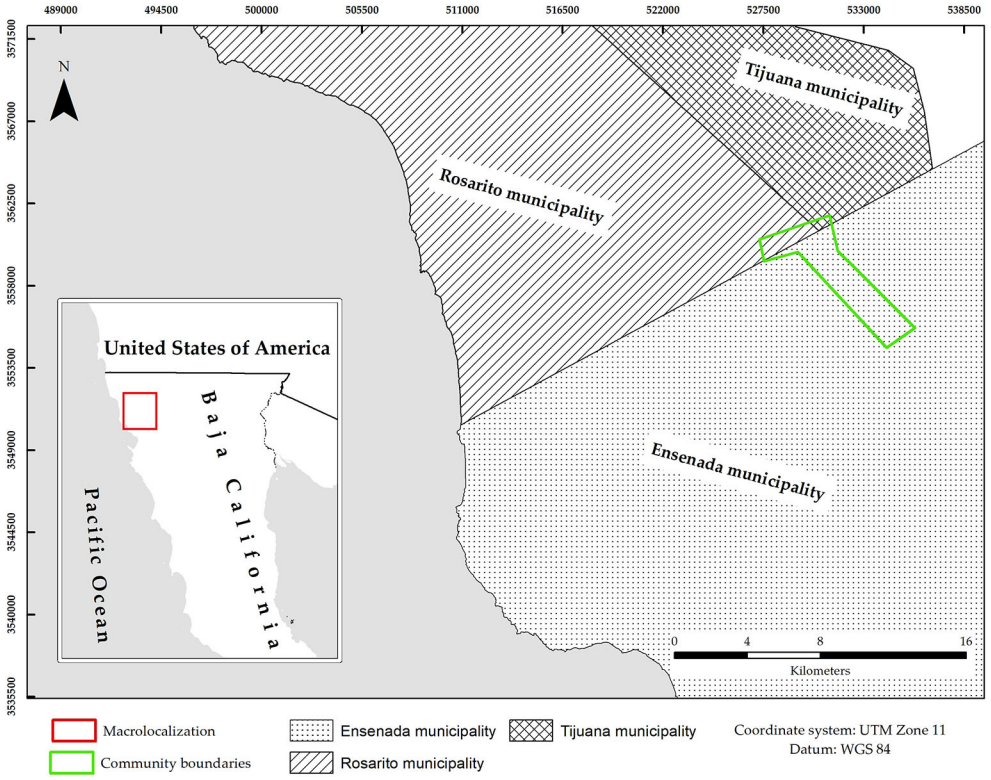

FIGURE 1
Map showing the polygonal territory of San José de la Zorra, one of four Kumiai native communities in Baja California. The inset shows the community's proximity to the United States of America and to the Pacific Ocean (retrieved from Andrade-Sánchez et al., 2021).

subject of this article refers exclusively to the Mexican Kumiai and in particular to the community of San José de la Zorra.

Although principally located in Ensenada, small parts of the northern fringe of this community are found in the southern sections of the municipalities of Rosarito and Tijuana (see Figure 1). The community is located in a rural area with a Mediterranean-style climate, 58 kms from the municipal seat of Ensenada and 18 kms northwest of the Guadalupe Valley (Leyva and Espejel, 2017). The development of the Guadalupe Valley has led to its designation as an international destination for viticultural and gastronomic excellence, attracting busloads of tourists (Zarate and Barragan, 2018, p.88)—and has radically changed the environment of the Kumiai people who settled into their small communities over a hundred years ago.

The original Kumiai semi-nomadic, clan-based organization was replaced by a community system of communal lands. San José de la Zorra was settled around the beginning of the XX century in accordance with changing national policies that were geared toward marginalizing the native groups (Morales, 2003, p. 91–92). According to the National Institute of Statistics and Geography [Instituto Nacional de Estadística y Geografía (INEGI), 2020] a total of 167 people constitute the community of San José de la Zorra. However, the community keeps a separate updated list showing more detailed information, that indicates a total of 99 people currently living there (Community list census information by interlocutor 6, 2020). Of this total population, 19 are indigenous language speakers capable of transmitting traditional food knowledge learned from their grandparents and parents reaching back to the first half of the past century (Community list census information by interlocutor 6, 2020). This dwindling number constitutes a cultural-heritage concern, since fluent speakers tend to be over forty years of age, and no children are learning the native language as their mother tongue (Leyva, 2014, p. 4).

The Kumiai adapted the cowboy culture as part of their identity related to cattle herding and grazing practices, an important activity for culinary diversification. San José de la Zorra depicts the characteristic housing patterns seen today, referred to as *rancherias*, consisting of a set of structures, or ranches, dispersed throughout the rural space that makes up the community (Magaña and Leon, 2006). Among their customs and traditions, is the elaboration of handicrafts from the leaves and seeds of wild plants (Garduño, 2014). Their economy is sustained by temporary employment, agriculture

(wine production and agricultural land lease), salaried work, handicrafts and remittances from the United States (Wilken-Robertson, 2018).

Methodology

Several factors contributed to our decision to work with the Kumiai of San José de la Zorra, apart from their basic characteristics of having thrived on semi-nomadic food procurement practices, their late inclusion of agricultural techniques, and a varied diet of different species of flora and fauna that represent Baja California biodiversity (Garduño, 2014). Of the four regional Kumiai communities, San José de la Zorra was chosen due to its location, its endemic wild foods and the openness of interlocutors. We believe the information they provide will contribute to the recognition of this regional food heritage under circumstances of scarce documentation and the rapid loss of members who carry living memories of changes to the traditional food system. The location is of special interest because of its juxtaposition to the Guadalupe Valley, where a robust gastronomical-viticultural development has taken place.

The overall methodological approach employed an array of qualitative techniques designed to characterize the extent to which community members consider the traditional food system as remaining functional, and to investigate the value they see in it and its maintenance. Ethnographic methods primarily employed participant observation and in-depth interviewing, but also utilized workshops and photographic tools (Berg, 2007; O'Reilly, 2011; Mikhailovich et al., 2015; Codesal et al., 2017).

In order to answer the research question regarding the persistence of the historical Kumiai traditional food system in the modern context, we compared our ethnographic findings with descriptions of the traditional Kumiai food system found in literature dating as far back as the first missionary contacts. The literature review also revealed the various cultural influences to which the Kumiai were exposed and forced to adapt throughout the different historical periods since first contact, thus providing information to compare with what is known from the primary sources (Snyder, 2019).

Fieldwork took the form of numerous day visits as well as stays of several days, over a period of 4 years. During these times information was gathered from informal conversations with key interlocutors and their family members, as well as the formal interviews and workshops. Fieldwork involved an initial period of rapport-building, and the gradual implementation of a snowball sampling (Etikan et al., 2016) designed to identify community members who possessed the highest degrees of knowledge about the traditional food system and maintained involvement with its techniques and practices. This method produced eight women and two men ranging in age from 25–60 years who became key interlocutors. More women were involved due to the nature of the research, involving food and food preparation, which is principally the domain of Kumiai females. Men tend to be more knowledgeable about hunting practices and techniques, and in the traditional ways of preparing game. We stopped the snowball sample at the point of data saturation. In-depth interviews were conducted with these ten interlocutors, comprising roughly half of the 19 Kumiai speakers of the community who acquired their traditional food knowledge in their mother tongue.

The guide for in-depth interviews was based on topics concerning the transmission of traditional food knowledge, food diversity in Kumiai traditional and contemporary diets, and how these relate to a healthy and sustainable diet. In-depth interviews provided information about present-day traditional food items and contemporary influences affecting their dietary practices and preferences. They also revealed members' knowledge and practices regarding the acquisition, preparation and storage of wild elements contained in the local ecosystem, as well as perceptions of their nutritional value and place in current dietary practices. Finally, the interviews contained members' thoughts about the loss of traditional food system knowledge and associated practices, and ideas for how to revalue and transmit these to younger generations.

Fieldwork also included ethnobotanical walks to identify and collect the traditional food items growing wild within a half-mile radius of the community, as well as participation in the food preparation process. These activities were recorded photographically in addition to field notes (Piñeiro and Diz, 2018). We also conducted two workshops with women from the community in 2019 and 2020. The first workshop was designed to identify the elements of the traditional food system and to discuss ways of improving their current diets. The second workshop developed plans for accomplishing these goals and discussed ways of integrating the community around them, with the vision of food as a uniting factor. This constitutes a topic of ongoing work with the community.

The study also included data collected in conjunction with our participation in the organization of a dinner event that showcased Baja California's native cultures and their foods, organized by the Institute of Native Cultures of Baja California. During this event, we collected questionnaires from an additional 15 members of three Kumiai communities, ranging in age from 18–60 years, regarding their knowledge about traditional foods, and the importance of keeping this knowledge alive. This allowed us to compare and corroborate with other Kumiai, some of the information retrieved from San José de la Zorra.

Data analysis

A grounded theory approach was utilized to develop themes surrounding the key elements of the Kumiai traditional food system, and to visualize relationships among these elements

within the context and processes of the food system. Interviews were processed using the software package Atlas.Ti (L-085-399) (Taylor and Bogdan, 1987; Restrepo-Ochoa, 2013). This analysis incorporates historical, cultural and ecological factors related to food disposition and preferences, thereby contributing to our integration of primary and secondary data.

We constructed tables to synthesize information obtained from in-depth interviews, in combination with other indirect data. For example, Figure 2 shows the different historical periods that influenced the Kumiai traditional food system, the nature of the culinary influences, and the ways in which those influences are seen in their current diet. Figure 3 shows three different foods that form part of the traditional Kumiai diet, as described during the interviews and identified on ethnobotanical treks; their botanical characteristics and nutritional values are added from the literature in order to lend credence to the perceptions expressed by interlocutors about the relatively healthier nature of traditional food items as compared with processed industrialized foods.

The research protocol was approved by the Institutional Review Board of the Autonomous University of Baja California. In addition a signed informed consent was obtained from the traditional authority of the Kumiai community of San Jose de la Zorra, and from all participants.

Results

The following results describe elements of the traditional diet in relation to the interpretation of what is known and perceived about the food traditions in a present-day context. Findings confirm that the present-day Kumiai daily diet maintains elements of their historical traditional food system that are collectively considered as traditional. They also show the ways in which the Kumiai reconfigured their traditional diet around enduring core practices of hunting and gathering animals and plants from within their local ecosystem, in response to various influences, and how they adapted and integrated these external culinary influences. Finally, results are presented concerning the value of the traditional food system to present-day Kumiai, not only as a cultural heritage, but also in terms of its relation to the local ecosystem, the nutritional value provided by Kumiai traditional foods and the problematic nature of transmitting knowledge about it to younger generations.

The Kumiai daily diet reflects significant diversification from their original traditional diet due to the incorporation of elements introduced by the migration of different cultural groups to the Baja California peninsula after the arrival of the Spanish missionaries, and especially since the 1970s, when modern Mexican culture began to expand into rural areas of Baja California. This gives rise to the first research question: How has the Kumiai traditional food system changed in response to historical and contemporary influences. Figure 2 shows a rough timeline of the cultures that established themselves in Kumiai territory, some of their contributions to the general food culture, and elements that are incorporated into the food dynamics of the Kumiai of San José de la Zorra. Ingredients, such as sugars, oils, cereals, spices and certain fruits appeared with the arrival of Spanish explorers to Mexico in 1519, giving rise to a process of "culinary miscegenation" (Bonilla Cazarín, 2008). While these items were incorporated into the diets of mesoamerican indigenous groups, they did not reach the Kumiai until 1834, when the final Dominican mission was built in the area where the San Jose de la Zorra reserve was later established in 1867 (Morales, 2003). Other foreign influences were inserted in subsequent periods, most notably the Mexican, Russian Molokan, Japanese and other Asian, and American (Meigs, 1994; Leyva and Espejel, 2017). These cultures exchanged culinary practices and ingredients with the Kumiai community, resulting in new ways of eating, preparing and producing foods for all of them. Although some members of the San Jose de la Zorra community have incorporated practices that reflect elements of the regional context, such as small-scale agriculture and the production of wine, cheese, and olive oil, community members consider only the older methods of gathering, hunting, and family farming as definitional of their traditional diet.

The establishment of settled communities brought with it the cultivation of other foods that were introduced to their original diet, such as "wheat, beans, and barley" (Interlocutor 2, Personal Communication, 2019), as well as the raising of farm animals, including cattle, as practiced by the missionaries and ranchers in the ninteenth and early twentieth centuries (Aschmann, 1952). The change to a sedentary lifestyle resulted in the Kumiai disconnection from their traditional fishing practices and consumption of seafood. This tendency was reinforced by the gradual settlement of migrant Mexican and international populations that progressively appropriated coastal areas, displacing the indigenous presence. In the contemporary era (XX–XXI) this disconnection is linked to urban growth and the privatization of beach areas in the municipality of Ensenada. Memories concerning knowledge about the use and consumption of marine resources in the Kumiai diet were documented in interviews carried out during the earlier stages of this research. As one interlocutor from San José de la Zorra mentioned: "*I have heard that the oldest people used to go to the coast to eat shells; I imagine they went down to Ensenada*" (Interlocutor 1, Personal communication, October 15, 2016). The oldest village elders indicate that perhaps during the early twentieth century, the Kumiai still maintained their nomadic relationship with coastal food procurement. However, a native Kumiai interlocutor from San José de la Zorra noted that "not much seafood is consumed" as part of their present-day traditional diet (Personal Communication, 2016[1]).

1 Personal communication with a person who now is deceased.

Cultures established in Kumiai territory (Ensenada Municipality)	Contributions to the local food culture	Elements incorporated into the Kumiai traditional food system
Spaniards-mestizos (Dominican missionary period XVII-XIX)	• **Agriculture>** grapes, figs, olives, citrus, apricots, wheat, corn. • **Mesoamerican crops>** corn, squash, chili, beans. • **Rancherias>** grazing animals (donkeys, goats, etc.)	• Olive tanning. • Planting in pattern of rancherias, and consumption of lemons, oranges, quince and figs.
Americans (XIX century)	• **Livestock>** cattle, sheep, pigs. • **Intensive crops>** wheat, barley.	• Potentiation of the cowboy culture and consumption of grazing animals.
Russian colony. Molokans (XX century)	• **Crafts>** cheese making, bread, sausages. • **Crops>** melon, cucumbers, apples, wheat. **Grazing>** Sheep.	• Cheese making and cheese consumption is incorporated and maintained in the diet.
Asian cultures (Japanese-Chinese) (XX century)	• **Grocery stores>** coffee, grains and household items. • **Intensive crops>** wheat and barley planted by outsiders within the study community.	• Wide acceptance of Chinese food for its flavor and abundant portions. • Extensive wheat and barley crops for livestock feed.
Migrant cultures from southern and northern Mexico (Mexico City, Oaxaca, Durango, Sinaloa) (XX century)	• **Crafts>** sauces; baked, fried & refried foods. • **Crops>** beans, tomatoes, tomatillos, onions, squash, chili, corn. • **Kitchen tools>** griddles, mortars, gas stove. • **Introduced products>** coffee, sugar.	• Incorporated into the food system> wheat flour, corn tortilla, hot sauces, and condiments. • Beans and coffee are important for traditional and contemporary diet. • Forms of cooking> fried, baked and pan cooked.
Modernity. Globalized food system (XX-XXI century)	• **Industrialized products** (pasta, flour, canned goods, chips, cookies, vegetable oil, soluble coffee, sugar).	• Welfare programs provided low-cost industrialized foods, including refined sugar to sweeten hot and cold drinks.

FIGURE 2
Cultures that arrived and settled in Kumiai territory. Showing the culinary elements adapted to the traditional and daily diet of the Kumiai. Author's creation based on information found in Meigs (1994), Piñón (2000), Williams (2004), Magaña and Leon (2006), Leyva and Espejel (2017), and field conversation information.

Contemporary version of the Kumiai traditional food system

Rural communities in Baja California enjoy an increasing access to, and consumption of, industrialized foods that, however, may have a negative effect on the health of native communities (Fleuriet, 2009). Such items include "junk food" (cookies, sodas and chips) and additional non-native foods incorporated from the government's list of elemental food items that are considered by the government as fulfilling the needs of the average household, including pasta, refined flour, bread, sugar, canned goods, rice, beans, eggs, dairy products, oils (Secretaría de Agricultura y Desarrollo Rural, 2020). Kumiai interlocutors say they incorporate such processed foods into their diet because they are readily accessible in local stores.

The Kumiai diet is under constant reconfiguration. Some of the ingredients that were used for traditional cooking have been replaced by what the modern market offers and although some everyday foods such as refined flour and sugar are not beneficial to their health (Weiss, 1994), they nevertheless have become incorporated into modern dietary practice (Fleuriet, 2003). Community members point out that, given the lack of refrigeration, it is more convenient to buy industrialized and canned foods. Nevertheless, there is awareness that these foods are not the same as food derived directly from the earth: *"most people consume products such as soups and canned food. Some of them used to harvest their own vegetables and grains, but many people no longer do so"* (Interlocutor 3, Personal communication, June 16, 2016).

Kumiai adoption and adaptation of outside foods is visible in the current preparations of their traditional foods. An example is the consumption of flour tortillas with nearly all meals and the incorporation of corn tortillas into their diet. As one community member stated: "In fact, we didn't eat corn tortillas until about 26 years ago. Before, there was no corn flour, [there were] no stores. Here wheat was sown and right here it was threshed and cleaned, brought home and ground" (Interlocutor 2, Personal communication, October 5, 2016). In general, present-day Kumiai prefer to accompany their meals with flour tortillas rather than corn tortillas, despite knowing that excessive consumption of refined wheat flour can contribute to negative health consequences. The Kumiai use of corn plays a smaller role in their daily diet than the ways corn is used in central and southern regions of the country, where it continues to be the main staple food and signifies great biological and cultural importance for the food systems of southern Mexico (Ordoñez, 2018).

Traditional food name	Ethnobotanical information	Nutritional characterization		Culinary and nutritional knowledge
Spanish: Bellota amarga **English: Bitter Acorn**	Scientific name: *Quercus agrifolia* Vegetation: coastal chaparral Growth: arboreal Flowering: March-April Use: food-housing-toys Parts Used: Stem; fruit Manner used: atole Taste: bitter Collection season: Autumn Frequency of consumption: medium	**Per 100gr**. Humidity: 63.76% Minerals: 2.24% Crude fiber 63.62% Carbohydrates: 10.45% Lipids: 15.67% Proteins: 8.03% Calories: 214.95%		**CK:** In adapting different seeds for human consumption, the Kumiai use processing techniques such as drying, grinding, leaching, and cooking to eliminate concentrations of tannic acid from the acorn. **NK**: Acorns are known for their great nutritional value and healthy unsaturated fats.
Spanish: Berro **English: Watercress**	Scientific name: *Nasturtium officinale* Vegetation: transitional chaparral. Growth: aquatic Use: edible-medicinal Parts Used: Stem-leaf Manner used: Direct collection, stew Taste: salty Collection time: Winter-spring Frequency of consumption: low	Calories: 11 Lipids: 0.1g-2.59% Sodium: 41mg-1.06% Potasio: 330mg-0.85% Carbohydrates: 1.3g-33.76% Proteins: 2.3g-59.74% Vitamin C: 43mg-1.11% Calcium: 120mg-0.31% Magnesium: 21mg-0.54%		**CK:** It is consumed either raw or cooked as part of a stew. **NK:** People reported that watercress is good for kidney pain and for diabetes.
Spanish: Islaya **English: Holly-leaf Cherry**	Scientific name: *Prunus ilicifolia* Vegetation: coastal chaparral Growth: shrubby Use: Edible Parts Used: fruit-seed Manner used: Direct from collection, ground Taste: sweet Collection season: summer-autumn Frequency of consumption: low	Pulp Humidity: 63.19% Minerals: 4.10% Crude fiber 76.82% Carbohydrates: 11.99% Lipids: 1.95% Proteins: 5.14% Calories: 86.07%	Seed Humidity: 42.07% Minerals: 2.86% Crude fiber 75.48% Carbohydrates: 8.37% Lipids: 3.01% Proteins: 10.28% Calories: 101.69%	**CK:** To process the seed, the techniques (such as drying, grinding, leaching, and cooking for detoxification) are the same as those used for preparing acorn atole. **NK:** People reported that holly-leaf helps with headaches

FIGURE 3
Nutritional, cultural and botanical characteristics of traditional food resources. Author creation based on information found in Cortés (1994), Weiss (1994), Lucero (1995), Wilken-Robertson (2018), U.S. Department of Agriculture (USDA) (2020), and field conversation information.

Contemporary kitchen space exhibits a duality of the modern and the traditional, since the Kumiai still prefer cooking with a wood stove, even if there is access to a gas stove. They cite the main reason as the flavor it brings to food. Interestingly, this characteristic has become a hallmark of the new gastronomy that is being developed in the region. Present-day family traditional meals within the community may contain handmade, fire-roasted flour tortillas, roasted or fried game rabbit, porridge made from acorns (*Quercus agrifolia*) "acorn atole" (Gutierrez and Von Glascoe, 2019, p. 216), seasonal fruits (in this case peaches), fresh cheese made from cow's milk, and occasionally a homemade sauce made with tomatoes and grilled peppers. Many of the families also consider it essential to have rice and beans, which have become a staple meal accompaniment (Field Observation, 2019). The use of sugar has increased in daily preparations, although people from 40 to 50 years old remember that only honey was used to sweeten drinks or food. Honey was not easily obtained because it had to be found and harvested. Traditionally, honey was considered a medicine more than a food.

These Kumiai recognize certain ingredients, techniques and preparation methods related to traditional ancestral practices versus those of recent or contemporary incorporation. Principal ingredients from the traditional system that are still consumed include: acorns, deer, wheat, quiote (the stem and flowers of *Yucca whipple*), rattlesnake, honey, mustard, cactus leaf (nopal), rabbit, lard, beans, wild mushrooms. Contemporary foods that form part of their diet include: potatoes, barley, rice, chicken, beef, corn, onions, and milk. Traditional flavors they identify as traditional are bitter-sweet-smokey; contemporary flavors are sweet-salty-smokey. Traditional and contemporary food preparation techniques include drying, roasting, boiling/stewing, baking and grinding. They also make preparations with traditional and contemporary ingredients and methods. These include: tortilla dough, pinole (wheat ground with water or milk and sugar or honey), atole (flour made with washed and slightly fermented acorns), pozole (soup made with alkaline-processed corn kernels), beef broth, stew (traditionally made of wild leaves collected according to season), dehydrated figs, beans cooked with wheat and barbecue (both traditional and contemporary).

The foods that are consumed daily in the community tend to be basic pantry staples. Yet community members still consume elements of their traditional diet at different times and for different reasons, such as to mark significant occasions or simply to experience tastes that carry important cultural meanings and sentiments. They also continue to prepare traditional foods as a way to keep alive ancestral practices associated with certain festivals, such as the annual community celebration of their patron saint, and the annual "Nativa Festival" which brings together members of all the native tribes of Baja California (Field Observation, 2017–2019). For more common celebrations such as birthdays, they tend to barbecue a freshly slaughtered cow or sheep in the style of the cowboy culture they adopted after the missionary period and reinterpreted in terms of contemporary Mexican customs.

Kumiai traditional food in relation to the local ecosystem

As mentioned above, the contemporary version of the traditional Kumiai diet maintains the use and consumption of different wild plant and animal species, thereby continuing to benefit from the nutritional value provided by them (Andrade-Sánchez et al., 2021). The second research question has to do with which of the traditional food system's original elements have been preserved and are still in use. Field work resulted in the identification of many vegetable and animal species important to the traditional food system, One interlocutor recalled what the ancients ate: *"Uh well, what we ate was deer, wheat tortillas, mustard, quiote flowers, rabbit meat, quail, and for fresh water, manzanita. All of this was prepared by my grandmother and hence the poleo that was on the hill; poleo is very good*" (Interlocutor 2, Personal communication October 3, 2016). What they call *poleo* (*Ptelea aptera)* is actually a species of Ptelea, commonly known as hops or quinine tree, which shares some of the medicinal characteristics of *Mentha pulegium*, more generally known as *poleo,* in that they both have beneficial effects on the digestive system. It is characteristic of the Kumiai to apply the name of a commonly known plant to any particular native plant found in their habitat, according to the similarity of their uses and effects.

Different types of animals identified as part of the traditional diet are still found in the ecosystems of low-lying shrubs and grasslands (Leyva and Espejel, 2017, p. 138–141), and are sporadically consumed, among them: rattlesnake (*Crotalus ruber,* subject to Special Protection by the NOM-059-SEMARNAT-2010), mule deer (*Odocoileus hemionus*), hare (*Lepus californicus*), rabbit (*Sylvilagus audubonii and Sylvilagus bachmani*), and quail (*Callipepla californica*). Their limited consumption is due to factors that include the displacement of fauna in response to population, tourism and agricultural development of the rural area, legal restrictions, and a lack of interest in continuing the practice.

Some uses of plant species are transitioning from their original culinary, sacred or medicinal use, to a commercial use (Cortés-Rodríguez and Venegas-Cardoso, 2011). The Kumiai made baskets of insect-repelling leaves that protected the seeds they harvested for food. They used the reed (*Juncus* sp.) to weave their *Sawil*—"a plate for cleaning seeds" and *Jilu*—"small woven pot to store seeds", and the willow (*Salix* sp.) to weave their *Shkwin*—or "woven pot" (Personal Communication, 2021). These plates and pots were important for the handling of seeds and other foods, and for their cleaning and storage (Tapia-Landeros and Grijalva, 2012). As the need to use and store plants for food, or to make utensils or tools with them lessened, some community members began to apply the same techniques to making decorative items that could be sold. The elaboration of handicrafts with reed and willow continue to be some of the most important activities within San Jose de la Zorra, and an important element for community sustenance (Field Observation, 2019). Kumiai artisans sell their hand-made jewelry and elegant basketry in local shops, shows and craft events, and the increasing demand "has become a major force in the local economy, where a large percentage of the local residents now depend to some degree on the income generated by this traditional activity" (Andrade-Sánchez et al., 2021).

Certain vegetal species are considered sacred in Kumiai culture, such as the white sage (*Salvia apiana*) native to coastal scrub and chaparral in Baja California and California. Aside from its use in sacred cleansing rituals, white sage is known to benefit the respiratory system (Córdova et al., 2016). These characteristics have garnered interest among members of the general public, which has led to an ongoing illicit harvest that increased dramatically in response to the SARS-CoV-2 (COVID-19) pandemic, when white sage products were offered by international online markets such as Amazon and Walmart (Ramirez et al., 2022). The significant uptake in the illicit overharvesting of white sage was observed by local native groups and documented by the NGO Terra Peninsular. This situation is concerning because white sage serves the local ecosystem in many ways, providing refuge and food for mammals and pollinating insects. It also carries cultural meaning in the form of medicinal, culinary and ceremonial uses for native peoples. The small-scale harvesting of white sage, as well as other plants and seeds such as acorns, rush and willow, is vital for maintaining cultural practices and contributing to the Kumiai economy, underscoring the importance of maintaining their sustainable management (Galván et al., 2016).

Workshop results underscored the need to preserve traditional knowledge and to reinforce the connection with natural foods. Participants mentioned the importance of conserving certain species due to reductions in their habitat availability associated with climatic changes as well as human activities such as grazing practices. Oak, sage, yerba santa ("holy

herb") and prickly pear were specifically singled out for their edible, medicinal and culturally relevant qualities. Oak (*Quercus agrifolia*) is emblematic of the Kumiai culture, as it provides shelter from sun and rain, as well as the acorns that are central to their traditional food system. Yet, not all Kumiai houses are sheltered by oaks, hence the need to propagate this species. Sage (*Salvia apiana, discussed above) was mentioned* for the use of its leaves for incense and medicine). Yerba santa (*Eriodictyon sessilifolium*) is significant for its medicinal uses, while prickly pear (*Opuntia* spp.) is an important food that has been shown to control blood sugar levels.

Workshop results also revealed important barriers to maintaining a healthy diet. Participants identified the lack of fresh food availability in the community…"*In the community we only have three stores to stock our pantries, but nothing fresh, everything is packaged. If you want fresh things for the daily meal, you have to leave the community and you can't always go, because it's difficult to do so*" (Interlocutor 5, personal communication, march 2020). Because the collection of traditional wild foods can be difficult, sometimes involving a major effort, participants expressed an interest in growing their own native and non-native foods in family vegetable gardens. This also explains the fact that certain ingredients, such as pinto beans and wheat, that are readily available in stores, have been adapted for the preparation of dishes considered traditional. Despite these factors, members of the community still collect wild plants from the immediate environment for food and medicinal purposes. In the following section we discuss an emerging and relevant topic as a subquestion of the second research question, namely: what nutritional value is provided by Kumiai traditional foods?

Kumiai knowledge about the nutritional value of traditional foods

The Kumiai worldview understands everything as being related through the natural order, such that wild foods that are consumed also have curative properties (Cortés-Rodríguez and Venegas-Cardoso, 2011; Wilken-Robertson, 2018; De la Fuente Ruiz, 2019). Present-day Kumiai ethnobotanical knowledge is seen as a kind of "green health insurance" that is shared among people who live in the area where medicinal and edible plants grow (Wilken-Robertson, 2018). Weiss (1994) presented evidence "to support the theory that Kumiai ancestral menus and lifeways of the past protected genetically susceptible populations from developing diabetes" (p. xv), specifically by controlling blood sugar levels (p. 190).

Some studies have shown that the elimination of traditional foods from the daily diet can adversely affect people's health, and can be potentially associated with an increased incidence of adult onset obesity and diabetes, which in turn can be related to the quality of food consumed today (Villela and Palinkas, 2000; cited in Nabhan, 2006, p. 130). Kumiai community members perceive that the industrialized food that has come to prevail in their current dietary practices can exert a negative influence on their health, and that the foods that once formed the basis of their grandparents' and distant ancestors' diet, contained beneficial nutritional properties: "There have been many people my age who have been sick and diabetic; I think it is due to diet, that one used to eat pure [food] from the fields, but no longer. Now people eat very differently, from cans and so on; [but] that is not healthy, [all food] should be natural" (Interlocutor 4, personal communication 2016–2019). Figure 3 shows ethnobotanical and nutritional information for three of the most important wild-food elements of the Kumiai traditional food system, as well as Kumiai knowledge and preparation techniques. These three wild foods exemplify the importance and value of ingredients in the traditional food system in terms of taste, appearance, and nutritional profile, namely, seed (acorn), berry (cherry), and leaf (watercress).

In addition to having a legitimate reputation in the diet of the Native Americans of Baja California and California, it is known that acorns (*Quercus* spp.) have more nutritional value than industrially produced modern grains such as wheat and corn (Weiss, 1994). Our interlocutors perceive their traditional dish of acorn atole to be "very nutritious food" (Field observation, 2021). Acorns are rich in tannins and provide up to 8 g of protein per 100 g (Lucero, 1995). Watercress (*Nasturtium officinale*), while believed by community members to help with liver problems and diabetes, is difficult to find due to the arid characteristics of their ecosystem. The fruit of the holly-leaf cherry or wild cherry (*Prunus ilicifolia*), is eaten during the summer season, and the leaves are used in infusions for headaches (Personal Communication, 2021); it has also been documented that traditionally the Kumiai prepare atole with cherry seeds, but with a special process because it contains cyanuric acid/hydrocyanic acid (cyanide) (Wilken-Robertson, 2018, p. 181). Our interlocutors describe using certain wild foods as remedies for common ailments such as headaches, colics (colicos) and flu, including: Yerba santa (*Eriodictyon lanatum*), Salvia (*Salvia apiana*), Yucca lechuguilla (*Hasperoyucca whipplei*), Mugwort or Feverfew (*Artemisia tridentata*).

Other foods considered part of the cultural landscape include edible wild vegetable species whose dietary consumption has been recommended for their high nutritional value (Lucero, 1995). For the Kumiai of San José de la Zorra these include manzanita (*Arctostaphylos glauca*), mustard (*Brassica nigra*), nopal (*Opuntia* spp.) and purslane (*Portulacca olaracea*). Also on this list is a peculiar edible bulb that flowers after the rainy season, which some children still search out, called "*Jalpap*" (name given by one interlocutor), a Wild Hyacinth native to the Western United States and northwestern Mexico, commonly known as blue dicks (*Dichelostemma capitatum*)

(field observation and conversation, 2016–2019). Children like to eat the bulb raw for its sweet nut-like flavor, but complain of sleepiness if they eat too much of it.

Community elders of San Jose de la Zorra reflect on their current diet of industrialized foods with high caloric content, along with a more sedentary lifestyle, and remember their grandmothers' food as healthier, requiring greater energy expenditure to procure and prepare (Personal Communication, 2019). These findings underscore the importance of native peoples' traditional food knowledge and the need to defend their presence in the local ecosystem.

The cultural transmission of traditional food knowledge

In this section we address concerns expressed by the Kumiai regarding the transmission of traditional food knowledge and practices. This inquiry is related to the second research question as it considers how certain attributes of the traditional food system will be able to maintain permanency, but also to the third research question of how can the present-day Kumiai traditional food system be valued. It is clear that its continued permanence will require the training and interest of younger generations in ancestral knowledge and ways. The Kumiai language is not written, and transmission of their cultural knowledge has always relied on oral tradition (Wilken-Robertson, 2018, p. 235). It has been mostly females—mothers, aunts, grandmothers—who have transmitted knowledge about food, and now this knowledge is in danger of fading away due to the loss of indigenous-language speakers (Garduño, 2015). We observed that food is part of a language where people can transmit their culture and an important value to food traditions.

Just as the language of native peoples has been learned through oral tradition, so have their recipes and ways of collecting, hunting, identifying and preparing the foods found in the wild. Food is intertwined with their culture and transmission of knowledge (Wilken-Robertson, 2012). We have shown how this knowledge is a product of cultural and culinary adaptation or reconfiguration through post-contact interactions, including the influx of other emerging food systems. We witness the process of continual adaptation by way of interactions with the local tourist dynamic through activities related to traditional cuisine, plant knowledge or handicraft workshops.

The questionnaire administered to 15 adults from three Kumiai communities showed that over three-quarters of them believe they have a basic knowledge about the identity and modes of preparation of their traditional foods. They name the most salient traditional food items as being acorn, sage, venison, quelite, quelite flower, deer and pigeon; and true to form, they include some items that have been adapted from cultural influences that have come their way post-missionary contact, such as corn, grapevine, and squash flowers, ingredients found in the valley area (Garduño, 2015). However, even though most of these respondents can name traditional food items, and claim to know where to find them in the wild, only 60% say they know how to prepare or preserve traditional Kumiai foods. Importantly, all of them believe it is important to transmit information about the ancient traditional Kumiai diet, and nearly all believe it important to share community knowledge about it with the surrounding region.

Today the Kumiai tend to maintain cultural independence, even though their children attend government schools built in their communities and learn in Spanish as opposed to their native tongue (Leyva, 2014). Nevertheless, some young natives' traditional knowledge is learned in childhood by listening to the elders and through educational community programs, where elders have the opportunity to teach the children about their traditions. It is observed that kitchen, classroom and community landscape have an important role for the exchange of knowledge about traditional practices and for strengthening the recognition of food and natural heritage. However it is learned, knowledge transmission has always played an important role in cultural survival (Muller, 2018), and is fundamental for the sustainability of native culture and habitats as part of the identity of contemporary Baja California natives (Wilken-Robertson, 2018).

Discussion

This study investigated the culturally-accepted foods and practices of present-day descendants of hunter-gatherers located in a particular Kumiai community, where food is not seen as a measurable indicator, but rather as a cultural construct that incorporates traditional forms of production and consumption. We have presented how the Kumiai traditional food system changed in response to historical and sociocultural exchanges. The main effect of the territorial reduction that accompanied national political development and its concomitant national and international migration, was the settlement of native groups into sedentary communities, which in turn resulted in the gradual disappearance of the semi-nomadic lifestyle and a disconnection with the coastal ecosystem. We found attributes of the present-day Kumiai traditional food system that remain functional and can be used to evaluate it in relation to the use of local resources and certain challenges presented by the local gastronomy scenario. We show how Kumiai traditional food is inextricably linked with the local environment, knowledge preservation and health. Yet in the current Kumiai community scenario we found that food alone becomes more complex, whether in reference to the everyday or the traditional, the natural or the industrialized, the globalized or the localized.

Ibarrola-Rivas and Galicia (2017) maintain that "food systems need to be oriented toward the sustainability of

ecosystems and quality of life" (p. 107). This is important, based on the direct relationship of Kumiai traditional food with its natural habitat, which is altered and threatened by abuses such as the exhaustive extraction of natural resources, or the commercialization of certain specimens of flora or fauna in response to a folkloric interest in native traditions. Such variation in the use of resources can have a negative effect on the environment and the sustainability of the local resource (Loring and Whitely, 2018).

The Kumiai of San José de la Zorra continue to adapt to a changing food system environment by engaging in economically productive family projects that incorporate traditions and customs related to native and endemic natural resources, including collecting practices, the production of artisanal handicrafts, wine production and ecotourism. This community has only just begun to explore the possibilities of developing the economic potential inherent in linking cultural activities involving tourism to its traditional food resources, food cultivation and preparation. If the traditional diet and customary uses of natural resources are part of a community's cultural heritage and provide added value as a means of subsistence, then food culture requires reference to elements and practices related to conservation of local ecosystems (Baptiste et al., 2017; IPES-Food and ETC Group, 2021).

However, the practices of the Kumiai traditional food system that have been maintained in the current socio-gastronomic setting that has flourished over the past three decades, have garnered little visibility in terms of the regional rural development process (Andrade-Sánchez et al., 2021). This is concerning given that traditional foods from indigenous cultures have been considered as a resource for tourism development, as key elements in health promotion, and as necessary for the creation of more sustainable production systems (Bringas and González, 2004; Anderson, 2005; Contreras and Thomé, 2019; Bak-Geller and Pasquier, 2020; Prunier et al., 2020). We consider that the incorporation of Kumiai ancestral territorial knowledge and efforts to sustain traditions, could improve the practices within the established industry that involves agriculture, restaurants, and tourism. Grey and Newman (2018) maintain that the market can incentivize the incorporation of indigenous foods into a larger gastronomic scenario. Nevertheless, it will require a concentrated effort to make the native traditional food system visible to this ongoing development, and to link some part of the development not only to knowledge about the nutritive value of the wild foods found in the territory, but to the repository of knowledge and techniques represented by members of Kumiai culture (Kuhnlein et al., 2019).

Our work confirms the observations found in the literature that in the Kumiai food system, the traditional diet stands in sharp contrast to the diet of the last 30 years where the availability and consumption of, and preference for industrialized and refined foods has prevailed (Cortés, 1994; Weiss, 1994; Fleuriet, 2003, 2009). The recognized nutritional value of certain elements of the traditional food system affords them a role in general health and health maintenance (Nabhan, 2006). Although not the focus of this research, there is an inseparable relationship between health and the consumption of traditionally grown or harvested foods. Different studies have highlighted the role of dietary change from traditional to industrialized foods, as risk factors for the development of obesity and type 2 diabetes among native groups in the arid America region, including the Kumiai of Baja California (Weiss, 1994; Alvarado-Ozuna et al., 2001; Fleuriet, 2003, 2009; Nabhan, 2006; Longstreth and Wilken-Robertson, 2010). This situation constitutes a diet-related national health concern (Bertrán and Pasquier, 2021) that we deem worthy of future study.

Another topic for future study that we identify, involves the concept of food sovereignty, defined as "the right of peoples to control their own seeds, land, water and food production, through local, autonomous (participatory, community and shared) and culturally appropriate production, in harmony and complementation with mother earth" (Comité Internacional para la Soberanía Alimentaria-Coordinación Regional América Latina y el Caribe 2012, cited in Micarelli, 2018: 120). This concept implies the importance of sustaining communities together around a number of activities, including food production, appropriation, promotion of indigenous traditional knowledge and the ecologically responsible use of land for farming (Chappell et al., 2014; Grey and Newman, 2018; Prunier et al., 2020). The period of the SARS-CoV-2 (COVID-19) pandemic saw increased interest in home gardening among Kumiai community members. However, a serious attempt to address food sovereignty would require addressing community organization in terms of who performs collection or cultivation in the traditional food system and how they do it (Wittman, 2011), as well as addressing the opportunity to generate community initiatives that aim to revalue and integrate some traditional foods into local marketing circuits in support of their local economy.

We underscore the importance of examining and diffusing human knowledge about the natural habitats of foods, where local food cultures act as the axis that guides and maintains the local food system (Béné et al., 2019). Research among existing native groups in Baja California shows that such expertise is in danger of becoming lost since few people remain who can speak of traditional knowledge and transmit traditional practices (Leyva, 2014; Garduño, 2015; Galván et al., 2016; Wilken-Robertson, 2018). We propose that knowledge about the traditional food system be introduced to younger generations through participative workshops and memorialized in the form of written materials. Not only will this contribute to the cultural sustainability of the Kumiai tribe, it will offer the potential of fostering the development of future generations' own alternative means of endemic food production within the framework of the tangible and intangible values of their heritage (Joseph and Turner, 2020).

This study illustrates an approach to the traditional food system by way of what we term the axis of nature-food-knowledge, which emphasizes the health of food environments, and we offer it as a reference for other traditional food systems with similar contexts. One of the strengths of this research is the documentation of knowledge that is being lost as part of the cultural and natural heritage of the region. Our goal is to diffuse this knowledge so that those who visit this region and those who decide to live here, will develop an awareness and respect for the surrounding natural resources and their uses, and the native culture that developed a food system based on these resources that perdured for many thousands of years. A perceived weakness of this research is the small number of interlocutors interviewed who retain memories of the traditional food system as practiced by their ancestors–roughly half of those who continue to live in the community. This factor lent more urgency to the project, owing to the belief that this knowledge forms an important part of the cultural heritage of the region, and needs to be revalorized by the current generation.

Conclusions

The native community of San José de la Zorra provides an example of how a traditional food system can function as an elemental link between culture and environment. Their small-scale use of complementary agricultural practices corresponds to the same seasonal availability of undomesticated foods that gave rise to their original semi-nomadic lifestyle, providing cultural resistance to the modern hegemonic industrialized food system and bringing into the twenty-first century an ancient wisdom about a semi-arid ecosystem where scarcity is a part of the natural cycle. This connection of food knowledge with local ecosystems where indigenous populations are found, allows opportunities for the implementation of traditional knowledge in the form of conservation strategies, as well as the revaluation of traditional wild foods. We conclude that the characteristics of the Kumiai traditional food system not only strengthen their cultural identity and community economies, but also present potential solutions to the problem of food system sustainability by way of wild food resource management, that contains elements of a strategy for improving the health of community members.

Data availability statement

The original contributions presented in the study are included in the article/supplementary materials, further inquiries can be directed to the corresponding authors.

Ethics statement

The studies involving human participants were reviewed and approved by Institutional Review Board of the Autonomous University of Baja California. The participants provided their written informed consent to participate in this study.

Author contributions

MB, JL, MV-C, NC, and CGu contributed to design. CGu contributed to data analysis. CGu and CGl contributed in writing. CGl contributed to revision and translation. MB, JL, MV-C, and NC contributed in articulation and review process. All authors have made an intellectual contribution to the article, read, and approved the final manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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